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ORIGINAL PAPER

A Slim Majority: The Influence of Sex Ratio on Women's Body Dissatisfaction and Weight Loss Motivations

Tania A. Reynolds[1,2] · Jon K. Maner[3] · David A. Frederick[4] · K. Jean Forney[5] · Justin R. Garcia[2]

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Abstract

The current investigation examined whether women's perceptions of the sex ratio (ratio of women to men) in the local population influence their body dissatisfaction and weight loss motivations. A higher ratio of women to men in a given population signifies a relative abundance of same-sex mating competitors, intensifying female intrasexual competition. Five studies ($N = 1{,}776$) tested the hypotheses that women's perceptions of a female-skewed sex ratio would correspond to increased feelings of intrasexual competitiveness and perceptions of unfavorable mating prospects, which would, in turn, be associated with heightened body dissatisfaction and weight loss motivations. Among university and community women (Studies 1and 2), perceptions of a female-skewed sex ratio corresponded to greater intrasexual competitiveness, increased body dissatisfaction, and increased dieting inclinations. Among single women, assessments of a female-skewed sex ratio corresponded to perceptions of unfavorable mating prospects, increased romantic pressure to alter their appearance, and higher body dissatisfaction (Study 3). Studies 4 and 5 experimentally manipulated perceived sex ratio. Women in the female-skewed condition felt less satisfied with their weights and shapes, but only if they believed the manipulation (Study 4). In Study 5, using a within-subjects design, women who evaluated a male-skewed (vs. female-skewed) dating profile array subsequently desired to lose less weight. Findings suggest women's perceptions of their social environments may contribute to body image and dieting motivations.

Keywords Sex ratio · Body dissatisfaction · Dieting · Weight restriction · Intrasexual competition

Introduction

When female Japanese medaka fish encounter relatively high proportions of females in their environments, they interrupt spawning couples and nudge males to attract their attention (Clark & Grant, 2010). Under these conditions, female medaka also chase and butt their heads aggressively against other females, but especially the females most favored by males. These behavioral shifts reveal that when immersed among many other females, female medaka are driven to compete with their same-sex competitors for mating opportunities. However, when the mating environment is more favorable to female medaka (i.e., when surrounded by relatively fewer female competitors and more male potential mates), their competition with one another abates, as they are instead approached by males eager to mate.

Across sexually reproducing species, from medaka fish to humans, the ratio of males to females in a given population signifies the level of competition for mating opportunities. The current paper examined whether this ecological factor—the local sex ratio—corresponds to women's perceptions of their mating prospects, and whether these have downstream associations with their body dissatisfaction and weight loss motivations. We hypothesized that as women perceive a female-skewed sex ratio (indicating a relative abundance of mating competitors), they would infer worse mating prospects and feel more competitive with same-sex peers for mates. Because physical appearance is a highly scrutinized and consequential domain of romantic partnership formation,

✉ Tania A. Reynolds
tareyn@unm.edu

1 Department of Psychology, The University of New Mexico, 2001 Redondo S. Dr., Albuquerque, NM 87106, USA

2 The Kinsey Institute, Indiana University, Bloomington, IN, USA

3 Department of Psychology, Florida State University, Tallahassee, FL, USA

4 Crean College of Health and Behavioral Sciences, Chapman University, Orange, CA, USA

5 Psychology Department, Ohio University, Athens, OH, USA

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we predicted that such perceptions of unfavorable mating environments would exacerbate women's body image concerns and weight loss motivations.

Implications of Skewed Sex Ratios for Mating Competition

The operational sex ratio, or the proportion of reproductively viable males to females within a given population, influences the degree of mating competition organisms face (Clutton-Brock & Parker, 1992; Emlen & Oring, 1977; Guttentag & Secord, 1983). Members of the less prevalent sex encounter many potential partners and few same-sex competitors, thereby reducing the degree of mating competition and offering a wider choice of potential partners (Pedersen, 1991). Members of the rarer sex are thus relatively able to realize their mating preferences without exerting as much effort toward appealing to potential mates (Griskevicius et al., 2012; Moss & Maner, 2016). In contrast, members of the more abundant sex face increased competition for mates and intensified pressure to appeal to the rarer sex's preferences.

The consequences of sex ratio for mating competition have been well-established across a variety of species (de Jong et al., 2012), including among humans (Maner & Ackerman, 2020). As the sex ratio becomes skewed toward relatively more men in the population (male-skewed), women experience greater ease in attracting and securing romantic partnerships (Kruger et al., 2010; Uecker & Regnerus, 2010). When women are the less prevalent sex (male-skewed sex ratio), they have ample choice among potential partners and are better able to realize their mating preferences. For example, among US populations characterized by an over-abundance vs. scarcity of men, women were more likely to marry highly educated and high earning partners (Lichter et al., 1995; Pollet & Nettle, 2007). In these male-skewed contexts, women married at younger ages, their marriages were less likely to end in divorce, and they were less likely to become single parents—suggesting male partners invested in children (Guttentag & Secord, 1983; Kruger et al., 2010, 2014). This increased relationship stability and paternal investment may explain why American women have more children when living in cities with male-skewed populations (Durante et al., 2012). Thus, when women are the rarer sex, they enjoy better prospects for attracting desirable romantic partners, maintaining those relationships, and securing paternal investment in children.

In contrast, when women are the more prevalent sex, they are surrounded by relatively more same-sex rivals than potential partners. Such contexts intensify female intrasexual competition for the limited pool of potential partners. In (female- vs. male-) skewed environments, women lower their standards for engaging in sexual activity (Kandrik et al., 2015; Moss & Maner, 2016; Schmitt, 2005) and attempt to poach one another's romantic partners (Schmitt, 2004). Supporting these real-world patterns of heightened intrasexual rivalry, experimental manipulations of female-skewed sex ratios cause women to behave more competitively and aggressively toward one another (Arnocky et al., 2014; Moss & Maner, 2016).

To attract mates in such unfavorable environments, members of the more abundant sex attempt to gain advantages over same-sex competitors by appealing to the preferences of potential partners (Moss & Maner, 2016). In animal models, these unfavorable contexts lead to increased courtship displays among the more prevalent sex (de Jong et al., 2012). When faced with female-skewed sex ratios, many women compete with one another to appeal directly to the romantic preferences of men. Although men desire a range of traits in potential partners, one trait many men prioritize is partners' physical attractiveness (Buss, 1989; Li et al., 2002; Lippa, 2007). Men's prioritization of physical attractiveness becomes even stronger in female-skewed populations, when men can afford to be especially choosy due to their undersupply (Stone et al., 2007; Walter et al., 2021).

Women are aware of the high priority men place on attractiveness (Li, 2007) and strategically leverage their physical appearance both to attract romantic partners and protect their established relationships against potential interlopers (Buss, 1988; Cashdan, 1998). Thus, physical appearance constitutes one critical domain in which women compete with one another to attract romantic partners, especially in highly competitive environments. When women perceive a female-skewed sex ratio, they may presume diminished prospects for attracting romantic partners, which should amplify motivations to compete with same-sex rivals in appearance domains. Indeed, during periods when US sex ratios became female-skewed, the skirts depicted in fashion magazines were shorter (Barber, 1999), supporting a link between unfavorable mating conditions and women's motivations to compete through their physical appearance.

Implications of Skewed Sex Ratios for Body Dissatisfaction

If men increase their prioritization of partner physical attractiveness under conditions of female-skewed sex ratios (Stone et al., 2007; Walter et al., 2021), more women may find themselves falling short of those heightened standards, thereby lowering their prospects for attracting mates. Such competitive mating environments are likely to increase the salience of one's relative attractiveness compared to same-sex peers, increase self-other comparisons, and exacerbate body image concerns (Hendrickse et al., 2017; Myers & Crowther, 2009; Wang et al., 2020). Thus, we hypothesized that compared to a

male-skewed sex ratio, exposure to a female-skewed sex ratio would evoke greater body dissatisfaction among women.

Those feelings of dissatisfaction may be directed especially toward their weights. Many women are dissatisfied with their appearances overall, but with their weights in particular (Frederick et al., 2016, 2020; Gualdi-Russo et al., 2022). In industrialized societies, both men and women perceive (thinner vs. heavier) women as possessing more attractive bodies and faces (Perilloux et al., 2013; Swami et al., 2010; Weeden & Sabini, 2007). Although women may overestimate the degree of thinness preferred by men (Gray & Frederick, 2012; Grossbard et al., 2011; Gualdi-Russo et al., 2022), many men report desiring relatively slender romantic partners (Chen & Brown, 2005; Legenbauer et al., 2009; Swami et al., 2010). Highly educated and high earning men especially prioritize thinness in prospective partners (Fales et al., 2016).

Corroborating men's self-reported preferences, women's weights are predictive of their romantic prospects and outcomes. Compared to their heavier counterparts, thinner women are more likely to be married (Averett & Korenman, 1996; Averett et al., 2008; Conley & Glauber, 2005) and to marry partners who are wealthier, more educated, and taller (Oreffice & Quintana-Domeque, 2010). Because heterosexual women across cultures tend to prioritize intellect and financial stability in prospective partners (Buss, 1989; Chang et al., 2011; Lippa, 2007), these patterns suggest relatively thinner women are better able to realize their romantic preferences. Moreover, men married to thinner (vs. heavier) wives experience greater marital satisfaction (Boyes & Latner, 2009; Meltzer & McNulty, 2010; Meltzer et al., 2011). These findings suggest that women's weights are consequential for their romantic prospects and, thus, may reflect one domain in which women compete to secure and retain romantic relationships.

Body dissatisfaction, as well as associated the weight loss behaviors, stem in part from heightened competition for mates (Abed, 1998; Davis & Arnocky, 2022; Ferguson et al., 2011; Mealey, 2000), making it important to integrate both sociocultural and evolutionary perspectives on body image (Frederick & Reynolds, 2022). Many women use dieting in an attempt to reduce their weight and enhance their physical appearance (Bove & Sobal, 2011; Markey & Markey, 2005; Putterman & Linden, 2004). Indeed, women who feel especially competitive with same-sex peers for mates exhibit heightened body dissatisfaction, drive for thinness, and restricted eating (Abed et al., 2012; Faer et al., 2005). To the extent that female body dissatisfaction can compel behaviors aimed at reducing weight (Smolak & Levine, 2015), ecological conditions that signal intensified mating competition should also exacerbate weight loss desires. In one study, for example, higher relative proportions of girls in Swedish schools correlated with a higher prevalence of eating disorders (Bould et al., 2016), suggesting that unfavorable female-skewed sex ratios are associated with extreme weight control behaviors. Thus, we predicted that women's perceptions of a female-skewed sex ratio would be associated with increased desire for weight loss, and that this association would be explained (i.e., statistically mediated) in part by heightened body dissatisfaction.

The Current Investigation

The current investigation sought to test the hypotheses that the sex ratio of women's immediate ecologies signals the intensity of mating competition, and thereby influences body dissatisfaction and weight loss motivations. Specifically, we predicted that women who perceived a female-skewed sex ratio (compared with a male-skewed sex ratio) would infer less favorable mating prospects and feel more competitive with same-sex peers for mates. We expected these perceptions to intensify feelings of romantic pressure to alter appearances to attract partners and, thus, exacerbate body dissatisfaction and weight loss motivations. See Fig. 1 for our hypothesized conceptual model.

At a broader level, this investigation is critical for identifying an understudied factor that may contribute to body dissatisfaction and dieting among women seeking men as partners: intrasexual competitiveness generated by female-skewed sex ratios. Women's intrasexual competitiveness has been treated largely as a dispositional factor—that is, some women are more competitive with same-sex peers than others—yet, it is possible that certain ecological conditions evoke women's competitive impulses, while others alleviate them. This may be particularly relevant on college campuses, where populations are often heavily female-skewed (NCES, 2019), creating mating pools characterized by heightened female intrasexual competition. At the methodological level,

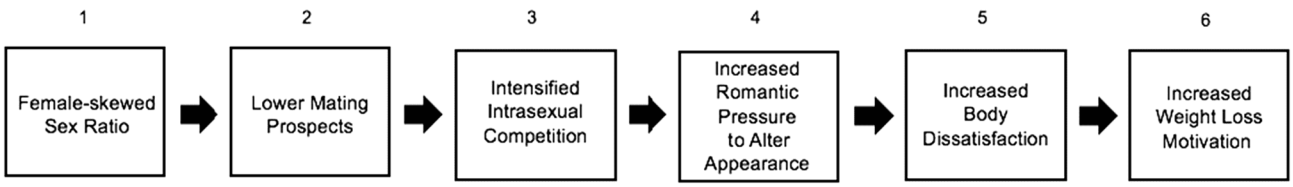

Fig. 1 Hypothesized causal pathway

although extant literature suggests a relationship between sex ratio, body dissatisfaction, and dieting, experimental research examining effects of sex ratio cues on women's body dissatisfaction are lacking (but see Arthur et al., 2020). Moreover, extant studies have not tested for direct links between perceptions of the sex ratio, inferences of mating prospects, intrasexual competitiveness, body dissatisfaction, and weight loss motivations.

Overview of Studies

Across five studies, we tested the hypotheses that women's perceptions of a female-skewed sex ratio within their local mating environments would signify poorer mating prospects, thereby increasing intrasexual competitiveness for mates, and consequently, amplifying body dissatisfaction and inclinations to lose weight. Framed in the opposite way, it is possible that perceiving a more favorable sex ratio (male-skewed) in the local mating environment would boost body satisfaction and reduce dieting motivations.

Study 1 assessed whether perceptions of a female-skewed mating market would translate to increased intrasexual mating competitiveness, which in turn would be associated with heightened body dissatisfaction and dieting inclinations. Study 2 assessed the replicability and generalizability of these patterns by recruiting a larger and more diverse sample of women. Study 3 assessed women's perceptions of mating prospects to examine whether women interpret the local sex ratio as diagnostic of mating prospects, and when this index signals unfavorable prospects, feel intensified romantic pressure to alter their appearance to attract partners and more dissatisfied with their bodies. Studies 4 and 5 aimed to provide causal support for the predicted link between women's evaluations of the local sex ratio and their body dissatisfaction and weight loss motivations. Study 4 experimentally manipulated perceptions of the local sex ratio to evaluate whether sex ratio influenced women's body dissatisfaction and intentions to engage in weight loss behaviors. Study 5 used a stronger manipulation of sex ratio by embedding it in an explicit mating context to evaluate whether women's perceptions of the mating market's sex ratio predicted assumptions of mating prospects, and thus, body dissatisfaction and desire for weight loss.

Studies 1 and 2

Studies 1and 2 tested the hypotheses that women's perceptions of a female-skewed sex ratio corresponds to increased intrasexual mating competitiveness, body dissatisfaction, and motivations to diet. Because a female-skewed sex ratio signifies a relatively high proportion of competitors to potential partners, we hypothesized that heightened intrasexual rivalry would statistically mediate the link between perceptions of a female-skewed sex ratio and women's body dissatisfaction. Because body dissatisfaction is a psychological pre-cursor of weight control behaviors (Smolak & Levine, 2015), we predicted that heightened body dissatisfaction would statistically mediate the association between women's perceptions of a female-skewed sex ratio and their dieting inclinations. Study 2 recruited a larger and more diverse sample of women to establish whether patterns emergent in Study 1 would hold across a wide range of settings and sex ratios. Because measures and analyses were identical across these two studies, we report them together to conserve space. Please see Supplemental Materials for additional measures across all studies.

Method

Participants

In Study 1, a total of 265 undergraduate women ages 18–25 completed an online survey for partial course credit. Nineteen individuals completed the survey twice, so only their first responses were included. Two individuals did not provide sufficient information to calculate BMI, two were male, and one was underage. Because the study's key hypotheses centered on the implications of the ratio of same-sex competitors for other-sex mates, 10 participants who were not heterosexual were also excluded. The final sample comprised 231 heterosexual undergraduate women ($M_{age} = 18.82$ years, SD = 1.20). The sample was predominately White (67.5%), followed by Latina (17.3%), Black (10.8%), and Middle Eastern (0.4%).

In Study 2, we recruited 528 US residents aged 18–39 to complete an online survey via Amazon's Mechanical Turk. Participants were excluded if they did not complete the survey, failed the attention check, had a BMI that likely reflected a data entry error (> 100), were not heterosexual, or completed the survey a second time. The final analyzed sample included 384 heterosexual women ($M_{age} = 27.7$ years, SD = 5.5), of which 72% were Caucasian, 12.5% Black, 8.6% Asian, 5.2% Hispanic, 1% Middle Eastern, and one not reporting.

Measures

The studies' measures were identical, with the exception of one minor wording difference in the measure of perceived sex ratio in the local mating market (see below).

Perceived Mating Market Sex Ratio

Five items were generated to assess women's perceptions of the local mating market's sex ratio: "(1) Here in [town-redacted], it is hard to find someone to date because there

are many more women than men; (2) When I walk around campus, there seems to be many more women than men; (3) There are many more attractive women than attractive men here in [town-redacted]; (4) When I am out at bars (or parties) there are many more women than men; (5) At [university-redacted], it is easier for a man to find a woman to date than for a woman to find a man to date." Participants were first instructed to think about their local environments and then indicate their agreement on 7-point scales (1 = Not at all, 7 = Completely). Responses were averaged to form a sex ratio perception composite ($\alpha = 0.87$). For Study 2, we replaced university-specific terms in the items above with the phrase "my town/city." For example, "When I walk around my town/city, there seems to be many more women than men" ($\alpha = 0.86$). Across both studies, removal of any item would have harmed the scale's reliability.

Local Sex Ratio

To measure the true sex ratio of women's local environments, Study 2 participants were asked to provide their current zip code, city, and state. This information was used to calculate the local sex ratio of single individuals aged 18–39 through US census data.

Mating Competitiveness

To measure women's feelings of competitiveness with same-sex peers in mating domains, participants completed the eight-item Female Competition for Mates Measure (Faer et al., 2005). Sample items read: "I don't care if other women think I dress provocatively because men like it" and "If women think that I am attractive, they will stay away from my partner." Participants responded on 5-point scales (1 = Strongly Disagree, 5 = Strongly Agree) and responses were averaged to form a composite mating competitiveness score ($\alpha s = 0.82$, 84 for Studies 1 and 2, respectively).

Body Dissatisfaction

Participants completed the 34-item Body Shape Questionnaire (BSQ; Cooper et al., 1987) using a 6-point scale (1 = Never, 6 = Always), which assessed body concerns over the past four weeks. A sample item reads: "Have you felt ashamed of your body?" The BSQ demonstrates good test–retest reliability and concurrent validity with other body image measures (Rosen et al., 1996). To account for missing data, responses were averaged (rather than summed), with higher values indicating greater body dissatisfaction (Study 1 $\alpha = 0.98$, Study 2 $\alpha = 0.98$).

Dieting Inclinations

To measure inclinations to diet and lose weight, participants completed the 13-item Dieting Subscale of the Eating Attitudes Test (EAT-26; Garner & Garfinkel, 1979) using a 6-point scale ranging from 1 = "never" to 6 = "always." This scoring system (as opposed to the original for the EAT-26; Garner et al., 1982) allows for greater sensitivity in capturing of low-level eating pathology in non-clinical populations (e.g., Keel et al., 2007). A sample item reads: "I feel guilty after eating." Responses were averaged, with higher scores indicating stronger dieting inclinations (Study 1 $\alpha = 0.91$, Study 2 $\alpha = 0.90$).

Body Mass

Because body size is often associated with body dissatisfaction and dieting behaviors (e.g., Neumark-Sztainer & Hannan, 2000), participants reported their weight and height, which were used to calculate body mass indices (BMIs; kg/m^2).

Table 1 Studies 1 and 2's descriptive statistics and correlations

	Study 1 M (SD)	Study 2 M (SD)	1	2	3	4	5	6
1. Perceived sex ratio (1–7)	4.03 (1.42)	3.54 (1.49)	–	.18**	.27***	.20***	−.02	.07
2. Mating competitiveness (1–6)	3.20 (0.96)	3.25 (1.06)	.15*	–	.41***	.46***	−.07	−.05
3. Body dissatisfaction (BSQ; 1–6)	2.94 (1.13)	3.04 (1.21)	.14*	.48***	–	.76***	.42***	−.01
4. Dieting inclinations (EAT-Diet; 1–6)	2.74 (1.01)	2.79 (0.99)	.20**	.52***	.76***	–	.20***	−.01
5. Body mass index	22.86 (3.45)	27.53 (7.81)	.01	.05	.42***	.30***	–	−.01
6. Sex ratio (single females: single males)		0.92 (0.22)						–

Range of possible scores noted in parentheses next to construct. Higher values of perceived sex ratio indicate perceptions of more women. Correlation coefficients below the diagonal are for Study 1 and above the diagonal are for Study 2.

$^{\dagger}p < .10$, $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

Data Analysis

Skewness was low across all variables (<|1.3|) as was kurtosis (<|2.3| for all variables) for both studies. See Table 1 for descriptive statistics and correlations among all variables for Studies 1 and 2. To test our hypothesized pathway, we conducted path analysis using SPSS AMOS 27. For both studies, the models fit the data well (see Figs. 2 and 3 for fit indices). Although the direct pathways from sex ratio to body dissatisfaction and dieting inclinations were not hypothesized, model comparisons suggested inclusion of these pathways enhanced model fit (but especially for Study 2). For consistency, we included these direct pathways in both Studies 1 and 2's models. To ensure the robustness of our direct and indirect effects, we used bootstrapping procedures ($n = 1000$) and 95% confidence intervals. To assess whether women's perceptions of their local sex ratio were associated with their level of mating competitiveness, body

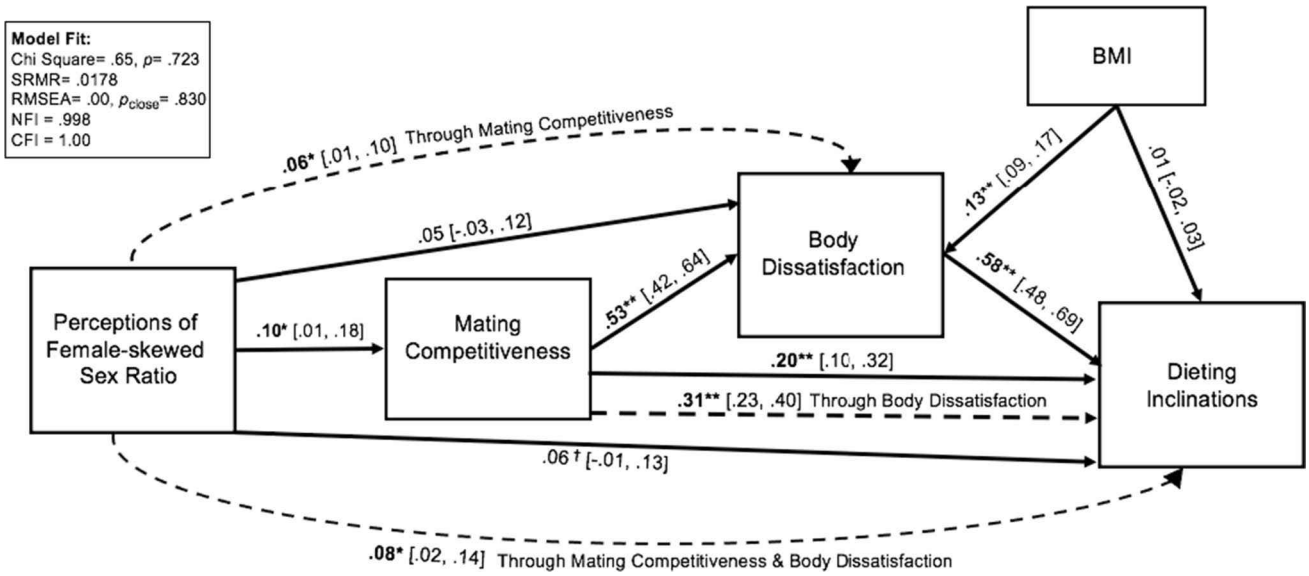

Fig. 2 Study 1's path analysis results. *Note.* Bootstrapped coefficients and 95% confidence intervals reported. Solid lines indicate direct effects and dashed lines indicate indirect effects. $^{\dagger}p < .10$, $^{*}p < .05$, $^{**}p < .01$

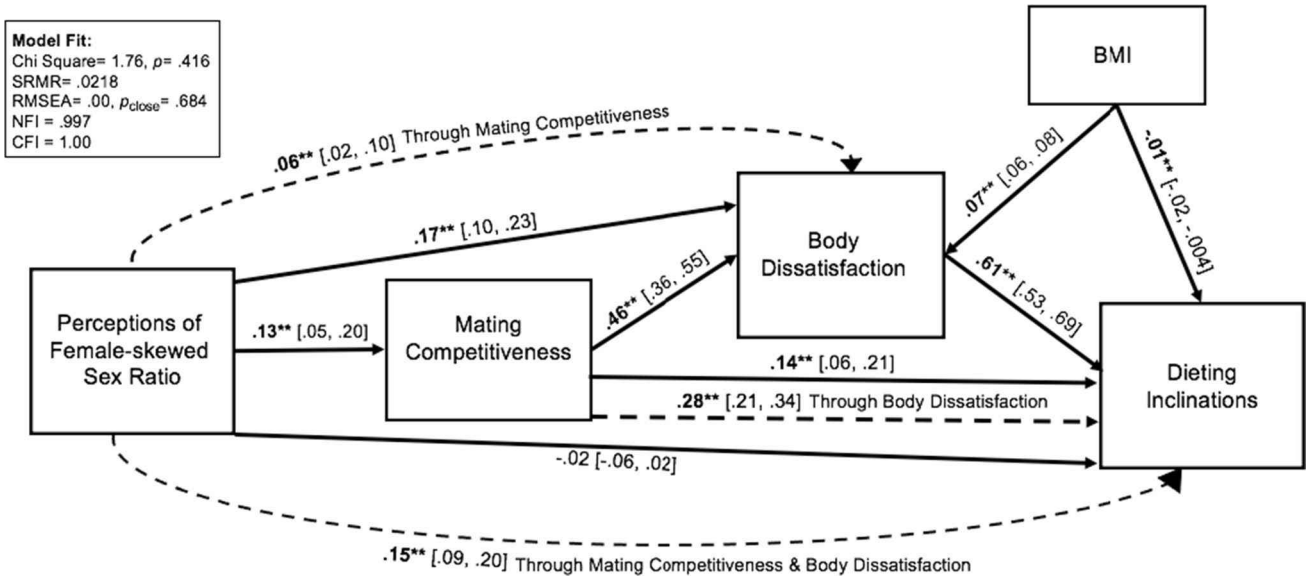

Fig. 3 Study 2's path analysis results. *Note.* Bootstrapped coefficients and 95% confidence intervals reported. Solid lines indicate direct effects and dashed lines indicate indirect effects. $^{\dagger}p < .10$, $^{*}p < .05$, $^{**}p < .01$

dissatisfaction, and dieting inclinations, we first examined the direct effects of each construct on the subsequent construct (see Fig. 2). Next, we examined indirect effects to test whether earlier constructs accounted statistically for variance later in the hypothesized causal chain. To account for individual differences in body size, we entered BMI as a predictor of both body dissatisfaction and dieting inclinations.

Results

Study 1

Consistent with hypotheses, women's perceptions of a female-skewed sex ratio were significantly associated with increased mating competitiveness ($\beta = 0.10$, SE = 0.04, $p = 0.023$; see Fig. 2). Thus, women who perceived more women in their mating environments also felt more competitive with same-sex peers for mates. Perceptions of an unfavorable sex ratio did not exhibit significant direct associations with body dissatisfaction ($\beta = 0.05$, SE = 0.04, $p = 0.191$) or dieting inclinations ($\beta = 0.06$, SE = 0.03, $p = 0.072$), however. Women's intrasexual mating competitiveness was significantly linked to body dissatisfaction, $\beta = 0.53$, SE = 0.06, $p = 0.002$, and dieting inclinations, $\beta = 0.20$, SE = 0.05, $p = 0.002$. That is, women who felt more competitive with same-sex peers for mates also felt less satisfied with their bodies and more strongly motivated to diet. Body dissatisfaction was strongly linked to dieting inclinations, $\beta = 0.58$, SE = 0.05, $p = 0.002$.

To examine whether women's feelings of mating competitiveness accounted for the link between female-skewed sex ratio perceptions and body dissatisfaction, we examined the indirect effect. Supporting hypotheses, there was a significant positive indirect effect from unfavorable sex ratio perceptions through mating competitiveness to body dissatisfaction ($\beta = 0.06$, SE = 0.02, $p = 0.023$; see dashed lines in Fig. 2). This result is consistent with the interpretation that women who perceived more women in their environments felt less satisfied with their bodies in part because they felt more competitive with other women for mates. Likewise, a significant indirect effect emerged from mating competitiveness through body dissatisfaction to dieting inclinations ($\beta = 0.31$, SE = 0.05, $p = 0.002$). Last, a significant indirect effect emerged from unfavorable sex ratio perceptions through both mating competitiveness and body dissatisfaction to predict higher dieting inclinations ($\beta = 0.08$, SE = 0.03, $p = 0.013$). These pathways are consistent with the interpretation that women who perceived more women in their local sex ratios felt more competitive with same-sex peers for mates and were thus less satisfied with their bodies and experienced stronger inclinations to engage in weight loss dieting.

Study 2

Because Study 2 participants were recruited from multiple locations, Study 2 afforded an opportunity to extract the sex ratio of the local single population using female participants' reported zip codes. However, this calculated sex ratio was only weakly correlated with female participants' perceptions of the sex ratio in their local mating populations ($r = 0.07$, $p = 0.197$). Thus, the zip code-based sex ratio was not included Study 2's model.

To examine whether the hypothesized pathway replicated in Study 2's community sample, we conducted the same path analysis performed in Study 1. As displayed in Fig. 3, the predicted link between women's perceiving a female-skewed sex ratio and their heightened mating competitiveness again emerged significant ($\beta = 0.13$, SE = 0.04, $p = 0.003$). This time, unfavorable sex ratio perceptions were also significantly associated with body dissatisfaction ($\beta = 0.17$, SE = 0.03, $p = 0.002$), but not dieting inclinations ($\beta = -0.02$, SE = 0.02, $p = 0.413$). Replicating Study 1, women's mating competitiveness was also associated with body dissatisfaction ($\beta = 0.46$, SE = 0.05, $p = 0.002$) and dieting inclinations ($\beta = 0.14$, SE = 0.04, $p = 0.002$). Last, body dissatisfaction was significantly associated with women's dieting inclinations ($\beta = 0.61$, SE = 0.04, $p = 0.002$).

Supporting hypotheses, there was a significant indirect effect from unfavorable sex ratio perceptions through mating competitiveness to body dissatisfaction ($\beta = 0.06$, SE = 0.02, $p = 0.003$). Likewise, a significant indirect effect emerged from mating competitiveness through body dissatisfaction to dieting inclinations ($\beta = 0.28$, SE = 0.03, $p = 0.002$). Last, a significant indirect effect emerged from female-skewed sex ratio perceptions through both mating competitiveness and body dissatisfaction to predict heightened dieting inclinations ($\beta = 0.15$, SE = 0.03, $p = 0.002$).

Discussion

Both Studies 1 and 2 provided initial support for the investigation's primary hypotheses. Women who perceived a more female-skewed sex ratio, relative to those who perceived a more balanced or male-skewed sex ratio, displayed higher levels of mating-related competitiveness, felt more dissatisfied with their bodies, and were more inclined to diet. Moreover, indirect effects suggested the link between perceived sex ratio and body dissatisfaction could be explained by heightened mating-related competitiveness. This is consistent with the hypothesis that heightened intrasexual romantic competition is one source of female body dissatisfaction (Abed, 1998). Second, the link between unfavorable sex ratio perceptions and increased dieting inclinations was statistically accounted for by both heightened mating competitiveness

and body dissatisfaction. These findings suggest women's body dissatisfaction compels behaviors aimed at increasing one's attractiveness to mates and thus both the psychological motivations (i.e., body dissatisfaction) and resultant weight restriction behaviors are more prevalent in unfavorable mating contexts.

However, because Study 1 recruited women from a single university, perceptions of the sex ratio could more strongly reflect individual differences than features of the local environment, limiting causal interpretations. Study 2 sought to address this limitation by recruiting women from a wider array of mating environments. Nonetheless, women's perceptions of the sex ratio within their local mating pools were not strongly correlated with the sex ratio extracted from zip codes. Zip codes are likely a crude index of mating populations. For example, a woman might live in a male-biased city, but if she attends a university, she may perceive her mating pool as female-biased, due to the sex ratio of enrolled students (NCES, 2019).

Study 3

Study 3 sought to identify the psychological mechanisms by which perceptions of the local sex ratio influence women's body dissatisfaction. We contend that sex ratio serves as one indicator of women's mating prospects, causing some women to believe they must enhance their appearance to attract partners, which, consequently, translates to body dissatisfaction and dieting behavior. Indeed, the findings of Studies 1 and 2 revealed perceptions of an unfavorable sex ratio corresponded to augmented competitiveness with same-sex peers for mates, granting tentative indirect support to the contention that women infer worse mating prospects from female-skewed sex ratios. Study 3 tested these hypothesized psychological mechanisms by examining whether women's perceptions of mating prospects and feelings of romantic pressure to alter their appearance to attract partners statistically account for the link between sex ratio perceptions and body dissatisfaction.

Method

Participants

Study 3 analyzed data from a subsample of participants who completed the 2017 Singles In America Project (see below). To be included in analyses, participants had to identify as women, as single, aged 18–39 years, and as heterosexual. Because some participants reported demographic values that were invalid (e.g., height of 2 feet), we restricted our sample to those who reported BMIs within 14.5–50.5, a range the overwhelming majority of the US population falls within. These criteria resulted in a final sample of 743 self-identified heterosexual single women ($M_{age} = 28.71$ years, SD = 6.14).

Procedure

Data were collected in 2017 as part of the annual Singles in America (SIA) study. Although SIA is sponsored by the relationship company Match, participants were not recruited or in any way drawn from the Match population or subsidiary sites. Participants were recruited by ResearchNow® (Dallas, TX, USA), using independent opt-in Internet research panels for population-based cross-sectional surveys. Recruitment targeted demographic distributions (i.e., age, gender, ethnicity, region, income) reflected in the most recent US Census' Current Population Survey, adjusted in real time through inbound click balancing. All data were collected online. Inclusion criteria required being at least 18 years old and fluent in English.

The SIA survey contained an extensive array of items assessing dating attitudes and behaviors. Study 3 examined the subset of items related to perceived sex ratio, mating prospects, romantic appearance pressures, and body image.

Measures

Local Sex Ratio Participants were asked to provide their current zip code. This information was used to calculate the local sex ratio of females relative to 100 males using census data.

Perceived Sex Ratio Participants completed a single item assessing their perceptions of the local sex ratio: "What is your best guess of the ratio of single heterosexual men to single heterosexual women in your city or town?" on a 5-point scale (1 = far more single women than single men, 5 = far more single men than single women). Responses were reverse-coded such that higher scores indicated perceptions of unfavorable (i.e., female-skewed) sex ratios.

Unfavorable Mating Prospects Participants completed an item assessing their perceptions of local women's unfavorable mating prospects. Specifically, the item read, "How hard do you think it is for women who live in your city to find desirable romantic partners?" (1 = Very Hard, 4 = Very Easy). The item was reverse-coded so higher scores indicated perceptions of more unfavorable mating prospects.

Romantic Appearance Pressure Participants completed an item assessing the degree to which they felt pressured to modify their appearance to attract romantic partners using a 4-point scale (1 = Strongly disagree, 4 = Strongly agree). The item read, "I feel pressure to change my appearance to attract dating partners."

Body Dissatisfaction The survey contained four items assessing body image. The first item was from the Appearance Evaluation scale of the Multidimensional Body-Self Relations Questionnaire (Cash, 2000), which assessed

participants' evaluations of their nude appearance: "I like the way I look without my clothes off." The survey also included three items assessing three aspects of affective body image (appearance, weight, muscle) similar to those used in a national study of body image (Frederick et al., 2020). The key differences were that current items assessed feelings about "muscle tone" instead of "muscle tone/size," employed a shorter Likert scale, and the stem measured "happiness" with appearance domains rather than "satisfaction." The items were, "I am happy with my [weight] / [appearance] / [muscle tone]." Participants responded to each on 4-point scales (1 = Strongly disagree, 4 = Strongly agree). We reverse-coded and averaged the four items to create a body dissatisfaction composite (α = 0.88).

Body Mass To account for individual differences in body size, we computed women's BMI from their self-reported heights and weights ($M = 27.29$, SD = 7.26).

Results

Just as with Study 2, local extracted sex ratios (based on zip codes) were relatively uncorrelated with female participants' perceptions of the ratio of single heterosexual women to men ($r = 0.04$, $p = 0.338$). Thus, this variable was dropped from the model. Skewness was low across all remaining variables (<|1.0|), as was kurtosis (<|1.2|). See Table 2 for descriptive statistics and correlations among all variables. To assess whether women used their perceptions of their mating market's sex ratio as an indicator of local mating prospects, and whether these assumptions influenced perceived romantic appearance pressures and body dissatisfaction, we performed path analysis using SPSS AMOS 26 (see Fig. 4). To ensure robustness of effects, we again used bootstrapping ($n = 1000$) and 95% confidence intervals.

Consistent with hypotheses, women's perceptions of a female-skewed sex ratio were significantly associated with

Table 2 Study 3's descriptive statistics and correlations

	M (SD)	1	2	3	4	5
1. Sex ratio (females per 100 males)	97.22 (14.65)	-				
2. Perceived female-skewed sex ratio (1–5)	3.74 (1.00)	.04	-			
3. Unfavorable mating prospects (1–5)	4.01 (0.97)	.01	**.21*****	–		
4. Romantic appearance pressure (1–4)	2.49 (1.04)	− .01	.01	**.13*****	–	
5. Body dissatisfaction (1–4)	2.63 (0.81)	.01	− .05	**.12****	**.21*****	–
6. Body mass index (14.5–50.5)	27.29 (7.26)	**− .08***	− .02	.01	**.23*****	**.28*****

Range of possible scores noted in parentheses next to construct.

$^{\dagger}p < .10$, $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

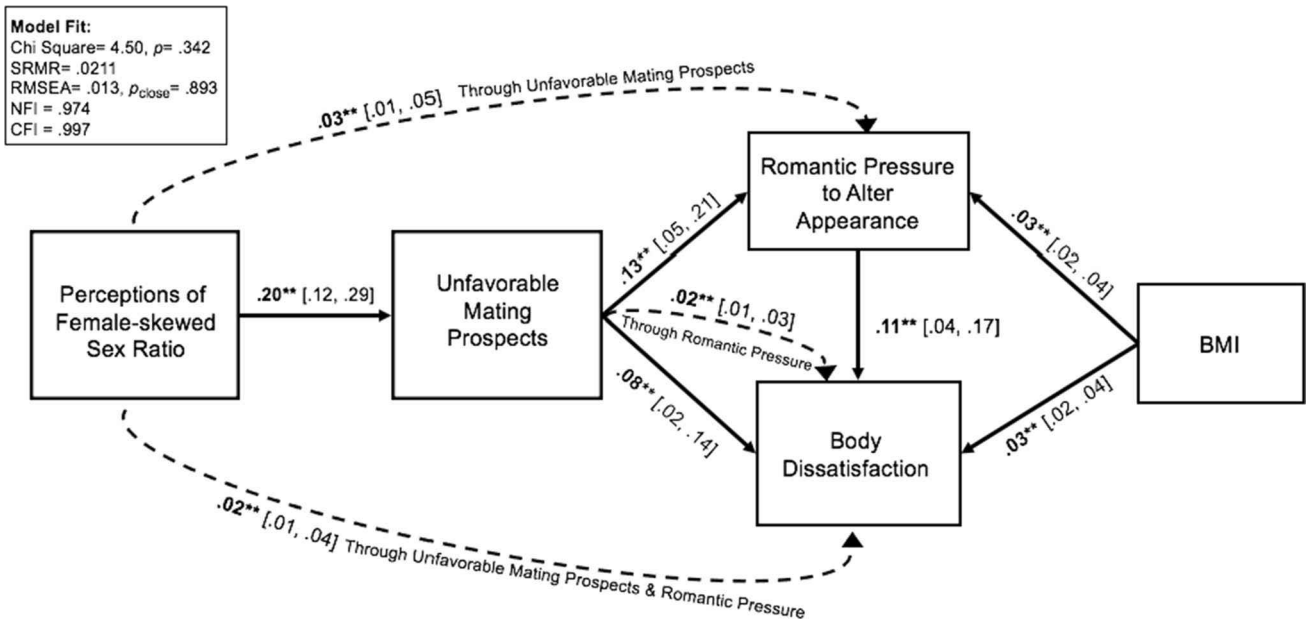

Fig. 4 Study 3's path analysis results. *Note*. Bootstrapped standardized coefficients and 95% confidence intervals reported. Solid lines indicate direct effects and dashed lines indicate indirect effects. $^{\dagger}p < .10$, $^{*}p < .05$, $^{**}p < .01$

their assumptions of unfavorable local mating prospects ($\beta = 0.20$, SE = 0.04, $p = 0.002$). That is, women who perceived more single women in their environments assumed worse prospects for finding romantic partners. Women who perceived worse mating prospects also felt greater romantic pressure to change their appearance to attract partners ($\beta = 0.13$, SE = 0.04, $p = 0.006$), supporting the link from general mating prospects to women's own appearance concerns. Moreover, perceived romantic pressure to alter one's appearance was significantly related to body dissatisfaction ($\beta = 0.11$, SE = 0.04, $p = 0.002$). Likewise, assumptions of unfavorable mating prospects were significantly associated with women's body dissatisfaction ($\beta = 0.08$, SE = 0.03, $p = 0.008$).

Perceptions of a female-skewed sex ratio also exhibited a significant positive indirect effect on romantic pressure through poorer mating prospects ($\beta = 0.03$, SE = 0.01, $p = 0.006$). Last, perceptions of a female-skewed sex ratio also exhibited a positive indirect effect on body dissatisfaction through poorer mating prospects and increased romantic pressures to alter one's appearance ($\beta = 0.02$, SE = 0.01, $p = 0.002$).

Discussion

Using a large sample of single women, Study 3 furnished evidence suggesting women infer local mating prospects from the sex ratio. When women perceived sex ratios characterized by relatively more (vs. fewer) women, they inferred worse local mating prospects, which corresponded to intensified perceptions of romantic pressure to alter their appearances and dissatisfaction with their bodies.

Study 3's significant indirect pathways identified two psychological mechanisms through which sex ratio may influence body dissatisfaction—presumed unfavorable mating prospects and romantic pressure to alter one's appearance to attract partners. These patterns build upon the findings of Studies 1 and 2 by further corroborating the link between the sex ratio, the degree of local mating competition, romantic appearance pressures, and body dissatisfaction. However, thus far, the investigation relied on correlational data, and thus, causal implications could not yet be drawn.

Study 4

Study 4 sought to provide causal evidence for the predicted link between the local sex ratio and women's body dissatisfaction and weight loss motivations. We did this by exposing women to cues signaling that the sex ratio of their local environment was skewed, either toward women or men. We predicted that participants exposed to the female (vs. male) skewed sex ratio would report lower body satisfaction and increased weight loss goals. We expected these effects would be strongest among participants who most strongly believed the sex ratio manipulation.

Method

Participants

University women reported to the laboratory in exchange for course credit. After removing one woman who was underage and six who were not heterosexual, the final sample comprised 145 heterosexual undergraduate women ($M_{age} = 19.1$ years, SD = 2.2, Range: 18–38). The sample was predominately White (59.3%), followed by Hispanic (17.9%), Black (13.8%), Multiracial/other (6.2%), and Asian (2.8%).

Procedure

Female participants were told they were participating in a study on memory. Participants were instructed to read carefully an ostensible recent article from the local newspaper because their memory for the article's information would later be tested. After reading the article, which served as the experimental manipulation of sex ratio, participants responded to measures assessing body satisfaction and dieting inclinations. To uphold the study's cover story, participants were asked to write a few sentences describing the content of the article. Participants also rated the extent to which they felt the article accurately described their current social environments, revealing the degree to which they believed the manipulation. Participants were fully debriefed before leaving the laboratory.

Following previous research (Durante et al., 2012; Griskevicius et al., 2012), participants were randomly assigned to read one of two brief news articles ostensibly from the local dispatch describing recent demographic shifts. One version, titled "Fewer Women for Every Man for Today's Students," portrayed increasing proportions of men enrolling in universities, leading to a male-skewed sex ratio on campuses and in the workforce. The alternate version described the reverse pattern, with women entering universities and workforces in higher proportions than men, creating female-skewed sex ratios.

Measures

Body Satisfaction After reading the article, female participants completed two body satisfaction items using a 11.5 cm visual analog scale (VAS). The two items (i.e., "How do you feel about your body shape right now?" and "How do you feel about your weight right now?") were rated with the end points Extremely Unsatisfied/Satisfied (Haedt-Matt et al., 2012). Previous research has found that VAS responses to these two items correlate highly with an established measure of body satisfaction (Heinberg & Thompson, 1995). Items were analyzed separately.

Desire for Weight Loss Three additional VAS items were used to assess weight loss motivations. Female participants indicated their agreement with three statements, "It is important to me to be thin," "I would like to exercise more," and "I would like to diet more," by making vertical marks along 11.5 cm lines using the endpoints Completely Disagree/Completely Agree. Items were analyzed separately.

Demographics Participants completed various demographic measures, including their height and weight, which were used to calculate BMI ($M = 23.4$, SD = 4.32).

Belief in Manipulation To measure belief in the manipulation, participants completed two items assessing the degree to which the demographic pattern portrayed in the article matched their own personal experiences. Using seven-point scales (1 = Not at all, 7 = Completely*)* participants answered, "To what extent did you feel that what was described in the article represented your college experience so far?" and "To what extent do you think that [university-redacted] fit the pattern described in the article?." Responses were averaged to form a composite measure of sex ratio manipulation belief ($\alpha = 0.92$).

Results

A series of linear regression models examined women's responses to the primary dependent measures across sex ratio conditions, with BMI as a covariate. None of these revealed a significant main effect of condition, suggesting the article manipulation was not sufficiently powerful to substantially shift women's body satisfaction or weight loss motivations ($ps > 0.636$).

Next, we conducted exploratory analyses to examine whether effects of the article manipulation depended on the extent to which women felt the articles accurately represented their current social environments. Women's responses to each of the dependent measures were regressed separately onto the sex ratio condition, their belief in the manipulation (z-scored), and the sex ratio-by-belief interaction term, with BMI as a covariate. The interaction between sex ratio condition and manipulation belief significantly predicted women's satisfaction with their weights, $\beta = -0.21$, $t(139) = 2.04$, $p = 0.043$ (see Fig. 5). To unpack this interaction, the effect of sex ratio condition was explored at both high and low levels of manipulation belief (2 *SD* above and below the mean). When participants believed the article matched their current environments, the hypothesized effect of sex ratio manipulation was significant, $\beta = -0.55$, $t(139) = 2.22$, $p = 0.028$. That is, participants in the female-skewed condition felt less

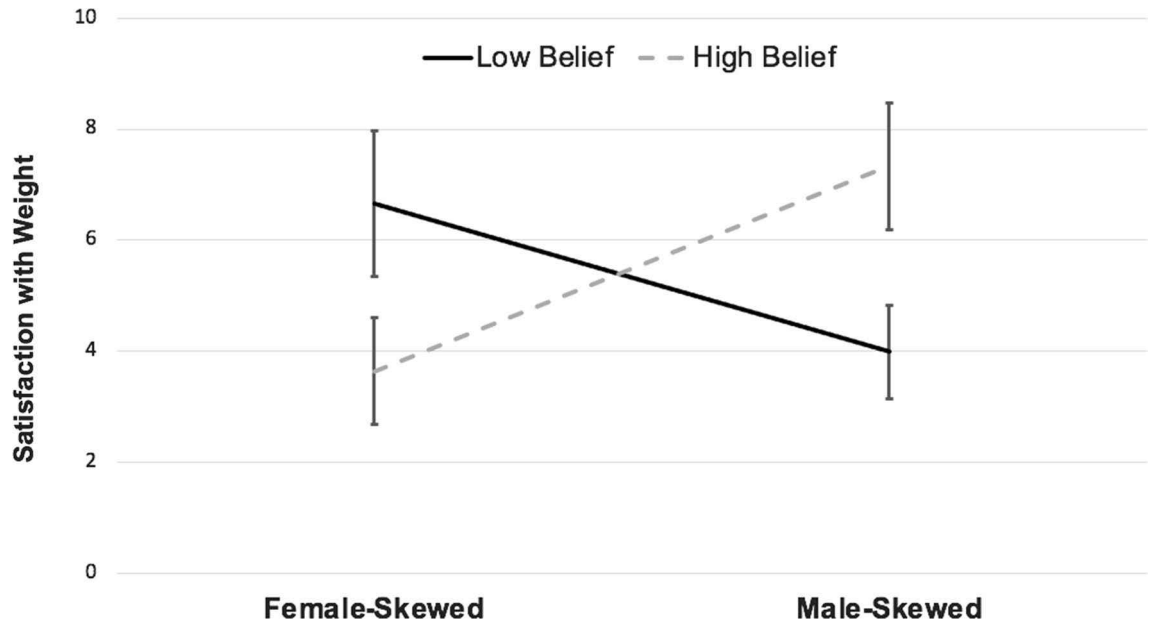

Fig. 5 Study 4's satisfaction with weight-by-sex ratio condition and level of manipulation belief. *Note.* Results of linear regression without BMI as a covariate. Confidence intervals reflect standard error

satisfied with their weights compared to those in the male-skewed condition. When participants did not believe the article reflected their current environment, the effect of sex ratio condition was marginally significant, but this time in the opposite direction, $\beta = 0.43$, $t(139) = 1.66$, $p = 0.099$. This reversal suggests participants in the female-skewed condition felt slightly more satisfied with their weights than those in the male-skewed condition, in spite of the article's description.

Using a similar regression model to predict participants' satisfaction with their body shape, a significant interaction between sex ratio condition and manipulation belief emerged, $\beta = -0.51$, $t(139) = 2.15$, $p = 0.033$ (see Fig. 6). This interaction was again probed among women who (did vs. did not) believe the manipulation. When participants believed the article matched their current environments, the sex ratio condition effect was marginally significant, $\beta = -0.50$, $t(139) = 1.90$, $p = 0.060$. That is, participants in the female-skewed condition felt marginally less satisfied with their shapes compared to those in the male-skewed condition. When participants did not believe the article reflected their current environment, the sex ratio condition effect was significant, but in the opposite direction, $\beta = 0.60$, $t(139) = 2.17$, $p = 0.032$. This reversal suggests participants in the female-skewed condition felt more satisfied with their shapes, but not because they believed the article's description. That these two patterns reversed when participants disagreed with the sex ratio manipulations grants some tentative indirect support for the study's hypotheses. No other dependent measures showed significant interactions with belief in the manipulation ($ps > 0.45$).

Discussion

Study 4 sought to provide causal evidence for the hypothesized link between sex ratio perceptions and women's body and shape satisfaction. The null effects of the sex ratio manipulation suggest reading a brief article was an insufficiently strong manipulation of sex ratio, perhaps because some women did not believe the article accurately reflected their environments. Indeed, educational statistics reveal that university sex ratios are generally female-skewed (NCES, 2019), and undergraduate women likely have strong a priori assumptions of their local environments. However, when we examined female participants who believed the article's sex ratio trends to be accurate, results were consistent with hypotheses. Women felt less satisfied with their weights and body shapes if they perceived themselves to be in female-skewed environment versus a male-skewed one. No significant effects emerged for weight loss motivations, suggesting the possibility that sex ratio perceptions exhibit stronger effects earlier in the hypothesized casual pathway (see Fig. 1), such as on body dissatisfaction, than their downstream processes (weight loss motivations), or that the single-item measures of weight loss motivations were not sufficiently sensitive to detect effects.

Although Study 4's results provided tentative support for the investigation's primary contentions as related to body dissatisfaction, the stimuli and design likely constrained our ability to detect meaningful differences in body dissatisfaction. Study 4's news articles were a relatively weak manipulation of mating market sex ratio; although one

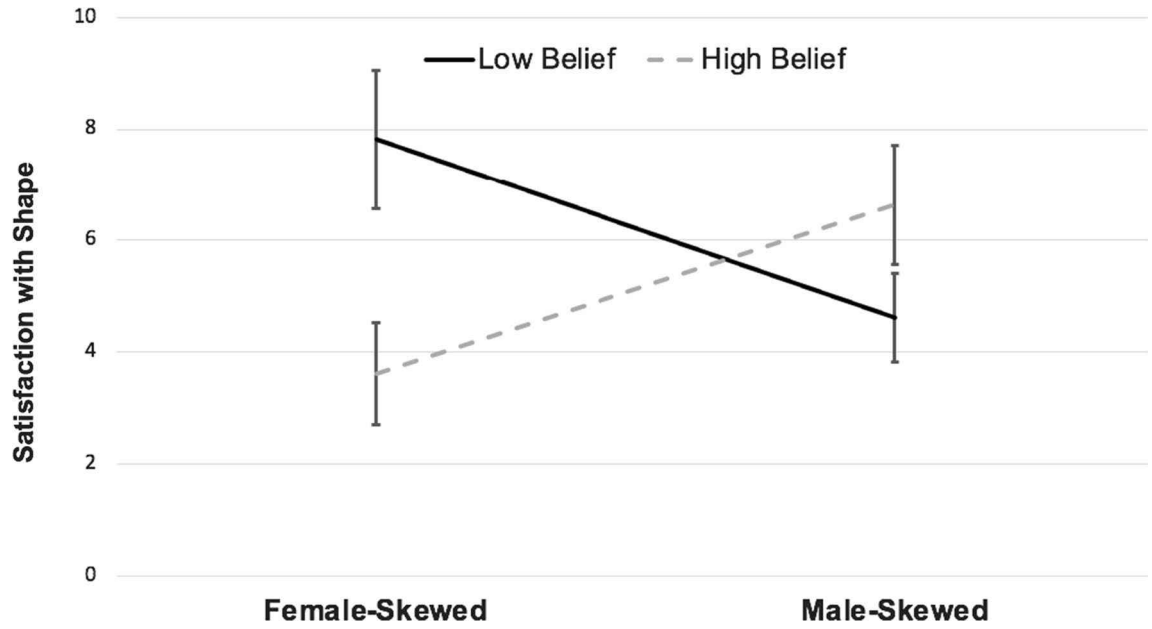

Fig. 6 Study 4's satisfaction with shape-by-sex ratio condition and level of manipulation belief. *Note.* Results of linear regression without BMI as a covariate. Confidence intervals reflect standard error

sentence referenced a woman finding herself in an office "full of single men/women," the remainder of the article did not state directly the consequences of the sex ratio for romantic relationship prospects. Thus, it is possible participants did not infer the association between these demographic patterns and mating prospects, which Study 3 identified as an important mediating inference for the translation of sex ratio to body dissatisfaction.

Study 5

Study 5 sought to address the primary limitations of Study 4 and provide a stronger experimental test of the investigation's primary hypotheses. If sex ratio influences women's body dissatisfaction because it alters inferences about mating prospects, then the sex ratio should be most consequential for body dissatisfaction when a mating context is made salient. Thus, to heighten the salience of mating motives, Study 5 participants were led to believe they were assisting in the design of a matching algorithm for a university dating service by assessing the dating profiles of fellow single students. Study 5 also improved upon Study 4 by using a mixed design that included measurement of body image before and after exposure to sex ratio manipulation to increase sensitivity to detect effects. Study 5 further expanded upon the previous studies by testing whether perceptions of same-sex competitors' attractiveness contributed to body dissatisfaction and weight loss motivations.

Method

Participants

In exchange for course credit, 286 heterosexual single university women completed a survey online and then reported to the laboratory. Eight participants' in-lab responses could not be tied to their Time 1 online data. Five women indicated they were not heterosexual and were removed from analyses. The final sample consisted of 273 heterosexual women ($M_{age} = 19.1$ years, SD = 1.61), of which 64% were Caucasian, 16.5% Hispanic, 12.9% Black, 3.3% Other, 2.2% Asian, 0.4% Arab, 0.7% Pacific Islander, and one not reporting.

Procedure

The study involved a $2 \times 2 \times 2$ mixed design, with two between-subjects independent variables (sex ratio in experimental prime; total number of profiles) and within-subjects dependent variables (body image measured before vs. after exposure to the prime).

Female participants were told the study's purpose was to perfect a matching algorithm for a new university dating service. Upon signing up for the study, participants were emailed a Time 1 online questionnaire, which they completed before reporting to the laboratory. To uphold the cover story, participants were asked to describe their ideal partner before completing the body image measures. At the laboratory, participants were told that to improve the dating service algorithm, investigators needed to assess which types of individuals were attracted to one another. Participants would therefore rate an array of dating profiles ostensibly submitted by fellow students and provide information about themselves in a survey (which again included the primary body image dependent measures; Time 2).

The composition of dating profiles served as the study's experimental sex ratio manipulation. Female participants were randomly exposed to view and rate one of four possible profile arrays varying in (A) female versus male-skewed sex ratio and (B) total number of profiles. One version contained 42 profiles (28 of the majority sex, 14 of the minority sex) and the other contained 21 profiles (14 of the majority sex and 7 of the minority sex). Therefore, both versions depicted a sex ratio of 2:1, but differed in the absolute number of profiles, so that both sex ratio and total number of potential competitors versus potential mates was manipulated. We manipulated profile quantity to examine whether the absolute number of potential rivals or mates altered the influence of sex ratio. For example, does having relatively fewer men in the mating pool more strongly influence body satisfaction if there are also very few men in the mating pool (in terms of absolute numbers)?

Thus, women were randomly assigned to assess one of four possible profile arrays: male-skewed/many photos, female-skewed/many photos, male-skewed/few photos or female-skewed/few photographs. Profile photographs were selected from a publicly accessible website, HotorNot.com. Although the site has been since converted into an app (Chat & Date), at the time of data collection, it was a rating site, which allowed users to upload their photographs to be rated publicly by visitors. Photographs were selected if they clearly depicted the face and body of a solitary individual.

To augment the salience of the sex ratio manipulation, the research assistant made verbal remarks to the participants congruent with the sex ratio condition just before profile exposure. Female participants in the male-skewed condition were told, "just like with typical online dating services, many more men than women showed interest in our service, so you will probably see a lot of them." Participants in the female-skewed condition were told, "we have had many more women than men interested in our dating service, so you will probably see a lot of them." Participants were then asked to rate each profile on physical attractiveness. To enhance the believability of the cover story and increase the saliency of the mating context, participants were told to indicate their interest in getting in contact with each man depicted (1 = not at all, 7 = very much so). This question was presented for

every profile (including the female profiles) to increase believability that men were also rating profiles. Participants were thoroughly debriefed upon completion of the in-lab questionnaires.

Measures

Mating Prospects After rating the dating profiles, participants were presented with three items assessing perceptions of their own mating prospects: "I think it would be __ to find a desirable romantic partner" (1 = Extremely Difficult, 7 = Extremely Easy); "My odds of finding a desirable romantic partner are ___" (1 = Extremely low, 7 = Extremely high); "Competition to find a desirable romantic partner is ___" (1 = Extremely low, 7 = Extremely high; reverse-coded). Responses were averaged to form a mating prospects composite ($\alpha = 0.627$).

Body Satisfaction Participants completed the 6-item Body Image States Scale, which assesses momentary changes in body satisfaction and demonstrates construct validity (Cash et al., 2002). A sample item reads: "Right now I feel ___ with my weight" (1 = Extremely Dissatisfied, 9 = Extremely Satisfied). Responses were averaged to form Time 1 and 2 composites ($\alpha_{T1} = 0.901$; $\alpha_{T2} = 0.911$, respectively).

Weight Loss Desire Along with indicating their height, participants reported their current weight and ideal weight. Desired weight loss was calculated by subtracting participants' ideal weight from their current weight. Higher values thus indicated greater desired weight loss.

Competitors' Physical Attractiveness Following each profile, participants rated the depicted individual's physical attractiveness using a 7-point scale (1 = not at all, 7 = very much so). To measure assessments of same-sex competitors, we averaged each participant's ratings of all of the female profiles ($M = 4.58$, SD = 1.00).

Body Mass To account for individual differences in body size, we computed women's BMI from their self-reported heights and weights ($M = 23.2$, SD = 4.45).

Results

There was a significant effect of the sex ratio condition on women's perceptions of their mating prospects. Women exposed to the female-skewed profile arrays perceived themselves to have slightly worse mating prospects ($M = 3.30$, SD = 1.05) than those exposed to the male-skewed arrays ($M = 3.57$, SD = 1.01; $t(271) = 2.19$, $p = 0.030$, $d = 0.26$). This finding supports the hypothesis that women indeed use the local sex ratio as an indicator of their mating prospects.

To examine whether women's body satisfaction changed in response to the sex ratio manipulation, we conducted a mixed design ANOVA with sex ratio condition, profile quantity and the sex ratio by profile quantity interaction term as independent variables. There were no statistically significant main effects or interactions. The predicted interaction between sex ratio condition and pre- versus post-exposure body satisfaction was marginally significant, $F(1, 268) = 3.23$, $p = 0.073$. Inspection of the means indicated that the hypothesized pattern emerged, with body satisfaction decreasing among women exposed to female-skewed sex ratios ($d = -0.07$), but increasing among women exposed to male-skewed sex ratios ($d = 0.14$). This effect was not qualified by a three-way interaction with profile quantity ($p = 0.684$), nor did it shift substantially when BMI was entered as a covariate, $F(1, 267) = 3.14$, $p = 0.078$.

A second repeated-measures ANOVA examined women's desired weight loss. The predicted weight loss by sex ratio condition was significant, $F(1, 267) = 3.92$, $p = 0.049$. No other interactions were statistically significant. Participants desired to lose significantly less weight after viewing the male-skewed profile array ($M = 10.42$lbs, $SE = 1.48$) compared to before ($M = 11.8$lbs, $SE = 1.54$), $p = 0.001$, $d = 0.22$. However, participants in the female-skewed condition did not change their desired weight loss following the profile array ($M = 12.8$lbs, $SE = 1.44$) compared to before ($M = 13.1$lbs, $SE = 1.50$), $p = 0.587$, $d = 0.07$. The predicted interaction between sex ratio condition and weight loss remained significant after accounting for BMI, $F(1, 266) = 4.24$, $p = 0.040$.

Last, we examined an alternative predictor of women's responses: the physical attractiveness of their same-sex rivals. Participants' average ratings of their same-sex rivals' attractiveness were uncorrelated with their mating prospects, $r = 0.02$, $p = 0.705$. Next, we conducted linear regression models to examine whether rival attractiveness predicted or interacted with the sex ratio condition to predict changes in body satisfaction. We entered T1 body satisfaction, rival attractiveness, sex ratio condition, and the rival attractiveness by sex ratio interaction to predict T2 body satisfaction. This model revealed a significant main effect of rival attractiveness, $\beta = 0.11$, $t = 2.46$, $p = 0.015$, such that female participants who rated their same-sex rivals as more attractive also reported higher levels of body satisfaction. This pattern might indicate that women who felt more satisfied with their bodies might have found it easier to acknowledge their rivals' attractiveness. Perceptions of rival attractiveness did not significantly interact with sex ratio to predict body satisfaction at Time 2, $\beta = -0.02$, $t = -0.42$, $p = 0.676$.

Next, a similar regression model examined whether rival attractiveness predicted or interacted with sex ratio condition to predict changes in desired weight loss. There was neither a significant main effect of rival attractiveness, $\beta = 0.03$, $t = 1.27$, $p = 0.205$, nor a significant interaction with sex ratio condition, $\beta = -0.02$, $t = -0.72$, $p = 0.474$. Taken together, these non-significant effects suggest perceptions of rivals' attractiveness were not driving the patterns of change in body satisfaction and desired weight loss found with sex ratio.

Discussion

Using a within-person design, Study 5 found causal support for the investigation's primary hypotheses. Supporting the overarching theoretical framework and conceptually replicating Study 3, Study 5 revealed women made inferences about their own mating prospects based on the local sex ratio. Moreover, women led to believe their local mating market was characterized by a higher proportion of men than women (i.e., more favorable sex ratio) desired to lose less weight than before receiving information about the mating market. In contrast to our expectations, those led to believe their local mating market was saturated with relatively more women did not change their weight loss goals. It is possible the female-skewed profile arrays were less impactful because undergraduate women may already be aware their immediate environments are female-skewed and thus, the manipulation only confirmed pre-existing assumptions. The female-skewed condition may therefore simply serve as a reminder of what they were already experiencing—a female-skewed population—and therefore did not change their body image or weight loss goals.

Because Study 5 varied the number of profiles along with the sex ratio of the profiles, it could assess whether the absolute number of competitors or potential mates magnified the effect of sex ratio. However, across analyses, profile quantity did not significantly interact with sex ratio, suggesting the effects of sex ratio on body satisfaction and desired weight loss held across the absolute number of rivals and potential mates. Study 5's results also ruled out an alternative explanation for the pattern of findings: namely, that women's assessments of their same-sex rivals' attractiveness were driving the effects found with sex ratio. If anything, women who perceived their same-sex rivals as more attractive also reported higher levels of body satisfaction. This pattern might suggest those women who felt more confident in their bodies were also more willing to acknowledge their competitors' physical appeal.

General Discussion

Many women are dissatisfied with their figures, which can lead them to experience a substantially diminished sense of well-being (Frederick et al., 2016; Goldschmidt et al., 2016). Across 5 studies and 1,776 heterosexual women, body dissatisfaction and motivations to lose weight were tied to perceptions of the local sex ratio. Among both undergraduate and community women (Studies 1 and 2), those who perceived their local mating markets as saturated with relatively more women than men felt more competitive with other women for romantic partners, which translated into heightened body dissatisfaction and motivations to diet. Study 3 uncovered psychological mechanisms through which sex ratio assessments might contribute to body dissatisfaction: women who perceived themselves to be surrounded by relatively more same-sex competitors assumed worse prospects for attracting romantic partners, which corresponded to increased perceptions of romantic pressure to alter their appearance.

In Study 4, women who believed themselves to be immersed in a female-skewed environment felt worse about their weights and shapes than did women who believed themselves to be surrounded by relatively more men. Study 5 provided stronger causal evidence for the primary hypotheses by straightforwardly manipulating the sex ratio of women's mating environments, and thus, their mating prospects. Indeed, women exposed to a female-skewed dating profile array perceived themselves to have slightly worse romantic prospects than those exposed to a male-skewed array, which Study 3 identified as an important intermediary assumption in the translation of sex ratio to body image. Upon exposure to the favorable male-saturated dating pool, women experienced a decrease in weight loss desires.

Taken together, these results both replicate and extend existing research on the consequences of sex ratio for women's psychologies and behaviors. Studies 1 and 2 replicated previous work finding that women feel more intrasexually competitive in female-skewed environments (Arnocky et al., 2014). Although prior investigations have demonstrated how this heightened competitiveness can translate to aggression toward appealing same-sex rivals (Moss & Maner, 2016), the current investigation demonstrated this increased competitiveness can also alter how women evaluate their own appearances. Results revealed that in competitive female-skewed contexts, women felt less satisfied with their bodies and more motivated to lose weight. Other work has found that in female-skewed environments, women decrease the commitment they require before engaging in sexual activity, perhaps to attract partners under unfavorable mating circumstances (Kandrik et al., 2015; Moss & Maner, 2016; Schmitt, 2005). Likewise, the current findings reveal women also feel pressured to alter their appearance to attract mates in these competitive contexts. Altogether, these findings build upon a growing body of evidence that humans, like other sexually reproducing species, are responsive to the sex ratios of their local mating environments.

Together, this package of findings reveals that women's immediate social environments can affect their body image and weight loss motivations. Although we focused only on sub-clinical levels of body dissatisfaction and dieting motivations, extant research demonstrates that body dissatisfaction below clinical cut-off points for eating disorders predicts poor psychological health, including anxiety, depression, lower life satisfaction and substance use (Frederick et al., 2016; Goldschmidt et al., 2016; Piran & Robinson, 2011; Puccio et al., 2016; Vannucci & Ohannessian, 2018). Shedding light

onto the mechanisms altering women's evaluations of and motivations to alter their bodies might promote the construction of more efficacious interventions and treatments to foster positive body image and well-being.

Patterns uncovered here suggest interventions aimed at altering women's perceptions of their mating prospects may prove useful in reducing female body dissatisfaction. Because perceptions of the sex ratio are more easily manipulable than local conditions, our findings that women's perceptions of their environments more strongly correlated with body image than metrics calculated from zip codes might offer optimism, such as through opportunities for intervention and treatment. Our studies highlighted that assumptions about mating prospects might serve as a potentially consequential mediating inference in the pathway through which sex ratio assessments alter body satisfaction. Indeed, the current investigation has identified multiple points whereby interventions might aim to interrupt the harmful consequences of female-skewed sex ratios: assumptions of mating prospects (Studies 3 and 5) and pressure to alter one's appearance to attract partners (Study 3).

Extant evidence tentatively supports that interventions emphasizing mating prospects can improve female body satisfaction. One investigation found women exposed to female body types larger than the thin ideal felt more satisfied with their bodies, but only if they were told men preferred those average-weight female figures (Meltzer & McNulty, 2015). Another study demonstrated the efficacy of a couple-based intervention program whereby women who critiqued cultural beauty standards alongside their romantic partners felt more satisfied with their bodies and were less inclined to idealize a thin figure (Ramirez et al., 2012). The efficacy of these two treatments not only supports the contention that some portion of women's body dissatisfaction and dieting motivations are aimed at attracting and retaining romantic partners, but also suggests interventions incorporating these romantic processes will prove efficacious. One promising opportunity for future intervention is suggested by Study 5, wherein the male-saturated sex ratio manipulation more strongly influenced body satisfaction and weight restriction goals than the female-saturated one. This pattern might suggest interventions examining the accuracy of women's perceptions about the abundance of "fish in the sea" or identifying adaptive ways to cope with unfavorable mating markets may prove useful in allaying women's body image concerns.

An important take-away from the current research is that the sex ratio of the immediate environment might diminish or enhance body satisfaction. Our findings lend credence to the pattern of heightened appearance monitoring, body dissatisfaction, thinness motivations, and eating disorders found among women at same-sex and female-skewed schools (Bould, et al., 2016; Davey et al., 2011; Dyer & Tiggemann, 1996; Leyera et al., 2014; Limbert, 2001; Wang et al., 2020). Moreover, the current results indicate that these pernicious outcomes may result from the implications women infer about their mating prospects. These real-world confirmations of our findings, along with the psychological mechanisms identified here, suggest that women who self-select into social contexts characterized by relatively high proportions of women may experience heightened body dissatisfaction. Indeed, a prospective investigation of university women revealed those who joined sororities later demonstrated increased motivations to be thin and more disordered eating symptoms compared to those who never joined these single-sex social groups (Allison & Park, 2004). The current findings may therefore prove useful in identifying at-risk individuals and contexts (e.g., female-skewed groups) likely to exacerbate body concerns, better targeting interventions with limited resources.

To be sure, however, Studies 2 and 3 suggested that women's perceptions of their local mating pools' sex ratios were relatively uncorrelated with the sex ratios calculated from their zip codes. This divergence might indicate that zip codes are a coarse index of the populations women consider as their relevant mating pools. For example, if a woman lives in a male-biased city, but works in a female-biased industry or attends a female- biased university, she might perceive her mating pool as female-skewed. Similar asymmetries have been uncovered in investigations of crime, whereby perceptions of crime and local crime rates are relatively uncorrelated (Gramlich, 2016). In these investigations, perceptions of crime correspond more closely to outcomes of interest than do local crime rates (Snyder et al., 2011). These divergences suggest that individuals have access to information about their personal circumstances that are not perfectly captured by average local patterns. Indeed, Study 4's findings echoed this sentiment, whereby female students' perceptions of their local environments were more strongly correlated with weight and shape satisfaction than the article descriptions. Because the first few studies were correlational, causal inferences should be tempered. That is, women's perceptions of their bodies could have altered their assessments of their mating environments. Study 5's experimental design offers evidence that mating market sex ratios can influence women's weight loss motivations. Nonetheless, future work might more thoroughly examine the relative influence of women's local sex ratios versus their perceptions of mating pool sex ratios for body dissatisfaction.

Further limitations of this research provide additional opportunities for future investigation. First, it examined only heterosexual women. These inclusion criteria were intentional, as the implications of sex ratio for mating prospects are more straightforward for heterosexual than non-heterosexual individuals. However, an interesting avenue for future research might examine these pathways among non-heterosexual women, for whom other women constitute both

potential partners and romantic rivals. Second, this investigation recruited participants from a Western, industrialized culture (i.e., the USA) where female thinness is idealized (Swami et al., 2010). It is possible that women's perceptions of their mating market's sex ratio would less strongly exacerbate body dissatisfaction in cultures where heavier female figures are valued, but perhaps especially when valued by men.

Third, this investigation examined how sex ratio shapes women's, but not men's, body dissatisfaction. Although men generally feel more satisfied with their bodies than do women (Frederick et al., 2016, 2022), many men are unhappy with their level of body fat and desire to be more muscular, often to attract women (Frederick et al., 2007). Indeed, many women report an attraction to toned and muscular men (Frederick & Haselton, 2007). If some portion of men's body dissatisfaction is rooted in motivations to attract romantic partners, then it is plausible that perceptions of male-saturated mating markets would similarly impair heterosexual men's body image, but perhaps most strongly in the domain of muscularity. The consequences of sex ratio for men's body image remain open questions for future research.

Fourth, sex ratio measures and manipulations differed across studies. That similar patterns emerged despite these differences lends credence to the generalizability of effects. However, it remains unclear whether women might infer different consequences across conceptualizations of sex ratio. For example, the sex ratio measures from Studies 3–5 mentioned single women specifically, whereas the measures employed in Studies 1 and 2 did not. Because the majority of the population is heterosexual (US Census Bureau, 2022), the sex ratio of single women should correlate highly with the sex ratio of the general population. Nonetheless, it is possible that highlighting the single status of these women might amplify sex ratio effects because implications for mating competition are salient. Another possibility is that the influence of sex ratio dynamics differs across age ranges. That is, women might be most sensitive to shifts in the sex ratio among more similarly-aged peers or among only those of reproductive age. Future investigations might therefore examine how nuances in the sex ratio manipulations or measures alter subsequent assumptions and behavior.

Last, the investigation examined only a few of the potential mechanisms through which sex ratio influences women's body image: unfavorable mating prospects (Studies 3, 5) and romantic appearance pressure (Study 3). One alternative explanation not examined here is the possibility that in female-skewed environments, women might infer that men are more inclined to pursue short-term sexual relationships rather than long-term and committed ones. Indeed, cross-cultural evidence reveals that when men are scarce, individuals exhibit more unrestricted sociosexual orientations, such that they are more open to casual sex (Schmitt, 2005). When pursuing short-term sexual partners, both men and women tend to place greater emphasis on partners' physical appearance (Li, 2007). Thus, it is possible that in female-skewed environments, women might infer that men are more interested in short-term sexual relationships, and place greater emphasis on partners' appearances, which contributes to their body image concerns and weight loss motivations. Future research might therefore examine whether women perceive men as more open to casual sex in such contexts and whether such assumptions exacerbate body dissatisfaction.

Conclusion

Many investigations have documented how sociocultural contexts can impair women's body image, such as through inundations of media depictions of idealized thin female figures (Groesz et al., 2002). However, insights from biology point to another ecological factor shaping these motivations and corresponding behaviors: the local sex ratio. Across sexually reproducing species, the sex ratio reflects the relative quantity of mating rivals to potential mates in a given population, thereby indicating the intensity of mating competition.

In the current investigation, we proposed and demonstrated that women's perceptions of the sex ratios in their immediate mating pools contributes not only to how competitive they feel toward one another, but also how they feel about themselves. When faced with a sea of same-sex competitors relative to potential partners, women experience increased body dissatisfaction and motivations to lose weight. By shedding light on the mediating psychological pathways through which these ecologies translate to body image and weight loss motivations, we can better design interventions and select environments maximally conducive to well-being and body esteem.

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Data Availability Data and syntax for all studies can be accessed at https://osf.io/vr6se/?view_only=88467ea2b2304738b9118434e42710cc.

Declarations

Conflicts of interest Although Match provided funding for Study 3, findings were not subject to approval by Match or others prior to submission or publication.

Consent to Participate Informed consent was obtained from all individual participants included in studies.

Ethics Approval Methods and materials were approved by the institutional review boards of Florida State University (Studies 1, 2, 4, 5) and Indiana University Bloomington (Study 3). The procedures used in this study adhere to the tenets of the Declaration of Helsinki.

References

Abed, R. T. (1998). The sexual competition hypothesis for eating disorders. *British Journal of Medical Psychology, 71*, 525–547.

Abed, R., Mehta, S., Figueredo, A. J., Aldridge, S., Balson, H., Meyer, C., & Palmer, R. (2012). Eating disorders and intrasexual competition: Testing an evolutionary hypothesis among young women. *The Scientific World Journal, 2012*. https://doi.org/10.1100/2012/290813

Allison, K. C., & Park, C. L. (2004). A prospective study of disordered eating among sorority and nonsorority women. *International Journal of Eating Disorders, 35*, 354–358.

Arnocky, S., Ribout, A., Mirza, R. S., & Knack, J. M. (2014). Perceived mate availability influences intrasexual competition, jealousy and mate-guarding behavior. *Journal of Evolutionary Psychology, 12*, 45–64.

Arthur, L. C., Brooks, R. C., & Blake, K. R. (2020). Female self-sexualization covaries with mate value but not mate availability. *Adaptive Human Behavior and Physiology, 6*, 277–291.

Averett, S., & Korenman, S. (1996). The economic reality of The Beauty Myth. *Journal of Human Resources, 31*, 304–330.

Averett, S. L., Sikora, A., & Argys, L. M. (2008). For better or worse: Relationship status and body mass index. *Economics & Human Biology, 6*, 330–349.

Barber, N. (1999). Women's dress fashions as a function of reproductive strategy. *Sex Roles, 40*, 459–471.

Bould, H., De Stavola, B., Magnusson, C., Micali, N., Dal, H., Evans, J., & Lewis, G. (2016). The influence of school on whether girls develop eating disorders. *International Journal of Epidemiology, 45*, 480–488.

Bove, C. F., & Sobal, J. (2011). Body weight relationships in early marriage. Weight relevance, weight comparisons, and weight talk. *Appetite, 57*, 729–742.

Boyes, A. D., & Latner, J. D. (2009). Weight stigma in existing romantic relationships. *Journal of Sex & Marital Therapy, 35*, 282–293.

Buss, D. M. (1988). From vigilance to violence: Tactics of mate retention in American undergraduates. *Ethology and Sociobiology, 9*, 291–317.

Buss, D. M. (1989). Sex differences in human mate preferences: Evolutionary hypotheses tested in 37 cultures. *Behavioral and Brain Sciences, 12*, 1–14.

Cash, T. F. (2000). *The Multidimensional Body-Self Relations Questionnaire Users' Manual: 3rd revision*. Available at http://www.body-images.com/assessments.

Cash, T. F., Fleming, E. C., Alindogan, J., Steadman, L., & Whitehead, A. (2002). Beyond body image as a trait: The development and validation of the Body Image States Scale. *Eating Disorders, 10*, 103–113.

Cashdan, E. (1998). Are men more competitive than women? *British Journal of Social Psychology, 37*, 213–229.

Census Bureau, U.S. (2022). *Household pulse survey*, July 21-Septempet 13, 2021. Retrieved from https://www.census.gov/library/stories/2021/11/census-bureau-survey-explores-sexual-orientation-and-gender-identity.html.

Chang, L., Wang, Y., Shackelford, T. K., & Buss, D. M. (2011). Chinese mate preferences: Cultural evolution and continuity across a quarter of a century. *Personality and Individual Differences, 50*, 678–683.

Chen, E. Y., & Brown, M. (2005). Obesity stigma in sexual relationships. *Obesity Research, 13*, 1393–1397.

Clark, L., & Grant, J. W. (2010). Intrasexual competition and courtship in female and male Japanese medaka, Oryzias latipes: Effects of operational sex ratio and density. *Animal Behaviour, 80*, 707–712.

Clutton-Brock, T. H., & Parker, G. A. (1992). Potential reproductive rates and the operation of sexual selection. *Quarterly Review of Biology, 67*, 437–456.

Conley, D., & Glauber, R. (2005). *Gender, body mass and economic status* (No. w11343). National Bureau of Economic Research.

Cooper, P. J., Taylor, M. J., Cooper, Z., & Fairbum, C. G. (1987). The development and validation of the Body Shape Questionnaire. *International Journal of Eating Disorders, 6*, 485–494.

Davey, Z., Jones, M. K., & Harris, L. M. (2011). A comparison of eating disorder symptomatology, role concerns, figure preference and social comparison between women who have attended single sex and coeducational schools. *Sex Roles, 65*, 751–759.

Davis, A. C., & Arnocky, S. (2022). An evolutionary perspective on appearance enhancement behavior. *Archives of Sexual Behavior, 51*, 3–37. https://doi.org/10.1007/s10508-020-01745-4

de Jong, K., Forsgren, E., Sandvik, H., & Amundsen, T. (2012). Measuring mating competition correctly: Available evidence supports operational sex ratio theory. *Behavioral Ecology, 23*, 1170–1177.

Durante, K. M., Griskevicius, V., Simpson, J. A., Cantú, S. M., & Tybur, J. M. (2012). Sex ratio and women's career choice: Does a scarcity of men lead women to choose briefcase over baby? *Journal of Personality and Social Psychology, 103*, 121–134.

Dyer, G., & Tiggemann, M. (1996). The effect of school environment on body concerns in adolescent women. *Sex Roles, 34*, 127–138.

Emlen, S. T., & Oring, L. W. (1977). Ecology, sexual selection, and the evolution of mating systems. *Science, 197*, 215–223.

Faer, L. M., Hendriks, A., Abed, R. T., & Figueredo, A. J. (2005). The evolutionary psychology of eating disorders: Female competition for mates or for status? *Psychology and Psychotherapy: Theory, Research and Practice, 78*, 397–417.

Fales, M. R., Frederick, D. A., Garcia, J. R., Gildersleeve, K. A., Haselton, M. G., & Fisher, H. E. (2016). Mating markets and bargaining hands: Mate preferences for attractiveness and resources in two national US studies. *Personality and Individual Differences, 88*, 78–87.

Ferguson, C. J., Winegard, B., & Winegard, B. M. (2011). Who is the fairest one of all? How evolution guides peer and media influences on female body dissatisfaction. *Review of General Psychology, 15*, 11–28.

Frederick, D. A., Buchanan, G. M., Sadehgi-Azar, L., Peplau, L. A., Haselton, M. G., Berezovskaya, A., & Lipinski, R. E. (2007). Desiring the muscular ideal: Men's body satisfaction in the United States, Ukraine, and Ghana. *Psychology of Men & Masculinity, 8*, 103–117. https://doi.org/10.1037/1524-9220.8.2.103

Frederick, D. A., Crerand, C. E., Brown, T. A., Perez, M., Best, C. R., Cook-Cottone, C. P., Gordon, A. R., Malcarne, V. L., Nagata, J. M., Parent, M. C., Pila, E., Pennesi, J.-L., Reynolds, T. A., Rodgers, R. F., Schaefer, L. M., Thompson, J. K., Tylka, T. L., & Murray, S. B. (2022). Demographic predictors of body image satisfaction: The US Body Project I. *Body Image, 41*, 17–31. https://doi.org/10.1016/j.bodyim.2022.01.011

Frederick, D. A., Garcia, J. R., Gesselman, A. N., Mark, K. P., Hatfield, E., & Bohrnstedt, G. (2020). The Happy American Body 2.0: Predictors of affective body satisfaction in two US national internet panel surveys. *Body Image, 32*, 70–84. https://doi.org/10.1016/j.bodyim.2019.11.003

Frederick, D. A., & Haselton, M. G. (2007). Why is muscularity sexy? Tests of the fitness indicator hypothesis. *Personality and Social Psychology Bulletin, 33*, 1167–1183. https://doi.org/10.1177/0146167207303022

Frederick, D. A., & Reynolds, T. A. (2022). The value of integrating evolutionary and sociocultural perspectives on body image [Commentary]. *Archives of Sexual Behavior, 51*, 57–66. https://doi.org/10.1007/s10508-021-01947-4

Frederick, D. A., Sandhu, G., Morse, P. J., & Swami, V. (2016). Correlates of appearance and weight satisfaction in a US national

sample: Personality, attachment style, television viewing, self-esteem, and life satisfaction. *Body Image, 17*, 191–203.
Garner, D. M., & Garfinkel, P. E. (1979). The Eating Attitudes Test: An index of the symptoms of anorexia nervosa. *Psychological Medicine, 9*, 273–279.
Garner, D. M., Olmsted, M. P., Bohr, Y., & Garfinkel, P. E. (1982). The Eating Attitudes Test: Psychometric features and clinical correlates. *Psychological Medicine, 12*, 871–878.
Goldschmidt, A. B., Wall, M., Choo, T. H. J., Becker, C., & Neumark-Sztainer, D. (2016). Shared risk factors for mood-, eating-, and weight-related health outcomes. *Health Psychology, 35*, 245–252.
Gramlich, J. (2016, November 16). *Voters' perceptions of crime continue to conflict with reality*. Pew Research Center. https://www.pewresearch.org/fact-tank/2016/11/16/voters-perceptions-of-crime-continue-to-conflict-with-reality/
Gray, P. B., & Frederick, D. A. (2012). Body image and body type preferences in St. Kitts, Caribbean: A cross-cultural comparison with U.S. samples regarding attitudes towards muscularity, body fat, and breast size. *Evolutionary Psychology, 10*, 631–655. https://doi.org/10.1177/147470491201000319
Griskevicius, V., Tybur, J. M., Ackerman, J. M., Delton, A. W., Robertson, T. E., & White, A. E. (2012). The financial consequences of too many men: Sex ratio effects on saving, borrowing, and spending. *Journal of Personality and Social Psychology, 102*, 69–80.
Groesz, L. M., Levine, M. P., & Murnen, S. K. (2002). The effect of experimental presentation of thin media images on body satisfaction: A meta-analytic review. *International Journal of Eating Disorders, 31*, 1–16.
Grossbard, J. R., Neighbors, C., & Larimer, M. E. (2011). Perceived norms for thinness and muscularity among college students: What do men and women really want? *Eating Behaviors, 12*, 192–199. https://doi.org/10.1007/s11199-008-9535-y
Gualdi-Russo, E., Rinaldo, N., Masotti, S., Bramanti, B., & Zaccagni, L. (2022). Sex differences in body image perception and ideals: Analysis of possible determinants. *International Journal of Environmental Research and Public Health, 19*, 2745. https://doi.org/10.3390/ijerph19052745
Guttentag, M., & Secord, P. F. (1983). *Too many women? The sex ratio question*. Sage.
Haedt-Matt, A. A., Zalta, A. K., Forbush, K. T., & Keel, P. K. (2012). Experimental evidence that changes in mood cause changes in body dissatisfaction among undergraduate women. *Body Image, 9*, 216–220.
Heinberg, L. J., & Thompson, J. K. (1995). Body image and televised images of thinness and attractiveness: A controlled laboratory investigation. *Journal of Social and Clinical Psychology, 14*, 325–338.
Hendrickse, J., Arpan, L. M., Clayton, R. B., & Ridgway, J. L. (2017). Instagram and college women's body image: Investigating the roles of appearance-related comparisons and intrasexual competition. *Computers in Human Behavior, 74*, 92–100.
Kandrik, M., Jones, B. C., & DeBruine, L. M. (2015). Scarcity of female mates predicts regional variation in men's and women's sociosexual orientation across US states. *Evolution and Human Behavior, 36*, 206–210.
Keel, P. K., Baxter, M. G., Heatherton, T. F., & Joiner, T. E., Jr. (2007). A 20-year longitudinal study of body weight, dieting, and eating disorder symptoms. *Journal of Abnormal Psychology, 116*, 422–432.
Kruger, D. J., Aiyer, S. M., Caldwell, C. H., & Zimmerman, M. A. (2014). Local scarcity of adult men predicts youth assault rates. *Journal of Community Psychology, 42*, 119–125.
Kruger, D. J., Fitzgerald, C. J., & Peterson, T. (2010). Female scarcity reduces women's marital ages and increases variance in men's marital ages. *Evolutionary Psychology, 8*, 147470491000800320.
Legenbauer, T., Vocks, S., Schäfer, C., Schütt-Strömel, S., Hiller, W., Wagner, C., & Vögele, C. (2009). Preference for attractiveness and thinness in a partner: Influence of internalization of the thin ideal and shape/weight dissatisfaction in heterosexual women, heterosexual men, lesbians, and gay men. *Body Image, 6*, 228–234.
Lereya, S. T., Eryigit-Madzwamuse, S., Patra, C., Smith, J. H., & Wolke, D. (2014). Body-esteem of pupils who attended single-sex versus mixed-sex schools: A cross-sectional study of intrasexual competition and peer victimization. *Journal of Adolescence, 37*, 1109–1119.
Li, N. P. (2007). Mate preference necessities in long-and short-term mating: People prioritize in themselves what their mates prioritize in them. *Acta Psychologica Sinica, 39*, 528–535.
Li, N. P., Bailey, J. M., Kenrick, D. T., & Linsenmeier, J. A. (2002). The necessities and luxuries of mate preferences: Testing the tradeoffs. *Journal of Personality and Social Psychology, 82*, 947–955.
Lichter, D. T., Anderson, R. N., & Hayward, M. D. (1995). Marriage markets and marital choice. *Journal of Family Issues, 16*, 412–431.
Limbert, C. (2001). A comparison of female university students from different school backgrounds using the Eating Disorder Inventory. *International Journal of Adolescent Mental Health, 13*, 145–154.
Lippa, R. A. (2007). The preferred traits of mates in a cross-national study of heterosexual and homosexual men and women: An examination of biological and cultural influences. *Archives of Sexual Behavior, 36*, 193–208.
Maner, J. K., & Ackerman, J. M. (2020). Ecological sex ratios and human mating. *Trends in Cognitive Sciences, 24*, 98–100.
Markey, C. N., & Markey, P. M. (2005). Relations between body image and dieting behaviors: An examination of gender differences. *Sex Roles, 53*, 519–530.
Mealey, L. (2000). Anorexia: A "losing" strategy? *Human Nature, 11*, 105–116.
Meltzer, A. L., & McNulty, J. K. (2010). Body image and marital satisfaction: Evidence for the mediating role of sexual frequency and sexual satisfaction. *Journal of Family Psychology, 24*, 156–164.
Meltzer, A. L., & McNulty, J. K. (2015). Telling women that men desire women with bodies larger than the thin-ideal improves women's body satisfaction. *Social Psychological and Personality Science, 6*, 391–398.
Meltzer, A. L., McNulty, J. K., Novak, S. A., Butler, E. A., & Karney, B. R. (2011). Marriages are more satisfying when wives are thinner than their husbands. *Social Psychological and Personality Science, 2*, 416–424.
Moss, J. H., & Maner, J. K. (2016). Biased sex ratios influence fundamental aspects of human mating. *Personality and Social Psychology Bulletin, 42*, 72–80.
Myers, T. A., & Crowther, J. H. (2009). Social comparison as a predictor of body dissatisfaction: A meta-analytic review. *Journal of Abnormal Psychology, 118*, 683–698.
National Center for Education Statistics. (2019). *Undergraduate enrollment*. Retrieved from https://nces.ed.gov/programs/coe/indicator_cha.asp.
Neumark-Sztainer, D., & Hannan, P. J. (2000). Weight-related behaviors among adolescent girls and boys: Results from a national survey. *Archives of Pediatrics & Adolescent Medicine, 154*, 569–577.
Oreffice, S., & Quintana-Domeque, C. (2010). Anthropometry and socioeconomics among couples: Evidence in the United States. *Economics & Human Biology, 8*, 373–384.
Pedersen, F. A. (1991). Secular trends in human sex ratios: Their influence on individual and family behavior. *Human Nature, 2*, 271–291.
Perilloux, C., Cloud, J. M., & Buss, D. M. (2013). Women's physical attractiveness and short-term mating strategies. *Personality and Individual Differences, 54*, 490–495.

Piran, N., & Robinson, S. R. (2011). Patterns of associations between eating disordered behaviors and substance use in two non-clinical samples: A university and a community based sample. *Journal of Health Psychology, 16*, 1027–1037.

Pollet, T. V., & Nettle, D. (2007). Driving a hard bargain: Sex ratio and male marriage success in a historical US population. *Biology Letters, 4*, 31–33.

Puccio, F., Fuller-Tyszkiewicz, M., Ong, D., & Krug, I. (2016). A systematic review and meta-analysis on the longitudinal relationship between eating pathology and depression. *International Journal of Eating Disorders, 49*, 439–454.

Putterman, E., & Linden, W. (2004). Appearance versus health: Does the reason for dieting affect dieting behavior? *Journal of Behavioral Medicine, 27*, 185–204.

Ramirez, A. L., Perez, M., & Taylor, A. (2012). Preliminary examination of a couple-based eating disorder prevention program. *Body Image, 9*, 324–333.

Rosen, J. C., Jones, A., Ramirez, E., & Waxman, S. (1996). Body Shape Questionnaire: Studies of validity and reliability. *International Journal of Eating Disorders, 20*, 315–319.

Schmitt, D. P. (2004). Patterns and universals of mate poaching across 53 nations: The effects of sex, culture, and personality on romantically attracting another person's partner. *Journal of Personality and Social Psychology, 86*, 560–584.

Schmitt, D. P. (2005). Sociosexuality from Argentina to Zimbabwe: A 48-nation study of sex, culture, and strategies of human mating. *Behavioral and Brain Sciences, 28*, 247–311.

Smolak, L., & Levine, M. P. (2015). Body image, disordered eating, and eating disorders. In L. Smolak & M. P. Levine (Eds.), *The Wiley handbook of eating disorders* (pp. 1–10). Wiley.

Snyder, J. K., Fessler, D. M., Tiokhin, L., Frederick, D. A., Lee, S. W., & Navarrete, C. D. (2011). Trade-offs in a dangerous world: Women's fear of crime predicts preferences for aggressive and formidable mates. *Evolution and Human Behavior, 32*, 127–137.

Stone, E. A., Shackelford, T. K., & Buss, D. M. (2007). Sex ratio and mate preferences: A cross-cultural investigation. *European Journal of Social Psychology, 37*, 288–296.

Swami, V., Frederick, D. A., Aavik, T., Alcalay, L., Allik, J., Anderson, D., & Danel, D. (2010). The attractive female body weight and female body dissatisfaction in 26 countries across 10 world regions: Results of the International Body Project I. *Personality and Social Psychology Bulletin, 36*, 309–325. https://doi.org/10.1177/0146167209359702

Uecker, J. E., & Regnerus, M. D. (2010). Bare market: Campus sex ratios, romantic relationships, and sexual behavior. *Sociological Quarterly, 51*, 408–435.

Vannucci, A., & Ohannessian, C. M. (2018). Body image dissatisfaction and anxiety trajectories during adolescence. *Journal of Clinical Child & Adolescent Psychology, 47*, 785–795.

Walter, K. V., Conroy-Beam, D., Buss, D. M., Asao, K., Sorokowska, A., Sorokowski, P., & Zupančič, M. (2021). Sex differences in human mate preferences vary across sex ratios. *Proceedings of the Royal Society B, 288*(1955), 20211115.

Wang, X., Chen, H., Chen, Z., & Yang, Y. (2020). Women's intrasexual competition results in beautification. *Social Psychological and Personality Science, 12*(5), 648–657.

Weeden, J., & Sabini, J. (2007). Subjective and objective measures of attractiveness and their relation to sexual behavior and sexual attitudes in university students. *Archives of Sexual Behavior, 36*, 79–88.