An evolutionary perspective on intergroup dating bias

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Psychological research has documented a tendency for women, relative to men, to exhibit greater intergroup bias in the context of dating (Hitsch, Hortaçsu, & Ariely, 2010; Hwang, 2013). Furthermore, this bias may not be offset by other person characteristics, such as income, that are typically evaluated positively in male romantic partners (Hitsch, Hortaçsu, & Ariely, 2006). This finding may be surprising given that much of the research on intergroup bias suggests that men tend to express greater intergroup bias than women in a variety of other contexts (reviewed in McDonald, Navarrete, & Van Vugt, 2012). Previous research attempting to explain this discrepancy has suggested that women’s greater intergroup bias in romantic and intimate contexts might be the result of an evolutionary history in which women were often the victims of sexual coercion, committed by outgroup men during intergroup conflict (McDonald, Donnellan, Cesario, & Navarrete, 2015). From this perspective, women’s intergroup bias in dating contexts may function to protect women’s reproductive choice by avoiding men more prone to reliance on the use of sexually coercive mating tactics.
The purpose of the current research is to investigate the factors that influence women’s intergroup dating decisions. Specifically, the proposed research will examine whether women’s dating bias against outgroup men can be explained in terms of an evolved threat management psychological system for managing threats to women’s reproductive choice. If this is true, women’s bias against outgroup men in dating contexts is predicted to be reduced when an outgroup individual is not perceived as a threat to reproductive choice, and elevated when the threat is magnified.

**Intergroup bias**

*Intergroup bias* is defined as “beliefs about the traits and characteristics of groups, or individuals by virtue of their group membership” (Dovidio & Gaertner, 2010, p.1084). Much of the research examining gender differences in intergroup bias finds that on average, men display greater bias than women (Ekehammar, 1985; Ekehammar & Sidanius, 1982; Pratto, Sidanius, & Levin, 2006). One particularly well-researched example of this is the literature on social dominance orientation. Social dominance orientation is a personality measure that reflects the tendency to prefer systems of group-based social hierarchy, and includes items such as, “some groups of people are just more worthy than others” (Sidanius & Pratto, 1999). Individuals scoring highly on the measure of social dominance orientation also tend to score highly on a variety of other measures related to intergroup bias, including racism, social conservatism, and patriotism (Sidanius & Pratto, 1999). A meta-analysis examining gender differences on social dominance orientation found that men scored more highly than women in nearly all samples examined, including samples across diverse cultures (Lee, Pratto, & Johnson, 2011). These findings imply that, at least in competitive group contexts, men consistently express more intergroup bias than do women.

Yet in the context of dating, intergroup bias is greater among women. In online dating, speed dating, and longitudinal dating studies, research documents on average, a greater same-race preference among women, relative to men (Fisman, Iyengar, Kamenica, & Simonson, 2006, 2008; Hitsch et al., 2010; Hwang, 2013; Levin, Taylor, & Caudle, 2007). For example, Fisman and colleagues (2008) conducted a speed dating study in which participants took part in four-minute conversations to determine their romantic interest in other participants. Results indicated that women, on average, displayed a stronger same-race preference than men. In the context of online dating, Hwang (2013) assessed demographics and romantic dating preferences from a popular online dating site. The data suggested that although most daters expressed a strong within-race dating preference in their dating profiles, this preference was stronger for women than men. Recent theorizing from an evolutionary perspective suggests that this tendency among women to prefer to date men of their same racial group may function as part of a psychological system for managing threats to reproductive choice (McDonald et al., 2015; Neuberg, Kenrick, & Schaller, 2011).
An evolutionary perspective on women’s dating bias

**Threat-management system**

A threat-management system perspective suggests that humans are equipped with a set of precautionary systems that evolved as a means to defend against threats to reproductive fitness that were recurrent throughout evolutionary history (Neuberg & Schaller, 2016). Each system utilizes mechanisms of perception, emotion, cognition, and behavior to identify and respond to environmental cues that imply the presence of a potential threat, as well as self-appraised vulnerabilities that increase or decrease one’s susceptibility to such threat. In other words, the output of a self-protection threat-management system should promote avoidance of potential threats to one’s safety. Whether the system is activated, or how strongly it is activated, will depend on cues in the environment signaling threat (e.g. being in a dangerous neighborhood at night) and one’s own vulnerability (e.g. being alone and unable to ward off attack).

Applying the threat-management perspective to women’s intergroup bias, past research (McDonald et al., 2015) has suggested that women may be equipped with a sexual-coercion threat-management system for avoiding threats to women’s reproductive choice. This perspective is built on a basic tenet of parental investment theory (Trivers, 1972) indicating that reproductive choice is a key component of women’s reproductive fitness.

**Parental investment theory**

Parental investment theory (Trivers, 1972) offers a valuable model for interpreting many observed differences between males and females, across species. The starting point of the theory is that males and females differ in the minimum level of obligatory parental investment that is required for successful reproduction. For males, obligatory investment is quite minimal, and ends following sperm production and ejaculation. In contrast, for females, obligatory investment includes a long internal gestation period and a lengthy period of breastfeeding.

This sex difference in reproductive physiology incentivizes different reproductive strategies for men and women. For men, because reproduction can occur with minimal effort and time investment, reproductive fitness can be readily increased by pursuing a quantity-based mating strategy. Yet for women, increasing the number of mates does not produce the same increase in reproductive fitness as it does for men, owing to their lower reproductive ceiling. Thus, women can best increase reproductive fitness by pursuing a reproductive strategy that emphasizes the selection of high-quality mates, capable and willing to invest resources into their offspring. From this perspective, reproductive choice is a key component of women’s mating strategy, and therefore, threats to women’s reproductive choice (i.e. sexual coercion) present a significant adaptive problem.

**Sexual selection**

The sex differences described by parental investment theory lead to intrasexual and intersexual conflict. Given the tendency for males to pursue a quantity-based mating strategy, there are strong incentives for intrasexual competition among males for access
to mating opportunities and to resources that will make them more appealing to mates. Males who do not compete, or who fail in doing so, risk leaving behind no offspring. Given this risk, some men may resort to the use of aggressive mating strategies to maximize their chance for reproductive success (McKibbin, Shackelford, Goetz, & Starratt, 2008; Thornhill & Palmer, 2000). This presents an inherent intersexual conflict, such that men will tend to desire many mating opportunities from a large number of women, and may sometimes resort to the use of sexual coercion to do so, and women will prefer to mate only with high-quality men. As a result, women may have evolved a psychological system for protecting their reproductive choice from such threats.

Evidence for the workings of this psychological system can be seen in research investigating the possibility that women are equipped with psychological mechanisms that facilitate defensive vigilance against potential threats to their reproductive choice. For instance, Bröder and Hohmann (2003) observed that women in the ovulatory phase of their menstrual cycle engaged in fewer risky behaviors (e.g. “Walk alone in the park or forest”) in favor of increasing the number of non-risky behaviors (e.g. “Watch TV at home”). In other words, women appear to avoid risky situations to reduce their risk of sexual assault, at a time in their menstrual cycle when the fitness consequences for mating behaviors are most acute (i.e. near ovulation). Along similar lines, Petralia and Gallup (2002) showed that women in the ovulatory phase of their menstrual cycle responded to reading a sexual assault scenario depicting a woman headed to her car alone at night while leaving a deserted campus building (relative to a control scenario) with greater handgrip strength. These results suggest that women may possess mechanisms for protecting reproductive choice that, when activated, result in greater motivation for defense, as indexed by women’s increased handgrip strength in the assault scenario.

Overall, these studies illustrate that when threats to reproductive choice are most costly in terms of reproductive fitness (i.e. when women are near to ovulation), women increase defensive behaviors and avoid threatening situations. These findings suggest that women may have evolved a psychological system for protecting reproductive choice. Such a system would be particularly important in contexts that afford opportunities for men to engage in sexually coercive behavior, including intergroup conflict.

**Intergroup conflict and sexual selection**

Throughout evolutionary history, outgroup members have continually posed a threat to men and women’s survival and reproductive success (Navarrete, McDonald, Molina, & Sidanius, 2010). Indeed, anthropological and archaeological research suggests that intergroup conflict was a recurrent adaptive challenge for our evolutionary ancestors (Keeley, 1996, 2014; LeBlanc & Register, 2003; Schaller & Neuberg, 2008). During times of conflict, men and women encountered different adaptive problems. The vital goals for men were to defend one’s own existing resources from invading outgroups, and to increase access to resources and mating opportunities from the outgroup (McDonald et al., 2012). Women, on the other hand, were rarely involved in conflict as warriors, but they often suffered as the victims of sexual assault at the hands of an invading group. Ethnographic studies of past and existing tribal groups shed light on this behavior. Examining data from the Standard Cross Cultural Sample within the
Human Relations Area Files, Anthropologist Peggy Sanday (1981) reviewed predictors of rape across 156 tribal societies. Her results indicated that there were higher rates of rape in tribal societies where intertribal warfare and conflict were recurrent (Meston & Buss, 2009; Sanday, 1981). For example, men of the Yanomamö tribes of Venuzuela and Brazil have been documented to engage in frequent tribal warfare often resulting in rape of the enemy tribe’s women (Chagnon, 1988; Harris, 1977; Wrangham & Peterson, 1996).

A historical review of modern conflict (Lalumière, Harris, Quinsey, & Rice, 2005) illuminates the modern-day links between rape and warfare. American soldiers fighting in Vietnam and German soldiers during World War II along the Eastern Front participated in mass rape of outgroup women. Brownmiller (1975) reported that rape has been associated with religious wars dating back to the First Crusade. Sexual assault took place as knights and pilgrims made their way to Constantinople (Wilson, 1969). Additional evidence suggests that wartime rape was associated with Medieval European warfare, including wars between the Ancient Greeks (reviewed in Gottschall, 2004).

Given these findings, intergroup conflict likely presented a recurrent threat to women’s reproductive choice throughout human evolutionary history. Women subjected to the sexually coercive mating tactics of men could not exert their own preference in their mate choice, and would therefore likely suffer a reduction in their reproductive fitness (McKibbin et al., 2008). As a result, a sexual-coercion threat management system in women is likely to include mechanisms specific to showing bias against, and avoidance of, outgroup men so as to protect reproductive choice (McDonald et al., 2015).

**Coalitional intergroup context**

If women have specific mechanisms for avoiding outgroup men in order to protect reproductive choice, then it is important to specify what constitutes *ingroup* versus *outgroup*. Anthropological literature indicates that, given the vast geographic distances between hunter-gather societies of different races throughout most of human evolutionary history, it is unlikely that humans would have encountered someone of another racial group (Stringer & McKie, 1997). As a result, it is unlikely that the human mind could have evolved adaptations specifically for categorizing individuals on the basis of their race. However, humans did live in groups, which often came into conflict with one another, and therefore would have benefited immensely from psychological mechanisms for tracking coalitional memberships and alliances. Thus, it is likely that humans are equipped with cognitive mechanisms for encoding visual and behavioral cues that track coalitional allegiance, such as dialect, shared clothing and ornamentation styles, and verbal cues of allegiance (Kurzban, Tooby, & Cosmides, 2001). From this perspective, race-based bias may be a by-product of the mechanism that enable humans to detect coalitional membership. Relevant to the research reported here, women’s tendency to prefer to date within their own racial group may not be a preference that is restricted to racial groups, but may be a broader within-coalition preference (McDonald et al., 2015).
A threat management system for avoiding sexual coercion in intergroup contexts

If women possess a sexual coercion threat-management system for protecting reproductive choice, then this system may include specific mechanisms for displaying increased bias against outgroup men (coalitional outgroups) because of the pervasive and recurrent threats they have posed to women’s reproductive choice throughout evolutionary history (McDonald et al., 2015). Evidence for this system is provided if women regulate bias as a function of their own vulnerability to reproductive threats, as well as increases or decreases of threat in the environment.

As examined by Navarrete, Fessler, Fleischman, and Geyer (2009), women’s bias against outgroup men appears to be connected to periods of fertility, as well as their perceived vulnerability to sexual coercion. Results of their research demonstrate that White women express greater bias against Black men when they are near to ovulation in their menstrual cycle, as compared to women at other points in their cycle, and that this association is strongest among women who appraise themselves higher in fear of, and vulnerability to, sexual coercion. Women who perceive themselves as vulnerable may have a lower threshold for the activation of the proposed threat management system that assists in circumventing sexual coercion. Those who feel they are more defenseless against sexual threat and have a greater likelihood of encountering threats of coercion may evaluate themselves as more vulnerable. Vulnerability in combination with greater risk of conception may elevate alertness to men perceived as potentially threatening.

Along similar lines, research has documented that women in fertile periods of their menstrual cycle express more bias against outgroup men who they associated with greater physicality (McDonald, Asher, Kerr, & Navarrete, 2011). Physically formidable men may pose a greater threat to women for a variety of reasons. For example, greater physical strength increases men’s ability to physically constrain a woman, thereby making more formidable men a greater threat to reproductive choice. It may also be that more physically strong men are more likely to use aggressive mating tactics, given the association between physical strength and aggressive behavior more generally (Sell, Tooby, & Cosmides, 2009). McDonald and colleagues (2011) found that perceptions of physicality in the outgroup was associated with greater bias among women near to ovulation in two intergroup contexts – one in which groups were defined according to race (Black and White) and one where participants were assigned to a novel and largely arbitrary group in the lab based on simple color preferences (i.e. a minimal group; Tajfel, Billig, Bundy, & Flament, 1971). That both contexts produced the same pattern of findings is consistent with the idea that these mechanisms were designed to protect reproductive choice in a coalitional context.

The above findings imply that women may express greater bias against outgroup men who appear more formidable or threatening. However, this is at odds with research demonstrating that women show a preference for masculine features in ingroup men (Cunningham, Barbee, & Pike, 1990; Keating, 1985), especially among women in the fertile window of the menstrual cycle (e.g. Penton-Voak & Perrett, 2000). It may be that masculinity is preferred in ingroup men as an indicator of high genetic quality, but not in outgroup men to the extent that it is viewed as a marker of aggression. Along these lines, the research of Geniole and McCormick (2013) suggest that women may find masculinity attractive only when it is not
perceived as an indicator of aggression. After controlling for the correlation of aggression with facial masculinity, female preferences for masculinity increased dramatically (Geniole & McCormick, 2013). Similarly, Li et al. (2014) conducted a study in which primes of male-on-female aggression were associated with a reduced preference for traits of masculinity in male targets. Given these findings, women may be hesitant to date men who appear threatening. This may be especially true for outgroup men, given that they have ancestrally posed a recurrent threat to women’s reproductive choice through the use of aggressive mating tactics during intergroup conflict. In sum, women may be particularly vigilant against outgroup men with masculine features given their potential to signal aggressive behaviors toward women.

Integrating these findings suggest that women who are at greater risk for conception, and who appraise themselves as vulnerable to sexual coercion, will appraise men of outgroup status more negatively, especially when indicators of threat or aggression are present (Geniole & McCormick, 2013; McDonald et al., 2011; Navarrete et al., 2009, 2010). Examining these factors in a dating context, McDonald and colleagues (2015) documented that women were less likely to accept a date request from an outgroup male (defined using minimal groups) when they evaluated themselves as vulnerable to sexual coercion and were also within the fertile period of their menstrual cycle. These findings provide evidence that women may be equipped with a sexual-coercion threat management system that functions to produce behavioral avoidance of individuals who women appraise as a threat to their reproductive choice.

The current research

The research reviewed above suggests that women’s prejudice against outgroup men, particularly in intimate contexts, may function to circumvent the sexually coercive mating tactics of men who have posed a persistent threat to reproductive choice over the course of human evolutionary history. From this perspective, characteristics typically associated with greater mating interest among women, such as physical attractiveness and financial wealth (Fisman et al., 2006; Hitsch et al., 2010; Perrett et al., 1999), are unlikely to offset women’s bias against outgroup men. However, it may be possible to exacerbate or attenuate women’s dating bias against outgroup men by increasing or reducing the extent to which they are perceived as a potential threat to reproductive choice.

For the present research, we pre-registered two studies examining women’s intergroup dating preferences using an online dating paradigm. Participants will rate their interest in a single, opposite-sex, hypothetical dating profile that is manipulated either to be a member of the ingroup or the outgroup, who is presented either as low or high in aggressive formidability. The influence of target formidability on dating interest will be examined in comparison to the influence of the target’s income (study 1) and attractiveness (study 2). Although attractiveness and income should be strong predictors of women’s interest in dating ingroup men, the influence of these factors should be quite minimal for outgroup men if women’s intergroup dating bias is primarily the result of mechanisms for sexual coercion avoidance. Rather, women’s interest in outgroup men should be most strongly predicted by the formidability of the target, particularly among
women who are at peak conception risk and who evaluate themselves as being vulnerable to sexual coercion.

Past research examining women’s intergroup dating bias has used both racial groups (i.e. Blacks and Whites) and minimal groups (i.e. novel groups created in the laboratory on the basis of arbitrary criteria, e.g. McDonald et al., 2011). Although these approaches both have their strengths, they are also each problematic. Using racial groups potentially confounds effects due to categorization as an outgroup member with pre-existing stereotypes related to racial groups (Pratto, Sidanius, Stallworth, & Malle, 1994). Using minimal-groups removes the influence of such stereotypes, but minimal groups are less ecologically valid.

To improve upon the weaknesses of these two approaches, a national group context may be the most appropriate. Indeed, a national context can provide an ecologically relevant outgroup, but one in which there are less readily accessible negative stereotypes. Literature examining discrimination against immigrants illustrates similarities to ethnic and racial prejudice and discrimination (Zick, Pettigrew, & Wagner, 2008; Zick, Wolf, et al., 2008). For example, a review by Pettigrew (1998) indicated that individuals, who had face-to-face contact with immigrant minorities in Britain, the Netherlands, and Germany, displayed a similar pattern of discrimination as that which exists among racial groups in the United States (Pettigrew, 1998). Although immigrants often differ both in their nationality and their racial and ethnic group membership, there is at least some evidence that bias exists unrelated to immigrants’ race or ethnic background. Gorodzeisky and Semyonov (2009) presented research that a greater number of Europeans (i.e. 33%) objected to incoming foreigners, regardless of their race or ethnicity, than Europeans who objected to foreigners on the basis of ethnic and racial origin alone (i.e. 14%).

Using a national context also permits the flexibility to select a group for which there are not strong stereotypes about the aggression or sexual coerciveness of the male citizens that could bias the results. Finally, using a national group context where the outgroup is predominantly White, makes it possible to use the same photographic stimuli for ingroup and outgroup individuals, thereby controlling for different perceptions of attractiveness that could otherwise be problematic when using racial groups.

To examine romantic interest in this intergroup context, information about the target individual will be presented via a typical online dating profile. After evaluation of the profile, participants will indicate their rating of romantic interest. Romantic interest will be assessed both as a short-term partner and a long-term partner. It is expected that the mechanisms of a sexual coercion threat management system will be activated in both contexts, but that they might be stronger in a short-term dating context that affords more opportunities for sexual aggression to occur (e.g. agreeing to meet the target for drinks at night, versus agreeing to meet for coffee during the day). Across studies, participants will also respond to a series of questionnaires providing information about their self-appraised vulnerability to sexual coercion and their current conception risk based on self-reports of the timing of their menstrual cycle.

The hypotheses for this project are as follows: (H1) Women will show a stronger dating preference for ingroup men relative to outgroup men. (H2) Women’s dating bias against outgroup men will be stronger among women who are in the fertile window of their menstrual cycle, and who also appraise themselves as vulnerable to sexual
coercion, as compared to women who are at low conception risk and those who do not appraise themselves as vulnerable. (H3) Women will show a preference for men who have higher levels of income (Study 1) and who are more physically attractive (Study 2), especially for physical attraction when women are at peak conception risk. However, this effect is likely to be moderated by group status, such that the effects of income and attractiveness will be stronger for ingroup targets than outgroup targets. (H4) Women will show the greatest bias against outgroup men who are described and pictured as aggressively formidable, regardless of levels of income (Study 1) or attractiveness (Study 2). This bias against formidable outgroup men should be particularly strong for women with heightened conception risk, and who appraise themselves as vulnerable to sexual coercion. (H5) A very different pattern should be produced for ingroup men, such that formidable will be evaluated positively, particularly at peak conception risk, given its association with genetic quality and likelihood of success in intrasexual competition (Rhodes, Chan, Zebrowitz, & Simmons, 2003; Weatherhead & Robertson, 1979). Moreover, ingroup men who are both formidable and wealthy (Study 1) or attractive (Study 2) should be evaluated the most positively.

**Study 1**

Research illustrates that women show a strong preference for men who are wealthy (Buss, 1989; Schwarz & Hassebrauck, 2012) and of the same race (Fisman et al., 2006; Furnham & McClelland, 2015; Hitsch et al., 2010). Hitsch and colleagues (2006) examined the interaction of these factors in a large sample of men and women using an online dating website. They found that Black men would need to make $154,000 more a year than a White man to have comparable success with a White woman (Hitsch et al., 2006). These results suggest that, although women typically place a high value on wealth in dating decisions, it is not sufficient to readily offset their bias against dating men from a different racial group. Additionally, past research provides evidence that women find ingroup men with masculine faces more attractive than ingroup men with more feminine faces, particularly when women are in the ovulatory window of their menstrual cycle (Penton-Voak & Perrett, 2000). However, this has not been directly examined in an intergroup context, though the research of McDonald and colleagues (2011) suggests that women evaluate men of the outgroup more negatively when they are associated with “physicality.” Thus, it is possible that although masculinity may be associated with an increase in dating preferences for ingroup men, outgroup men appearing masculine may be perceived as more threatening. The current study will examine the influence of both wealth and aggressive formidability on women’s dating preferences for ingroup and outgroup men.

**Method**

**Participants**

We pre-registered the methodology as described in the following sections. Participants were recruited via Amazon’s Mechanical Turk and compensated approximately $.10 per minute of the study. Only American workers with an approval rate greater or equal to 95% who had previously completed 100 or more HITs on MTurk were eligible to
participate. Additional restrictions placed on participation were as follows: (a) female, (b) heterosexual, (c) Caucasian, (d) born an American citizen, and (e) between the ages of 25 and 35 years, (f) not using hormonal contraceptives and (g) single. Finally, participants were excluded from analysis if they failed an attention or manipulation check.

Sample size was set to a minimum of 420 participants in order to achieve 80% power to detect the highest order four-way interaction. Calculations based on the effect size of the three-way interaction (group condition, conception risk, and vulnerability to sexual coercion) reported by McDonald and colleagues (2015) that examines women’s likelihood of responding to a date request from a minimal ingroup or outgroup member, as a function of their self-appraised vulnerability to sexual coercion, and conception risk. Given the similarity in the studies, this is the best available estimate of the anticipated effect size for the current research. Re-analysis of the data from McDonald et al. (2015) indicated that the change in $r^2$ from the addition of the third-order interaction was .033. Using the power analysis tool, G-power (Faul, Erdfelder, Buchner, & Lang, 2009) an apriori power analysis was conducted using this anticipated effect size. The model specified was a random effects, linear multiple regression. The other parameters set were a two-tailed alpha = .05, desired power = .80, and the total number of predictors = 4.

A total of 909 participants were recruited from Mturk, of these participants, 274 were excluded from analyses for reasons relevant to demographics (i.e. not between ages 25 and 35, not female, not heterosexual, not solely Caucasian, and/or not single), attention failures (i.e. careless responses, failing attention checks, and/or attempting the study more than once and altering responses), and/or issues relevant to conception risk (i.e. not having menstruated, having had menstruation stop without cause for period or pregnancy, use of hormonal contraceptives within the last 3 months, using hormonal replacement therapy, having been pregnant or given birth in the last year, missing pertinent information, providing impossible data, and/or having an average cycle fewer than 24 days or greater than 36 days). An additional 206 participants failed one or more of the manipulation checks. The final sample was composed of 430 White, heterosexual, women. The average age was 29.8 years ($SD = 3.40$) and the average income was $38,295 ($SD = 21,443$).

**Procedure**

This study is a $2 \times 2 \times 2$ between-subjects factorial experimental design with two additional continuous individual difference predictors (conception risk and vulnerability to sexual coercion). Manipulations included group status (ingroup vs outgroup), aggressive formidability (low vs high), and income (low vs high).

Participants signed up for the study via Mturk. The study was described as assessing women’s responses to hypothetical dating profiles. Following informed consent, they answered basic demographic questions, an assessment of their vulnerability to sexual coercion (embedded within a standard personality inventory to disguise the purpose of the study), and a set of items to self-report their mate value (see the Supplemental Data). Participants were then asked to evaluate a dating profile created to resemble a real online dating profile consisting of demographic material, a self-summary, professional work, hobbies, and a photograph. The manipulations of group status, income, and formidability were embedded within the profile.
Following their review of the dating profile, participants answered a set of items assessing their attention to the manipulations, a measure of their romantic interest in the target, and a questionnaire about their menstrual cycle history so that their conception risk could be calculated (see the Supplemental Data). All participants were then debriefed and compensated.

**Materials and measures**

**Hypothetical dating profiles.** A total of eight hypothetical dating profiles were created (see Figure 1 for an example). Each profile included basic biographical information and a smiling image of a moderately attractive male. Images were drawn randomly from a

![Figure 1. Dating profile example.](image-url)
pool of three images taken from the Chicago Face Database (Ma, Correll, & Wittenbrink, 2015). Faces were selected on the basis of pilot-testing to confirm that they were moderately attractive (i.e. average rated physical attractiveness did not significantly differ from a rating of 4 on a 7-point Likert scale).

**Group status manipulation.** Each profile presented information regarding the nationality of the target as the manipulation of group status. Ingroup status was represented by the nationality of “American” and outgroup status was drawn randomly from a pool of nationalities (Australia, Ireland, United Kingdom). Nationalities were selected on the basis of pilot-testing to ensure that participants perceived that the dominant racial group of the nation was Caucasian and that the people were not perceived to differ from the Americans on key dimensions (e.g. sexual behavior, socioeconomic status, violent behavior, religiosity). To control for geographic mobility, both ingroup and outgroup profiles indicated that the target had just moved to the area recently.

**Income manipulation.** Income was manipulated in the biographical information section of the profile. The low income condition was set to $20,000–$30,000 and the high income condition was set to $90,000–$100,000. These ranges were selected on the basis of MTurk demographic data (Ipeirotis, 2010) indicating that 66.7% of US MTurk workers make less than $60,000/year with the majority making between $25,000 and $60,000. All targets were described as a having a profession in business (i.e. working for a healthcare provider), so that the income earned would seem reasonable for either condition.

**Formidability manipulation.** Formidability was manipulated via two means: the masculinity/femininity of the target profile photo, and the aggressive nature of the hobbies described. For the photos, the same images described above from the Chicago Face Database were altered using the program *Psychomorph* (Tiddeman, Burt, & Perrett, 2001) to create faces that appear high in formidability (masculine) and low in formidability (feminine) (see the Supplemental Data). Research on formidability has illustrated that more masculinized faces increase perceptions of dominance (Perrett et al., 1998). Per established methodology (Welling, Moreau, Bird, Hansen, & Carré, 2016; Welling, Persola, Wheatley, Cárdena, & Puts, 2013), using the computer graphics software *Psychomorph*, 60 young adult male and 60 young adult female 2D digital facial images were averaged to create prototypical facial templates of males and females. The prototypes were then used to alter the male photographs. Transformations were produced by increasing or decreasing the linear differences in the 2D shape between the female and male symmetrized prototypes (see Tiddeman et al., 2001). Thus, increasing the target photograph by 50% of the linear difference between male and female prototypes constitutes a more masculine (more formidable) image and decreasing the photograph by 50% produces a more feminine (less formidable) image. Pilot tests confirmed that the altered images were perceived as similar in their age and attractiveness, and that the manipulation of the masculinity/femininity produced a perceptible difference in sexual dimorphism. Additionally, formidability was manipulated through the description of the hobbies and activities the target engages in (i.e. volunteering with the elderly and gardening
versus boxing and hunting), which were determined via pilot testing to be perceived as “not threatening at all” to “extremely threatening,” respectively.

**Manipulation check.** A set of manipulation checks were included to ensure that the participants noticed the manipulated information on the profile. Participants were asked to identify the target’s nationality, income, hobbies, as well as his age and profession. Participants who incorrectly answered the multiple-choice questions relevant to the manipulations were excluded from analyses.

**Romantic interest.** A series of eight questions on a 7-point Likert scale (1 = Not at all to 7 = Very Much) were used to assess the romantic interest of each participant toward the presented hypothetical dating profile (see the Supplemental Data for full list of items). Participants were prompted to respond to questions that included date initiation/acceptance (e.g. “How willing are you to accept (initiate) a date with this person”), long-term/short-term relationship (e.g. “How likely are you to consider this person for a short-term (long-term) relationship”), desired setting of date (e.g. “How likely are you to meet this person for coffee in the afternoon (drinks at night)”), and attraction toward the male target (e.g. “How physically (romantically) attracted to this person are you”). To examine whether it was feasible to create short-term and long-term dating subscales, a factor analysis on the items was conducted. The results indicated a single-factor structure that explained 76.94% of the variance with an eigenvalue of 6.16. The items were therefore used to create a single composite variable assessing romantic interest, which displayed high reliability ( α = .96).

**Conception risk.** Conception risk was estimated using the backward counting method (Gangestad et al., 2016). Participants responded to questions about cycle regularity, cycle length and use of hormonal contraceptives. Participants provided dates of their last two menstrual onsets, their predicted next menstrual onset date, and average cycle length (see supplemental Data). Additionally, participants indicated their level of certainty for each estimate, which served to weight estimates using the anchors 1 = not at all certain to 9 = completely certain. Calendars were available to assist participants in approximating dates. To acquire a weighted average of the three cycle lengths, we used their certainty estimates and the three cycle lengths. The cycle lengths included the length of their current cycle based on the days between participant’s last two menstrual cycle onsets, the length of days between last menstrual cycle onset and predicted next menstrual cycle onset, and their reported average cycle length, with each estimate weighted by reported certainty. Based on the weighted average cycle length, we counted the weighted average cycle length forward from the last menstrual cycle onset, and then back 15 days to determine date of ovulation. The number of days from ovulation to the date the survey was taken was then mapped on to conception risk values based on actuarial data from a weighted (by sample size) average of probabilities from published studies (Colombo & Masarotto, 2000; Schwartz, MacDonald, & Heuchel, 1980; Wilcox, Weinberg, & Baird, 1998).

**Vulnerability to sexual coercion.** The Fear of Rape Scale (Senn & Dzinas, 1996) was used to measure women’s self-appraised vulnerability to sexual coercion. The scale
consists of 30-items (α = .95) that assess behavioral defensiveness or vigilance (e.g. If I was driving alone and I had to park my car I would try to park on a well-lit street” and “I avoid going out alone at night”) as well as more explicit statements of fear of sexual threat (e.g. “I am suspicious of men”). Participants will respond to each item using a 7-point scale (e.g. ranging from 1 = Never to 7 = Always) (see the Supplemental Data for full list of items).

Mate value. The Mate Value Scale (Edlund & Sagarin, 2014) was used with the addition of a question assessing self-perceived physical attractiveness, each measured on a seven-point response scale, to assess self-perceived mate value (α = .93) (see the Supplemental Data for full list of items). This measure was included for exploratory purposes only.

Results
Preregistered analyses
We preregistered the following analyses, performed in IBM SPSS version 24. Descriptive statistics for measured variables (i.e. romantic interest, conception risk, and vulnerability to sexual coercion) are provided in Table 1. Simple main effects of the key manipulations were examined via independent samples t-tests. No effect of formidability was obtained (t(428) = 1.09, p = .278; 95% CI of difference [-.13 to .44]; d = .10), but a main effect of income (t(428) = −2.75, p = .006; 95% CI of difference [−.68 to −.11]; d = −.26) and group status (t(428) = −2.57, p = .010; 95% CI of difference [−.66 to −.09]; d = −.25) were detected. Consistent with expectations, women expressed greater romantic interest in male targets with a high income (M = 3.59, SD = 1.51) than male targets with a low income (M = 3.21, SD = 1.47). However, contrary to H1, women displayed a stronger preference for outgroup men (M = 3.60, SD = 1.47) relative to ingroup men (M = 3.22, SD = 1.50).

The primary analysis was conducted using a moderated multiple regression analysis predicting participants’ romantic interest in the target profile. The three manipulations (group status, income, formidability) were entered as dummy-coded predictors, as well as the two measured variables (conception risk, vulnerability to sexual coercion). All possible interactions were also entered (with continuous variables mean-centered prior to calculation of interaction). The five-way interaction was not statistically significant, nor were any of the four-way interactions; all were subsequently dropped from the model. Full regression results from this reduced model are provided in Table 2. Access to the Study 1 dataset is available through the Open Science Framework at osf.io/6bwmq.

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<th>S1 M (SD)</th>
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<tr>
<td>1. Conception risk</td>
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<td>.04</td>
<td>.00</td>
<td>.04 (.08)</td>
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<tr>
<td>2. Vulnerability to sexual coercion</td>
<td>.06</td>
<td>–</td>
<td>.01</td>
<td>4.40 (1.08)</td>
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<tr>
<td>3. Romantic interest</td>
<td>−.05</td>
<td>−.07</td>
<td>–</td>
<td>3.38 (1.50)</td>
</tr>
<tr>
<td>S2 M (SD)</td>
<td>.04 (.08)</td>
<td>4.29 (1.15)</td>
<td>3.26 (1.46)</td>
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Values in top-right diagonal are for Study 1; values in bottom-left diagonal are for Study 2.
**H1.** The prediction that women would exhibit greater romantic interest for ingroup men over outgroup men was not supported; no main effect of group status was present in the regression model. Moreover, the independent samples t-test reported above provided evidence contrary to the prediction, specifically that the outgroup target was preferred over the ingroup.

**H2.** The prediction that conception risk would negatively predict romantic interest in outgroup men for women who appraise themselves as vulnerable to sexual coercion was partially supported. The 3-way interaction between target group status, conception risk, and vulnerability to sexual coercion was significant ($b = -4.22$, $SE = 1.61$, $t(404) = -2.62$, $p = .009$, 95% CI [−7.40 to −1.05]). To probe this interaction, the SPSS add-on macro PROCESS was used to estimate a three-way moderation model (Model 3; 10,000 bootstrap samples) with only target group status, conception risk, and vulnerability to sexual coercion as predictors. The two-way interaction between conception risk and vulnerability to sexual coercion was not significant for women in the ingroup condition ($b = 1.39$, $SE = .99$, $t(422) = 1.41$, $p = .160$, 95% CI [−.55 to 3.33]), but was significant in the outgroup condition ($b = -2.53$, $SE = 1.21$, $t(422) = -2.10$, $p = .037$, 95% CI [−4.90 to −.16]).

Focusing on the outgroup condition, simple slopes for the effect of conception risk on romantic interest was examined at one SD above and below the mean of
vulnerability to sexual coercion. Results revealed a pattern of effects consistent with the hypothesis, but which were not statistically significant (see Figure 2). Conception risk was positively associated with romantic interest in outgroup men among women who reported low vulnerability to sexual coercion ($b = 2.69, SE = 1.93, t(422) = 1.39, p = .164, 95\% \text{ CI} [-1.10 \text{ to } 6.48]$). In contrast, and consistent with the hypothesis, conception risk was negatively associated with romantic interest in outgroup men when women reported high vulnerability to sexual coercion ($b = -2.77, SE = 1.93, t(422) = -1.43, p = .153, 95\% \text{ CI} [-6.56 \text{ to } 1.03]$). Importantly though, neither simple slope was statistically different from zero.

$H3$. The prediction that women would show greater romantic interest in men who have higher levels of income, particularly for ingroup men, was largely not supported. Although the independent samples t-test showed a stronger preference for men with higher versus lower income, the full model with all predictors included revealed neither a main effect of income, nor an interaction between income and group status. This pattern implies that although women may prefer high-income partners, that preference does not depend on whether the target male is a member of the ingroup or outgroup.

$H4$. The prediction that women would display the least interest in formidable outgroup men, regardless of income level, particularly among women with high conception risk and who appraise themselves as vulnerable to sexual coercion was not supported as there was not a significant four-way interaction between group status, target formidability, conception risk, and vulnerability to sexual coercion. Similarly, the interaction between group status and formidability was not significant. There was a marginal effect

![Figure 2.](image-url)

Figure 2. Romantic interest in ingroup and outgroup male targets as a function of women’s conception risk and self-appraised vulnerability to sexual coercion. Top panel: Study 1. Bottom panel: Study 2.
of formidability such that women displayed less interest in targets of high formidability, versus low formidability, however there was no evidence that this effect varied by the target’s group status, conception risk, or vulnerability to sexual coercion.

H5. The prediction that formidable ingroup men would be evaluated positively, particularly at elevated conception risk was not supported. As indicated in the results for H4, target formidability and group status did not interact, with or without the addition of conception risk. Subsequently, the additional prediction that women would rate formidable and wealthy ingroup men the most positively was also not supported as there was no interaction among group status, target formidability, and target income.

**Discussion**

Results of Study 1 are largely not supportive of the pre-registered hypotheses. A key concern however, is the nature of the manipulation of group status, as well as the strength of the manipulation of formidability. Contrary to predictions and past research (Fisman et al., 2006, 2008; Hitsch et al., 2010; Hwang, 2013; Levin et al., 2007), women displayed a pattern of mating preferences that favored the outgroup. As a result, the prediction that an outgroup man’s wealth will not be sufficient to offset women’s typical pattern of intergroup dating bias, cannot be tested, as there is no bias to offset. Similarly, the manipulation of formidability did not produce a significant independent main effect, suggesting that it may have been too weak to alter women’s preferences. Although participants were excluded for failing to attend to the manipulated material (i.e. the man’s hobbies) a check was not included to determine whether formidable male profiles were actual perceived by participants to be more formidable. Subsequently, the absence of any effects of formidability or interactions with group status is difficult to interpret.

The hypothesis that fertile women who evaluate themselves as vulnerable to sexual coercion would show greater dating bias against outgroup men was partially supported. Women’s conception risk was negatively associated with romantic interest in an outgroup male target, but only among women who perceive themselves as vulnerable to sexual coercion (though the simple slope was not statistically significant). This is consistent with past research documenting a very similar pattern (McDonald et al., 2015) and supportive of the proposition that women display bias against male targets that have been a persistent threat to reproductive choice throughout evolutionary history, particularly when threats to reproductive choice are most costly (i.e. at elevated conception risk) and among women who are most vulnerable to such threats.

The interaction effect also showed that conception risk was positively associated with romantic interest in outgroup men, but only among women reporting a low vulnerability to sexual coercion (simple slope not statistically significant). This pattern is also consistent with past research. For example, McDonald et al. (2015) found that women were more likely to reject date requests from outgroup men as a function of elevated conception risk for women who self-appraised as vulnerable to sexual coercion. However, the pattern trended in the reverse direction for women reporting low
vulnerability, that is, conception risk predicted greater willingness to accept a date request from the outgroup. Along similar lines, McDonald et al. (2011) reported that women showed greater bias against outgroup men as a function of conception risk among women who perceived the outgroup as physically formidable, but the effect trended in the reverse direction (conception risk predicted less bias against the outgroup) for women who did not perceive the outgroup as formidable. Overall, this pattern implies that the association between conception risk and intergroup bias depends on perceived threat, such that women who are more vulnerable or perceive the target as more dangerous, display less interest, whereas women who are not vulnerable or do not perceive the target as dangerous, display greater interest. This elevated preference for the outgroup may reflect the activation of mechanisms to reduce inbreeding and increase genetic diversity of one’s offspring (Roberts & Little, 2008; Salvatore, Meltzer, March, & Gaertner, 2016; Wedekind, Seebeck, Bettens, & Paepke, 1995).

**Study 2**

Study 2 was pre-registered, and very similar to Study 1, with the exception that the physical attractiveness of the male target was manipulated rather than income. Past research has demonstrated that physical attractiveness is an important feature to women in mate selection when tested within ingroup contexts (Buss, Shackelford, Kirkpatrick, & Larsen, 2001; Feingold, 1992; Perrett et al., 1999; Rhodes, 2006). However, as in Study 1, it was expected that attractiveness would not be sufficient to offset women’s preference for ingroup men over outgroup men.

**Method**

**Participants**

Recruitment for Study 2 followed the same, pre-registered, procedure as Study 1. Recruited from MTurk were 904 participants, of which 273 were excluded from analyses for issues regarding demographics (i.e. not between ages 25–35, not being female, not heterosexual, not solely Caucasian, and/or not single), attention (i.e. careless responses, failing attention checks, and/or attempting the study more than once and altering responses), and/or conception risk issues (i.e. not having menstruated, having had menstruation stop without cause for period or pregnancy, currently using hormonal contraceptives or within the last 3 months, using hormonal replacement therapy, having been pregnant or given birth in the last year, missing pertinent information, providing impossible data, and/or having an average cycle less than 24 days or greater than 36 days). An additional 146 participants failed manipulation checks. Overall, the final sample size included 485 White, heterosexual, women. The average age was 29.8 years ($SD = 3.37$) and the average income was $37,426 ($SD = 20,025$).

**Procedure**

Study 2 used a $2 \times 2 \times 2$ between-subjects factorial experimental design with the addition of two continuous predictors (conception risk and vulnerability to sexual coercion). The experimental procedure was nearly identical to that of Study 1. The key
change was that income was not manipulated, but physical attractiveness was. To that
end, the income of the target was held constant at $50,000 to $60,000. The manipulated
factors included group status (ingroup vs outgroup), aggressive formidability (low vs
high), and physical attractiveness (unattractive vs attractive).

Materials and measures
Study 2 used the same measures from Study 1 to assess romantic interest, conception risk,
vulnerability to sexual coercion (α = .96), and mate-value (α = .92). As in Study 1, the items
comprising the assessment of romantic interest loaded on a single factor that explained
76.72% of the variance in responses, with an eigenvalue of 6.14. The items were therefore
kept as a composite scale, which had good reliability (α = .96). The same method was used
to manipulate group membership and formidability of the target as in Study 1 (see the
Supplemental Data for Survey items and manipulated facial images).

Attractiveness manipulation. The same images from Study 1 were digitally altered
using the program Psychomorph (Tiddeman et al., 2001). Photographs were uploaded to
the program, delineated for facial points, and attached to a symmetrical template that
served as a reference for altering facial features. Each image was successfully morphed
into an unattractive (asymmetrical) and attractive (symmetrical) face per the symmetriz-
ing template (see Supplemental Data). Photographs were pilot tested for physical
attractiveness and symmetry, verifying that symmetrical images were perceived as
both more symmetrical and more attractive than asymmetrical images. Indeed, research
has shown that individuals with greater bilateral symmetry are perceived as more
attractive and therefore preferred as mates (e.g. Perrett et al., 1999).

Manipulation check. A set of questions assessing attention to the manipulations was
included following participants rating of the hypothetical dating pro-
file. Participants
were asked to identify the target’s nationality, hobbies, age, and profession via multiple
choice. They were also asked how to report how physically attractive they found the
target male. Participants who incorrectly answered the multiple choice questions refer-
cencing the manipulations were excluded from analyses.

Results
Preregistered analyses
Descriptive statistics for measured variables (i.e. romantic interest, conception risk, and
vulnerability to sexual coercion) are provided in Table 1. We first examined whether the
manipulation of attractiveness was effective. An independent samples t-test was con-
ducted in which ratings of the attractiveness of the target were compared for the low
and high attractiveness groups. Results revealed a marginal effect in the opposite
direction of predictions (t(483) = 1.82, p = .070, 95% CI of difference [−.02 to .40];
d = .17), that is, participants reported that the target with low attractiveness
(M = 3.85, SD = 1.13) was more attractive than the target with high attractiveness
(M = 3.66, SD = 1.18). This suggests that the manipulation of attractiveness, despite
positive pilot testing, was not effective. Similarly, the effect of the attractiveness manip-
ulation on romantic interest had no significant effect (r(483) = 0.87, p = .386; 95% CI of
The manipulation was subsequently excluded from further analyses.

Simple main effects of the remaining key manipulations on romantic interest were examined via independent samples t-tests. No effect of target formidability (t(483) = 0.87, p = .386; 95% CI of difference [−.15 to .38]; d = .08) was obtained, but a main effect of group status was revealed (t(483) = −2.21, p = .028; 95% CI of difference [−.55 to −.03]; d = −.20). Contrary to H1, women expressed greater romantic interest in outgroup male targets (M = 3.41, SD = 1.44) than ingroup male targets (M = 3.11, SD = 1.47).

The primary analysis was conducted using a moderated multiple regression analysis as in Study 1, except that target income was not included as a manipulation and the attractiveness manipulation was excluded owing to the failed manipulation check. The highest order four-way interaction was not statistically significant and was subsequently dropped from the model. Full regression results from this reduced model are provided in Table 3. Access to the Study 2 dataset is available through the Open Science Framework at osf.io/6bwmq.

H1. The prediction that women would show a greater romantic interest in ingroup men as compared to outgroup men was not supported. Target group status produced a marginal main effect in the regression model (β = .32, SE = .18, t(470) = 1.76, p = .079, 95% CI [−.04 to .69]). However, as in the independent-samples t-test presented in the preliminary analysis, the effect was in the opposite direction as predicted, such that outgroup men were preferred over ingroup men.

H2. The prediction that fertile women who appraise themselves as vulnerable to sexual coercion women would show the strongest dating bias against outgroup men, versus ingroup men, was not supported. There was a marginal interaction between target group status, conception risk, and vulnerability to sexual coercion (β = 2.93, SE = 1.58, t(470) = 1.86, p = .064, 95% CI [−.17 to 6.02]). However, the pattern of the interaction was contrary to predictions (see Figure 2). The SPSS add-on macro PROCESS was used to probe the interaction. To do so, a three-way moderation

<table>
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<th>Table 3. Study 2 multiple regression results.</th>
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<td>Formidability</td>
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<td>Conception risk</td>
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<td>Group status × VSC × CR</td>
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<td>Formidability × VSC × CR</td>
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Group status is coded 0 (ingroup), 1 (outgroup).
CR: conception risk; VSC: vulnerability to sexual coercion.
model (Model 3; 10,000 bootstrap samples) with only target group status, conception risk, and vulnerability to sexual coercion as predictors was analyzed. Results indicated that the two-way interaction between conception risk and vulnerability to sexual coercion was significant only in the ingroup condition \((b = -2.54, SE = 1.03, t(477) = -2.46, p = .014, 95\% CI [-4.56 to -.51])\) but not in the outgroup condition \((b = .53, SE = 1.17, t(477) = .45, p = .652, 95\% CI [-1.78 to 2.84])\). Examining the pattern of simple slopes in the ingroup condition at one \(SD\) above and below the mean of vulnerability to sexual coercion, there was no effect of conception risk on romantic interest when vulnerability to sexual coercion was low \((b = 1.77, SE = 1.79, t(477) = .994, p = .321, 95\% CI [-1.73 to 5.28])\). However, conception risk negatively predicted romantic interest in the ingroup target when vulnerability to sexual coercion was high \((b = -4.04, SE = 1.54, t(477) = -2.63, p = .009, 95\% CI [-7.06 to -1.02])\). This pattern was predicted for the outgroup, but not the ingroup, and therefore contradicts H2.

**H3.** The prediction that women would show more interest in attractive men, particularly ingroup men, could not be assessed owing to the fact that the manipulation of attractiveness was not effective.

**H4.** The prediction that women would display the least interest in physically formidable outgroup men, particularly for women at peak conception risk and who evaluate themselves as vulnerable to sexual coercion, was not supported. There was no significant interaction between group status and target formidability, nor was there a four-way interaction between group, formidability, conception risk, and vulnerability to sexual coercion.

**H5.** The prediction that formidable ingroup men would be most desirable, particularly for women at peak conception risk, was not supported. As in H4 above, there was no interaction between formidability, group status, and conception risk.

**Discussion**

Study 2 faced many of the same challenges as did Study 1. The manipulation of group status produced an effect contradictory to expectations and past research. Women showed a dating preference for outgroup men as opposed to ingroup men. Moreover, the manipulation of attractiveness was not effective; participants tended to perceive the target manipulated to be less attractive, as slightly more attractive than the attractive target. Consequently, the prediction that women’s bias against dating outgroup men cannot be offset with physical attractiveness cannot be tested, owing both to an absence of bias against the outgroup, and a failed manipulation of attractiveness. Finally, as in Study 1, the manipulation of formidability appeared to be quite weak, such that no independent effect of formidability was obtained. Subsequently, the failure of increased formidability to exacerbate intergroup dating bias is difficult to interpret.
Similar to study 1, there was a (marginal) interaction between group status, conception risk, and vulnerability to sexual coercion. Importantly though, the pattern of the interaction was directly contradictory to that obtained in Study 1. Here, the interaction of conception risk and vulnerability to sexual coercion had no significant influence on women’s romantic interest in outgroup men, but did influence women’s preferences for ingroup men. Women showed a pattern whereby conception risk predicted less interest in ingroup men among women with high vulnerability to sexual coercion. This pattern could potentially be attributed to the unorthodox preference that women showed for the outgroup, but this does not help to reconcile the findings with those from Study 1, where a preference was also shown for the ingroup.

**General discussion**

Past research has provided robust evidence for an intergroup dating bias among women. In particular, much of this research has documented a preference among women for men of the same racial group (Fisman et al., 2006, 2008; Hitsch et al., 2010; Hwang, 2013; Levin et al., 2007). More recently, research has shown that intergroup dating bias extends to the context of minimal groups (McDonald et al., 2015), providing evidence that the ingroup preference may represent the workings of an evolved psychological system for avoiding men of a coalitional outgroup, owing to an evolutionary history in which such men posed a persistent threat to women’s reproductive choice. Consistent with this theorizing, this bias is moderated by contexts and individual attributes that exacerbate the threat posed by outgroup men, namely conception risk, formidability of the target, and self-appraised vulnerability.

The results of the current set of studies provide mixed evidence in support of this past research. Although the results of Study 1 provide strong evidence of a pre-registered conceptual replication of the pattern of findings reported in McDonald et al. (2015), Study 2 shows no such effect. Indeed Study 2 shows the predicted pattern, but for evaluations of ingroup men not outgroup men. It is not unreasonable to expect that women who appraise themselves as vulnerable to sexual coercion would express less interest in dating a target male as a function of conception risk, however, the absence of the effect among women evaluating an outgroup male is contradictory to predictions. Overall, the inconsistency across the two studies is difficult to interpret, but may be attributed to a novel manipulation of group status (nationality) that failed to produce any evidence of bias against outgroup men. Concerns regarding this manipulation are discussed in the limitations section.

Beyond the interest in replicating the findings from past research, a key aim of the current research was to examine whether dating bias against outgroup men could be reduced by altering other characteristics of the target. On the assumption that women’s bias against outgroup men is driven by a perceived threat to reproductive choice, then bolstering that threat via an increase in the perceived formidability should exacerbate the bias, whereas reducing the formidability should ameliorate it. In contrast, other traits typically associated with dating preferences among women (i.e. income and attractiveness) should do little to alter women’s outgroup bias. These predictions were not supported, largely because of a failure to generate a group status manipulation that produced outgroup bias, as well as a potentially weak manipulation of formidability.
Limitations

Participant concerns
The design of the studies reported here required a very particular population (e.g. single, American, Caucasian women, between the ages of 25–35, not using hormonal contraceptives). These criteria were listed in the study description on Mturk. Despite this, many participants who attempted to participate were kicked out for failing to meet screening criteria, and then re-entered the study with altered information (e.g. changing their gender or race in order to qualify to participate and earn financial compensation). We excluded these individuals from analysis, but it is likely that many participants who did not meet our criteria altered their responses on their first attempt, therefore adding error to the data collected. Also of concern is the number of participants who failed an attention check or failed to correctly identify key features of the manipulation. Indeed, in Study 1 32% failed a check on their attention to the manipulations, and in Study 2, 23% failed at least one such check. Overall, this suggests that many of the participants were motivated only to complete the study to receive compensation, and that the data may contain a greater degree of variability due to error than what may have been obtained using a student sample.

Manipulation of group status
Previous research investigating women’s evolved psychology of intergroup bias has used racial and minimal groups to define the intergroup context. The current set of studies used national groups to limit the potentially confounding impact of racial stereotypes of outgroup men, and to create a more realistic intergroup context than what minimal groups provide. Outgroup nationalities were selected to ensure that the only perceived difference between the ingroup and outgroup was nationality. Indeed, the nations used (Ireland, United Kingdom, and Australia) were selected owing to pilot testing demonstrating that they are perceived as being predominantly Caucasian and that they do not differ from Americans in any features that may confound the findings (e.g. sexual behavior, socioeconomic status, violent behavior, religiosity). Although these criteria create a clean manipulation of group status, in retrospect it raises multiple concerns.

One problem with the nationality manipulation is that many of our American participants likely have an ethnic heritage originating in Ireland or the United Kingdom. The connection to that heritage may have led participants to perceive the outgroup target as an ingroup member. If that were true, then the preference for the outgroup in both Study 1 and Study 2 could be re-interpreted as an ingroup preference. Another potential explanation for the outgroup preference is the potential that men from these nations are perceived as exotic and desirable, or valued for other, unmeasured positive cultural attributes. Related to this line of reasoning, is the possibility that these outgroup men were perceived as having optimal genetic distinctiveness. Mating with outgroup men has the potential to increase the genetic variability of one’s offspring. Yet, at least some research and theorizing suggests that too much genetic dissimilarity can be problematic (Bateson, 1983; Helgason, Palsson, & Guthbjartsson, 2008). In other words, the association between genetic similarity and reproductive success may be curvilinear. Men of
another racial group may be perceived as too dissimilar, whereas outgroup men of the same race may be optimally distinct and therefore highly desired.

**Manipulation of formidability and attractiveness**

The manipulations of formidability and attractiveness did not appear to effectively, or strongly, manipulate the desired constructs. The alterations of the digital photographs of the targets for masculinity/femininity (to manipulate formidability) and symmetry/asymmetry (to manipulate attractiveness) followed standard procedures in the literature. Additionally, pilot testing confirmed that participants perceived the differences in sexual dimorphism and attractiveness. Despite this, the manipulation check for the attractiveness manipulation indicated a marginal effect in the reverse direction, and formidability produced no significant effects. One potential explanation for this discrepancy is that the two manipulations were examined in isolation in the pilot tests, but were used in combination in the research reported here. The combination of symmetry and sexual dimorphism alterations (e.g. an asymmetrical masculine face) may produce odd or weakened effects, perhaps owing to their non-natural appearance.

The manipulation of symmetry may not have been strong enough to elicit strong variation in perceptions of attractiveness. Although symmetry is preferred over asymmetry in a face, if that face is only moderately attractive, the manipulation may not have sufficient power to increase romantic interest. Formidability was manipulated both via the masculinity/femininity of the target’s face, as well as the hobbies listed for the target. We anticipated that masculinity alone would not be sufficient to engender a perception of formidable threat, and added aggressively formidable hobbies to increase the strength of the manipulation. Although pilot testing confirmed that these hobbies are perceived as formidable, when examined in the context of the dating profile, aggressive formidability may have been quite weak. For example, the potential for a target who’s hobbies are boxing and hunting to be perceived as threatening may be diminished by the information that he is a white-collar, gainfully employed White male who likes to sing karaoke. Overall, these manipulations may have been too weak to have a meaningful impact on women’s romantic interest in the target.

**Future directions**

Ultimately the structure of our pre-registered design was well-suited to test a set of hypotheses that stand to add much knowledge to the literature on women’s intergroup dating bias. However, a number of issues arose with the participant population and the manipulation of key constructs. Future research may benefit from replicating the current studies, but with a student population in a laboratory setting that permits greater attention to study materials, and potentially, interactions with or exposure to prospective dating partners. As discussed above, using real-world groups (racial, ethnic, religious, etc.) may continue to pose a problem. Women’s dating bias has been most clearly illustrated in the context of racial groups. Yet racial groups cannot be separated from their stereotypes. Selecting outgroup nationalities allowed us to control for race, attractiveness, and a variety of stereotypes, but ultimately diluted the power of what it means to be a group. Minimal groups may provide the most sensible manipulation of group status owing to the absence
of negative or positive stereotypes. That ambiguity may serve as a blank canvass on which the influence of participants’ intergroup psychology can be more clearly observed.

Manipulations of attractiveness likely need to go beyond symmetry/asymmetry, thereby requiring the use of different targets for low and high attractiveness conditions. Although this presents its own challenges, it increases both the strength of the manipulation and the ecological validity. Formidability may not be easily manipulated with hobbies and masculinity. A stronger manipulation may be exposure to threatening behavior by the target.

**Conclusion**

Research on the motivations that underlie women’s intergroup bias are still in an early stage. The current and past research provide compelling evidence that there are conditions under which women show strong bias against outgroup men, and others in which women show a preference for outgroup men. A key question for future research will be identifying the factors that moderate this preference.

**Notes**

1. This was the only exclusionary criteria that was not part of the original pre-registration. We discovered during data collection that participants were entering the study multiple times and changing their answers to screening questions (e.g. gender, race, use of hormonal contraceptives) presumably to participate despite not meeting the inclusionary criteria. The validity of their responses could not be assured, so these individuals were excluded from analyses.

2. A second measure of conception risk using the forward-counting method was also pre-registered for both studies, however a mistake in the questionnaire administration led to the exclusion of a key item necessary for its calculation. It is therefore not reported here.

3. See note 1 above.

**Disclosure statement**

No potential conflict of interest was reported by the authors.

**Supplemental data**

Supplemental data for this article can be accessed through the Open Science initiative.

**References**


