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Fertility and Intergroup Bias in Racial and Minimal-Group Contexts: Evidence for Shared Architecture

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Abstract

Recent research has shown that White women's bias against Black men increases with elevated fertility across the menstrual cycle. We demonstrate that the association between fertility and intergroup bias is not limited to groups defined by race, but extends to group categories that are minimally defined, and may depend on the extent to which women associate out-group men with physical formidability. In Study 1, Black and White women with strong associations between the racial out-group and physical formidability displayed greater bias against out-group men as conception risk increased. Study 2 replicated these results in a minimal-group paradigm. These findings are consistent with the notion that women may be endowed with a psychological system that generates intergroup bias via mechanisms that rely on categorization heuristics and perceptions of the physical formidability of out-group men, particularly when the costs of sexual coercion are high.

Keywords

intergroup relations, prejudice, menstrual cycle, sexual coercion, evolutionary psychology

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Research has demonstrated that during the fertile phase of the menstrual cycle, women evince increased suspicion of unfamiliar men (Garver-Apgar, Gangestad, & Simpson, 2007), greater risk aversion (Bröder & Hohmann, 2003), and increased strength when threatened (Petralia & Gallup, 2002). Such effects are hypothesized to be the output of a psychological system that functions to protect women's reproductive choice by influencing thoughts and behavior in ways that may decrease the probability of sexual coercion.

Recent work has suggested that such processes may lead women to express greater prejudice against men from a negatively stereotyped group. Navarrete, Fessler, Fleischman, and Geyer (2009) found that White women evaluated Black men more negatively as their risk of conception increased across the menstrual cycle. In the present research, we investigated the notion that the link between fertility and race bias may be a by-product of a psychological system that is particularly sensitive to cues of group membership when the costs of sexual coercion are highest. Specifically, we examined whether the link between conception risk and race bias generalizes to intergroup contexts in which groups are distinguished by minimally defined criteria.

Additionally, we propose that the mechanisms underlying both types of bias may have similar psychological roots; thus, the association between increased intergroup bias and conception risk may rely on perceptions of the physical formidability of out-group men in both racial and minimal-group contexts. This qualification is based on the understanding that a woman's blanket prejudice against all out-group men carries the opportunity cost of decreasing her pool of potential mates, particularly mates whose optimal genetic distinctiveness has the potential to increase the genetic variability of her offspring (Roberts & Little, 2008; Wedekind, Seebeck, Bettens, & Paepke, 1995). For these reasons, selection may have favored a flexible psychological system that is sensitive to perceptions of the potential for coercive threat from the target. Given that out-group members may not be as readily monitored and sanctioned as in-group members are, out-group men appraised as physically formidable may be perceived as having greater potential to physically overpower a woman and constrain her goals and behavior, thereby posing a greater risk to her reproductive choice. Although such appraisals of out-group men are important throughout the menstrual cycle, they are

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undoubtedly of particular importance when conception risk is high, given that this is when the costs of coercion have their gravest consequences in terms of reproductive fitness. Thus, a bias against out-group men who are perceived as being physically formidable may overwhelm the preference for genetic heterogeneity during the fertile phase of the menstrual cycle.

According to this perspective, perceptions of physical formidability (hereafter, *physicality*) should moderate the relationship between conception risk and intergroup bias: The association should be stronger among women who more readily associate out-group men with physicality, and weaker among women who less readily associate out-group men with physicality. To the extent that these processes rely on group-categorization heuristics, such effects should apply to both racial and minimal-group contexts.

In two studies using mixed-race samples of American women, we examined the effects of conception risk and physicality appraisals on evaluations of Black and White male targets (Study 1) and on evaluations of male targets with group distinctions delineated along near-arbitrary criteria in a variant of the minimal-group paradigm (Tajfel, 1970; Study 2).

Study 1

Participants and procedure

Participants included 224 White[1] and 28 Black female university students (ages 18–23 years, $M = 19.15$, $SD = 1.16$) who were not pregnant, were not using hormonal contraceptives, and reported cycle lengths within a normal range (20–40 days). Participants completed assessments of conception risk and provided demographic information within a larger set of randomly ordered questionnaires. They then completed two Implicit Association Tests (IATs), which were also presented in a random order. Finally, participants were debriefed and given course credit for participation. Responses were recorded on a computer using Medialab and DirectRT (Empirisoft Corp., New York, NY) questionnaire and reaction time software.

Predictors

Conception risk. Participants reported the dates of the beginning of their last two menstrual periods, using calendars as an aid in making their estimates. From these dates, current cycle day and cycle length were determined using the forward-counting method (Gangestad & Thornhill, 1998). Conception risk was then estimated using actuarial data from Wilcox, Dunson, Weinberg, Trussell, and Baird (2001); higher values of this variable indicate higher conception risk (range: .00–.09; $M = .03$, $SD = .03$).

Physicality associations. Perceived physical formidability of the out-group was assessed using the stereotype IAT (Amodio & Devine, 2006). In this task, participants quickly categorize stereotype content words as physical (e.g., "muscular") or mental (e.g., "brainy") and faces as European American or African American. Responses were made by pressing the "e" and "i" keys on a keyboard; the location of the keys corresponded to the location of the category labels on the left or right side of the computer screen. Assignment of categories to response keys resulted in stereotype-congruent pairing of categories on some trials (i.e., European American faces and mental words assigned to the same key; African American faces and physical words assigned to the same key) and stereotype-incongruent pairing of categories on other trials (i.e., European American faces and physical words assigned to the same key; African American faces and mental words assigned to the same key). The difference in average reaction time between the congruent and incongruent category pairings was computed using the scoring algorithm recommended by Greenwald, Nosek, and Banaji (2003). These difference scores provide an index of the strength of associations between a participant's racial out-group and the category "physical" and between the participant's racial in-group and the category "mental" relative to the strength of the reverse associations; higher values indicate greater relative strength of the former associations ($M = 0.25$, $SD = 0.37$). Stereotype content words were taken from Navarrete et al. (2009), and target images of five Black and five White male faces were obtained from the NimStim database (Tottenham et al., 2009; for examples of stimuli, see Fig. S1 and Table S1 in the Supplemental Material available online).

Outcome: evaluative intergroup bias

Bias in intergroup evaluation was assessed using the evaluative IAT (Amodio & Devine, 2006), in which participants categorize evaluative content words as good (e.g., "happy") or bad (e.g., "horrible") and faces as African American or European American. The task is similar to that of the stereotype IAT: Participants categorize stimuli into one set of paired categories (e.g., "European American and good" vs. "African American and bad") and then into the reverse set of paired categories (e.g., "European American and bad" vs. "African American and good"). The difference in average reaction time between the two category pairings was computed (Greenwald et al., 2003) as an index of the strength of associations between a participant's racial in-group and positive evaluations and between the participant's racial out-group and negative evaluations relative to the strength of the reverse associations; higher values indicate greater relative strength of the former associations ($M = 0.35$, $SD = 0.38$). The target images were identical to those used in the stereotype IAT. Evaluative content words were taken from Navarrete et al. (2009; for a list of the evaluative content words, see Table S1 in the Supplemental Material).

Results

Following Aiken and West (1991), we conducted a multiple regression analysis in which zero-centered conception risk, physicality associations, and their product term were entered as predictors of intergroup bias. Participant's race was also entered into the model (White = 1; Black = −1) to control for mean differences in intergroup prejudice. The analysis revealed a significant main effect for race, β = 0.57, $t(247) = 5.86$, $p < .001$; White women exhibited more intergroup bias than Black women did. Controlling for this effect, we found a two-way interaction[2] between conception risk and physicality associations, β = 0.18, $t(247) = 3.26$, $p = .001$. Zero-order correlations are presented in Table 1, and full regression results are reported in Table 2.

As predicted, simple-slopes analyses conducted at 1 standard deviation above and below the mean of physicality associations (Fig. 1) indicated that greater conception risk led to increased intergroup bias when physicality associations were high, β = 0.23, $t(247) = 3.03$, $p = .003$, but not when such associations were low, β = −0.13, $t(247) = -1.60$, $p = .110$.

Study 2

Results from Study 1 indicated that women's negative implicit evaluations of a racial out-group rise with increasing conception risk when perceptions of the out-group are strongly associated with physicality. In Study 2, we sought to replicate these findings using group categories defined outside a racial context.

Participants and procedure

Eighty-five university women (ages 18–27 years, $M = 19.49$, $SD = 1.42$; 82% White and 18% non-White) participated in this study in exchange for course credit. Inclusionary criteria were identical to those in Study 1.

Before the experiment, participants were assigned to groups using a variant of the minimal-group paradigm (Tajfel, 1970) in which group assignment was based on participants' readiness to perceive certain colors. Participants viewed a computer monitor that presented an image of a 56-block grid of two primary colors (red and blue, red and yellow, or blue and yellow; see Fig. S2 in the Supplemental Material available online), which were randomly dispersed in equal proportions across the grid. On each of three trials, a grid was presented for 2 s, followed by a prompt to indicate which color on the grid was more prevalent. Participants were told that they more readily perceived whichever color they estimated as more prevalent on at least two of the three trials and were subsequently assigned membership to a group on the basis of that determination (e.g., "You tend to perceive BLUE more easily, you are in the BLUE group"). Participants wore T-shirts that designated their group color as a reminder of their group membership for the rest of the experiment. Following the group assignment, participants completed a set of questionnaires and tasks that included the measures relevant to the present study. At the end of the session, participants were debriefed and given course credit.

Predictors and outcome

Conception risk ($M = .03$, $SD = .03$), physicality associations ($M = 0.06$, $SD = 0.47$), and evaluative intergroup bias ($M = 0.15$, $SD = 0.37$) were measured as described in Study 1 with the following exceptions: IAT target images all portrayed White males whose shirts were electronically manipulated to be either the same color as the participant's (in-group) or the alternative color from the color-perception task (out-group; for example images, see Fig. S3 in the Supplemental Material available online), and the IAT category labels were changed to reflect the minimal groups (e.g., Red Group vs. Blue Group) instead of racial groups. As in Study 1, measures were administered in a random order, with the exception that the measurement of physicality associations always preceded the measurement of evaluative bias.

Results

As in Study 1, we conducted a multiple regression analysis in which conception risk, physicality associations, their product term, and participant's race (White = 1; non-White = −1) were

Table 1. Zero-Order Correlations for Conception Risk, Physicality Associations, and Evaluative Intergroup Bias in Studies 1 and 2

	Study 1: racial groups			Study 2: minimal groups		
Variable	Conception risk	Physicality associations	Intergroup bias	Conception risk	Physicality associations	Intergroup bias
Conception risk	—			—		
Physicality associations	.06	—		−.11	—	
Intergroup bias	.05	.24*	—	.27*	.22*	—

*$p < .05$.

Table 2. Conception Risk and Physicality Associations as Predictors of Evaluative Intergroup Bias in Studies 1 and 2

	Study 1: racial groups				Study 2: minimal groups			
Variable	*b*	*SE b*	β	*t*(247)	*b*	*SE b*	β	*t*(80)
Race	0.21	0.04	0.57	5.86*	0.01	0.05	0.02	0.13
Conception risk	0.61	0.74	0.05	0.83	3.56	1.30	0.28	2.74*
Physicality associations	0.08	0.06	0.08	1.30	0.17	0.08	0.22	2.12*
Conception Risk × Physicality Associations	6.40	1.96	0.18	3.26*	5.71	2.79	0.21	2.05*

*$p < .05$.

simultaneously entered as predictors of intergroup bias. Results revealed significant main effects for conception risk, β = 0.28, $t(80) = 2.74$, $p = .008$, and physicality associations, β = 0.22, $t(80) = 2.12$, $p = .037$, which were qualified by a significant interaction between these two predictors, β = 0.21, $t(80) = 2.05$, $p = .044$. Zero-order correlations are provided in Table 1, and regression results are reported in Table 2.

As predicted, simple-slopes analyses conducted at 1 standard deviation above and below the mean of physicality associations revealed that conception risk positively predicted intergroup bias when physicality associations were high, β = 0.50, $t(80) = 3.48$, $p = .001$, but not when physicality associations were low, β = 0.07, $t(80) = 0.46$, $p = .646$ (Fig. 1).

General Discussion

Across two independent samples of women with normal menstrual cycles, and in both racial and minimal-group contexts, we found that an increased risk of conception led to greater intergroup prejudice among participants with strong associations between the out-group and physicality, but not among participants with weaker associations between the out-group and physicality. These findings are consistent with the notion that at least some aspects of modern-day prejudice may be understood as a by-product of a psychological system that predisposes women to avoid persons or situations perceived as threats to their reproductive choice when the costs to reproductive fitness are highest. Given that these effects held in a minimal-group context, our findings suggest that this system may rely on basic group categorization as a hazard heuristic for reducing the risk of exposure to potentially coercive men when conception risk is high, and that prior exposure to the out-group may not be necessary.

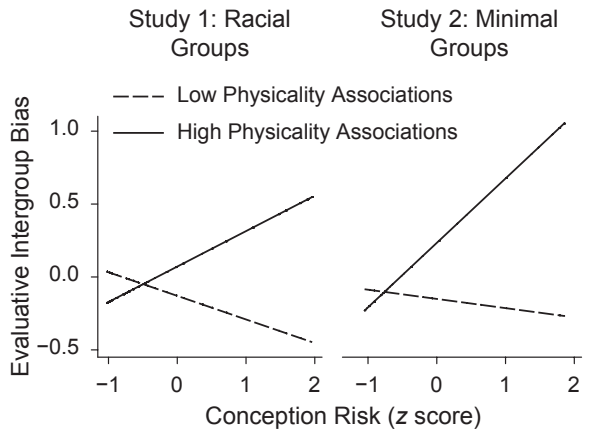

Fig. 1. Evaluative intergroup bias in Studies 1 and 2 as a function of conception risk and physicality associations (1 standard deviation above and below the mean).

An evolutionary perspective suggests that such a system is plausible if sexual coercion was a persistent adaptive problem for women throughout evolutionary history (Chavanne & Gallup, 1998; Thornhill & Palmer, 2000). Navarrete, McDonald, Molina, and Sidanius (2010) argued that coercive mating may have been particularly acute in intergroup contexts over human evolutionary history, and that the risk of being assaulted may have been much greater for women in the presence of unfamiliar out-group men than in the presence of their own group members. Alternatively, bias against out-group males may be influenced by the interaction between a heightened vigilance against coercion when conception risk is high (e.g., Garver-Apgar et al., 2007) and culturally transmitted representations of out-group men—particularly Black American men—as coercive (e.g., Lonsway & Fitzgerald, 1994). These cultural representations of racial groups may influence how research participants mentally represent novel intergroup stimuli in laboratory settings—including stimuli in a minimal-group paradigm.

It is worth emphasizing that our findings do not preclude the possibility that women are equipped with mechanisms that decrease negativity to out-group men during the fertile window as a way to increase their potential exposure to males with optimally distinct genes, and thus reap the fitness benefits of increased genetic heterogeneity in offspring (e.g., Roberts & Little, 2008). The tendency for intergroup bias to be negatively associated with conception risk in our studies when physicality associations were low is consistent with such a perspective.[3]

We must acknowledge the methodological limitations of this research. As a difference-score measure of bias, the IAT has obvious drawbacks, most notably the inability to clearly establish the underlying cause of the bias score. Although we report that stronger associations of the out-group with physicality lead to increased bias, the bias could conceivably be caused by stronger associations of the in-group with "mental" concepts instead. Thus, a potential alternative explanation of our results is that women's preference for intelligent mates increases when conception risk is high. However, given that the literature has provided little empirical support for shifts in preference for intelligent mates over the menstrual cycle (Gangestad, Garver-Apgar, Simpson, & Cousins, 2007; Gangestad, Thornhill, & Garver-Apgar, 2010; Prokosch, Coss, Scheib, & Blosiz, 2008), at present we think that physicality associations provide a more plausible account of our findings. Future research should address the empirical limitations of the measures we used.

Additionally, our findings may seem to contradict earlier studies that have demonstrated a link between fertility and preferences for cues of dominance (reviewed in Gangestad et al., 2007). However, such work has typically focused on mating preferences within women's racial in-group. We propose that physicality may indeed signal high genetic quality in a potential in-group mate, but that physicality in out-group men may signal a coercive threat. Future research on mate preferences may benefit from such considerations.

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Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

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Supplemental Material

Additional supporting information may be found at http://pss.sagepub.com/content/by/supplemental-data

Notes

1. Seventy-seven participants were from the study described in Navarrete et al. (2009), which included only White women. Data for these participants were combined with data from an additional 175 participants that were collected since publication of the results for the initial sample. No significant differences in implicit evaluation, conception risk, or stereotyping were found among White subjects between samples.

2. The three-way interaction among participant's race, conception risk, and physicality appraisals was nonsignificant, $\beta = -0.04$, $t(244) = -0.48$, $p = .632$.

3. In both studies, simple-slopes analyses at 2 standard deviations above and below the mean levels of physicality associations revealed a negative association between conception risk and intergroup bias when physicality associations were low, although the effect in Study 2 did not reach statistical significance—Study 1: $\beta = -0.31$, $t(247) = -2.43$, $p = .016$; Study 2: $\beta = -0.14$, $t(80) = -0.60$, $p = .550$.

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