Interacting With Sexist Men Triggers Social Identity Threat Among Female Engineers

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Social identity threat is the notion that one of a person's many social identities may be at risk of being devalued in a particular context (C. M. Steele, S. J. Spencer, & J. Aronson, 2002). The authors suggest that in domains in which women are already negatively stereotyped, interacting with a sexist man can trigger social identity threat, undermining women's performance. In Study 1, male engineering students who scored highly on a subtle measure of sexism behaved in a dominant and sexually interested way toward an ostensible female classmate. In Studies 2 and 3, female engineering students who interacted with such sexist men, or with confederates trained to behave in the same way, performed worse on an engineering test than did women who interacted with nonsexist men. Study 4 replicated this finding and showed that women's underperformance did not extend to an English test, an area in which women are not negatively stereotyped. Study 5 showed that interacting with sexist men leads women to suppress concerns about gender stereotypes, an established mechanism of stereotype threat. Discussion addresses implications for social identity threat and for women's performance in school and at work.

Keywords: social identity threat, stereotype threat, women in engineering, sexism, interactions

When two people interact, they engage in a complex process of social perception. In addition to attending to the discussion or task that is the overt focus of their interaction, people may make judgments about their interaction partner and attempt to ascertain what judgments he or she is making about them. In interactions between men and women, this process may be complicated by gender roles, the potential for sexual attraction, and, most relevant to the present research, the possibility that one person could hold, and the other person could be viewed in light of, sexist attitudes.

Sexist attitudes may be of particular concern during interactions that take place in domains in which members of one gender face an unwelcoming environment, such as in engineering and mathematics—fields in which women are underrepresented and targeted by a negative stereotype that alleges their relative incompetence. We hypothesize that men in these fields who hold sexist attitudes create a threatening environment by displaying their sexism in subtle ways to female colleagues with whom they interact. This behavior can undermine women's ability to succeed in the field by leading them to underperform in the domain.

Our hypothesis arises from theorizing on social identity threat, which builds on social identity theory's emphasis on the importance of maintaining a positive view of ones' group (Tajfel & Turner, 1986), to propose that that one of a person's many social identities may be at risk of being devalued in a particular context (Steele, Spencer, & Aronson, 2002). Although researchers are only beginning to examine the triggers and consequences of social

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identity threat, early research has focused on manipulations that frame a particular environment as devaluing one of their social identities and the consequences for members of the devalued group. These studies show that social identity threat can be conveyed by a corporate brochure that claims a color-blind ideology but shows few minorities (Purdie-Vaughns, Steele, Davies, & Ditlmann, 2008) or from the mere suggestion that an instructor seems sexist, even in absence of any actual sexist behavior (Adams, Garcia, Purdie-Vaughns, & Steele, 2005). Such social identity threat can result in underperformance, distrust, and uncertainty about social belonging (see Walton & Cohen, 2007).

We seek to extend this research by testing a critical feature of theorizing on social identity threat: the idea that threat may reside in the environment itself, rather than in how that environment is framed or presented. The studies described above manipulated people's construal of the environment as threatening or not, while holding constant the environment itself. In contrast, we seek to manipulate the degree of threat in the actual environment and examine how this threat is communicated to members of the devalued group. We suggest that in domains in which women are negatively stereotyped, the behavior of sexist men can create an environment that devalues women's contributions and abilities. When women interact with a sexist man, they pick up on subtle cues in his behavior indicating that he holds sexist attitudes, and this triggers social identity threat. We infer the presence of social identity threat by examining one well-established consequence: underperformance in the threatened domain.

Although fewer people today than in past generations endorse explicitly sexist beliefs (Swim, Aikin, Hall, & Hunter, 1995), individual differences in sexist attitudes persist, for example in the extent to which people deny that women are discriminated against (Swim et al., 1995) or implicitly associate women with low-status roles (Rudman & Kilianski, 2000).

Little research has examined whether men with different levels of sexist attitudes actually behave differently in interactions with women, although it seems plausible that they would. One study found that more sexist men write with more sexist language than do less sexist men (Swim, Mallet, & Stangor, 2004); another found that they rate other men's behaviors, such as making unwanted sexual advances, as less sexist (Swim, Mallett, Russo-Devosa, Stangor, 2005). In addition, gender-schematic men who have recently watched pornography show more sexual interest in a female interviewer (McKenzie-Mohr & Zanna, 1990), and men who score highly on a likelihood to sexually harass measure ask more sexist interview questions (Rudman & Borgida, 1995). If sexism does predict behavior toward women, differences between more sexist and less sexist men's behavior are likely to be subtle, rather than overt (Dovidio & Gaertner, 2004). Most educational and professional settings explicitly forbid sexual harassment and gender discrimination. Gender biases, however, may continue to be expressed in more ambiguous situations. Men may refrain from discriminating against women when their actions could be attributed to sexism, for instance, but discriminate in contexts that obscure the bias motivating their behavior (Uhlmann & Cohen, 2005; see also Monin & Miller, 2001), praise women's competence but allocate scarce resources to men (Vescio, Gervais, Snyder, & Hoover, 2005), or justify discrimination as a way of protecting women from stress or danger (Glick & Fiske, 2001; Jackman, 1994).

Even subtly sexist behavior may trigger social identity threat in women, as people are highly sensitive to cues suggesting that one of their social identities is devalued (Adams et al., 2005; Purdie-Vaughns et al., 2008; Steele et al., 2002). Sexist behavior in domains such as mathematics and engineering is likely to trigger not only social identity threat but also stereotype threat. Stereotype threat is a specific form of social identity threat, in which individuals targeted by a stereotype alleging inferior ability in a domain feel pressure to avoid being judged in light of that stereotype and worry that they could inadvertently confirm it through their performance in that domain. Stereotype threat can reduce people's prospects of success in the domain in a number of ways: It may steer their interests elsewhere (Davies, Spencer, Quinn, & Gerhardstein, 2002), lead them to feel that they do not belong socially (Walton & Cohen, 2007), or cause them to disidentify from the domain altogether (Steele, 1997). Most relevant to the present research, stereotype threat can also undermine test performance in the threatened domain (for a review, see Steele et al., 2002).

Considerable research has identified the cognitive and affective processes that explain how stereotype threat, once it has been triggered, undermines performance (for a review, see Schmader, Johns, & Forbes, 2008). Far less research has examined how cues in the social environment trigger threat (cf. Cohen, Steele, & Ross, 1999; Davies et al., 2002; Inzlicht & Ben-Zeev, 2000, 2003; Purdie-Vaughns et al., 2008; Walton & Cohen, 2007). Common laboratory manipulations of stereotype threat, such as messages that a test is or is not evaluative of ability or that it does or does not yield group differences, are unlikely to be mechanisms through which real-world social environments exacerbate or alleviate threat. Instead, in people's daily lives, a major source of information about how they are viewed comes from how other people behave toward them. Because people are acutely aware of, and sensitive to, how others view them (Leary & Baumeister, 2000), social interactions are likely to be an important trigger of social identity threat in real-world environments. If these social interactions communicate that a person's social identity is devalued, or that he or she is at risk of being judged stereotypically, then social identity threat and its negative consequences might be pervasive in educational or professional settings in which people hold demeaning stereotypes about each other.

Overview of Studies

In the present research, we propose to test one way in which an environment that devalues women's abilities can trigger social identity threat, and more specifically stereotype threat, among women. We hypothesized that men in engineering and mathematical domains who hold sexist attitudes can trigger threat among their female colleagues through interpersonal behavior that devalues women's contributions and abilities. We tested our process model using the experimental-causal-chain design recommended by Spencer, Zanna, and Fong (2005; see also Vescio et al., 2005; Word, Zanna, & Cooper, 1974). In Study 1 and a replication, we examined whether men's level of sexism would predict their behavior toward a woman with whom they interacted. We did not expect men to make blatantly sexist or stereotypic statements or to sexually harass their interaction partner, especially in this closely observed laboratory setting. Instead, we predicted that more sexist men would show more subtle dominance toward and sexual inter-

est in the woman (cf. Rudman & Borgida, 1995). We tested this prediction by observing men's behavior in a work-related interaction with an ostensible female peer.

In Studies 2–5, we examined the effect men's level of sexism has on their female interaction partners. We predicted that men's sexism would trigger stereotype threat. To test this hypothesis, we first assessed women's test performance in a stereotyped domain, and then addressed several alternative explanations. In Study 2, we examined how male participants' sexism scores predicted their female interaction partners' performance on a test in engineering, a field in which women are negatively stereotyped. In Study 3, we manipulated the sexist behavior itself and examined its effect on women's engineering test performance. In Study 4, we addressed alternative explanations for women's underperformance by examining whether dominant and sexually interested behavior would affect women only in a domain in which they are negatively stereotyped. In Study 5, we further addressed alternative explanations by examining whether dominant and sexually interested behavior would lead women to suppress concerns about the stereotype, an established mechanism of stereotype threat.

Study 1

In Study 1, we examined whether men's level of sexism would affect their behavior toward a woman in the context of a conversation about engineering. We expected that more sexist men would exhibit more subtle dominance and sexual interest toward the woman.

Male engineering students completed a subtle measure of sexism and then participated in a structured, work-related interaction with a female confederate posing as another engineering student. By using a female confederate, we isolated the man's behavior while holding constant the woman's behavior.

Creation of a Subtle Measure of Sexism

We wanted to assess sexist beliefs about women without arousing suspicion about the purpose of the study, a potential risk of survey measures of sexism (e.g., Glick & Fiske, 1996; Swim et al., 1995), and without priming thoughts related to gender roles, a potential risk of using an Implicit Association Test (Greenwald, McGhee, & Schwartz, 1998). For these reasons, we developed a subtle measure of sexism by assessing the manner in which participants finished sentences about women. We used sentence stems created by von Hippel, Sekaquaptewa, and Vargas (1997) to assess stereotypic explanatory bias, because they included three stems that featured female names enacting tasks associated with female stereotypes: "Shirley asked for help getting home," "Jenny went home to cook dinner," and "Katherine baby-sat the neighbor's kids," along with 19 other stems that served as distracters. To score the measure, coders rated the degree to which participants portrayed women in sexist ways in their completions to the three target stems.[1] Scoring details are described below.

Measure Validation

To ensure that the sentence-completion measure assesses sexism, we conducted two pilot studies. In Pilot Study A, 26 male introductory psychology students (12 White, 10 East Asian, 4 other) enrolled in engineering, mathematics, or science programs participated individually. They filled out the sentence-completion measure, along with several attitude measures. To assess convergent validity, we asked them to complete each subscale of the Old Fashioned Sexism and Modern Sexism Scale (Old Fashioned Sexism, Denial of Discrimination, and Antagonism Towards Women's Demands; Swim et al., 1995); each subscale of the Ambivalent Sexism Inventory (Hostile Sexism, Complementary Gender Differentiation, Heterosexual Intimacy, and Protective Paternalism; Glick & Fiske, 1996); and the Social Dominance Orientation Scale, which is associated with endorsement of traditional gender roles and low support for women's rights (Pratto, Sidanius, Stallworth, & Malle, 1994). To assess discriminant validity, we asked them to complete measures of extraversion (Costa & McCrae, 1985) and impression management (Paulhus, 1984). Finally, they reported their ethnicity and year in school.

In Pilot Study B, 58 male engineering students participated (48 White, 6 East Asian, 6 South Asian). In addition to the measures from Pilot Study A, participants completed a five-block Implicit Association Test designed to tap into the degree to which they associated competence and incompetence with female engineers relative to male engineers. Category labels were "incompetent" (brainless, dumb, helpless, illogical, inept, irrational, slow, stupid, unskilled, and weak) versus "competent" (capable, efficient, expert, intelligent, proficient, qualified, rational, skilled, smart, and strong), and "male engineer" (target words were he, his, him, and himself) versus "female engineer" (she, her, hers, and herself). Following the scoring algorithm recommended by Greenwald, Nosek, and Banaji (2003), we transformed the raw reaction times into a single score, in which higher scores reflected a tendency to associate competence with male engineers and incompetence with female engineers. Eight participants' scores were excluded because they made errors on more than 15% of the trials in the critical blocks.

Results

Scoring the sentence completion measure of sexism. Two coders, who were blind to participants' scores on the attitude measures, used a one-to-five scale to rate the sexism of each target sentence completion. Sentences were rated as more sexist to the extent that the female protagonist was portrayed in stereotype-consistent ways. For example, responses to the stem "Jenny went home to cook dinner" were rated as a five if they portrayed women in historical roles (e.g., ". . . for her husband") or as sex objects (e.g., ". . . naked") but were rated as a one if they portrayed women as equal to men (e.g., ". . . because Tim cooked dinner last night") or in modern roles (e.g., ". . . after work"). Inter-rater agreement was acceptable for each item (rs $> .72$), so we averaged the two coders' ratings to form a single rating for each statement, then

[1] von Hippel et al.'s (1997) measure also included male names enacting tasks associated with male stereotypes (e.g., "Bert changed the oil"), but prior research with these materials suggests that people respond more strongly to female stereotypicality than to male stereotypicality (Sekaquaptewa & Thompson, 2002), so we treated these sentence stems as distracters. Sentence completions were also coded for explanatory bias, as in von Hippel et al., but these ratings were unrelated to the variables of interest in the current studies and, thus, are not discussed further.

averaged the three critical statements to produce one sexism score for each participant (Pilot Study 1 $M = 3.23$, $SD = 0.69$; Pilot Study 2 $M = 3.20$, $SD = 0.67$).

Predicting scores on the sentence-completion measure. We calculated averages for each subscale of each survey measure, standardized them, and entered them simultaneously into a regression predicting scores on the sentence completion measure. Analyses controlled for ethnicity (dummy coded into White vs. minority ethnicity) and year in school. Nonsignificant variables were dropped from the regression.

In Pilot Study A, three significant predictors of the sexism of participants' sentence completions emerged. More sexist sentence completions were associated with greater social dominance orientation, $\beta = .45$, $t(23) = 2.39$, $p = .03$; marginally with greater denial of discrimination (a subscale of the Modern Sexism Scale), $\beta = .33$, $t(23) = 1.75$, $p = .09$; and marginally with less complementary gender differentiation (a subscale of the Ambivalent Sexism Inventory), $\beta = -.32$, $t(23) = -1.89$, $p = .07$. Year in school was not a significant control variable, $\beta = -.01$, $t(23) = -0.06$, $p = .96$, but ethnicity was, $\beta = -.62$, $t(23) = -3.33$, $p = .003$, with White participants making less sexist sentence completions than ethnic minority participants. No other variables were significant predictors, including the discriminant validity measures of extraversion and impression management (βs $< .44$, ts < 1.43, ps $> .19$).

Pilot Study B replicated and extended these results. As in Pilot Study A, higher scores on Social Dominance Orientation, $\beta = .33$, $t(47) = 2.19$, $p = .03$, and the Denial of Discrimination subscale of the Modern Sexism Scale, $\beta = .38$, $t(47) = 2.59$, $p = .01$, were associated with more sexist sentence completions, as were lower scores on The Complementary Gender Differentiation subscale of the Ambivalent Sexism Inventory, $\beta = -.34$, $t(47) = -2.41$, $p = .02$. In addition, associating competency traits with male engineers relative to female engineers on the Implicit Association Test was marginally associated with more sexist sentence completions, $\beta = .24$, $t(47) = 1.64$, $p = .10$. Ethnicity, $\beta = -.25$, $t(47) = -1.66$, $p = .10$), but not year in school, was a marginally significant control variable, $\beta = -.17$, $t(47) = -1.09$, $p = .28$, with White participants again making fewer sexist sentence completions than minorities.[2] No other variables were significant predictors of sexism of sentence completions (βs $< .20$, ts $< .1.27$, ps $> .21$).

The results of Pilot Studies A and B suggest that the sentence-completion measure of sexism does indeed assess men's level of sexism. Across two samples, men who completed sentence stems in more sexist ways reported more support for dominating outgroups, denied that women are discriminated against, and disagreed with statements that women are more pure and cultured than men. In Pilot Study B, these men also tended to associate competence with male engineers and incompetence with female engineers.

Having created and validated a subtle measure of sexism, we proceeded to examine whether it would predict behavior in an interaction with a woman.

Method

Participants

Twenty-eight male undergraduate engineering students at the University of Waterloo (Waterloo, Ontario, Canada) participated for $6.00 or partial course credit. Nine participants identified their ethnicity as East Asian, 7 as White, and 1 each as Middle Eastern and South Asian. Ethnicity information was not available for the other 10 participants.

Procedure

Students participated individually with a female confederate. Both the experimenter and the confederate were blind to participants' sexism scores; the confederate was further blind to the hypotheses. Participants were told that the study investigated how engineering students discuss issues in the media. The experimenter arranged for the confederate to enter the experimental room first, where she sat on the closest of two small couches arranged perpendicular to each other. A box on the couch beside the confederate forced the participant to sit on the second couch but allowed him to choose how far from her to sit. Although the experimenter introduced the confederate as a fellow participant and as an engineering student, she was actually a drama student trained to maintain a consistent level of friendliness across participants. The experimenter explained that because the study was taking less time than she had expected, she would like them to complete an additional task (the sentence-completion task) as a favor to other researchers. All participants agreed. After the participant and the confederate completed the sentence-completion measure, the experimenter asked them to read a newspaper article from *The New York Times* (Lohr & Gaither, 2001, December 8) and then to discuss it with each other. The article describes a dispute between Hewlett-Packard's CEO, Carleton S. Fiorina, and the sons of one of the founders of the company over a proposed merger with Compaq Computer. We chose this article because it is relevant to engineering, and so the discussion could approximate a work-related interaction. When participants indicated that they had read the article, the experimenter gave them a set of questions to answer in their discussion (e.g., "Do you think Ms. Fiorina is doing a good job managing the merger?"), turned on a video camera to tape the interaction, and left the room.

When the participant and confederate indicated that they had finished the discussion, the experimenter brought the confederate into an adjacent room so that she and the participant could each complete a short questionnaire in private. Participants reported how attractive the confederate was and how attracted they were to her (e.g., -5 = *not at all attracted*, 5 = *very attracted*; $\alpha = .81$). Finally, participants were thanked and debriefed.

Coding of Participants' Behavior

Coders and observers were trained, female undergraduates who were blind to participants' level of sexism and to the purpose of the study.

Body position and posture. One coder watched the videotaped interactions and scored how close participants sat to the confed-

[2] This main effect of ethnicity on sexism was not replicated in the subsequent studies for which a sufficient number of minority students participated: Study 1, $F(1, 16) = 0.72$, $p = .41$; Study 2, $F(1, 18) = 0.80$, $p = .38$. A meta-analysis across Pilot Studies A and B and Studies 1 and 3 reveals no significant main effect of ethnicity on sexism ($z = 1.46$, $p = .15$).

erate by marking the participants' and confederate's position on a diagram of the couches and measuring the distance between them. Two coders used a 5-point scale to report the openness of participants' postures (i.e., shoulders back and knees wide apart; 1 = *very closed posture*, 5 = *very open posture*). Inter-rater reliability was acceptable (r = .61), and disagreements were resolved through discussion.

Observers' impressions. Two observers watched the videos and reported their overall impressions of participants' sexual motivation, dominance, and confidence, (e.g., 1 = *not confident*, 5 = *very confident*). Inter-rater reliability for each item was acceptable (.70 < rs < .92), and disagreements were resolved through discussion.

Looking at the confederate's body. After each interaction, the confederate reported how much the participant had looked at her body (e.g., −5 = *not at all*, 5 = *very much*). Pilot testing revealed that coders could not clearly see where participants were looking from the videos.

These measures of sitting proximity, openness of posture, confidence, dominance, sexual motivation, and looking at the confederate's body formed a reliable composite index (α = .77). They were therefore standardized and combined into a single index of dominance and sexual interest.

Overt sexist statements. Two coders, who were blind to participants' sexism scores, watched the videos to identify overtly sexist statements.

Results and Discussion

Subtle Measure of Sexism

Coders rated the sexism of each target sentence (rs > .88) in the same manner as in the pilot study.

Behavior in Interaction

Ethnicity did not moderate the relation between sexism and behavior among participants for whom ethnicity information was available, β = .22, $t(14)$ = 0.60, p = .56; therefore, analyses collapse across ethnicity.

Overt sexist statements. Participants made no overtly stereotypic or demeaning verbal statements.

Dominance and sexual interest. We centered men's scores on the subtle sexism measure and entered them into a regression predicting the index of dominance and sexual interest (Aiken & West, 1991). The more sexist participants' sentence completions were, the higher they scored on the index of dominance and sexual interest, β = .57, $t(26)$ = 3.56, p = .001.

These results show that men's sexist attitudes predict their behavior in a work-related interaction with a woman. Men who scored highly on a subtle measure of sexism showed more dominance and sexual interest, according to observer's impressions, ratings of their body posture, and the confederate's reports, than did men who scored lower.

Alternative Explanations

Attraction to the confederate. One alternative explanation for the relation between men's sexism scores and their behavior is that sexist men were simply more attracted to the confederate than were nonsexist men, and that is why they showed more sexual interest. This was not the case. Men's scores on the sexism measure were unrelated to their reported feelings of attraction to the confederate, β = −.13, $t(26)$ = −0.67, p = .51.

Replication

Thirty-five male undergraduate engineering majors participated in a follow-up study that followed the same methodology as Study 1 and involved a different female confederate. In addition to the observer- and confederate-based measures of participants' behavior used in Study 1, the observers rated the extent to which participants flirted and showed romantic interest in the confederate (e.g., 1 = *did not show any romantic interest*, 5 = *showed a lot of romantic interest*), and the confederate rated the participants' levels of sexism and sexual motivation (e.g., −5 = *not at all sexually motivated*, 5 = *very sexually motivated*; α = .83). Replicating Study 1, the more sexist participants' sentence completions were, the greater dominance and sexual interest they showed in the interaction, β = .38, $t(33)$ = 2.33, p = .026. As in Study 1, participants' sexism was not associated with their reported level of attraction to the confederate, β = .003, $t(33)$ = 0.02, p = .99.

Together, results of Study 1 and the replication demonstrate that men's attitudes toward women predict their behavior in an interaction with a female engineer. Men who scored highly on the sexism measure did not overtly make stereotypic statements in the interaction or sexually harass their partners. The differences between their behavior and that of less sexist men were subtle, but they were consistent: The sexist men behaved more dominantly and expressed more sexual interest toward the ostensible female peer.

In Studies 2–5, we investigated the effect sexist men's behavior has on the women with whom they interact.

Study 2

We have suggested that sexist men's behavior would cue women that they might be devalued and viewed stereotypically, triggering stereotype threat and undermining their test performance. As a first test of this hypothesis, in Study 2, we examined the extent to which men's scores on a subtle measure of sexism predicted women's performance on an engineering test.

Method

Participants

A total of 32 female and 32 male undergraduate engineering students at the University of Waterloo participated in exchange for $8.00 or partial course credit. One male–female pair of engineering students participated in each session. Pairs had not met each other prior to the study. Sixteen men and 14 women were White, 4 men and 4 women were East Asian, and 12 men and 14 women did not report their ethnicity.

Procedure

Participants came to the lab under the same cover story and basic procedure as in Study 1. After being introduced, participants filled out the sentence-completion measure of sexism and then

read and discussed the same newspaper article from Study 1. They then completed an engineering test. Written instructions informed participants that the test was "an excellent indicator of engineering ability and aptitude" and that they had 20 min to complete it. After the test, participants were thanked and debriefed.

Engineering test. The test was composed of 18 multiple-choice items drawn from practice problems available for the Fundamentals of Engineering Exam (National Society of Professional Engineers, 2003), an exam engineers must pass to obtain a professional license in the United States. The questions sample from broad areas of engineering, including mathematics, electric circuits, statistics, chemistry, thermodynamics, dynamics, material science, and computing. One point was assigned for each correct answer, and one quarter of a point was subtracted for each incorrect answer to correct for guessing; the resulting score was converted to a percentage. Questions from participants' major area were excluded in our calculation of final scores (e.g., chemistry questions were not included for chemical engineering majors), because participants would find these questions easy to answer, and performance on easy questions is not undermined by stereotype threat (O'Brien & Crandall, 2003; Spencer, Steele, & Quinn, 1999).

Results and Discussion

Subtle Measure of Sexism

Two coders rated the sexism of the sentences in the same manner as in the previous studies (rs $> .74$). Male and female participants did not differ in their levels of sexism ($F < 1$), consistent with findings along other subtle or implicit measures of sexism and gender stereotyping (e.g., Banaji & Greenwald, 1995, Study 3; Rudman, Greenwald, & McGhee, 2001, Study 4; Rudman & Kilianski, 2000).

Performance on the Engineering Test

We centered men's and women's scores on the subtle sexism measure and then multiplied the two variables to create an interaction term. We first regressed men's test scores and then regressed women's test scores onto these three variables, with the main effects entered first followed by the interaction term (Aiken & West, 1991). Ethnicity did not moderate the effect of participants' sexism on partner's engineering test score for men or women (βs $< .14$, ts $< .53$, ps $> .60$), so analyses collapse across ethnicity.

Men's performance on the engineering test. Neither men's own level of sexism nor their female partner's level of sexism, nor the interaction between the two, affected men's test scores (βs $< .23$, ts < 1.17, ps $> .25$).

Women's performance on the engineering test. Women's own level of sexism did not affect their test scores, $\beta = -.03$, $t(28) = -0.17$, $p > .86$, nor did the interaction between their level of sexism and the level of sexism of their male partner, $\beta = .25$, $t(28) = -1.51$, $p = .14$. What did predict women's test scores was the level of sexism of their male partner, $\beta = -.38$, $t(28) = -2.14$, $p = .04$. The more sexist their male partner's sentence completions were, the worse women performed on the engineering test. Women who interacted with a man low in sexism (-1 SD) scored an average of 25% on the test—as well as men ($M = 27\%$). But women who interacted with a man high in sexism ($+1$ SD) scored an average of 13%.

These results begin to suggest that one consequence of men's sexist attitudes may be women's poorer performance in stereotype-relevant domains. In Studies 3–5, we examine whether men's behavior plays a causal role in undermining women's performance and investigate a mechanism through which this effect occurs.

Alternative Explanations

Women's attraction to sexist men. It could be that women were attracted to men who made more sexist sentence completions and underperformed on the engineering test because they were distracted by these feelings. As a preliminary examination of this possibility, two female undergraduates watched the videos from the replication of Study 1 and rated the attractiveness of the male participants (1 = *very unattractive*, 5 = *very attractive*; $r = .63$). Their ratings did not predict men's sexism scores ($r = .17$, $p = .39$) or the degree to which the men behaved in a dominant and sexually interested way ($r = .07$, $p = .71$). Still, women's individual experiences of attraction could differ from the raters' views of his attractiveness, so in Study 3, we both held the man's appearance constant and assessed participants' reports of attraction.

Another third variable. It is possible that some other third variable covaried with men's sexism scores, and this variable was what undermined women's engineering performance. To be sure that women's underperformance resulted from the more sexist men's dominant and sexually interested behavior, we manipulated those cues directly in Study 3.

In Study 3, women interacted with a male confederate who was trained to behave like either the more sexist or less sexist men in Study 1. In addition, women reported their attraction to him and their perceptions of the interaction.

Study 3

The primary goal of Study 3 was to conceptually replicate the findings from Study 2 using an experimental design. A male confederate was trained to interact with female engineering students in one of two ways. In the "sexist cues" condition, he reproduced the subtle dominant and sexually interested behaviors of men who scored higher on sexism in Study 1. In the "no sexist cues" condition, he behaved in a more neutral way, like the men who scored lower on sexism. If women underperform after interacting with a sexist man because of his dominant and sexually interested behavior, rather than because of some third variable, then women who interact with a male confederate when he behaves like a sexist man should underperform on an engineering test, compared with women who interact with him when he behaves like a less sexist man. Their underperformance should not be predicted by the degree to which they report attraction to the confederate.

A secondary goal of Study 3 was to examine women's feelings about the interaction and the relation of these feelings to their performance. We reasoned that women who had more positive feelings about the interaction would perform better on the test if they had interacted with a man who did not reveal sexist cues.

However, when the man revealed sexist cues, his behavior would be likely to disrupt women's performance regardless of how positively they felt about it. Women also completed items assessing the valence of their feelings about the interaction and we examined how these perceptions were related to performance. To examine whether women need to be explicitly aware of a man's dominance and sexual interest for it to affect their performance in a stereotyped domain, we asked women to report their metaperceptions of the confederate's dominance and sexual interest.

Method

Participants

Seventeen female undergraduate engineering students at the University of Waterloo participated in exchange for payment of $8.00 or partial course credit.

Confederate Behavior

Two male confederates, who were blind to the hypotheses of the study, were trained to express the subtle dominant and sexually interested behaviors identified by the coders and the confederate in Study 1. Specifically, in the "sexist cues" condition, the confederate positioned himself closer to the participants, sat with an open posture (shoulders back, knees wide apart), looked at the participant often during the interaction, and maintained a confident facial expression. In the "no sexist cues" condition he sat farther from the participant, leaned forward, closed his knees, and held a more tentative facial expression. The confederate followed the same verbal script in both conditions. One confederate participated in each session. Trained research assistants regularly viewed the videotapes to ensure that the confederates' behavior in each condition was consistent over time.

Procedure

The confederate randomly assigned participants to either the sexist cues condition or the no sexist cues condition so the experimenter could remain blind to condition. The study featured the same cover story as the previous studies. When the participant arrived at the laboratory, the experimenter introduced her and the confederate to each other and invited them to sit on couches arranged perpendicular to each other. The procedure, including the engineering test, continued as in Study 2.

Before debriefing, participants completed an 11-item measure. Two items assessed participants' attraction to the confederate (α = .84; e.g., "how attracted were you to your partner?"; -5 = *not at all attracted*, 5 = *very attracted*). Three items examined women's metaperceptions of the confederate's dominance and sexual interest (α = .72; e.g., "how confident do you think your partner felt when talking to you?"; "how physically attracted do you think your partner was to you?"; -5 = *not at all attracted*, 5 = *very attracted*). On the remaining six items, participants reported the valence of their feelings about the interaction (α = .75). They reported how positive or negative their experience was (-5 = *very negative*, 5 = *very positive*), how pleasant or unpleasant and how friendly their partner was, how much he liked them, how comfortable he seemed, and whether he flirted with them (1 = *my partner did not flirt with me*, 4 = *my partner flirted with me a lot*). These items in this measure were standardized and averaged.

Results and Discussion

Including the individual confederate in the analyses does not moderate or change the pattern of results and so is not discussed further.

Engineering Test Performance

Participants in the sexist cues condition scored lower on the engineering test (M = 11%) than did women in the no sexist cues condition (M = 22%), $F(1, 15) = 5.67$, $p = .03$.

Attraction to the Confederate

Participants in the sexist cues condition reported feeling more attracted to the confederate ($M = 1.06$) than did participants in the no sexist cues condition ($M = -1.44$), $F(1, 15) = 11.12$, $p = .01$. Women's feelings of attraction, however, did not predict their performance on the test, $\beta = -.30$, $t(15) = -1.23$, $p = .24$.

Metaperceptions of Dominance and Sexual Interest

Participants' metaperceptions of the confederate's dominance and sexual interest did not predict their score on the test, alone or moderated by cue condition (βs $< .25$, ts $< .87$, ps $> .40$), nor did cue condition affect participants' metaperceptions, $F(1, 15) = 1.93$, $p = .19$.

Feelings About the Interaction

The valence of participants' feelings did not predict their test score, alone or moderated by cue condition (βs $< .23$, ts $< .70$, ps $> .49$), nor did cue condition affect the valence of participants' feelings, $F(1, 15) = .68$, $p = .42$.

The results of Study 3 were consistent with the hypothesis that women detect cues from sexist men's behavior that they are at risk of being stereotyped. When dominant and sexually interested behavior was experimentally manipulated using a trained confederate, women underperformed in a domain in which they are stereotyped. Although they reported more attraction to the confederate when he behaved in a dominant and sexually interested way, it did not explain their score on the test.

Neither women's metaperceptions of dominance and sexual interest nor their feelings about the interaction predicted their score on the engineering test, and neither differed by cue condition. This could suggest that sexist behavior does not make an overt impression on women and is not seen as any more positive or negative than more egalitarian behavior. We are hesitant to accept this conclusion for two reasons, however. First, the relation between the valence of women's feelings about the interaction and their score on the test does form a meaningful pattern. Women in the sexist cues condition do tend to report more metaperceptions of dominance and sexual interest, just not significantly so, and more positive feelings in the no sexist cue condition tend to be associated with better performance. Second, the sample size for testing these effects in this study is quite low and may have prevented these trends from emerging as significant. For these reasons, we

reexamine these issues by again measuring participants' feelings about the interaction in Study 4.

Alternative Explanations

We have argued that women underperformed on the engineering tests in Studies 2 and 3 because they detected cues suggesting that they were at risk of being devalued and judged through the lens of a negative stereotype and, thus, experienced stereotype threat. Evidence from Study 3 is inconsistent with one alternative explanation, that women underperformed because they were distracted by their attraction to the confederate when he displayed sexist cues. However, there are at least two additional alternative explanations for the effect of the confederate's behavior on women's engineering performance. As described in more detail below, both alternative explanations suggest that women underperformed because of factors that would undermine their intellectual ability in general. Study 4 addressed these alternative explanations by comparing the effect of a man's dominant and sexually interested behavior on women's performance in a domain in which they are stereotyped (i.e., mathematics) with their performance in a domain in which they are not (i.e., English).

Self-objectification. Participants could have interpreted the sexist cues as indicating that their partner judged them on their appearance and other external attributes, rather than on their abilities. If so, they could have experienced self-objectification, which can cause cognitive decrements. According to self-objectification theory, a societal focus on women's appearance and sexuality causes women to take observers' perspectives on themselves and to become hyperaware of their external, rather than internal, attributes (Fredrickson & Roberts, 1997; Fredrickson, Roberts, Noll, Quinn, & Twenge, 1998). This hyperawareness takes up mental energy, undermining women's performance on tasks requiring sustained attention, including intellectual tests (Fredrickson et al., 1998; Quinn, Kallen, Twenge, & Fredrickson, 2006).

Deliberate underperformance. It could be that women interpreted the sexist cues as indicating that their male partner preferred traditional gender roles. If so, they could have deliberately underperformed to encourage his attention and to make him feel better about his own test score. More than 30 years ago, Zanna and Pack (1975) found evidence for this phenomenon. Of course, gender attitudes have changed dramatically in the past 30 years (Swim et al., 1995), and instructions clearly indicated to participants that their test answers would be confidential. Still, Study 4 addressed this possibility as well.

In Study 4, we examined the effect of sexist cues on women's performance in a domain in which women are negatively stereotyped (i.e., mathematics) and a domain in which they are not negatively stereotyped (i.e., English). If women underperformed in Study 3 because of distraction from their attraction to the confederate, self-objectification, or deliberately to encourage his attention, their performance should drop after sexist behavior, regardless of domain. However, if they underperformed because the man's sexist behavior triggered social identity threat, and specifically stereotype threat, they should underperform only in the domain in which they are negatively stereotyped (Adams et al., 2005). To obtain further evidence addressing the different explanations, we also asked participants to complete measures of self-objectification and motivation to deliberately underperform.

Study 4

In Study 4, women interacted with a male confederate who either did or did not display sexist cues and then completed a test that included items from a domain in which women are negatively stereotyped (i.e., mathematics), and items from a domain in which women are not negatively stereotyped (i.e., English). They also completed paper-and-pencil measures of attraction, metaperceptions of dominant and sexually interested behavior, and the valence of their feelings about the interaction, along with measures of self-objectification and deliberate underperformance.

Method

Participants

A total of 25 female undergraduate students at the University of Waterloo participated for payment of $8.00 or partial course credit. Because women are negatively stereotyped in math and science as well as in engineering, the study included students majoring in math ($n = 6$), science ($n = 8$), and engineering ($n = 11$). Three participants (2 in the no sexist cues condition and 1 in the sexist cues condition) expressed suspicion about the confederate. Their data were excluded from analyses.

Procedure

The procedure was identical to that of Study 3, except that the test was portrayed as a quantitative and verbal test and, after completing the test, participants completed scale items assessing attraction, self-objectification, deliberate underperformance, and perceptions of dominant and sexually interested behavior.

Confederate Behavior

Three male confederates were trained in the same manner as in Study 3 and followed the same script. One confederate participated in each experimental session.

Materials

Mathematics and English test. The test was composed of five pages of math problems (12 problems total, taken from the Graduate Record Exam in Advanced Mathematics; Educational Testing Service, 1987) alternating with five pages of English problems (21 problems total, taken from the Graduate Record Exam in English Literature; Educational Testing Service, 1986).[3] Page order was counterbalanced so that half of the participants had a math page first and half had an English page first. Scores were calculated for math and English separately by summing the number of correct

[3] The test included more English problems than math problems because pilot tests revealed that the English problems took less time to complete. Because of experimenter error, the test was portrayed as diagnostic of quantitative and English ability for the first 16 participants, but the test was portrayed as nondiagnostic for the last 6 participants. The same pattern of results was obtained for each set of test instructions.

answers and then subtracting one fifth of a point for each incorrect answer to control for guessing.

Attraction, metaperceptions, and feelings about the interaction. Participants completed the same 11 items included in Study 3 to assess their level of attraction to the confederate, their metaperceptions of dominance and sexual interest, and their feelings about the interaction.

Measure of self-objectification. We assessed self-objectification in two ways. First, participants completed the 10-item Self-Objectification Questionnaire (Fredrickson et al., 1998), which compares how important external attributes (e.g., sex appeal; $\alpha = .77$) and internal attributes (e.g., energy level; $\alpha = .88$) are to a person's self-concept. Following the scoring methods developed by Fredrickson et al. (1998), we calculated an overall score by subtracting the average internal response from the average external response. Higher scores index higher levels of self-objectification.

Second, we administered a more subtle measure of self-objectification. Written instructions directed participants to recall their interaction with their discussion partner. They were then asked to report the perspective from which they recalled this memory, on a 10-point scale with endpoints labeled *completely first person perspective* and *completely third person perspective* (Libby & Eibach, 2002; Libby, Eibach, & Gilovich, 2005). Written instructions clarified the definitions of each perspective (i.e., "With the first-person visual perspective you see an event from the same visual perspective that you originally did; in other words, in your memory you are looking out at your surroundings through your own eye"). We reasoned that recalling the interaction more from a third-person perspective would reflect seeing the self from an observer's point of view, a form of self-objectification.

Measure of deliberate underperformance. To assess any motivation participants may have had to deliberately underperform to attract the attention of men, we created a 12-item deliberate underperformance scale ($\alpha = .75$). Participants used 9-point scales to respond to such items as, "I believe men in my program prefer women who are less successful than they are" and "I would try to get the best mark possible on a test even if men would resent me for doing well" (reverse coded).

Results and Discussion

Performance on Mathematics and English Tests

To test our main hypothesis, we standardized scores on the math and English problems to put them on the same metric and conducted a mixed model analysis of variance predicting math versus English performance from condition (sexist cues vs. no sexist cues) and page order (page of math questions first vs. page of English questions first). Because participants came from three different programs, we also included their program (math, science, or engineering) as a between-subjects factor. Including the individual confederate in the analyses does not affect the pattern of results and so is not discussed further.

As predicted, the interaction between condition and math versus English problems was significant, $F(1, 10) = 5.14$, $p = .05$. As illustrated in Figure 1, participants in the sexist cues condition performed worse on math problems than did participants in the no sexist cues condition, $F(1, 10) = 7.57$, $p = .02$. However, participants' scores on English problems were unaffected by condition, $F(1, 10) = 0.39$, $p = .54$.[4]

Attraction to Confederate

As in Study 3, participants reported feeling more attracted to the confederate in the sexist cues condition ($M = 1.20$) than in the no sexist cues condition ($M = -0.63$), $F(1, 20) = 4.56$, $p = .045$. However, as in that study, attraction did not predict their performance on the math problems ($r = .05$, $p = .88$).

Metaperceptions of Dominance and Sexual Interest

As in Study 3, participants' metaperceptions of dominance and sexual interest did not affect their score on the math problems, alone or moderated by cue condition (βs $< .08$, ts $< .35$, ps $> .72$), nor did cue condition affect participants' metaperceptions, $F(1, 20) = 0.10$, $p = .76$.

Positivity of Feelings About the Interaction

Participants in the sexist cues condition reported more positive feelings about the interaction ($M = 0.33$) than participants in the no sexist cues condition ($M = -0.28$), $F(1, 20) = 10.22$, $p = .005$. However, the positivity of participants' feelings did not independently predict participants' score on the math problems, $\beta = -.06$, $t(20) = -0.26$, $p = .80$. Instead, the relation was moderated by cue condition (dummy coded), $\beta = -.62$, $t(18) = -2.34$, $p = .03$.[5] In the no sexist cues condition, more positive impressions were associated with higher math scores, $\beta = .78$, $t(18) = 2.79$, $p = .01$; whereas in the sexist cues condition, the positivity of their impressions was not related to their math score, $\beta = -.21$, $t(18) = -0.66$, $p = .52$. None of these variables predicted participants' score on the English problems (βs $< .19$, ts $< .66$, ps $> .52$).

Self-Objectification

There was no effect of condition on self-reported self-objectification ($F < 1.05$, $p > .30$), nor on the perspective measure of self-objectification ($F < 1.04$, $p > .32$).

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[4] There were also marginally significant main effects of page order (math page first vs. English page first), $F(1, 10) = 4.41$, $p = .06$, and participants' program, $F(2, 10) = 3.00$, $p = .10$. These main effects were qualified by interactions between the condition and participants' program, $F(2, 10) = 4.08$, $p = .05$, and between page order and participants' program, $F(2, 10) = 10.81$, $p = .003$. These two-way interactions were qualified by a marginally significant three-way interaction between condition, page order, and participants' program, $F(2, 10) = 3.91$, $p = .06$. This interaction was not particularly meaningful, because our interest lay in predicting differences between math and English performance, and this interaction was unmoderated by math versus English scores. However, the means were as follows: engineering majors tended to perform better than math and science majors when the test began with a page of math questions but worse than math and science majors when the test began with a page of English questions. Math majors outperformed science majors, except in the no sexist cues condition, when the test began with a page of English questions.

[5] This interaction is significant when the data from Studies 3 and 4 are combined, $\beta = -.41$, $t(35) = -2.02$, $p = .05$.

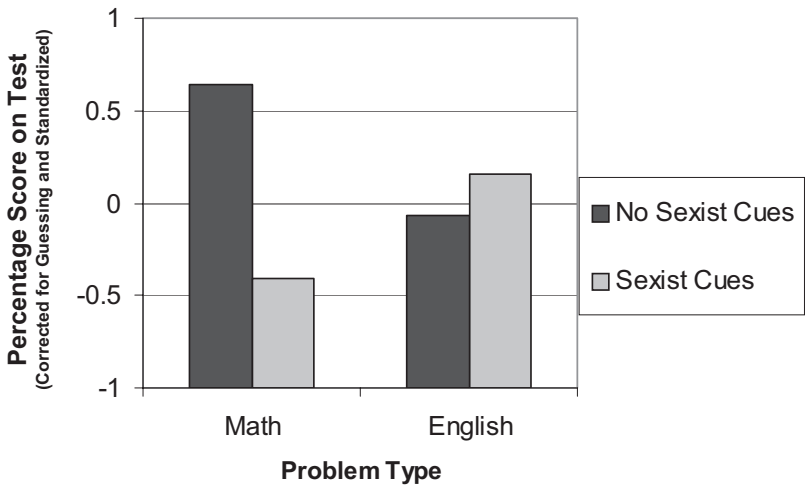

Figure 1. Participants' scores, corrected for guessing and standardized, on math and English problems as a function of confederate behavior condition: Study 4.

Deliberate Underperformance

There was a main effect of behavior condition on self-reported motivation to deliberately underperform, $F(1, 20) = 4.67$, $p < .05$. However, participants in the sexist cues condition reported *less* motivation to deliberately underperform ($M = 2.35$) than did participants in the no sexist cues condition ($M = 2.93$).

In Study 4, when a confederate displayed sexist cues, women underperformed on mathematics problems but not on English problems. These results are inconsistent with several alternative explanations, which would predict that sexist cues should undermine women's intellectual performance in general. They are consistent, however, with a stereotype-threat explanation—that participants detected cues in the confederate's behavior suggesting that they could be judged according to a negative stereotype, which triggered stereotype threat and undermined their performance in the stereotyped domain.

Women's metaperceptions of dominance and sexual interest did not vary by condition and did not predict their scores on the math problems, suggesting that women do not have to be explicitly aware of subtle sexist behavior for it to affect their performance. Women in the sexist cues condition reported more positive feelings about the interaction than did women in the no sexist cues condition, even as they underperformed on the math problems, suggesting that sexist behavior can undermine women's performance, even when it is viewed quite positively. In contrast, women in the no sexist cues condition performed better on the math problems the more positive their feelings were about the interaction, suggesting that egalitarian behaviors, to the extent that they are seen positively, can *help* women's performance.

Alternative Explanations

Floor or ceiling effect on the English problems. It might be argued that participants in the sexist cues condition underperformed only on the math portion of the test because a floor effect on the English questions prevented participants from scoring any lower than they did in the no sexist cues condition. This seemed unlikely because we assigned a correction penalty for guessing, such that chance performance on the unstandardized scores would equal zero. We found that the unstandardized English scores were significantly above zero, $t(21) = 4.54$, $p < .001$, suggesting that their scores could have dropped further, if they had been undermined by distraction because of attraction, self-objectification, or deliberate underperformance.

Alternately, it could be argued that participants' scores on the English problems did not differ across conditions because the English questions were too *easy* to be affected by the confederate's behavior. This seems unlikely, given that participants were math, engineering, and science majors who did not have strong English backgrounds. Indeed, comparing their unstandardized scores on the math and English problems reveals that they scored lower on the English problems ($M = 14\%$) than they did on the math problems ($M = 22\%$), $t(21) = 2.03$, $p = .05$.

Low power to detect effects. It could be argued that the sexist cues condition did not have an effect on the paper-and-pencil measures designed to further address alternatives to stereotype threat because the relatively small sample size provided low power to detect significant effects. To address this concern we remeasured these constructs in Study 5.

Deliberate underperformance only in the stereotyped domain. It could also be argued that women in the sexist cues condition underperformed only on the math problems because they inferred that the confederate preferred stereotypic women who had stronger English than math abilities. Study 5 also addressed this concern.

We have hypothesized that the behavior of sexist men serves as a cue to women that they could be devalued and judged according to a negative gender stereotype. Studies 2–4 supported this view by examining the effect of sexist behavior on a well-established consequence of social identity threat, and more specifically stereotype threat: underperformance in the stereotyped domain. Women underperformed on an engineering or math test after interacting with a man with sexist attitudes (Study 2) or whose behavior displayed sexist cues (Studies 3 and 4), but they did not underperform in a domain in which they were not stereotyped

(Study 4). The goal of Study 5 was to provide converging evidence that men's sexist behavior leads to stereotype threat among women, by examining the effect of men's sexist behavior on a mechanism of stereotype threat effects on performance.

Study 5

In Study 5, we examined the effect of men's dominant and sexually interested behavior on an established mechanism through which stereotype threat leads to underperformance: suppression of thoughts about the stereotype. When people begin to suspect that their performance may be judged according to a negative stereotype, they activate thoughts about the stereotype and concerns about performance, and this activation predicts underperformance on a subsequent test (Davies et al., 2002; Steele & Aronson, 1995). In a series of laboratory studies, Logel, Iserman, Davies, Quinn, and Spencer (in press) replicated this stereotype-activation finding with women (Study 2). It is important to note, however, that Logel et al. also showed that once women began working on a math test, those under stereotype threat attempted to *suppress* these thoughts so that they could concentrate on the test (Studies 2 and 3). Because thought suppression is effortful (e.g., Wegner, Carter, Schneider, & White, 1987; Wegner, 1994), it leaves few mental resources for solving difficult test problems, resulting in working memory deficits (Croizet et al., 2004; Schmader & Johns, 2003), fewer correct test answers, and lower test scores (Logel et al., in press).

If men's dominant and sexually interested behavior serves as a cue to women that they are at risk of being stereotyped, women should suppress concerns about the gender stereotype when they are ready to begin working on a mathematics test. In contrast, if this behavior causes women to deliberately underperform, either overall or just in a stereotyped domain, they should activate thoughts of the gender stereotype, rather than suppress those thoughts. Finally, if it causes women to be distracted by feelings of attraction, or to experience self-objectification, women should show no extra suppression or activation of the stereotype. In this way, by manipulating men's dominant and sexually interested behavior and examining the degree to which women suppressed (or activated) the gender stereotype, we sought converging evidence that men's sexist behavior induces stereotype threat.

In Study 5, female students in quantitative programs interacted with a confederate who either did or did not display subtle sexist cues. They then completed a lexical decision task assessing thoughts related to the negative gender stereotype. We expected women who interacted with a confederate who displayed subtle sexist cues to suppress thoughts of the stereotype more than women who interacted with a confederate who did not display such cues. We also assessed self-objectification and motivation to deliberately underperform again.

Method

Participants

Twenty-six female undergraduate students at the University of Waterloo participated individually for $8.00 or partial course credit. As in Study 4, participants were either math majors (n = 11), science majors (n = 9), or engineering majors (n = 5). One participant did not specify in which quantitative program she was enrolled, so she was excluded from analyses that included program as a predictor. One participant in the no sexist cues condition expressed suspicion, and 1 participant in the sexist cues condition failed to follow the instructions. Their data were excluded from analyses.

Procedure

The procedure and cover story were the same as Study 4, except that after the interaction, participants were asked to first complete the lexical decision task and survey measures before completing the test. Once participants completed the survey measures, they were told they would not actually take a test and were thanked and debriefed.

Confederate behavior. Three confederates, all male drama students, were trained in the same manner as in Studies 3 and 4 and followed the same script. One confederate participated in each experimental session.

Suppression of the stereotype. We measured suppression of concerns about the negative gender stereotype using a lexical decision task (Logel et al., in press). Letter strings were presented one at a time on a computer screen. Participants were instructed to press a key to indicate whether each string was a word or a nonword. The task included 12 words shown in prior research (Logel et al., in press) to be related to the stereotype (*illogical, intuitive, weak, indecisive, irrational, emotional, complaining, uncertain, worried, confused, failure,* and *distracted*). Each gender stereotype word was also matched with a neutral word based on length and language frequency using norms established by Kucera and Francis (1967; they were *defining, animated, melon, someone, advisable, door, coal, context, relative, punctuated, saturated*, and *heating*). There were also 12 nonword strings, for a total of 36 trials. Participants were instructed to complete the task as quickly and as accurately as possible. The more participants suppressed concerns about the stereotype, the slower we expected them to respond to the stereotypic words.

Questionnaire measures assessing alternative explanations. We abbreviated the measures of deliberate underperformance (five items, α = .68), and self-objectification (three external items, α = .54, and three internal items, α = .53) and included these along with the same one-item memory perspective measure of self-objectification used in Study 4.

Results and Discussion

Suppression of the Stereotype

To score the lexical decision task, we excluded data from trials in which participants made errors and in which participants' response time was identified as an outlier (see Van Selst & Jolicoeur, 1994). We then calculated average response latencies for each participant on stereotypic and neutral words.

We conducted an analysis of covariance to test the effect of condition on participants' reaction time identifying gender stereotypic words. We controlled for their reaction time to neutral words to account for individual differences in overall response speed and, as in Study 4, included their program of study as a between-subjects factor. Including the individual confederate in the analy-

ses does not change the pattern of results and so is not discussed further.

The predicted main effect was significant, $F(1, 17) = 4.58$, $p = .05$. Participants who had interacted with the confederate who displayed sexist cues responded more slowly to gender stereotypic words ($M = 708.25$ ms) than did participants who had interacted with the confederate who did not display such cues ($M = 658.26$ ms). Reaction time on the neutral words was a significant covariate, $F(1, 17) = 136.58$, $p = .000$, but there was no significant effect of participants' program, $F = 1.90$, $p = .18$, nor an interaction between program and condition ($F < 1$).

Self-Objectification

Analysis of self-reported self-objectification yielded a main effect of condition, $F(1, 22) = 4.74$, $p = .04$. Participants reported *lower* levels of self-objectification in the sexist cues condition ($M = -0.82$) than in the no sexist cues condition ($M = -0.19$). There was no condition effect on the memory perspective measure of self-objectification, $F(1, 22) = 1.74$, $p = .20$.

Deliberate Underperformance

As in Study 4, women tended to report *less* willingness to deliberately underperform in the sexist cues condition ($M = 2.92$) than in the no sexist cues condition ($M = 3.62$), $F(1, 22) = 3.16$, $p = .09$.

Combined Questionnaire Data Across Studies 5 and 6

We combined the survey data from Studies 5 and 6 to provide more statistical power to detect condition effects on these measures. Across the two studies, women reported less willingness to deliberately underperform in the sexist cues condition ($M = 2.65$) than in the no sexist cues condition ($M = 3.29$), $F(1, 44) = 5.64$, $p = .02$. Similarly, women reported lower levels of self-objectification in the sexist cues condition ($M = -0.89$) than in the no sexist cues condition ($M = -0.41$), $F(1, 44) = 5.47$, $p = .02$. The memory perspective measure of self-objectification yielded no condition effect, $F(1, 44) = 2.18$, $p = .15$.

The results of Study 5 provide further evidence that women detect cues in men's dominant and sexually interested behavior indicating that they may be devalued and stereotyped. Women who interacted with a confederate who displayed subtle sexist cues suppressed thoughts of the negative gender stereotype relative to women who had interacted with a confederate who did not display such cues. This finding is inconsistent with alternative explanations but consistent with our argument that the confederate's behavior triggered stereotype threat in women.

General Discussion

Because women are numerical minorities in fields such as engineering and mathematics, most of their interactions are with men. The present research suggests that some of these interactions can have negative consequences for women's performance in such fields. When they interact with sexist men, women in engineering or mathematics may experience social identity threat, and specifically stereotype threat, which can undermine their performance in the domain.

In Study 1, the higher men scored on a subtle measure of sexism, the more dominance and sexual interest they exhibited toward a female confederate whom they believed to be a fellow engineering student. Studies 2–5 examined how such behavior affects women. The studies provide converging evidence that women detect cues in sexist men's behavior that they could be devalued and are at risk of being viewed through the lens of a negative gender stereotype. As a consequence, women who interacted with a sexist man (Study 2) or with a male confederate trained to behave like one (Study 3), underperformed on an engineering test relative to women who had interacted with a nonsexist man. Their underperformance was confined specifically to a domain in which women are negatively stereotyped (Study 4), and they suppressed thoughts of gender stereotypes (Study 5). Additional measures ruled out alternative explanations (Studies 3–5).

These studies go beyond previous research that has primarily focused on manipulating participant's construal of the degree of threat in an environment. By manipulating the degree of threat in the actual environment itself (i.e., levels of subtle sexist behavior), the present studies are the first to test a critical claim of theorizing on social identity threat—that environments can be potent sources of creating threat. By showing how this threat is conveyed to women—through men's behavior in interactions—these results also highlight how social identity threat can be an interpersonal phenomenon. If, as these findings suggest, people use interpersonal interactions as a key source of information about how their social identities are viewed in a given context, then social identity threat may have a significant impact on the real-world academic and workplace performance of people who are devalued or negatively stereotyped within their organizations.

Although the results showed that interpersonal interactions are an important mechanism through which prejudicial attitudes can be conveyed, it is not our intention to suggest that individual attitudes are the only source of threat that can be revealed when members of dominant and devalued groups interact. Interpersonal behavior can likely convey any number of threatening aspects of a particular environment: local norms about intergroup sensitivity, the social identity ideology (i.e., color blind or valuing of diversity), the existence of a "glass ceiling," the "cultural centeredness" of an organization (Steele et al., 2002), or the status of one's group relative to an outgroup (Branscombe, Spears, Ellemers, & Doosje, 2002). Furthermore, although we have demonstrated the effect that men's sexist attitudes and behavior have on women's performance, we do not believe that the consequences of interactions that convey social identity threat are constrained to performance. Behavior that reveals prejudicial attitudes may also create distrust and uncertainty about social belonging and otherwise undermine the experience of people who possess a devalued social identity (see Cohen et al., 1999; Purdie-Vaughns et al., 2008; Walton & Cohen, 2007).

Such interpersonal interaction may even be rewarding to the performer. As women underperformed intellectually, they reported feeling more attracted to the man who displayed dominant and sexually interested behavior. This result underscores the complexity, and potential intractability, of patterns of interaction between men and women. A sexist man's behavior may be reinforced by women's resulting attraction to him, creating a cycle that further impairs women's ability to succeed in domains in which they are negatively stereotyped.

This cycle may be especially hard to break given how early these patterns of behavior may begin. Although there are no gender differences on standardized math tests in grades 2 through 11 (Hyde, Lindberg, Linn, Ellis, & Williams, 2008), boys do begin to outperform girls in high school at complex problem solving, a skill that is important for success in engineering and mathematics fields (Hyde, Fennema, & Lamon, 1990; Hyde & Linn, 2006). This timing coincides with increased mixed-sex socializing (Pellegrini, 2001) and dating. As some adolescent boys begin to view girls primarily as sex objects, and girls come to see themselves as women for whom stereotypes about women's math ability apply (Steele, 2003), boys' sexist behavior may trigger social identity threat beginning in high school.

These studies are the first that we know of to show that men's sexist attitudes predict their actual behavior in an interaction with a woman. The differences between more sexist and less sexist men's behavior were subtle, consistent with research on cross-race interaction (Dovidio & Gaertner, 2004). The sexist men, and confederates trained to emulate their behavior, did not even raise issues of women's contributions or representations in math and engineering. Instead, their behavior revealed subtle dominance and sexual interest that was nonetheless sufficient to trigger social identity threat among women.

The results of these studies add to a growing understanding of the negative impact of sexism on women. A peer's suggestion that a male instructor might be sexist can undermine women's evaluation of his instruction and their test performance, even in absence of actual sexist behavior (Adams et al., 2005). Learning that a male evaluator is sexist can prevent women from benefiting from his positive feedback (Crocker, Voelkl, Testa, & Major, 1991). Behavior reflecting benevolent sexism creates self-doubts that impair women's cognitive performance in a feminine domain (Dardenne, Dumont, & Bollier, 2007). The present results are also consistent with research demonstrating the cost to members of lower-status groups when they interact with members of higher status groups. Black participants are drained of executive function after interacting with a White experimenter (Richeson & Shelton, 2003; Richeson, Trewalter, & Shelton, 2005), and people who are facially disfigured or obese are highly mindful, and not well liked, when they interact with a nonstigmatized person (Frable, Blackstone, & Sherbaum, 1990).

For women, there are also situations in which interactions with men are beneficial. Learning that a male evaluator is sexist may prevent women from benefiting from his positive feedback, but it also buffers them against his negative feedback (Crocker et al., 1991). If interacting with a sexist man depresses women's performance, could interacting with a man who holds egalitarian views restore women's performance? The present studies did not include a no-interaction control group, because numerous studies have already assessed women's performance in absence of an interaction and have demonstrated that their mathematics and engineering scores depend on the level of stereotype threat from other sources (e.g., test instructions, gender primes; for a review, see Steele et al., 2002). Thus, we assessed whether interacting with a man who displays sexist behavior would depress women's performance in an otherwise low-threat situation representing a fair world. Study 2 was an exception: The test was portrayed as diagnostic of engineering ability, a high-threat situation meant to approximate a real-world testing environment. In such circumstances, women typically perform worse than men (Walton & Cohen, 2003). However, in this study, women who were paired with a man who was low in sexism performed as well as men. This finding could potentially suggest that men's subtle egalitarian behaviors might have meaningful positive consequences, buffering women from social identity threat in devaluing environments. Also consistent with this possibility, women in Study 4 who interacted with a confederate who did not reveal sexist cues performed better on the math problems to the extent that they reported positive feelings about the interaction.

This finding also suggests one way to treat an environmental problem with an environmental solution. Ideally, organizations need to take steps to reduce the effect of social identity threat by reducing the level of prejudice in the environment. Changing deep-seated prejudice is difficult, however, and we are only just beginning to learn how to change subtle prejudicial attitudes and implicit behaviors (Kawakami, Dovidio, Moll, Hermsen, & Russin, 2000). In the meantime, some social psychologists have already built upon findings that social identity threat can vary on the basis of people's construal of the environment, to develop effective interventions. By helping students reconstrue negative belonging experiences (Walton & Cohen, 2007) or reaffirm their self-integrity (Cohen, Garcia, Apfel, & Master, 2006), these interventions have been effective at improving students' grades in the face of social identity and stereotype threat. Together, these lines of research suggest that by changing threatening environments, changing people's construals of these environments, and harnessing the power by which these variables interact, reducing social identity threat is not intractable but is quite possible.

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