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Gender Equality Eliminates Gender Gaps in Engagement With Female-Stereotypic Domains

Corinne A. Moss-Racusin[1], Samantha A. Rapp[1], Sophie S. Brown[1], Kerry A. O'Brien[1], and Alyssa Croft[2]

[1] Department of Psychology, Skidmore College

[2] Department of Psychology, University of Arizona

Although prior work reveals that gender bias against women produces gender gaps favoring men in science, technology, engineering, and mathematics engagement, research has yet to explore whether gender bias against men produces gender gaps favoring women in health care, early education, and domestic (HEED) engagement. Supporting preregistered predictions, results from an online study with MTurkers ($N = 296$) and a laboratory study with college students ($N = 275$) revealed that men expressed less sense of belonging, positivity toward, and aspirations to participate in HEED (and anticipated more discrimination) than did women when exposed to the reality of antimale gender biases in these domains. However, when told that HEED displays gender equality, men's engagement matched women's. Moderated mediation analyses revealed the importance of sense of belonging (and to a lesser extent, anticipated discrimination) in explaining *why* gender bias leads men to express less HEED positivity and aspirations than women. The current research thus provided novel evidence suggesting that gender bias contributes to men's underrepresentation in HEED, with important implications for broader occupational gender segregation.

Public Significance Statement

The current research provided the first demonstration that gender biases targeting men in health care, early education, and domestic (HEED) roles contribute to gender gaps in HEED engagement; in contrast, gender equality raises men's interest in HEED to the level of women's. Results add to the growing body of literature suggesting that gender biases help perpetuate lingering occupational gender segregation.

Keywords: gender stereotyping, gender differences, HEED, gender gap, occupational gender segregation

Supplemental materials: https://doi.org/10.1037/xap0000459.supp

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Despite trends toward increased gender egalitarianism (Twenge, 1997), occupational gender segregation in the United States remains stark (Levanon & Grusky, 2016). That is, although people report growing acceptance of nontraditional gender roles, many professions remain largely dominated by men or by women. Of importance, a large body of research has explored women's underrepresentation in STEM (science, technology, engineering, and mathematics; e.g., Cheryan & Plaut, 2010). However, relatively little work has explored men's underrepresentation in HEED (healthcare, early education, and domestic roles; Croft et al., 2015). This is ironic, given that gender disparities are often starker in HEED than STEM. For example, women constitute 40%–50% of scientists and statisticians, whereas men comprise only 1%–20% of teachers and nurses (U.S. Bureau of Labor Statistics, 2021). Indeed, over the past half century, women have entered professions traditionally occupied by men to a much greater degree than men have entered those traditionally occupied by women (Croft et al., 2015).

Unfortunately, people express less concern with men's underrepresentation in HEED than with women's underrepresentation in STEM (Block et al., 2019). This asymmetry is likely the result of numerous factors relating to the broader gender status hierarchy (e.g., Rudman et al., 2012), including devaluing the importance of

Corinne A. Moss-Racusin https://orcid.org/0000-0002-9824-7524

All methods, materials, and analyses were preregistered and are available on Open Science Framework (Experiment 1: https://osf.io/cbzj4/?view_only=66c47fad734f4f508e92be53705ddb00 and Experiment 2: https://osf.io/7485q/?view_only=fe77050fae50404d965885b010d02139).

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Correspondence concerning this article should be addressed to Corinne A. Moss-Racusin, Department of Psychology, Skidmore College, 815 North Broadway, Saratoga Springs, NY 12866, United States. Email: cmossrac@skidmore.edu

work traditionally done by women (Block et al., 2018; Croft et al., 2015) and the related idea that men's underrepresentation in HEED is attributable to their own free choices to avoid low-status fields (whereas women are more actively kept out of high-status STEM work; Block et al., 2019). Of great importance, the relative lack of interest HEED gender gaps is worrisome, given that men's underrepresentation negatively impacts men themselves, women, children, and society at large (Croft et al., 2021; Meeussen et al., 2019). For example, restricting men's communality can have serious consequences for their mental, physical, and relational health (Moss-Racusin, 2014). Further, the lack of male early education teachers reinforces children's existing gender stereotypes and suggests that women are more adept at care-oriented work relative to men (Martin & Ruble, 2010). Thus, it is critical to better understand the factors contributing to men's underrepresentation in HEED to ultimately facilitate their full participation. In response, the current research provides the first experimental test (to our knowledge) of the existence of gender biases targeting men as one cause of gender disparities in HEED engagement.

The Impact of Gender Bias Targeting Men

While researchers have historically focused on gender biases targeting women rather than men (Manzi, 2019), a mounting body of evidence suggests that men face severe consequences when their behavior violates masculine stereotypes (Moss-Racusin, 2014). To begin, feminine domains remain strongly gender stereotyped. For example, a meta-analysis of 16 nationally representative polls from 1946 to 2018 revealed that men's perceived advantages in agency remained stable, while women's advantages in communality were seen to increase (Eagly et al., 2020). Similarly, female gender roles were viewed as more characteristic of women relative to men in 2014 than in 1983 (Haines et al., 2016). Thus, while people appear to show increasingly flexible attitudes toward traditionally masculine domains, traditionally feminine domains are still viewed as relatively inappropriate for men (Croft et al., 2015; Meeussen et al., 2019).

Men also face backlash (i.e., social and economic penalties; Rudman, 1998) when they violate gender stereotypes by displaying knowledge of traditionally feminine pursuits (e.g., childcare, cooking, baking; Rudman & Fairchild, 2004), advocating on behalf of others rather than themselves (Bosak et al., 2018), being self-effacing rather than self-promoting on a job interview (Rudman, 1998), and behaving modestly at work (Moss-Racusin et al., 2010). These patterns are particularly pronounced in HEED professions: Men suffered a "wimpiness penalty" for excelling in the historically feminine occupation of employee relations counselor (Heilman & Wallen, 2010). Male (vs. female) nurses are viewed as more likely to encounter harassment and rejection (Cherry & Deaux, 1978) and report higher levels of workplace bullying (Erikson & Einarsen, 2004). Further, male early elementary educators report experiencing discrimination (Allan, 1993) and are rated as posing a greater safety threat to children, less likable (Moss-Racusin & Johnson, 2016) and less hirable (Kim & Weseley, 2017) than identical women. Thus, evidence reveals that men in HEED are likely to encounter gender biases. However, research has yet to determine whether knowledge of gender bias leads to men's relative lack of HEED engagement.

In contrast, prior research reveals that biases targeting women do contribute to gender disparities in STEM domains (Moss-Racusin et al., 2018). Specifically, when exposed to a news article reporting the results of prior research (Moss-Racusin et al., 2012) revealing gender bias targeting women in STEM, women expressed significantly less sense of belonging, positivity toward, trust and comfort, and aspirations to participate in STEM than did men; however, when told that gender bias does not exist in STEM, this gender gap vanished, such that women's enthusiasm rose to match men's (Moss-Racusin et al., 2018). These results suggest that the existence of gender bias (targeting women) is one factor driving women out of STEM. In the current work, we provided the first test of whether the existence of gender bias (targeting men) is one factor driving men out of HEED.

Of importance, men's lack of enthusiasm for HEED does not appear to be inevitable. While some have argued that men may naturally lack communal skills and caretaking abilities (i.e., that there is a "kernel of truth" to gender stereotypes tasking women as superior in these domains), many studies do not find evidence of gender differences in social and emotional domains (e.g., Lamm et al., 2011), and other work reveals that men's communal abilities fluctuate predictably with situational factors (Croft et al., 2015). For example, when men were educated about emerging egalitarian gender attitudes (relative to when they were told that most people believe men should not be communal), they rated themselves as more communal, more positively disposed toward gender-related social progress, and were less likely to hide their communal behavior (Van Grootel et al., 2018). Indeed, just as evidence suggests that biological sex differences in STEM aptitude are nonexistent or small (e.g., Spelke, 2005), it is premature to conclude that men inherently lack the propensity for HEED work. Instead, like women contemplating STEM careers, men in HEED may be (understandably) deterred by biases. This suggests that reducing gender bias could boost men's representation in essential HEED professions (Meeussen et al., 2019).

Of great importance, "gender exceptionalism" renders the predicted results far from a foregone conclusion. That is, because men both dominate and depend upon women (e.g., for emotional and sexual intimacy), gender serves as a truly unique case of intergroup relations (Glick & Fiske, 1996; Moss-Racusin, 2021). Moreover, the historical and cross-cultural gender status hierarchy results in many asymmetries in men's and women's experiences. For example, women experience substantially higher levels of sexism and gender-biased treatment relative to men (Rudman & Glick, 2021) and tend to be more attuned to recognize everyday sexism (Basford et al., 2013). As such, when they do experience and notice it, men may reasonably respond to being targeted by gender bias in different ways than do women; if so, the established effect of gender bias on gender gaps in STEM engagement (Moss-Racusin et al., 2018) would not be observed in the case of men's and women's reactions in HEED domains. Thus, the current research does not merely reflect a narrow test of an established phenomenon with a novel group. Instead, whether and how women and men respond to antimale biases in HEED is an open question, rendering the current novel research potentially both theoretically and empirically generative.

More specifically, an alternate possibility is that both women and men are deterred by antimale biases in HEED. As discussed above, men's STEM engagement is not undermined by antifemale biases (Moss-Racusin et al., 2018). In contrast, women may be deterred by the existence of antimale bias in HEED because experiences of systemic sexism (in any form, even targeting their gender outgroup)

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could dampen their enthusiasm. In other words, the presence of any gender bias may be sufficient to undermine women's professional engagement, while men may only be influenced by biases that target them directly. Alternately/in addition, men may not be impacted by antimale biases at all, perhaps because they do not frequently experience everyday gender bias and/or because HEED work is often viewed as affording relatively low status and pay (and disengagement can thus be attributed to a general lack of interest; Block et al., 2018). In these scenarios, men's enthusiasm for HEED may remain stably high or low, irrespective of the existence of gender bias.

Of importance, these critical open questions make our novel experiments essential for drawing broader conclusions about the role of bias in reinforcing gender differences. Indeed, the predicted results would support not only the current hypothesis that antimale bias contributes to men's underrepresentation in HEED but also the broader argument that workplace gender bias is one cause of persistent occupational gender segregation.

The Current Research

Our primary goal was to perform the first test of whether gender biases targeting men contribute to men's underrepresentation in HEED. We showed participants a news article summarizing scientific research revealing either (real-world; Moss-Racusin & Johnson, 2016) gender bias targeting men (gender bias condition) or gender equality in HEED (gender equality condition; participants in the control condition saw no article). All participants then reported their engagement with HEED (i.e., anticipated discrimination, sense of belonging, positivity, and aspirations). We thus used a 3 (gender bias existence: bias, equality, control) × 2 (participant gender: male, female) between-subjects design.

Hypothesis 1: HEED Gender Differences in the Presence of Gender Bias

We hypothesized that the existence of gender bias and participant gender would interact significantly for each dependent variable. Specifically, mirroring the known impact of gender biases targeting women on STEM engagement (Moss-Racusin et al., 2018), we expected that men (vs. women) in the gender bias condition would anticipate more discrimination and report lower belonging, positive attitudes toward, and aspirations to work in HEED. Further, because the control condition simply reflected real-world HEED biases targeting men (e.g., Moss-Racusin & Johnson, 2016), we predicted similar gender differences. In other words, men should express less HEED engagement than women, when in the presence of gender biases. Of importance, these gender differences should disappear in the equality condition, wherein men do not expect to encounter bias. This would suggest that men do not "naturally" dislike HEED work. Rather, akin to women in STEM (Moss-Racusin et al., 2018), men are deterred by workplace gender biases.

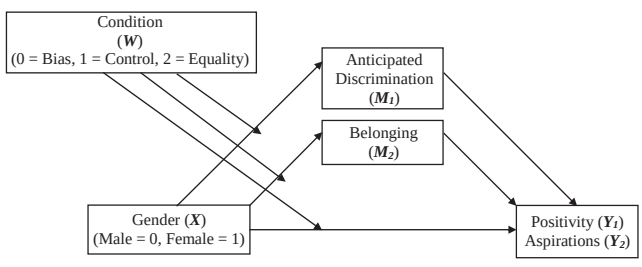
Hypothesis 2: Moderated Mediation

We also investigated the processes underscoring the gender differences outlined above to shed light on *why* encountering gender bias targeting one's in-group can dampen engagement with a particular professional domain. Some prior work has revealed that, in gender stereotypic environments, sense of belonging helps explain the effect of gender on interest and engagement. For example, sense of belonging mediated women's anticipated success in computer science (Cheryan et al., 2011), and female high school students' interest in STEM majors and male students' interest in HEED majors (Tellhed et al., 2017). Further, Moss-Racusin et al. (2018) demonstrated that in the presence of gender bias (but not gender equality), both sense of belonging and anticipated discrimination mediated the effect of participant gender on STEM positivity and aspirations. Give this prior work, we predicted that a similar process would emerge to help explain men's engagement with HEED.

Specifically, we tested a moderated mediation model wherein the effect of participant gender on HEED positivity and aspirations would be mediated by both anticipated discrimination and sense of belonging (see Figure 1, for the conceptual model). Consistent with previous findings (Moss-Racusin et al., 2018), we predicted that experimental condition would moderate the effects of participant gender on the outcomes and mediators, but not the effects of the mediators on the outcomes. That is, we expected anticipated discrimination to consistently dampen HEED engagement and belonging to consistently boost it. However, we predicted that participant gender would only be linked to the mediators and outcomes in the presence of gender bias (i.e., the bias and control conditions). In the equality condition, we expected no impact of participant gender on these variables. In sum, we hypothesized that men would report lower HEED positivity and aspirations than women in the presence of gender bias, and that this effect would be partially explained by the fact that they also anticipated more discrimination and felt less sense of belonging. In the gender equality condition, we expected no participant gender differences to explain (although we still expected links between the mediators and outcomes).

However, although these predicted results would be consistent with prior work (Moss-Racusin et al., 2018), it was entirely possible that they would not emerge in the current context. As discussed above, because of the broader historical and cross-cultural gender status hierarchy, men and women have asymmetrical experiences with gender-based discrimination (e.g., Rudman et al., 2012). Further, STEM and HEED fields are not valued equivalently (Block et al., 2018, 2019; Croft et al., 2015). As a result, the processes underscoring women's responses to discrimination in masculine domains may not parallel men's responses to discrimination in feminine domains. Thus, just as the current research is necessary to determine *whether* men are uniquely deterred from HEED by biases against them, it is also needed to determine *why* (and whether these mechanisms are unique to men).

Figure 1
Conceptual Moderated Mediation Model



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Experiment 1

Method

Transparency and Openness

All methods, materials, and analyses were preregistered and are available on Open Science Framework (Experiment 1: https://osf.io/cbzj4/?view_only=66c47fad734f4f508e92be53705ddb00 and Experiment 2: https://osf.io/7485q/?view_only=fe77050fae50404d965885b010d02139). Any deviations from this preregistration are noted. We report how we determined our sample size, all data exclusions (if any), all manipulations, and all measures in the study. All data have been made publicly available at the Open Science Framework (Experiment 1: https://osf.io/cbzj4/?view_only=66c47fad734f4f508e92be53705ddb00 and Experiment 2: https://osf.io/7485q/?view_only=fe77050fae50404d965885b010d02139). Analysis code for this study is available by emailing the first author. Data were analyzed using SPSS (Version 27).

Participants

Participants were recruited via Amazon Mechanical Turk (MTurk), located in the United States, 18 years or older, and fluent in English. An a priori power analysis conducted with G * Power (Faul et al., 2007) revealed that 244 participants would be required to detect a small–medium effect size ($f = 0.20$). We recruited 350 participants (accounting for attrition and/or necessary data exclusions described in our preregistration). Four were excluded for providing clear evidence of failing to attend to the task (e.g., answering every question with the same value, answering fewer than half of questions), and 50 were excluded for failing a straightforward manipulation check ("What did the research described in the article you read about find?" with the response options "Men encounter gender bias in elementary education," "Men do not encounter gender bias in elementary education," or "I was not asked to read an article"). This resulted in a final sample of 296 (41% female, $M_{age} = 38.23$ years, $SD = 11.41$, range = 19–70), of which 72% was White, 11% Black, 6% Latinx, 5% East Asian, 1% each South Asian and Southeast Asian, 3% Native American/Pacific Islander, and 1% multiracial. Of participants, 6% reported currently working in early elementary education, 28% reported having worked in the field previously, and 4% reported majoring in education. Because these demographic variables (apart from gender) did not meaningfully affect results, they are not mentioned further.

Materials

Stimulus Articles. We manipulated the alleged existence of bias targeting men in HEED fields by adapting news articles from prior research on bias targeting women in STEM (Moss-Racusin et al., 2018). The original articles were based on an actual news article (Midura, 2013) conveying the results of published research on STEM gender bias (Moss-Racusin et al., 2012). In the current gender bias condition, the article conveyed the reality of HEED gender bias by stating that experimental research generated evidence that educators preferred a female (vs. identical male) applicant for an elementary teacher position (e.g., Moss-Racusin & Johnson, 2016). In the gender equality condition, the article reported evidence of gender equality. For example, the article was entitled "Research Finds Evidence of Gender [Bias/Equality] in Early Elementary Education" and contained the conclusion, "It appears that male teachers are [not] evaluated fairly based on their skills and abilities, and are [not] judged as inferior simply because of their gender." No article was presented in the control condition.

Measures. We measured HEED engagement using four scales modified from prior research (Moss-Racusin et al., 2018; see Supplemental Materials and Supplemental Table S1 for measures and correlations). Items were presented on Likert scales ranging from 1 (*not at all*) to 7 (*very much*) and averaged to form each index. Anticipated discrimination contained eight items, including "I would expect to sometimes be treated unfairly in early elementary education" ($\alpha = .92$). Sense of belonging contained eight items, including "How much do you think you belong in early elementary education?" ($\alpha = .96$). Positive attitudes toward HEED contained five items, including "How positive is your impression of a career in early elementary education?" ($\alpha = .91$). Aspirations to participate in HEED contained five items, including "If you were offered a job in early elementary education, how likely would you be to take it?" ($\alpha = .97$).

Procedure

Participants were recruited using CloudResearch (Litman et al., 2017). After consenting to our study via MTurk ("First Impressions of Jobs"), participants were told that we were interested in their perceptions of various fields. They were then randomly assigned to read one of two experimental articles or no article in the control condition. All participants completed the four randomized dependent variable scales (with items in each scale also randomized). Finally, they reported their demographic information, completed a manipulation check, were fully debriefed, and compensated $1.00.

Results and Discussion

Supporting Hypothesis 1, interactions between gender bias and participant gender emerged for each outcome variable (though the interaction was merely trending toward significance for positivity; see Table 1, for results of two-way independent analyses of variance [ANOVAs] and Table 2, for means and standard deviations). Simple effects tests revealed that in the gender bias condition, men (vs. women) anticipated more discrimination, $t(100) = 5.34$, $p = .000$, $d = 1.10$; expressed less sense of belonging, $t(100) = -2.48$, $p = .015$, $d = .50$; positive attitudes toward, $t(100) = -2.17$, $p = .033$, $d = .44$; and aspirations to work in HEED, $t(100) = -2.44$, $p = .017$, $d = .48$. This suggests that, when exposed to scientific evidence of HEED gender biases, men expressed less HEED engagement than did women. As predicted, gender gaps also generally emerged in the control condition, such that men (vs. women) expressed less sense of belonging, $t(95) = -4.06$, $p = .000$, $d = .82$; positivity, $t(95) = -3.03$, $p = .003$, $d = .82$; and aspirations to participate in HEED, $t(95) = -3.88$, $p = .000$, $d = .78$. Thus, when tacitly influenced by their knowledge of real-world gender bias, men largely expressed less HEED engagement than did women. Unexpectedly, men and women anticipated equally low levels of discrimination in this condition, $t(95) = .94$, $p = .348$, $d = .19$.

As predicted, gender differences largely vanished in the equality condition, such that men and women expressed equally high belonging, $t(95) = 1.06$, $p = .291$, $d = .22$; positivity, $t(95) = .15$, $p = .878$, $d = .03$; and aspirations, $t(95) = .83$, $p = .408$, $d = .17$.

Table 1

ANOVA Results: Effects of Bias Existence and Participant Gender on HEED Engagement (Experiment 1)

Variable	Effect	*df*	*F*	*p*	η_p^2
Anticipated discrimination	Bias existence	2	12.38	.000	.08
	Participant gender	1	25.23	.000	.08
	Interaction	2	7.26	.001	.05
	Error	290			
	Total	296			
Sense of belonging	Bias existence	2	14.66	.000	.09
	Participant gender	1	10.64	.001	.04
	Interaction	2	6.68	.001	.04
	Error	290			
	Total	296			
Positivity	Bias existence	2	2.48	.085	.02
	Participant gender	1	8.58	.004	.03
	Interaction	2	2.67	.071	.02
	Error	290			
	Total	296			
Aspirations	Bias existence	2	17.62	.000	.11
	Participant gender	1	10.29	.001	.03
	Interaction	2	6.13	.002	.04
	Error	290			
	Total	296			

Note. ANOVA = analysis of variance; HEED = health care, early education, and domestic.

Notably, these results reveal that gender gaps in HEED engagement favoring women, which emerged when participants were exposed to the reality of gender bias (in the bias and control conditions), may be eliminated by gender equality. However, again unexpectedly (and just below significance), men anticipated weakly *more* discrimination than did women in this condition, $t(95) = 1.96$, $p = .053$, $d = .42$.

To test Hypothesis 2, we ran moderated mediation analysis using Hayes's PROCESS macro (Hayes, 2017) Model 8 and 10,000 bootstrap resamples. As preregistered, we entered gender as the predictor (X), experimental condition (W) as the moderator, anticipated discrimination (M_1) and sense of belonging (M_2) as parallel mediators, with positive attitudes toward HEED as the outcome (Y_1). We then repeated the process for the outcome HEED aspirations (Y_2). Results largely supported Hypothesis 2 and were consistent with prior work on the impact of gender bias on women's STEM engagement (Moss-Racusin et al., 2018). Specifically, for positivity (Figure 2), the indirect effects of both anticipated discrimination and sense of belonging were significant (i.e., the confidence interval did not cross zero) in both the control and bias conditions, but not the equality condition. Results for HEED aspirations (Figure 3) provided partial support for Hypothesis 2; as expected, the indirect effect of sense of belonging was significant in the control and bias (but not equality) conditions. However, anticipated discrimination yielded no significant effects.

This experiment provided the first evidence (to our knowledge) of the impact of gender bias targeting men on adult's HEED engagement. Supporting Hypothesis 1, gender differences in HEED engagement favoring women typically emerged in the presence of antimale gender biases, but not in the presence of gender equality. Anticipated discrimination showed a slightly divergent pattern: While men anticipated more discrimination than did women in the bias condition (supporting predictions), they also did so in the equality condition (but not the control condition). These results raise the possibility that *any mention* of antimale gender bias (even claims that it does not exist) could prime men to expect discrimination. Consistent with this idea, men anticipated equally low levels of discrimination as women in the control condition (which contained no discussion of gender bias), perhaps due to men's generally less frequent experiences of occupational gender discrimination. Overall, results were consistent with prior work demonstrating that gender biases targeting women produced gender differences in STEM engagement (Moss-Racusin et al., 2018). This suggests that both men and women are deterred from pursuing careers in which they are likely to be targeted by gender biases, and that women (like men) are *not* meaningfully put off by the existence of bias targeting a gender outgroup.

Further, moderated mediation results largely supported Hypothesis 2. Consistent with patterns for women in STEM (Moss-Racusin et al., 2018), when men were exposed to the reality of HEED gender bias in the control and bias conditions, they expressed less positivity toward HEED than did women—an effect that was partially explained by the fact that they anticipated more discrimination and felt less sense of belonging. Unexpectedly, only sense of belonging emerged as a mediator for the effect of gender on HEED aspirations, suggesting that sense of belonging (but not anticipated discrimination) can help explain why the presence of gender bias produces gender gaps in HEED aspirations. Taken together, moderated mediation results from this study add to the growing body of work (e.g., Cheryan et al., 2011; Moss-Racusin et al., 2018) signaling the importance of sense of belonging in understanding

Table 2

Means and Standard Deviations of Dependent Variables by Bias Existence and Participant Gender (Experiment 1)

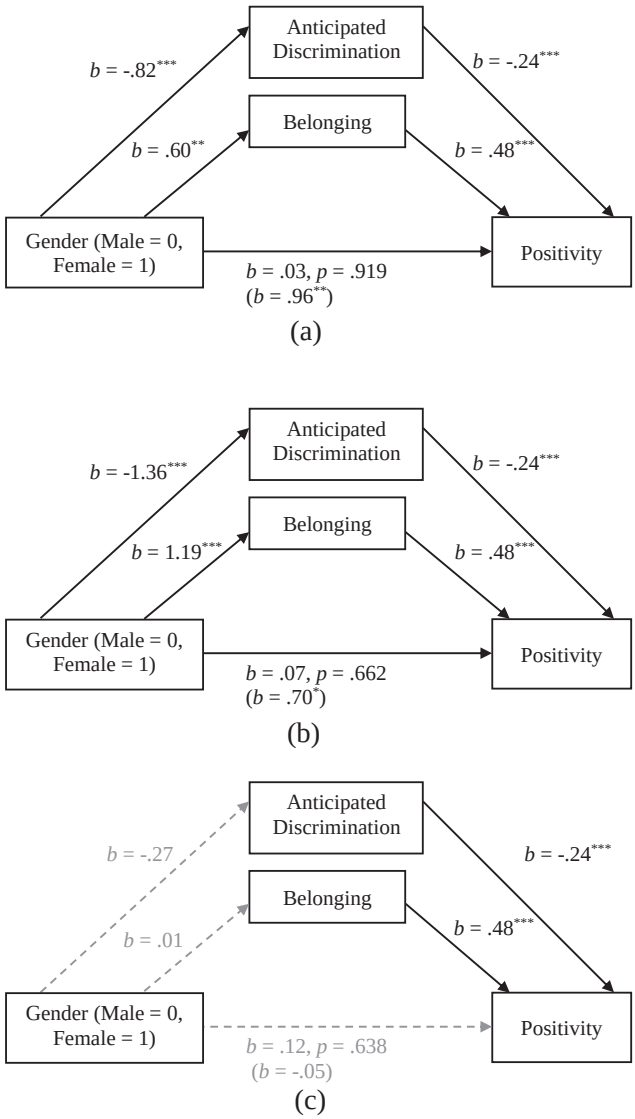
	Equality				Bias				Control			
	Men		Women		Men		Women		Men		Women	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Discrimination	2.81_a	1.38	2.27_b	1.18	4.20_c	1.52	2.58_d	1.43	2.70_e	1.17	2.48_e	1.15
Belonging	4.75_a	1.44	4.41_a	1.60	2.95_b	1.70	3.81_c	1.75	2.90_d	1.55	4.25_e	1.72
Positivity	4.34_a	1.39	4.29_a	1.48	3.58_b	1.56	4.29_c	1.64	3.92_d	1.55	4.89_e	1.54
Aspirations	4.42_a	1.63	4.13_a	1.79	2.41_b	1.43	3.22_c	1.92	2.56_d	1.77	4.00_e	1.90

Note. HEED = health care, early education, and domestic. Larger numbers (on a scale of 1–7) reflect greater amounts of anticipated discrimination, sense of belonging, positive attitudes toward, and aspirations to participate in HEED. Means within each condition (within each row) not sharing a subscript differ significantly ($p < .05$).

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Figure 2

Moderated Mediation Results for Positive Attitudes Toward HEED, Experiment 1



Note. Moderated parallel mediation model testing the indirect effects of gender on positive attitudes via anticipated discrimination and sense of belonging as a function of the experimental manipulation. Figure 2a shows the mediational model in the control condition, Figure 2b presents the mediational model in the bias condition, and Figure 2c displays the mediation model in the equality condition. The total effects are shown with parenthesis, and the direct effects (i.e., controlling for belonging and anticipated discrimination) are shown without parenthesis. *b* indicates the unstandardized regression coefficient. Solid lines indicate significant effects at $p < .05$, and dotted lines represent nonsignificant effects. HEED = health care, early education, and domestic; CI = confidence interval. (a) *Control condition* (anticipated discrimination indirect effect = .20, 95% CI [.09, .34]; belonging indirect effect = .29, 95% CI [.10, .47]). (b) *Bias condition* (anticipated discrimination indirect effect = .33, 95% CI [.15, .57]; belonging indirect effect = .57, 95% CI [.27, .89]). (c) *Equality condition* (anticipated discrimination indirect effect = .07, 95% CI [−.05, .20]; belonging indirect effect = .01, 95% CI [−.28, .29]).

* $p < .05$. ** $p < .01$. *** $p < .001$.

the processes by which gender bias shapes subsequent domain engagement.

In sum, Experiment 1 provided promising initial support for our predictions. However, in keeping with recent discussions of the importance of replication (e.g., Nosek et al., 2012; Open Science Collaboration, 2015; Stroebe & Strack, 2014), we hesitated to draw strong conclusions from these novel results before replicating them. Additionally, Experiment 1's MTurk participants, with an average age of 38, were largely past the life stage of considering possible careers. Although participants' reported college major, age, and experience working in elementary education did not moderate results (i.e., the three-way interactions between these demographic variables, participant gender, and experimental condition were not significant), we note that these analyses were exploratory. Relatedly, these null results may reflect the fact that we did not adequately power the study to detect these exploratory effects. Thus, we reasoned that it was important to conduct a more focused test to determine whether results would generalize to emerging adults more actively involved in career planning.

Experiment 2

Method

Participants

Participants were undergraduates at a selective liberal arts college in the Northeastern United States (18 or older; fluent in English) who received either course credit or $10. A priori power calculations using G*Power (Faul et al., 2007) indicated 244 participants to detect a small–medium effect size ($f = 0.20$), and we preregistered recruiting 350 participants (to account for attrition and/or exclusions). Unfortunately, it was necessary to stop data collection early due to the COVID-19 pandemic (and subsequent campus closure), resulting in an initial sample of 284.

Four participants were excluded for failing to attend to the task (e.g., answering every question with the same value, answering less than half of questions), and five were excluded for failing a straightforward manipulation check, resulting in a final sample of 275 (63% female, $M_{age} = 18.96$ years, $SD = 1.05$, range = 18–22). Participants were 62% White, 5% Black, 6% Latinx, 10% East Asian, 4% South Asian, 5% Southeast Asian, 3% Middle Eastern, 1% Native American/Pacific Islander, and 4% multiracial. Of participants, 6% reported currently working in early elementary education, 42% reported having worked in the field previously, and 3% reported majoring in education. Because these demographic variables (apart from gender) did not meaningfully affect results, they are not mentioned further.

Materials and Procedure

The materials and procedure were identical to Experiment 1, except that participants completed the study at desktop computers in private laboratory rooms following the instructions of a research assistant (blind to experimental condition).

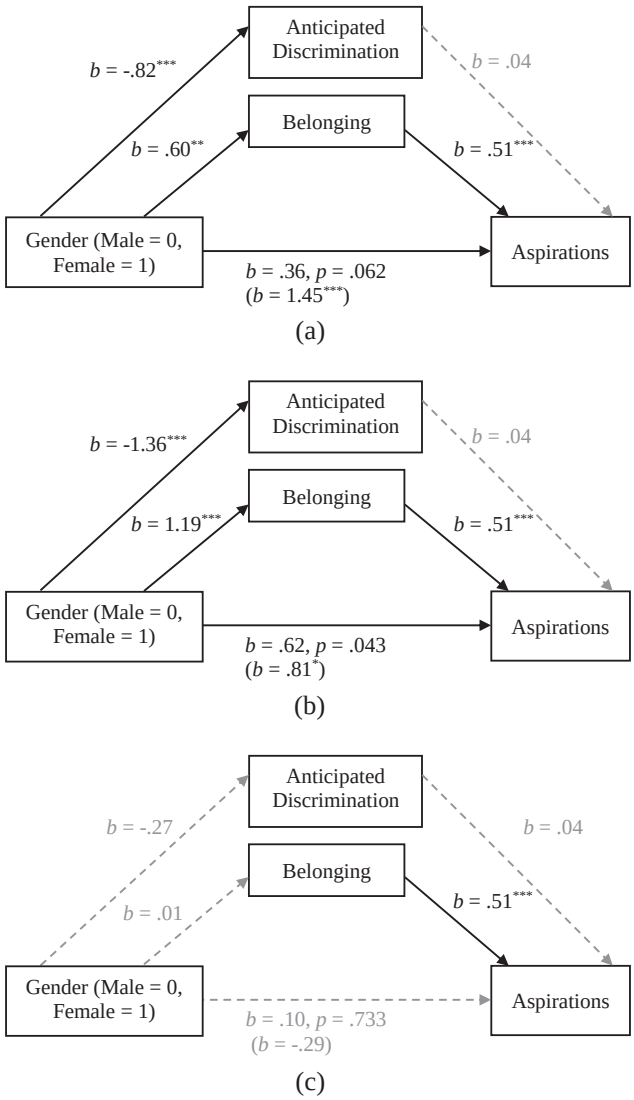
Results and Discussion

Supporting predictions, interactions between the existence of gender bias and participant gender emerged on each measure (see Table 3, for results of two-way independent ANOVAs and

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Figure 3

Moderated Mediation Results for Aspirations to Participate in HEED, Experiment 1



Note. HEED = health care, early education, and domestic; CI = confidence interval. Moderated parallel mediation model testing the indirect effects of gender on HEED aspirations via anticipated discrimination and sense of belonging as a function of the experimental manipulation. Figure 3a shows the mediational model in the control condition, Figure 3b presents the mediational model in the bias condition, and Figure 3c displays the mediation model in the equality condition. The total effects are shown with parenthesis, and the direct effects (i.e., controlling for belonging and anticipated discrimination) are shown without parenthesis. *b* indicates the unstandardized regression coefficient. Solid lines indicate significant effects at $p < .05$, and dotted lines represent nonsignificant effects. (a) *Control condition* (anticipated discrimination indirect effect = −.03, 95% CI [−.13, .07]; belonging indirect effect = .31, 95% CI [.11, .53]). (b) *Bias condition* (anticipated discrimination indirect effect = −.05, 95% CI [−.22, .11]; belonging indirect effect = .61, 95% CI [.28, .98]). (c) *Equality condition* (anticipated discrimination indirect effect = −.01, 95% CI [−.06, .04]); belonging indirect effect = .01, 95% CI [−.31, .31]).
* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4, for means and standard deviations). As in Experiment 1, men (vs. women) in the gender bias condition anticipated more discrimination, $t(90) = 7.74$, $p < .001$, $d = 1.55$, and reported less belonging, $t(90) = -6.47$, $p < .001$, $d = 1.38$; positivity, $t(90) = -5.67$, $p < .001$, $d = 1.17$; and aspirations to participate in HEED, $t(90) = -3.42$, $p = .001$, $d = .75$.

Other results were also consistent with predictions; men reported less HEED engagement than did women in the control, but not the equality, condition. Specifically, in the presence of real-world HEED gender biases in the control condition, men (vs. women) anticipated more discrimination, $t(91) = 3.24$, $p = .002$, $d = .65$, and less belonging, $t(91) = -4.98$, $p = .000$, $d = 1.15$; positivity, $t(91) = -4.20$, $p = .000$, $d = .94$; and aspirations, $t(91) = -2.86$, $p = .005$, $d = .68$. These differences were eliminated by gender equality, such that (relative to women) men reported similar levels of anticipated discrimination, $t(88) = -1.29$, $p = .202$, $d = .29$; belonging, $t(88) = -1.17$, $p = .244$, $d = .25$; positivity, $t(88) = -.45$, $p = .656$, $d = .10$; and aspirations, $t(88) = .19$, $p = .849$, $d = .04$.

Moderated mediations largely supported Hypothesis 2 and mirrored Experiment 1. Both anticipated discrimination and belonging again mediated the effect of participant gender on positivity in the control and bias (but not equality) conditions (Figure 4). However, aspirations demonstrated the same unexpected pattern as in Experiment 1: Belonging (but not anticipated discrimination) mediated the effect of participant gender on aspirations in the bias and control (but not equality) conditions (Figure 5).

Taken together, these results demonstrate the causal impact of antimale bias on gender gaps in HEED engagement. Further, they highlight the importance of promoting gender equality for increasing men's HEED engagement. Indeed, results obtained with this student sample were even more uniform than those obtained with MTurk workers in Experiment 1, such that men anticipated more discrimination and reported less sense of belonging, positivity, and aspirations to participate in HEED than did women only in the presence of gender biases targeting men (i.e., the bias and control conditions). Remarkably, these consistent gender differences vanished when participants were told to expect gender equality. This suggests that male students—who are ostensibly grappling actively with decisions about future career trajectories—may be particularly deterred by gender biases in HEED. Further, moderated mediation results highlighted the importance of sense of belonging (and, to a slightly lesser degree, anticipated discrimination) in understanding *why* bias contributes to HEED gender gaps.

General Discussion

These preregistered experiments are the first to show that exposure to (demonstrated: Heilman & Wallen, 2010; Kim & Weseley, 2017; Moss-Racusin & Johnson, 2016) antimale gender bias contributes to gender gaps in HEED engagement. Across two studies and 571 participants (both MTurkers and undergraduates), reading about real gender biases led men to anticipate more discrimination and report less sense of belonging, positivity toward, and aspirations to participate in HEED than comparable women. These gender differences in HEED engagement were substantial, with effect sizes in the bias condition ranging from $d = .44$–1.55 (and 50% of effects greater than $d = 1.00$). For comparison, effect sizes favoring men in STEM engagement in the presence of gender bias observed in past

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Table 3
ANOVA Results: Effects of Bias Existence and Participant Gender on HEED Engagement (Experiment 2)

Variable	Effect	*df*	*F*	*p*	η_p^2
Anticipated discrimination	Bias existence	2	32.13	.000	.193
	Participant gender	1	40.80	.000	.132
	Interaction	2	23.07	.000	.146
	Error	290			
	Total	296			
Sense of belonging	Bias existence	2	12.68	.000	.09
	Participant gender	1	50.65	.000	.16
	Interaction	2	6.61	.002	.05
	Error	290			
	Total	296			
Positivity	Bias existence	2	12.00	.000	.08
	Participant gender	1	36.73	.000	.12
	Interaction	2	8.22	.000	.06
	Error	290			
	Total	296			
Aspirations	Bias existence	2	9.97	.000	.07
	Participant gender	1	11.10	.001	.04
	Interaction	2	3.53	.031	.03
	Error	290			
	Total	296			

Note. ANOVA = analysis of variance; HEED = health care, early education, and domestic.

research (Moss-Racusin et al., 2018) were smaller, ranging from $d = .35–.81$ (with 0% of effects greater than $d = 1.00$). This raises the concerning possibility that gender bias plays an even more substantial role in deterring men from HEED than it does in deterring women from STEM. Further, moderated mediation results suggested that sense of belonging played a particularly strong role in helping to explain why gender bias undermines men's HEED engagement, adding to the growing evidence that this variable shapes occupational choice (e.g., Cheryan et al., 2011; Moss-Racusin et al., 2018; Tellhed et al., 2017).

Men's underrepresentation in HEED has numerous serious consequences, as discussed at length elsewhere (e.g., Croft et al., 2015; Meeussen et al., 2019). Indeed, observing women disproportionately perform care-oriented work may perpetuate children's gender stereotypes, further reinforcing the existing gender status hierarchy. Progress toward occupational gender diversification has been asymmetrical, with historically female domains remaining less integrated than historically male ones (e.g., Block et al., 2019; Croft et al., 2015). Gender justice cannot be achieved if only traditionally masculine domains are diversified. That is, if there is more latitude for women to enter historically higher status, masculine/STEM domains but relatively little opportunity for men to perform historically feminine/HEED work, then women likely experience pressure to do both (contributing to the documented "second shift," whereby women working for pay outside the home still complete more unpaid labor than their male partners inside the home; Hochschild, 1989).

Of great importance, gender gaps in HEED enthusiasm are not inevitable. They consistently disappear when men expect to be treated fairly (i.e., the equality condition). Like women in response to STEM (Moss-Racusin et al., 2018), it does not appear that men "naturally" recoil from care-oriented HEED work—indeed, to suggest that men's underrepresentation in these domains stems largely from their preferences may seriously underestimate men's propensity to provide support and warmth. Rather, like women contemplating STEM (and in contrast to assumptions that men freely choose to avoid HEED; Block et al., 2019), men appear to be (understandably) deterred from gender-atypical domains by the existence of biases targeting them. Hearteningly, they are also engaged by the promise of equality. Thus, the current work builds upon prior findings (Moss-Racusin et al., 2018) to suggest that reducing gender bias may serve as a pathway not only to engage men in important HEED work but also to reduce persistent occupational gender differentiation more broadly. To the extent that gender segregation in turn serves to perpetuate stereotypes and the existing status hierarchy, this is an important finding.

Further, given that women have historically experienced sexism, it was plausible that they would be deterred from HEED by the mere existence of gender bias targeting *any* gender (although this may be unlikely, given that women are well-represented in fields with documented antimale biases; Allan, 1993; Kim & Weseley, 2017; Moss-Racusin & Johnson, 2016). In other words, we could have observed only main effects of bias condition, such that men and women were equally disengaged from HEED by bias targeting men. Instead, the interactions between participant gender and the bias manipulation (here and in prior work; Moss-Racusin et al., 2018) suggest that the group deterred by bias is typically the one targeted. In this way, the current work goes beyond merely replicating past findings obtained with women facing bias in STEM fields using a novel group. Instead, this work represents a novel advance in understanding the ways in which people respond to being targeted with bias in a counterstereotypic domain.

Table 4
Means and Standard Deviations of Dependent Variables by Bias Existence and Participant Gender (Experiment 2)

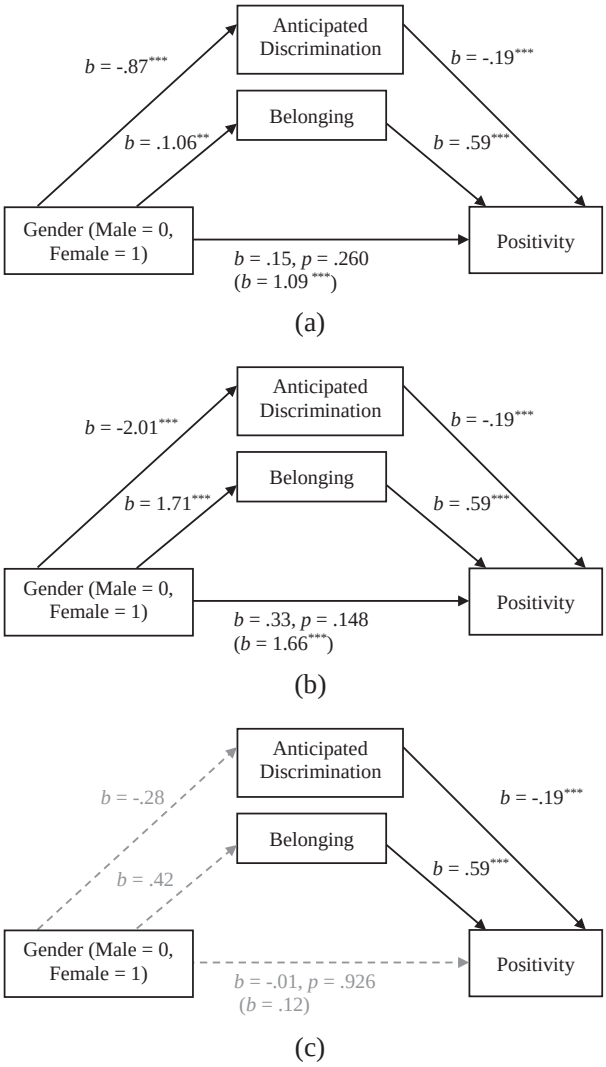
	Equality				Bias				Control			
	Men		Women		Men		Women		Men		Women	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Discrimination	2.26_a	0.77	2.50_a	0.90	4.68_b	1.60	2.62_c	0.98	3.87_d	1.60	3.02_e	0.92
Belonging	4.01_a	1.40	4.34_a	1.22	2.52_b	1.12	4.15_c	1.23	2.73_d	0.94	4.03_e	1.29
Positivity	4.62_a	1.07	4.74_a	1.30	2.95_b	1.63	4.61_c	1.17	3.43_d	1.10	4.52_e	1.22
Aspirations	3.81_a	1.95	3.73_a	1.67	2.18_b	1.20	3.35_c	1.84	2.37_d	0.96	3.31_e	1.70

Note. HEED = health care, early education, and domestic. Larger numbers (on a scale of 1–7) reflect greater amounts of anticipated discrimination, sense of belonging, positive attitudes toward, and aspirations to participate in HEED. Means within each condition (within each row) not sharing a subscript differ significantly ($p < .05$).

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Figure 4

Moderated Mediation Results for Positive Attitudes Toward HEED, Experiment 2



Note. Moderated parallel mediation model testing the indirect effects of gender on positive attitudes via anticipated discrimination and sense of belonging as a function of the experimental manipulation. Figure 4a shows the mediational model in the control condition, Figure 4b presents the mediational model in the bias condition, and Figure 4c displays the mediation model in the equality condition. The total effects are shown with parenthesis, and the direct effects (i.e., controlling for belonging and anticipated discrimination) are shown without parenthesis. *b* indicates the unstandardized regression coefficient. Solid lines indicate significant effects at $p < .05$, and dotted lines represent nonsignificant effects. HEED = health care, early education, and domestic; CI = confidence interval. (a) *Control condition* (anticipated discrimination indirect effect = .16, 95% CI [.06, .28]; belonging indirect effect = .62, 95% CI [.43, .84]). (b) *Bias condition* (anticipated discrimination indirect effect = .38, 95% CI [.15, .64]; belonging indirect effect = 1.00, 95% CI [.71, 1.31]). (c) *Equality condition* (anticipated discrimination indirect effect = −.05, 95% CI [−.14, .02]; belonging indirect effect = .25, 95% CI [−.05, .56]).
* $p < .05$. ** $p < .01$. *** $p < .001$.

Limitations and Future Directions

This work is not without limitations, which raise compelling future directions. First, although seven of eight dependent variables showed a consistent pattern across both experiments (i.e., no gender differences in the equality condition, but differences in bias and control), anticipated discrimination showed a slightly different pattern in Experiment 1 (such that in the equality condition, men anticipated weakly more discrimination than women, and in the control condition, there was no gender difference). While we could speculate about possible causes of these unexpected results, they did not replicate in Experiment 2. Further, the expected gender difference was observed in the bias condition. Relatedly, while anticipated discrimination did emerge as a mediator of the effect of gender on positivity in the bias and control conditions in both studies (as predicted), unexpectedly, it did not mediate the effect on HEED aspirations. Future work should determine whether this pattern replicates, and if so, should more thoroughly explore the different processes that may explain why gender bias undermines engagement in nontraditional domains for men versus women. Again, because of the broader gender status hierarchy, the current results were far from a foregone conclusion, and there may be additional important asymmetries in the ways in which men and women are deterred by discrimination in gender counterstereotypic fields.

Additionally, it was not possible to utilize a control condition featuring a neutral level of the manipulated independent variable. That is, consistent with prior work (Moss-Racusin et al., 2018), we were unable to conceptualize a means to remove the existence of gender bias in the control condition; instead, control participants read no article and simply reported their HEED engagement in the absence of a manipulation. As such, this condition reflects "the real world" rather than a true neutral point, and thus, it is unsurprising that control participants largely responded like those in the bias condition (i.e., because antimale bias in HEED existed in both conditions). Given this limitation, we cannot determine the degree to which gender bias deters men's HEED engagement, gender equality promotes it, or some combination. Thus, future research should seek to derive an active control condition in order to better specify the nature of the causal mechanism at play.

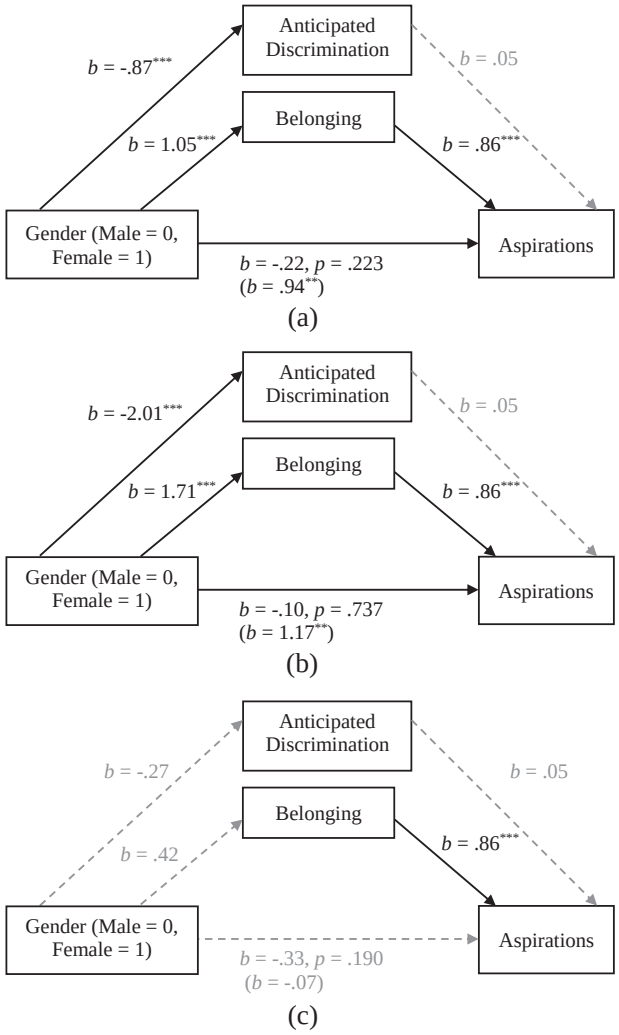
Future work should also probe the replicability, nature, and boundary conditions of the current effects. Of great importance, the current work did not explore these issues from an intersectional perspective. As others have noted astutely elsewhere (e.g., McCormick-Huhn et al., 2019), it is crucial for psychological science to take a more intersectional approach and consider phenomena within the context of simultaneous membership in multiple important social groups. More specifically, because HEED work has historically been racialized as well as gendered (e.g., Wingfield, 2009), future work must examine the ways in which stereotypic expectations pertaining to race, gender, and other marginalized groups may simultaneously impact enthusiasm for different domains. Additionally, research could utilize a variety of stimulus materials in order to determine whether different types of evidence of bias (e.g., results of scientific research as utilized here vs. individual men's anecdotal experiences) are differentially impactful.

An additional weakness of the current work was its necessary reliance on anticipated (rather than actual) outcomes. For example,

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Figure 5

Moderated Mediation Results for Aspirations to Participate in HEED, Experiment 2



Note. Moderated parallel mediation model testing the indirect effects of gender on HEED aspirations via anticipated discrimination and sense of belonging as a function of the experimental manipulation. Figure 5a shows the mediational model in the control condition, Figure 5b presents the mediational model in the bias condition, and Figure 5c displays the mediation model in the equality condition. The total effects are shown with parenthesis, and the direct effects (i.e., controlling for belonging and anticipated discrimination) are shown without parenthesis. *b* indicates the unstandardized regression coefficient. Solid lines indicate significant effects at $p < .05$, and dotted lines represent nonsignificant effects. HEED = health care, early education, and domestic; CI = confidence interval. (a) *Control condition* (anticipated discrimination indirect effect = −.04, 95% CI [−.17, .08]; belonging indirect effect = .91, 95% CI [.63, 1.23]). (b) *Bias condition* (anticipated discrimination indirect effect = −.10, 95% CI [−.40, .17]; belonging indirect effect = 1.47, 95% CI [1.00, 1.97]). (c) *Equality condition* (anticipated discrimination indirect effect = .01, 95% CI [−.03, .08]); belonging indirect effect = .36, 95% CI [−.08, .79]).
* $p < .05$. ** $p < .01$. *** $p < .001$.

while the aspirations scale has been utilized in prior work (e.g., Cheryan & Plaut, 2010; Cheryan et al., 2011; Moss-Racusin et al., 2018), it has not been validated with respective to predicting actual behaviors. Future longitudinal and/or quasi-experimental work should explore whether there are ethical ways to probe the impact of gender bias on actual subsequent outcomes. This work could measure people's real-world professional decisions and/or engagement with job opportunities in HEED as a function of exposure to gender bias. For example, participants could be exposed to a series of job ads, some of which include HEED opportunities. Researchers could measure outcomes such as time spent reviewing each ad and/or rank ordering of ads to determine whether being targeted by contextual gender bias impacts actual behaviors. Additional work could further examine the impact of gender bias on men's engagement with different roles within HEED domains, such as nursing or unpaid domestic labor. Also, although the current work notes the potential importance of perceiving HEED work as relatively low in status, it did not directly manipulate occupational status in order to directly test its causal influence on men's and women's enthusiasm for HEED. Future research should do so and should also compare the relative influence of different potential moderators and mediators (e.g., the existence of gender bias vs. differences in perceived occupational status) in shaping men's and women's interest in different domains. Doing so would shed needed additional light on the processes perpetuating occupational gender segregation more broadly.

Additional limitations are associated with the current participants. Of importance, like many other studies (Rad et al., 2018), this work did not utilize particularly diverse samples. For example, the samples were not representative of the racial demographics of the United States, such that participants of color were underrepresented. This makes it difficult to determine the extent to which the current results would generalize across racial (and other demographic) groups. Future research should seek to recruit less homogeneous samples in order to determine whether subgroups of men respond differently to knowledge of gender bias in HEED. It could also fruitfully examine the impact of other types of biases on target group engagement (e.g., by exploring whether the existence of homophobia deters queer people's enthusiasm for certain domains).

Finally, additional research derived from the current work could test interventions designed to reduce gender gaps in HEED enthusiasm. That is, the current results revealed that when participants believed that HEED exhibited gender equality, men's engagement in HEED matched women's. Thus, interventions that stress the extent to which HEED professionals are currently toward gender equality (and/or predict achieving it in the future) might reasonably boost men's participation in HEED. Similar interventions emphasizing desired gender equality in STEM could also raise women's participant in STEM and thus potentially reduce occupational gender segregation more broadly.

Conclusions

Results from these experiments constitute the first known evidence that gender biases deter men from pursuing gender counterstereotypic domains. While it was certainly possible that men's

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relatively privileged position might shield them from the impact of antimale gender biases on their enthusiasm for traditionally feminine work, the current results demonstrate that this does not appear to be the case. Rather, like women considering careers in traditionally masculine STEM domains, men's enthusiasm for work in HEED was undermined by gender bias. Men's sense of belonging (and to a lesser extent, anticipated discrimination) in HEED partially explained gender gaps, suggesting a promising mechanism for future study. Moreover, challenging claims that men simply lack interest in or aptitude for care-oriented work, gender gaps in HEED engagement were closed by gender equality. This suggests that ongoing occupational gender segregation is not inevitable and instead may be ameliorated by reducing pernicious gender biases targeting men and women in counterstereotypic domains.

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