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Resource Availability Differentially Influences Women's Perceptions of Same- (Versus Cross-) Sex Others' Competitiveness

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Across four studies, the current research tested the prediction that women would perceive greater competitive tendencies in same- (vs. cross-) sex others when resources were scarce. Contrary to predictions, results found evidence that women perceived more competitive tendencies in same- (vs. cross-) sex targets when resources were abundant. Study 1 demonstrated that women (but not men) perceived greater competition within groups of female same-sex targets (vs. groups of male same-sex targets and groups of cross-sex targets) residing in ecologies where resources were widely available; no such pattern emerged when judging competition within groups residing in ecologies where resources were scarce. In Study 2, women (but not men) who held relatively low levels of resource scarcity beliefs (i.e., those who believed resources were relatively abundant) attributed greater competitive tendencies to same-sex targets than cross-sex targets. Study 3 showed that enacting a resource abundance (but not a scarcity) mindset led women to expect same-sex targets to behave more competitively toward them than cross-sex targets; this effect, however, did not replicate in Study 4. With the exception of Study 4, these data suggest that, contrary to intuition—and our predictions—women perceive same-sex others to be more competitive than cross-sex others when resources are abundant.

Public Significance Statement

This research shows that women perceive other women to be more competitive than men in contexts where resources are abundant. These findings were not present in men and were not found in contexts of scarcity. As such, this work suggests that resource abundance might have important implications for women's interpersonal interactions with other women.

Keywords: abundance, female intrasexual competition, person perception, resources, scarcity

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A common theme in popular culture is that scarcity leads women to view other women as competitive threats. For instance, according to a recent article published in the women's magazine *Elle*, when women view jobs or career opportunities to be scarce, they tend to view other women as competitors (Bright, 2019). Although this claim makes intuitive sense, it neglects to consider the idea that, when competing over tangible resources such as jobs, women are not only competing against women—they are also competing against men. However, might scarcity differentially impact how

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women view the competitive tendencies of their same- and cross-sex peers?[1]

Here, the current work draws from research and theory on female social relationships, female competition, and resource availability to develop evolutionarily informed predictions about the effects of resource availability cues on women's perceptions of same- and cross-sex others' competitiveness. Specifically, we reason that women, but not men, will evaluate same-sex others as more competitive than cross-sex others when resources are scarce. By establishing a linkage between resource availability and women's perceptions of same- and cross-sex others' competitiveness, the current research seeks to provide insights regarding the relationship between these two variables and to highlight the role they may play in women's social relationships.

Female Social Relationships

Social bonds among females carry a multitude of benefits for survival and reproductive success. For instance, in nonhuman primates, female–female social bonds are associated with decreased stress (Silk et al., 2006) and increased infant survival (Silk et al., 2003). In humans, female–female social bonds have similar, important benefits. Female social partners can provide alloparenting (i.e., caregiving to nonoffspring) support, which is reasoned to increase the likelihood of infant survival (Hrdy, 2009) and reproductive output (Isler & van Schaik, 2012). Moreover, female–female social bonds in women are associated with increased overall well-being (Knickmeyer et al., 2002). Women, as compared with men, are also more likely to emphasize friendships as part of a well-lived life (e.g., Benenson, 2014; Krems et al., 2017).

Although women report having closer and more supportive relationships with their same-sex peers than do men (Baumgarte & Nelson, 2009), beginning in childhood, women are less affiliative with, tolerant of, and invested in these peers than are men (Benenson & Alavi, 2004; Benenson et al., 2009, 2015). Girls are commonly thought to be more social than boys, however, research shows that girls spend less time with their same-sex peers than boys, a tendency that arises in early childhood (Benenson et al., 1998, 2012, 2015). For instance, Benenson and colleagues (2012) studied this phenomenon using a paradigm where 3- to 5-year-old children could choose to play with an adult, a familiar same-sex peer, or alone. Compared with boys, girls were shown to spend less time interacting with a same-sex peer. Not only do boys spend more time than girls interacting with same-sex peers, they also appear to enjoy these interactions more (Benenson et al., 1998).

Women's relationships with their same-sex peers are frequently characterized by uncertainty and conflict, a pattern of behavior that can be seen in girls as young as 10 years old (Lange et al., 2005). This discord does not seem to dissipate as women continue into adulthood. College-aged women report experiencing more disagreements or "falling outs" with their female peers compared with similarly aged men's reports of their male peers (Dunbar & Machin, 2014; see also Benenson, Kuhn, et al., 2014; Reynolds, 2021). This could be because, compared with men, women have higher expectations for relationships with same-sex peers (Elkins & Peterson, 1993; Hall, 2011) and lower thresholds for interpersonal conflict in these relationships (Benenson et al., 2009; Vigil, 2007). For instance, women report being more bothered than men by their same-sex peers' style of social interaction and interests (Benenson et al., 2009). Women also report more anger than men in response to a same-sex peer's social transgressions (Benenson, Kuhn, et al., 2014). Women are not only more angered and bothered by same-sex peers' transgressions, they are also more likely than men to report ending a friendship when a transgression has occurred (Vigil, 2007). Although the thought of losing a relationship with a same-sex peer is highly distressing for women, such relationships nevertheless tend to be relatively fragile, and hence, shorter in duration than those of men (Benenson & Alavi, 2004; Benenson & Christakos, 2003).

Perspectives drawn from evolutionary theory posit that this sex difference in sociality occurs because selection pressures have favored tendencies for males to work collaboratively with each other to garner resources (e.g., hunting) and to combat rival groups of men (Geary, 1998; Wrangham, 1999). Providing support for this perspective, meta-analytic findings show that men's same-sex interactions are characterized by more cooperation and less conflict than women's same-sex

[1] Instead of the more historically common "opposite-sex," we use the term "cross-sex" here for a few reasons, including those related to the updating of language for inclusivity as well as for ease of discussing male–male and female–female (same-sex) interactions versus cross-sex (male–female, female–male) interactions throughout.

interactions (Balliet et al., 2011). Moreover, beginning in early childhood and continuing into adulthood, unrelated men spend more time working together on shared activities than do women (Benenson et al., 1997; Caldwell & Peplau, 1982). That men's same-sex interactions are characterized by more cooperation and less conflict than women's suggests that the benefits available to men from positive interactions with their same-sex peers may be greater than those available to women. Indeed, simply adding another unrelated male to the group increases that group's formidability in intergroup contests, thus benefiting other males in that group. Adding another unrelated female to the group does not yield similar benefits for same-sex members. Although unrelated women in traditional hunter-gatherer societies (i.e., the Hadza) do engage in alloparenting, this is relatively rare; the majority of alloparenting comes from female kin (Crittenden & Marlowe, 2008). Drawing on nonhuman primate data, Benenson et al. (2013) suggest that the addition of a newcomer female carries greater potential threats (e.g., to existing mateships, necessitates greater travel to access desirable food sources, etc.) than benefits for same-sex group members.

Consistent with this idea, when comparing the amount of assistance sought and received from same-sex peers (vs. parents), men indicate both seeking and receiving greater assistance from same-sex peers than did women (Benenson, Saelen, et al., 2008). Other research has examined sex differences in willingness to cooperate and collaborate with same-sex peers in the competitive field of academia. For instance, Massen and colleagues (2017) find that men are more willing to share their papers and data with same-sex peers than are women. Further, men who are full professors are more likely to publish academic papers with same-sex assistant professors in their department than are women (Benenson, Markovits, & Wrangham, 2014). Taken together, this research suggests that women are less cooperative and affiliative with same-sex peers than are men.

Women's Same-Sex Competition

Why, and under what conditions, do women compete with their same-sex peers? Competition among same-sex others is common in men and women, and both tend to compete more with same- than cross-sex others (Cashdan, 1998; Elsesser & Lever, 2011). Sex differences emerge in the form such competition takes, however. Women's competition can differ from men's, in that women strongly prefer to compete in an indirect (i.e., covert) manner, such as excluding a rival or spreading harmful rumors; moreover, women tend to hide, disguise, and deny their competition with one another (Benenson, 2013; Björkqvist et al., 1992; Vaillancourt, 2013). Men's same-sex competition, on the other hand, is more likely to be direct (i.e., face-to-face) and can involve physical aggression (Archer, 2004; Ainsworth & Maner, 2012; Griskevicius et al., 2009).

Evolutionary theories of intrasexual competition suggest that women's same-sex competition is more akin to scramble competition, such that women often compete alone and often for more widely-dispersed resources than do men (Benenson & Abadzi, 2020), which may be more harmful for women's same-sex relationships. Men's same-sex competition is qualified by the need to maintain coalitional alliances with same-sex others to attain resources and facilitate successful intergroup conflict (i.e., warfare; Baumeister et al., 2017; Benenson, 2009). As such, men's same-sex competition tends to be more good-natured and less harmful for same-sex social relationships than women's same-sex competition (Schneider et al., 2005, 2007). For instance, men are less likely than women to exclude a temporary alliance partner (Benenson et al., 2013) and are more likely to engage in affiliative contact following a competition (Benenson & Wrangham, 2016).[2]

While the majority of the extant literature on women's same-sex competition has focused on mate attraction (for review see Fisher & Krems, in press; Krems et al., in press), evolutionary theoretical perspectives suggest that women's competition with same-sex others centers on issues related to both mate attraction and resource acquisition (Benenson, 2013; Campbell, 2004).[3] Given that access to resources poses a greater limiting factor on female reproductive success than access to mates (Stockley & Bro-Jørgensen, 2011), women are expected to exhibit competition over resources (Stockley & Campbell, 2013). To the extent that

[2] Here, we focus on women's same-sex competition (for an overview of men's competition, see Benenson, 2014; Krems et al., in press).

[3] Here, it bears noting that women's competition occurs in domains beyond mating and resource competition. Although not commonly researched, women's competition occurs across the lifespan (Low, 2017), including competition over status (Benenson & Abadzi, 2020) and child-rearing (Linney et al., 2017).

mates can be a primary route to resources, then we would of course expect competition over mates as well. Consistent with this perspective, Tsimane women report frequent same-sex conflicts over food resources and men (Rucas et al., 2012). Similarly, college-aged women in the United States (U.S.) report that their competitive interactions with their same-sex peers occur most frequently over success at work, male attention, and looking attractive (Cashdan, 1998). Here, we provide a brief overview of the literature discussing women's competition over mates before delving into the research examining women's competition over resources.

Much of the research examining women's competition for romantic partners has focused on the important role of context and rival characteristics. For example, research finds that women's same-sex competition increases when potential mates are scarce (Arnocky et al., 2014; Moss & Maner, 2016). In one study, researchers found that women reported higher levels of intrasexual competition, indicating an increased tendency to view same-sex members competitively, after reading an article describing men as becomingly increasingly scarce (Arnocky et al., 2014). Others find that the evaluation of the competitive threat posed by same-sex others varies as a function of rival's personal characteristics, specifically physical attractiveness. That is, given that men place high value on potential mates' physical attractiveness (Li, 2007; Li et al., 2002; Li & Kenrick, 2006), women view highly attractive same-sex others as the greatest threat to their mating goals (Fink et al., 2014). Men, on the other hand, exhibit an increased preference to affiliate with attractive same-sex peers in mating (as compared with neutral) contexts, indicating that men may be driven to cooperate with desirable same-sex others to achieve their mating goals (Buunk & Massar, 2014).

Given that men prefer female mates who are attractive, women with high trait levels of intrasexual competition (or those who have had intrasexual competition and mate attraction goals made salient) report an increased desire to use and buy products to enhance their attractiveness (Arnocky & Piché, 2014; Hill & Durante, 2011; Hudders et al., 2014). For instance, Arnocky and Piché (2014) demonstrated that women's tendency to view same-sex members competitively predicted their desire to spend money on cosmetic surgery procedures. Others have experimentally manipulated intrasexual competition and mate attraction goals via the display of highly attractive photographs of same- and cross-sex others (Hill & Durante, 2011; Hudders et al., 2014). This research finds that, when such goals are made salient, women report a greater desire to engage in potentially risky beautification procedures, such as consuming dangerous diet pills (Hill & Durante, 2011). Together, this research demonstrates that women's competition for mates can impact their views of potential same-sex rivals and subsequent competitive behavior.

Relatively less research has focused on women's same-sex competition over resources, although women are theorized to frequently compete with one another over financial and physical resources (Campbell, 1999, 2004). Much of the research examining the extent to which women compete with same-sex others over resources has been done using a variety of economic games. This work suggests that women are competitive with one another over resources, and that there are some distinct patterns of resource competition among women. For example, Geniole and colleagues (2015) examined men's and women's retaliation toward alleged same-sex partners using the Point Subtraction Aggression Paradigm. Participants were given three options: they can choose to earn points, protect their points, or steal points from the other player. Instructions relayed that stealing points would not increase the player's number of points; it would simply detract points from the other player's total. During the game, the alleged opponent randomly steals points from the participant. The dependent variable of interest was retaliation (i.e., proportion of "steal" options out of all other options). Results provided evidence that women's retaliation toward fictious same-sex opponents increased when more (vs. less) points were stolen. This pattern was not found in men. A follow-up study revealed that women (but not men) who exhibited more retaliation toward same-sex partners reported that they did so because they were motivated to protect their resources. This research suggests that, when competing over resources, women are more retaliatory toward same-sex opponents than are men.

Additional economic games research further demonstrates that women's, but not men's, resource competition differs based on the sex of their opponent. When competing against same-, as compared with cross-, sex opponents, women exert more effort (Mago & Razzolini, 2019), are less generous (Ben-Ner et al., 2004; Eckel & Grossman,

2001; but see Saad & Gill, 2001), and are more competitive (Sutter et al., 2009). Men's behavior in these games does not typically differ based on the sex of their opponent. Together, this research suggests that women are more likely to compete over resources with same-sex than cross-sex others, and that women behave more competitively toward same-sex opponents than do men when competing over resources.

Resource Scarcity and Competition

Intensity of competition over resources typically increases when resources are (or are perceived to be) scarce (Grossman & Mendoza, 2003; Kristofferson et al., 2016; Roux et al., 2015; Sirola & Pitesa, 2017; Wheeler et al., 2010); moreover, making resource scarcity salient seems to affect people's perceptions of interpersonal competition. For example, activating a scarcity mindset, via having participants recall previous experiences of resource scarcity, both increases the salience of competition and also increases one's competitive orientation (Roux et al., 2015). Other research manipulating scarcity via limited quantity product advertisements finds that portraying products as being limited (vs. abundant) increases beliefs that others pose a competitive threat (Kristofferson et al., 2016). Together, this research suggests that resource scarcity can increase both one's own and also perceptions of others' competitiveness.

If, as the above economic games work suggests, women are more competitive over resources with same-sex others than are men, then cues of resource scarcity might particularly affect perceptions of women's same-sex competition. There is some support for this proposition. For example, correlational data link higher rates of female–female assault in areas where women's unemployment levels are high (Campbell et al., 1998). Experimental research—albeit among children—finds that, under conditions of scarcity, females form more exclusionary alliances and engage in higher levels of interference competition (i.e., directly interfering with others' ability to access resources) with same-sex others than do males (Benenson, Antonellis, et al., 2008; Roy & Benenson, 2002). To the best of our knowledge, however, little research has examined whether contexts of scarcity differentially influence adult women's (vs. men's) competition with same- and cross-sex others.

The Current Research

The current research was designed to examine whether resource availability differentially influences men's and women's perceptions of competitiveness in same- and cross-sex peers. Here, perceptions of competitiveness refer to evaluations of competitive traits and behavior. This research, to the best of our knowledge, is the first to examine both men's and women's perceptions of competitiveness in same- and cross-sex others. The original hypothesis was that, under conditions of scarcity, women, but not men, would perceive greater competitive tendencies in same- (vs. cross-) sex others. This reasoning was based on evolutionary perspectives on intrasexual competition—notably on work suggesting that men's competition is qualified by the need to maintain coalitional alliances with same-sex others to attain resources (Baumeister et al., 2017; Benenson, 2009) and research showing that conditions of scarcity intensify the competitive same-sex behavior of girls, but not boys (Benenson, Antonellis, et al., 2008; Roy & Benenson, 2002).

Four studies were conducted to test this hypothesis. Study 1 was designed to examine whether observers differentially evaluate competitiveness within groups of female same-sex targets, groups of male same-sex targets, and groups of cross-sex (male and female) targets in environments where resources were described as scarce or readily available. Given the pattern of results that emerged in Study 1, Studies 2–4 tested between competing hypotheses, testing the original hypothesis against the updated hypothesis that under contexts of abundance, women (but not men; Study 2) would evaluate same-sex targets as more competitive than cross-sex targets. Study 2 aimed to establish proof of concept, examining whether there is a real-world relationship between resource-scarcity beliefs and perceptions of same- and cross-sex others' competitiveness. Studies 3 and 4 sought to examine whether experimentally eliciting thoughts of resource scarcity (vs. availability) impacts women's evaluations of same- (vs. cross-) sex others' competitiveness.

Study 1: Beliefs About Others' Competitiveness as a Function of Resource Availability

Past research finds that information about resource availability in a given ecology influences

perceivers' evaluations of the behavioral tendencies of individuals residing in that ecology (Neuberg & Sng, 2013; Williams et al., 2016). For instance, Williams and colleagues (2016) found that individuals residing in resource scarce ecologies are perceived to be more impulsive and opportunistic than those residing in ecologies where resources are plentiful. Building on these findings, the purpose of Study 1 was to examine whether social perceivers use cues of environmental resource availability when making judgments about the competitive behaviors of those who reside in these environments. Importantly, Study 1 was designed to examine whether men's and women's beliefs about others' competitiveness in resource scarce (vs. abundant) environments varies based on the sex of the targets being evaluated (i.e., groups of female same-sex targets, groups of male same-sex targets, groups of cross-sex [male and female] targets). Examining men and women's perceptions of same- and cross-sex targets' competitiveness is relatively novel, as past, related research has focused solely on same-sex targets. Cross-sex target groups were also included to help establish whether environmental conditions specifically influenced beliefs about competitiveness in same-sex interactions or more generally influenced beliefs about competitiveness among all groups in that environment.

Based on previous research showing that individuals residing in harsh, resource scarce ecologies are perceived to behave more opportunistically than those residing in resource plentiful ecologies (Williams et al., 2016), conditions of resource scarcity were expected to increase perceptions of competitive interactions for all targets. Moreover, perceptions of competitiveness among the targets were expected to differ in the resource scarcity environment. Specifically, in resource-scarce environments, observers were expected to perceive more competitive interactions occurring among female same-sex targets than male same-sex targets and cross-sex targets. The rationale for this prediction is drawn from prior research and theory on the nature of competition in men and women. Evolutionary theories of intrasexual competition suggests that men's competition is qualified by the need to maintain coalitional alliances with same-sex others to attain resources (Baumeister et al., 2017; Benenson, 2009). As such, men's competition tends to be more good-natured and less harmful for same-sex relationships than that exhibited in women (Schneider et al., 2005, 2007). For instance, men are less likely than women to exclude a temporary alliance partner (Benenson et al., 2013) and are more likely to engage in affiliative contact following a competition (Benenson & Wrangham, 2016). Other research finds that, conditions of resource scarcity tend to intensify the competitive same-sex behaviors of girls, but not boys (Benenson, Antonellis, et al., 2008; Roy & Benenson, 2002). Taken together, this research suggests that, in contexts of scarcity, observers should perceive female same-sex target groups to have more competitive interactions than male same-sex and cross-sex target groups.

Method

Participants

See online supplemental materials for a priori power analysis. Ultimately, 243 undergraduate students participated. Prior to data analysis, participants were excluded for: failing attention filters (n = 7); biased-responding (i.e., selecting the same response for every item across all dependent variables; n = 5); or indicating that they had worked as a research assistant in the lab conducting the research (n = 2), leaving a total of 229 participants (119 female; M_{age} = 19.81, SD_{age} = 1.85; age range: 18–31).

Design and Procedure

Study 1 utilized a 2 (participant sex: male vs. female) × 2 (resource availability condition: scarce vs. abundant) × 3 (target groups: female–female, male–male, vs. male–female) mixed-factorial design, with the last factor measured within subjects. Participants were told that they would be asked to generalize about various behaviors and attitudes groups of people might hold in specific environments. Via Qualtrics software, participants were randomly assigned to read a brief vignette describing an environment where resources were scarce (n = 112) or abundant (n = 117); vignettes were accompanied by images used in previous research (Williams et al., 2016) depicting the described environment. The resource scarcity vignette read: "Imagine a poor, economically underdeveloped community where money and jobs are scarce and unpredictable, and opportunities are limited." The resource abundance vignette read: "Imagine a wealthy, economically developed community where money and jobs are plentiful and expected to be available well into the future."

Participants were then asked to complete three 10-item measures, completed once for each target group, assessing the extent to which they believed competitive interactions occurred within groups female same-sex targets, groups of male same-sex targets, and groups of cross-sex (male and female) targets in that environment. To control for potential order effects, the presentation of these measures was counterbalanced between participants. Although the wording of the items varied based on the sex of the targets (e.g., female same-sex targets: "In this environment, women are competitive when interacting with other women."), the same 10 items were completed for all target groups (i.e., deceptive, truthful [reverse coded], hostile, friendly [reverse coded], manipulative, sincere [reverse coded], selfish, generous [reverse coded], competitive, and collaborative [reverse coded]). All items were responded to on 7-point scales (1: *strongly disagree*; 7: *strongly agree*). Mean composites for ratings of competitiveness were computed by averaging the items across each measure (*female–female:* $\alpha = .86$; *male–male:* $\alpha = .88$; *male–female:* $\alpha = .87$). Following completion of these measures, participants responded to standard demographic items, items assessing attention and suspicion, and were debriefed.

Results

To test the hypotheses, a 2 (participant sex: male vs. female) × 2 (resource availability condition: scarce vs. abundant) × 3 (target groups: female–female, male–male, vs. male–female) mixed-model analysis of variance (ANOVA) was conducted. Supporting our hypothesis, results revealed a main effect of resource availability condition, with higher ratings of competitiveness for targets in the scarcity condition ($M = 4.37$, $SE = .07$) than in the abundant condition ($M = 3.54$, $SE = .07$), $F(1, 225) = 72.15$, $p \leq .001$, $\eta^2 = .19$. A main effect of target groups also emerged, $F(2, 450) = 7.78$, $p \leq .001$, $\eta^2 = .01$. Pairwise comparisons using Bonferroni corrections to control for multiple comparisons revealed that male same-sex target groups ($M = 4.05$, $SE = .06$) were rated as having higher competitiveness than groups of cross-sex targets ($M = 3.86$, $SE = .06$; $p \leq .001$). Ratings of competitiveness did not differ between female ($M = 3.96$, $SE = .06$) and male same-sex target groups ($p = .334$), nor did differences emerge between female same-sex and cross-sex target groups ($p = .068$). No main effect of participant sex emerged ($p = .644$).

Results additionally provided evidence of a significant two-way interaction between resource availability condition and target groups, $F(2, 450) = 23.26$, $p \leq .001$, $\eta^2 = .02$. See Table 1 for descriptive statistics. Here, we probed this interaction by examining differences in perceived target groups' competitiveness within each resource availability condition. Simple effects tests revealed ratings of target groups' competitiveness differed in the resource scarcity condition, $F(2, 224) = 13.00$, $p \leq .001$, $\eta^2 = .01$. That is, in resource scarce environments, male same-sex target groups were rated as having higher levels of competitiveness than female same-sex and cross-sex target groups ($ps \leq .001$). Although cross-sex target groups were rated as having higher competitiveness than female same-sex target groups under conditions of scarcity, this comparison was not statistically significant ($p = .054$). This pattern of results does not support the original prediction that in resource scarce conditions female same-sex target groups would be perceived to have higher levels of competitive interactions than male same-sex and cross-sex target groups. Instead, these results suggest that observers perceive more competitive interaction to occur in groups of men (vs. groups of women and cross-sex groups) under conditions of scarcity.

Simple effects tests further revealed differences in perceptions of target groups' competitiveness for the resource abundance condition, $F(2, 224) =$

Table 1
Study 1 Ratings of Target Groups' Competitiveness Within Resource Availability Condition

Condition	Female–Female	Male–Male	Male–Female
Scarcity	4.18 (.95)[a]	4.59 (.87)[b]	4.34 (.87)[a]
Abundance	3.73 (.79)[a]	3.52 (.78)[b]	3.38 (.81)[b]

Note. Standard deviations provided in parentheses. Row means that do not share a superscript significantly differed by Bonferroni-corrected pairwise comparisons ($ps \leq .014$).

16.73, $p \leq .001$, $\eta^2 = .01$. That is, in environments where resources were plentiful, female same-sex target groups were rated as having higher competitiveness than male same-sex ($p = .014$) and cross-sex ($p \leq .001$) target groups. No differences emerged between male same-sex and cross-sex target groups ($p = .085$). These results suggest that under conditions of abundance, observers perceive more competitive interactions to occur among women than among men and in cross-sex groups, which is directly opposite to our original prediction. No other significant two-way interactions emerged ($ps \geq .833$).

Although not predicted in advance, these effects were qualified by a three-way interaction between participant sex, resource availability condition, and target groups, $F(2, 450) = 5.29$, $p = .004$, $\eta^2 = .004$. See Table 2 for descriptive statistics and Figure 1 for graphical depiction of results. Here, we probed this interaction by examining men's and women's ratings of target groups' competitiveness within each resource availability condition.

In the resource scarcity condition, significant differences in ratings of target groups' competitiveness emerged for women, $F(2, 224) = 13.15$, $p \leq .001$, $\eta^2 = .01$, but not men ($p = .087$). That is, in contexts of resource scarcity, women rated male same-sex target groups as having higher levels of competitiveness than female same-sex and cross-sex target groups ($ps \leq .001$). Women's ratings of competitiveness between female same-sex and cross-sex target groups in contexts of scarcity did not differ ($p = .068$). These results indicate that women, but not men, perceive male same-sex target groups to have more competitive interactions in contexts of scarcity than female same-sex and cross-sex target groups.

In the resource abundance condition, significant differences in ratings of target groups' competitiveness emerged for both men, $F(2, 224) = 7.07$, $p = .001$, $\eta^2 = .004$, and women, $F(2, 224) = 12.16$, $p \leq .001$, $\eta^2 = .01$. Men's ratings of male and female same-sex target groups' competitiveness in the resource abundance condition did not differ ($p = 1.000$), but they did rate both male ($p = .024$) and female ($p = .005$) same-sex target groups to have higher levels of competitiveness than cross-sex target groups. Women rated female same-sex target groups as having higher levels of competitiveness than both male same-sex and cross-sex target groups in contexts of abundance ($ps \leq .001$); their ratings of competitiveness between male same-sex and cross-sex target groups in the resource abundance condition did not differ ($p = 1.000$).

Discussion

Results did not support the prediction that observers would perceive more competitive interactions to occur within female same-sex target groups than male same-sex and cross-sex target groups in environments where resources are scarce. Instead, results demonstrated that observers perceive more competitive interaction to occur within male same-sex (as compared with female same-sex and cross-sex) target groups under conditions of scarcity. Although not predicted in advance, perceptions of competitiveness among the target groups differed in the resource abundance condition, suggesting that when resources are abundant, observers perceive female same-sex target groups to have higher levels of competitive interaction than male same-sex and cross-sex target groups. Moreover, this pattern of results was found to be sex-differentiated. That is, in environments where resources were plentiful, women perceived more competitive interactions to occur within groups of female same-sex (as compared with male same-sex and cross-sex) targets. However, men's perceptions of competitive interactions occurring within male

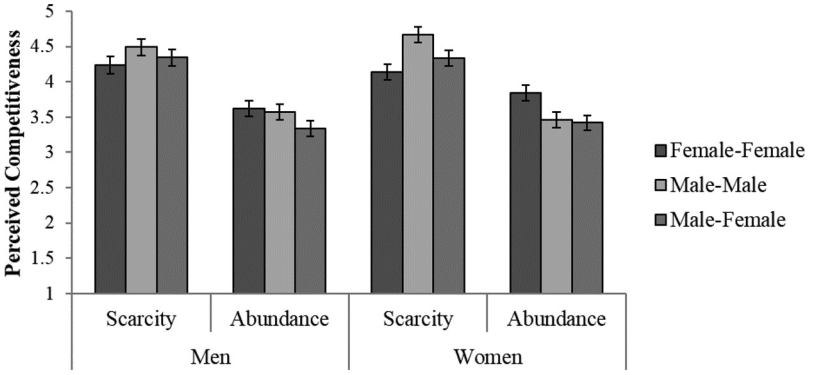
Table 2
Study 1 Ratings of Target Groups' Competitiveness as a Function of Resource Availability Condition and Participant Sex

	Men		Women	
Target group	Scarcity	Abundance	Scarcity	Abundance
Female–Female	4.24 (.79)[a]	3.62 (.80)[a]	4.14 (1.06)[a]	3.85 (.77)[a]
Male–Male	4.49 (.61)[a]	3.57 (.76)[a]	4.67 (1.04)[b]	3.46 (.79)[b]
Male–Female	4.34 (.73)[a]	3.34 (.78)[b]	4.34 (.98)[a]	3.42 (.84)[b]

Note. Standard deviations provided in parentheses. Column means that do not share a superscript significantly different by Bonferroni-corrected pairwise comparisons ($ps \leq .021$).

Figure 1

Results From Study 1: Effects of Resource Availability Condition on Men's and Women's Ratings of Competitiveness in Female Same-Sex, Male Same-Sex, and Cross-Sex Target Groups



Note. Error bars represent ±1 *SE*.

and female same-sex target groups in resource-abundant environments did not differ. As such, these findings suggest that women, but not men, perceive more competitive interactions to occur in same- than cross-sex others when resources are plentiful and widely available.

Study 2: Resource Scarcity Beliefs and Attributions of Others' Competitiveness

Study 2 was designed to build on Study 1 by examining whether a real-world relationship exists between resource scarcity beliefs and perceptions of same-, versus cross-, sex others' competitiveness. That is, Study 2 sought to provide external validity by assessing whether men's and women's evaluations of same- (vs. cross-) sex others' competitiveness varied based on their perceptions of resource scarcity. To this end, we measured perceptions of resource scarcity and utilized a modified functional-projection task assessing perceptions of competitive tendencies in same- and cross-sex others.

Study 2 tested two competing hypotheses. The original hypothesis tested the prediction that women with relatively high resource scarcity beliefs would make greater competitive attributions of same-, as compared with cross-, sex others; a similar pattern was not expected in men. However, given that Study 1 found women believed higher levels of competition occurs among female, as compared with male, same-sex others in resource abundant environments, the updated hypothesis tested the prediction that women with relatively low resource scarcity (i.e., relative abundance) beliefs would evaluate same-sex targets as more competitive than cross-sex targets.

Method

Participants

See online supplemental materials for a priori power analysis. Ultimately, 236 undergraduate students participated. Prior to data analysis, participants were excluded for: failing attention filters (n = 12); bias-responding (i.e., selecting the same response for every item across all dependent variables; n = 2); or indicating that they had worked as a research assistant in the lab conducting the research (n = 3), leaving a total of 219 participants (143 female; M_{age} = 20.09, SD_{age} = 2.64; age range: 18–48).

Design and Procedure

Participants came into the laboratory to participate in research allegedly examining the factors that influence people's ability to accurately detect others' personality characteristics. Upon signing the informed consent, participants completed a few distractor measures to bolster the cover story before responding to items assessing their perceptions of resource scarcity, which served as one of the predictor variables. Participants then completed the dependent measure, a modified functional projection

task assessing perceptions of competitive characteristics in same- and cross-sex others. Finally, participants completed standard demographic items as well as items assessing attention and suspicion before being debriefed.

Resource Scarcity Measure

Beliefs about resource scarcity were assessed using a five-item scale created for the purposed of the current study. Specifically, participants responded to the following items: "Financial uncertainty is increasing;" "With everything going on in the world today, people worry about being able to make enough money to buy the things that they need;" "There aren't enough jobs for all who need them;" "I wonder whether the current generation will have access to good jobs;" and "People do not need to worry about resource availability because there is plenty to go around (reverse coded)." All items were responded to on a 7-point Likert-type scale (1: *strongly disagree*; 7: *strongly agree*). These items were averaged together into a *resource scarcity beliefs* index ($\alpha = .71$).

Functional Projection Task

As the main dependent variable, participants completed a functional projection task adapted for the current project. The functional projection task is an established procedure for assessing inferences based on internal states or individual characteristics (DelPriore et al., 2018; Krems et al., 2015). The functional projection task included eight target photographs (four male; four female) taken from previous research (DelPriore et al., 2018). This previous research has verified that the facial expressions displayed were indeed neutral, and that the targets in the photographs were perceived to be slightly above average in attractiveness. Prior to completing the functional projection task, participants were told that they would view and rate the personality characteristics of others based on facial photographs. Participants were told that each person was asked to display a neutral facial expression while their photograph was taken. While viewing each photograph, participants were asked to indicate the extent to which they believed each person was: deceptive, truthful (reverse scored), hostile, friendly (reverse scored), manipulative, sincere (reverse coded), selfish, generous (reverse scored), competitive, and collaborative (reverse scored). The ratings were made on 9-point scales (1: *not at all*; 9: *very much*). Items for male and female targets were averaged separately into *female competitiveness* ($\alpha = .89$) and *male competitiveness* ($\alpha = .89$) indices.

Results

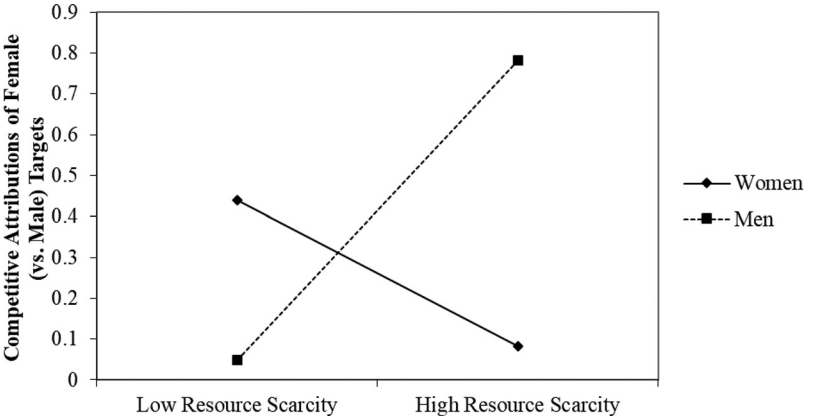
Data analysis was conducted using the MEMORE SPSS macro (model 3, Montoya, 2019), which allows for moderation to be tested in repeated-measures designs. MEMORE creates a difference score between the outcome measures and assesses the impact of the moderating variables on this difference score. For this analysis, the predictors were participant sex, resource scarcity (centered), and the interaction between the two. The measures assessing attributions of competitive tendencies in male and female targets were entered as outcome variables. Outcome variables were entered in a manner where higher values on the difference score computed by the MEMORE macro correspond to increased perceptions of female, as compared with male, targets' competitiveness.

Results revealed no significant main effect of resource scarcity ($p = .245$) or participant sex ($p = .520$) on evaluations of female (vs. male) targets' competitiveness. However, a 2-way interaction between participant sex and resource scarcity beliefs emerged, $b = -.54$, $SE = .11$, $p \leq .001$. See Figure 2 for graphical depiction of interaction. Whereas women who reported heightened perceptions of resource scarcity were originally expected to attribute greater competitive tendencies to same- (as compared with cross-) sex others, simple slope analyses revealed the opposite pattern of results. That is, the simple slope for women showed that lower perceptions of resource scarcity predicted increased attributions of competitive tendencies in female, as compared with male, targets, $b = -.18$, $SE = .08$, $p = .020$. More specifically, women with high (+1 *SD*) levels of resource scarcity beliefs did not differ in their evaluations of male and female targets' competitiveness ($p = .353$). However, women with low (−1 *SD*) levels of resource scarcity beliefs (i.e., those who believed resources were available) evaluated female targets as more competitive than male targets, $b = .44$, $SE = .12$, $p \leq .001$, supporting the updated hypothesis.

The opposite pattern of results emerged in the simple slope for men, where higher perceptions of resource scarcity corresponded to increased perceptions of competitiveness in female (as compared with male) targets, $b = .36$, $SE = .08$, $p \leq .001$. That is, men with high (+1 *SD*) levels of resource scarcity beliefs evaluated female targets as more

Figure 2

Results From Study 2: Interaction Between Participant Sex and Resource Scarcity Beliefs on Attributions of Competitiveness in Female (vs. Male) Targets



Note. Higher values on the *y* axis correspond to increased perceptions of female (as compared with male) competitiveness.

competitive than male targets, $b = .78$, $SE = .15$, $p \leq .001$. However, men with low (-1 *SD*) levels of resource scarcity beliefs (i.e., those who believed resources were available) did not differ in their evaluations of male and female targets' competitiveness ($p = .629$).

Discussion

The results of Study 2 did not provide support for the original prediction that women who perceive higher resource scarcity in their environment would make more competitive attributions of same- (vs. cross-) sex others; women's attributions of competitiveness in male and female targets did not differ at high levels of perceived resource scarcity. However, conceptually consistent with the findings of Study 1, women who perceived relatively low levels of resource scarcity (i.e., those who believed resources were available) evaluated same-sex others to be more competitive than cross-sex others. These results suggest that women do not perceive same-sex others to be more competitive than cross-sex others in resource scarce environments, but instead show that women evaluate same-sex others to be more competitive than cross-sex others in environments where resources are available.

Men's competitive attributions at low levels of resource scarcity did not differ based on target sex. Instead, men perceived female targets to be more competitive than male targets at high levels of resource scarcity. Although unexpected, this result is not unexplainable. Past research shows that men who perceive greater levels of job insecurity evaluate women to be more threatening (Ospina et al., 2019). The current results suggest that men's beliefs about scarcity in their environment is related to their view of women's competitiveness, which may have implications for how such men treat women. While somewhat beyond the scope of the current investigation, future research would benefit from examining this possibility.

Study 3: Experimental Examination of Resource Availability and Women's Expectations of Competitiveness From Same- and Cross-Sex Others

Given the sex-differentiated pattern of results found in the previous two studies, the subsequent studies opted to focus only on female participants. Study 3 was designed to build on the results of the previous studies by experimentally examining the relationship between resource availability and women's competitive attributions of same- (vs. cross-) sex others. To this end, participants completed an episodic recall task used in previous research to manipulate resource scarcity (vs. abundance; Mittal & Griskevicius, 2016; Rodeheffer et al., 2012) before completing a functional projection task similar to that used in Study 2.

Study 3 tested two competing hypotheses. The original hypothesis tested the prediction that activating a resource scarcity (vs. abundance) mindset would increase women's competitive expectations of same-, versus cross-, sex targets. Based on the results of Studies 1–2, the updated hypothesis tested the prediction that women in the resource abundance condition will expect same-sex targets to behave more competitively toward them than cross-sex targets.

Method

Participants

See online supplemental materials for a priori power analysis. Ultimately, 119 female undergraduate students participated. Prior to data analysis, participants were excluded for: failing attention filters (n = 2); not responding or responding inappropriately to the stimulus (i.e., indicating that they did not believe resources were scarce when in the scarcity condition; n = 5); bias-responding (i.e., selecting the same response for every item across all dependent variables; n = 3); or indicating that they had worked as a research assistant in the lab conducting the research (n = 2), leaving a total of 107 female participants (M_{age} = 18.86, SD_{age} = 1.48; age range: 18–28).

Design and Procedure

Study 3 utilized a 2 (condition: scarcity vs. abundance, between subjects) × 2 (target sex: female vs. male, within subjects) mixed factorial design. Participants came into the research lab to ostensibly participate in research assessing whether visualization ability is related to accuracy in judging others' personal characteristics. Via random assignment, participants were assigned to the resource scarcity or abundance condition. Following the experimental manipulation, participants completed a functional projection task similar to the one used in Study 2, which served as the primary dependent measure. After completing the dependent measure, participants completed a manipulation check to ensure the effectiveness of the manipulation. Finally, all participants completed standard demographic information, as well as items assessing attention and suspicion before being debriefed.

Experimental Manipulation

For the experimental manipulation of resource availability, participants completed an episodic recall task (adapted from Mittal & Griskevicius, 2016). Participants in the resource scarcity condition (n = 55) were asked to briefly list three reasons for why they think the economy is worsening and that resources are becoming scarce. Those assigned to the resource abundance condition (n = 52) were asked to list three reasons suggesting that the economy is becoming better and that resources are becoming more abundant (adapted from Rodeheffer et al., 2012).

Functional Projection Task

The functional projection task was similar to the task in Study 2, with two exceptions. First, the instructions were modified to explain that the task was assessing people's perceptions of how others will behave *toward them*. This change was made to specifically examine whether women expect same- and cross-sex others to behave competitively toward them in everyday interpersonal interactions. Second, while viewing each photograph, participants were asked to report their expectations of the targets' competitive behavior directed toward them using the same 10-items used in Study 2 (e.g., "This person would be deceptive when interacting with me."). The ratings were made on 9-point scales (1: *not at all*; 9: *very much*). Items for male and female targets were averaged separately into *expected female competitiveness* (α = .90) and *expected male competitiveness* (α = .89) indices.

Manipulation Check

To ensure the effectiveness of the manipulation, participants completed a two-item manipulation check (Mittal & Griskevicius, 2016). Participants were instructed to indicate the extent to which they agreed or disagreed with the following statements: "Resources are becoming scarce" and "Financial uncertainty is increasing." Each item was responded to on a 7-point scale (1: *strongly disagree*; 7: *strongly agree*); items were averaged together to create a mean composite of perceived resource scarcity.

Results

Manipulation Check

To examine the effectiveness of the experimental manipulation, an independent-samples t test, with condition as the predictor variable, and the composite measure of perceived resource scarcity as the outcome variable, was conducted. Results

provided evidence that those in the scarcity condition ($M = 4.93$, $SD = 1.36$) perceived more resource scarcity than those in the abundance condition ($M = 4.28$, $SD = 1.41$), $t(105) = -2.42$, $p = .017$, $\eta^2 = .05$.

Competitive Attributions

For the main analysis, a 2 (condition: scarcity vs. abundance, between subjects) × 2 (target sex: female vs. male, within subjects) mixed-model ANOVA was conducted. A main effect of target sex competitiveness emerged, where participants reported expecting the female targets ($M = 4.62$, $SD = .85$) to behave more competitively toward them than the male targets ($M = 4.25$, $SD = .76$), $F(1, 105) = 20.51$, $p \leq .001$, $\eta^2 = .05$. The main effect of resource availability condition was not significant ($p = .492$).

Results further revealed a two-way interaction between resource availability condition and target sex, $F(1, 105) = 4.84$, $p = .030$, $\eta^2 = .01$. See Table 3 for descriptive statistics and Figure 3 for interaction. Simple effects tests revealed that expected competitiveness of male and female targets differed in the resource abundance condition, $F(1, 105) = 22.01$, $p \leq .001$, $\eta^2 = .06$, where women expected female targets ($M = 4.67$, $SD = .79$) to behave more competitively toward them than male targets ($M = 4.11$, $SD = .72$). No significant difference in expected target sex competitiveness emerged in the resource scarcity condition ($p = .098$).

Discussion

Although it was originally hypothesized that women in the resource scarcity condition would expect same-sex targets to behave more competitively toward them than cross-sex targets, this hypothesis was not supported. Results showed that women's expectations of same- and cross-sex targets' competitiveness did not differ in the scarcity condition. However, in the abundance condition, women reported expecting their same-sex peers to behave more competitively toward them than their cross-sex peers, supporting our updated hypothesis. This result does not support the conventional wisdom that men are typically thought to be more competitive than women, instead showing that women view cross-sex others as less competitive than same-sex others under contexts of abundance.

Table 3
Study 3 Ratings of Expected Male and Female Targets' Competitiveness Within Resource Availability Condition

Condition	Female Targets	Male Targets
Scarcity	4.58 (.91)[a]	4.38 (.77)[a]
Abundance	4.67 (.79)[a]	4.11 (.72)[b]

Note. Values in parentheses represent standard deviations. Row means that do not share a superscript were significantly different by Bonferroni corrected pairwise comparisons ($p \leq .001$).

Study 4: Replication of Study 3

Study 4 was designed to replicate the results of Study 3 by enacting a resource scarcity (vs. abundance) mindset and measuring women's expectations of competitive behavior directed toward from same- and cross-sex others.[4] Again, Study 4 tested two competing hypotheses. The original hypothesis tested the prediction that women who are led to recall incidences of resource scarcity would report expecting same- (vs. cross-) sex others to behave more competitively toward them. However, based on the results of the previous studies, the updated hypothesis tested the prediction that women in the resource abundance condition would expect same-sex targets to behave more competitively toward them than cross-sex targets.

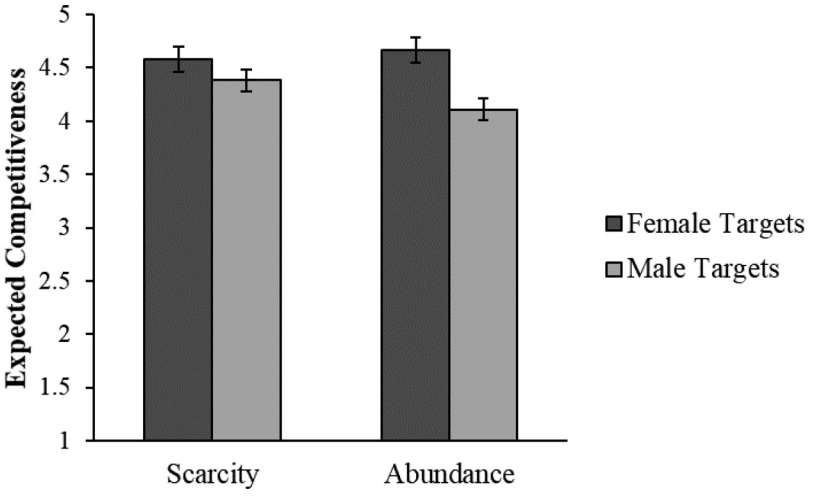
Method

Participants

See online supplemental materials for a priori power analysis. Ultimately, 321 female undergraduate students participated. Prior to data analysis, participants were excluded for: failing attention filters ($n = 4$); not responding or responding inappropriately to the stimulus (i.e., indicating that they did not believe resources were scarce when in the scarcity condition; $n = 4$); bias-responding (i.e., selecting the same response for every item across all dependent variables; $n = 1$); indicating that they had worked as a research assistant in the lab conducting the research ($n = 2$); or not meeting the criteria for age (i.e., younger than 18 years old; $n = 1$), leaving a total of 309 female participants ($M_{age} = 18.61$, $SD_{age} = .94$; age range: 18–22).

[4] Study 4 additionally sought to extend the results of Study 3 by examining whether a resource scarcity (vs. abundance) mindset might impact women's treatment of same- (vs. cross-) sex co-workers in the workplace. These hypotheses, variables, and analyses are included in the online supplemental materials.

Figure 3
Results From Study 3: Interaction Between Resource Availability Condition and Expected Target Sex Competitiveness



Note. Error bars represent ±1 *SE*.

Design and Procedure

The design and procedure for Study 4 were similar to Study 3. Study 4 used a 2 (condition: scarcity vs. abundance, between subjects) × 2 (target sex: female vs. male, within subjects) mixed-factorial design. After signing the informed consent, participants then completed the resource scarcity (n = 154) or availability (n = 155) manipulation and the functional projection task. Following the functional projection task, participants completed additional measures (described in the online supplemental materials), responded to the 2-item manipulation check, a standard demographics questionnaire, and items assessing attention and suspicion before being debriefed.

Results

Manipulation Check

Results of an independent-samples t test provided evidence that those in the scarcity condition (M = 4.96, SD = 1.27) perceived more resource scarcity than those in the abundance condition (M = 4.13, SD = 1.29), $t(307) = -5.72, p \leq .001, \eta^2 = .10$.

Competitive Attributions

After the appropriate recoding, composite indices of competitiveness attributed in the functional projection task were computed for *expected female competitiveness* (α = .91) and *expected male competitiveness* (α = .87). To test the hypothesis, a 2 (condition: scarcity vs. abundance, between subjects) × 2 (target sex: female vs. male, within subjects) mixed-model ANOVA was conducted on the composite variables of expected target competitiveness. See Table 4 for descriptive statistics. A main effect of target sex on expected competitiveness emerged, where women reported expecting the female targets (M = 4.57, SD = .92) to behave more competitively toward them than the male targets (M = 4.16, SD = .75), $F(1, 307) = 63.51, p \leq .001, \eta^2 = .06$. The main effect of resource availability condition was not significant (p = .455), and no 2-way interaction between resource availability condition and target sex emerged (p = .579). As such, the results failed to support the original and updated hypotheses, which both predicted a significant two-way interaction, even as each predicted a different pattern of results. Instead, these results suggest that women expected female targets to behave more competitively toward them than male targets, regardless of resource availability condition.

Discussion

Overall, the findings in Study 4 failed to support both the original hypothesis and the updated

Table 4
Study 4 Ratings of Expected Male and Female Targets' Competitiveness Within Resource Availability Condition

Condition	Female Targets	Male Targets
Scarcity	4.61 (.92)	4.17 (.76)
Abundance	4.52 (.92)	4.14 (.74)

Note. Standard deviations provided in parentheses.

hypothesis made based on the results of the previous studies. That is, the results for the competitive attributions analysis in Study 4 suggest that, regardless of resource availability condition, women expected female targets to behave more competitively toward them than male targets. This finding fails to replicate the results found in Study 3, which demonstrated that women in the resource abundance condition expected female targets to behave more competitively toward them than male targets.

One possibility for the disparate findings between Study 3 and Study 4 is that the pattern of results in Study 3 represents a false positive finding. Although not statistically significant (i.e., $p = .098$), the results in Study 3 were trending in a way where women in the resource scarcity condition did expect same-sex targets to behave more competitively toward them than male targets. As such, another possibility is that the results in Study 3 arose due to lack of power; the pattern of results found in Study 4 may have emerged if Study 3 had included a larger sample size. In sum, the pattern of results in Study 4 is not consistent with the findings of the previous three studies. Instead, these results show that cues of resource availability do not differentially impact women's competitive attributions of same- (vs. cross-) sex others.

General Discussion

Drawing from past research and theory on female social relationships, female intrasexual competition, and resource scarcity (see e.g., Benenson, Antonellis, et al., 2008; Campbell, 1999; Campbell et al., 1998; Roy & Benenson, 2002), the current work sought to examine the hypothesis that resource scarcity (compared with abundance) would lead women (but not men) to perceive greater competitive tendencies in same-, as compared with cross-, sex others. To examine this possibility, we conducted four studies using both experimental (Studies 1, 3, and 4) and cross-sectional (Study 2) methodology. Results from each of our studies failed to support the original hypothesis. Instead, with the exception of Study 4, results revealed that women perceive same-sex others to be competitive than cross-sex others when resources are *abundant*. Specifically, Study 1 demonstrated that women perceive more competitiveness in groups of females (vs. groups of males and cross-sex groups) in ecologies where resources are widely available. No such pattern emerged in resource scarce ecologies or among male raters. Conceptually replicating these results, Study 2 found that women (but not men) who believe that resources are relatively available (vs. scarce) perceived greater competitive tendencies in same-sex targets than in cross-sex targets. Study 3 provided evidence that experimentally inducing a resource abundance mindset led women to expect that same-sex others would behave more competitively toward them than cross-sex others. An exception to this pattern emerged in Study 4, which was designed to replicate and extend the results of Study 3. This study failed to find any links between experimentally induced resource scarcity (vs. abundance) cues and women's expectations about the competitiveness of same- versus cross-sex others. Together, this pattern of results suggests that perceived resource abundance, rather than scarcity, may lead women to believe their same-sex peers are more competitive than their cross-sex peers.

One possible explanation for the demonstrated pattern of results is that resource abundance cues change people's beliefs about the benefits associated with behaving selfishly. Research finds that resource scarcity increases people's perceived need for others and fosters interdependence, cooperation, and egalitarian values (see e.g., Carey & Markus, 2017; Kraus et al., 2012). These patterns are reasoned to emerge because the survival benefits of cooperation are particularly high and the benefits of selfish behavior are relatively low when resources are scarce. When resources are widely available, on the other hand, one does not need to rely on others to survive. Further, the benefits available from behaving selfishly are likely to be relatively high in such environments, because the magnitude of resource gains from selfish action will be necessarily greater in resource-abundant compared with resource-scarce environments. Indeed, game theoretical models in evolutionary biology demonstrate that the benefits of resource sharing decrease in environments where resources are readily abundant

and that behaving selfishly in these contexts may actually be the most advantageous strategy (Mazzolini & Celani, 2020). Consistent with this reasoning, research finds that people report a more independent self-construal in ecologies where resources were abundant or an abundance mindset had been experimentally activated (Adams et al., 2012). Taken together, these perspectives advance the counterintuitive idea that resource abundance may actually encourage greater selfishness and promote competitive behavior with conspecifics.

The results of the current research found that, in contexts of abundance, changes in perceptions of others' competitiveness were specific to female perceivers, however. Why would women be more sensitive to changes in perceptions of resource availability than men? Although speculative, it is possible that the relationship between resource abundance and interdependence might be most obvious in women's interpersonal relationships with their same-sex peers. This reasoning is based on the synthesis of several lines of research. First, when deciding whether to behave cooperatively (i.e., altruistically) or competitively (i.e., selfishly) women's behavior is found to be more sensitive to contextual cues than is men's (Andreoni & Vesterlund, 2001; Cox & Deck, 2007; Kamas & Preston, 2012; Miller & Ubeda, 2012). Second, compared with men, women are typically more interdependent (Cross & Madson, 1997) and communal (Costa et al., 2001), and their interpersonal relationships with their same-sex peers are characterized by greater communality and egalitarianism (Benenson et al., 2019; Benenson & Schinazi, 2004; Suh et al., 2004). If experiencing abundance decreases interdependence and encourages selfishness, this effect should be especially evident in women's same-sex social relationships, given their higher base levels of interdependence and communality.

Consistent with this explanation, research shows that women tend to act more selfishly and engage in fewer altruistic behaviors than men under contexts of relative abundance, when the cost of giving is relatively low (Andreoni & Vesterlund, 2001; Cox & Deck, 2007; Kamas & Preston, 2012). The reverse is true under contexts of relative scarcity, when the cost of giving is relatively high. In the latter contexts, women tend to be less selfish and more altruistic than men. This past work did not specifically examine whether women's behavior under contexts of abundance (vs. relative scarcity) varied as a function of their interaction partner's sex (i.e., the sex of the interaction partner was not provided to the participants), which limits the inferences that can be made regarding the sex-specificity of women's behavior. However, given that past research finds women are more competitive and less cooperative and generous with same- (vs. cross-) sex others (Ben-Ner et al., 2004; Eckel & Grossman, 2001; Sutter et al., 2009), it is plausible that this effect may be amplified when women are interacting with same-sex peers under contexts of abundance. Such speculations are consistent with previous work showing that female adolescents from higher (vs. lower) SES backgrounds report more competitive attitudes toward their same-sex peers (Buunk et al., 2014). Together, this work suggests that women may behave more competitively toward their same- (vs. cross-) sex peers in ecologies where resources are abundant, providing a potential explanation for the pattern of results found in the current research.

To the best of our knowledge, this research is the first to examine men's and women's perceptions of competitiveness in same- and cross-sex others. Our results show that women, but not men, perceive greater competitive tendencies in same- (as compared with cross-) sex others in contexts of resource abundance. As such, these results highlight the importance of including participants and targets of both sexes when asserting that one sex competes in ways that the other sex does not, which has important implications for future research on intrasexual competition.

Limitations and Future Directions

Inherent in the current work are some key limitations, which could limit the generalizability of the findings. One major limitation arises from the sample characteristics. The current research utilized samples consisting of undergraduate students attending a relatively upper-class, private university, and the majority of participants across these samples were White (see Table S1 in the online supplemental materials for more detail). The characteristics of these samples differ substantially from the general population in the U.S. and across the world. Future research on this topic should examine whether the patterns of results found in the current study persist across samples that are more representative of the general population. For example, given that intrasexual competition is typically higher in younger women (Fernandez et al., 2014), follow-up studies could assess whether participant's age plays a role in their evaluations of same- and cross-sex others'

competitiveness under contexts of differing resource availability.

The traits used as dependent variables across all studies pose as another potential limitation. We specifically chose to measure perceptions of competitiveness instead of having participants report their own competitiveness because women tend to hide, disguise, and deny their competition with one another (Benenson, 2013; Litwin & Hallstein, 2007). Moreover, whereas women are reticent to admit that they themselves compete with other women, they are quick to report experiencing competition from their same-sex peers (Tracy, 1991). However, given that women want to be seen as agreeable for both mate acquisition (Griskevicius et al., 2006) and female friendship purposes (for review see Reynolds, 2021), it is possible that, owing to concerns about being evaluated as disagreeable, women in our studies may not have responded honestly when reporting their perceptions of others' competitiveness.

Another limitation can be found in the stimuli used in Studies 2–4. That is, the male and female targets in these studies were all above average in attractiveness. Given that past research finds women evaluate highly attractive same-sex others to pose a greater competitive threat than less attractive same-sex others (Fink et al., 2014), it could be useful for future studies to include targets of differing attractiveness levels. This addition would help clarify whether the effects found for women in the current study generalize to all same-sex peers, or whether these effects are specific to peers with above-average levels of attractiveness. Future research may also benefit from greater specificity—that is, specifying who one is competing against (e.g., friends, kin, allies, rivals) and what one is competing over (e.g., friends, resources, mates, etc.). Given that women's competition occurs across a myriad of domains across women's life course (Linney et al., 2017; Low, 2017), it is likely that this pattern of results found in the current research will vary based on the target and domain of competition.

Although the current work suggests that women evaluate same-sex others to be more competitive than cross-sex others under contexts of abundance, it failed to account for the fact that times of relative abundance do not increase everyone's resources linearly. For instance, in the U.S., economic growth is associated with increased economic inequality (i.e., a larger gap between those in higher income brackets and those in lower income brackets; Rubin & Segal, 2015). That is, during times of abundance, the disparity between the best off and the worst off in society is exacerbated. Recent theoretical perspective suggest that economic inequality increases competition for status and relative standing, which carries a host of negative psychological and social implications (Buttrick & Oishi, 2017). Consistent with this reasoning, high levels of economic inequality are associated with greater conflict (Krupp & Cook, 2018), lower interdependence (Sánchez-Rodríguez, Willis, & Rodríguez-Bailón, 2019), and decreased feelings of wealth (Sánchez-Rodríguez, Jetten, et al., 2019). Other research finds that economic inequality can bias perceptions of others, leading people to perceive others as more competitive (Moreno-Bella et al., 2019; Sommet et al., 2019). Given that economic inequality intensifies women's status concerns, which drives women's intrasexually competitive behaviors (Blake et al., 2018; Blake & Brooks, 2019), and economic inequality increases under contexts of abundance (Rubin & Segal, 2015), the effects found in the current study may be better explained by concerns over increased inequality (rather than abundance, per se). This possibility should be examined in future research.

Conclusions

Past research and theory would suggest that female competition is intensified when competing over scarce resources. Seeking to build upon this prior work, the current research examined whether women's perceptions of same- (vs. cross-) sex others' competitiveness is greater under contexts of scarcity and how this might influence women's interpersonal relationships in competitive environments. Results of the current work did not provide evidence supporting our original predictions. Instead, with the exception of Study 4, our studies demonstrate that women perceived same-sex others to be more competitive than cross-sex others in contexts where resources were readily available. This work suggests that, when resources are abundant, women may evaluate their same-sex peers to have greater competitive tendencies than their cross-sex peers.

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