An Emphasis on Brilliance Fosters Masculinity Contest Cultures

Andrea C. Vial[a], Melis Muradoglu[b], George Newman[c], & Andrei Cimpian[b]

[a]Department of Psychology, New York University Abu Dhabi, United Arab Emirates

[b]Department of Psychology, New York University, New York, NY 10003, USA

[c]Yale University School of Management, New Haven, CT 06511, USA

In press, *Psychological Science*.

Corresponding author:
Andrea C. Vial
email: andrea.vial@nyu.edu

Acknowledgments

We are grateful to the members of the Cognitive Development Lab at New York University for helpful comments on previous drafts of this manuscript. This work was funded in part by U.S. National Science Foundation grant BCS-1733897 awarded to Cimpian.

Abstract

Women are underrepresented in fields where success is believed to require brilliance, but the reasons for this pattern are poorly understood. We investigate perceptions of a "masculinity contest culture," an organizational environment of ruthless competition, as a key mechanism whereby a perceived emphasis on brilliance discourages female participation. Across three pre-registered correlational and experimental studies involving lay participants online (N = 870) and academics from 30+ disciplines (N = 1,347), we find a positive association between the perception that a field or organization values brilliance and the perception that this field or organization is characterized by a masculinity contest culture. This association was particularly strong among women. In turn, perceiving a masculinity contest culture predicted lower interest and sense of belonging, and stronger impostor feelings. Experimentally reducing the perception of a masculinity contest culture eliminated gender gaps in interest and belonging in a brilliance-oriented organization, suggesting possible avenues for intervention.

Keywords: *brilliance; impostor feelings; gender stereotypes; masculinity contest culture; sense of belonging*

Statement of Relevance

Women are underrepresented in academic and other professional domains that tend to prize "raw" intellectual talent. Our findings identify an important reason why these disparities occur: namely, because the emphasis on intellectual talent is often accompanied by (the perception of) a work culture characterized by a competitive struggle for intellectual dominance, also known as a "masculinity contest culture." The present research also suggests a potential means of addressing this problem. Rather than trying to revise (what are likely to be) deeply rooted beliefs about the

perceived value of exceptional intellectual ability in these fields, it may be more fruitful to change workplace norms: Organizations seeking to attract a diverse workforce in domains that prize brilliance might benefit from setting strong norms to curb competition for intellectual dominance (e.g., vying for "star status") and instead foster a culture of free exchange and openness.

An Emphasis on Brilliance Fosters Masculinity Contest Cultures

Women are underrepresented in fields where success is believed to require exceptional intelligence (or "brilliance"), such as philosophy, economics, and mathematics (Leslie, Cimpian et al., 2015; Meyer et al., 2015; Storage et al., 2016). While this relationship between a field's perceived emphasis on brilliance and women's representation is well-documented, the underlying causal mechanisms are less understood. Here, we propose and test the hypothesis that an emphasis on brilliance has a negative effect on gender diversity because it fosters a workplace climate in which a masculine-coded, competition-based style of interpersonal interaction is perceived to be dominant. Perceptions of such a "masculinity contest culture" (Berdahl et al., 2018) may then lower women's interest and well-being in organizations or fields in which brilliance is strongly emphasized.

The term "masculinity contest culture" refers to an organizational environment where individuals feel the "need to aggressively compete and dominate others" (Berdahl et al., 2018; Kupers, 2005, p. 713). In such contexts, individuals may be encouraged to display stereotypically masculine behaviors and attitudes, such as aggressiveness, independence, ambition, and competitiveness (Prentice & Carranza, 2002; Spence et al., 1979), that may be enacted in routine "mine's bigger than yours" contests (Berdahl et al., 2018). Masculinity contest cultures are experienced negatively by men as well as women (Glick et al., 2018; Reid et al., 2018), but might be particularly difficult to navigate for women, who are traditionally socialized to be modest about their achievements and to avoid being dominant or competitive (Heatherington et al., 1993; Williams & Tiedens, 2016).

An emphasis on brilliance may promote elements of a masculinity contest culture (Berdahl et al., 2018) in a few ways. Because brilliance is associated with men (Bian et al., 2017;

Storage et al., 2020), privileging stereotypically masculine traits could favor the proliferation of male-typed behavior as the default (Cheryan & Markus, 2020; Cheryan et al., 2017). Moreover, because brilliance is commonly viewed as a fixed attribute rather than something that can be cultivated (Rattan et al., 2012), an emphasis on brilliance may promote performance goals (Dweck, 2008): Individuals may feel pressured to "show off" their intellectual talent and demonstrate that their intelligence is superior to others'. In turn, this felt pressure may incite competition to attain "star status," encourage intellectually-oriented dominance behaviors (e.g., harsh criticism, dismissing opposing views), and discourage collaboration. Indeed, past work suggests that organizations where talent is viewed as fixed tend to be characterized by less collaborative norms and more unethical behavior (Canning et al., 2020).

Thus, masculinity contest cultures—or the perception of such cultures—may be part of the reason why the belief that brilliance is required for success, a belief that seems unprejudiced on its face, creates gender inequality. This mechanism fills an important gap in the literature: Although women in past studies reported lower interest in brilliance-oriented jobs, as well as a lower sense of belonging (Bian et al., 2018; Deiglmayr et al., 2019) and stronger feelings of being "impostors" (Muradoglu et al., 2021) in such positions, we still know little about the proximal variables underlying these effects: Why is it, exactly, that messages that emphasize brilliance undermine women's interest and well-being? Here, we propose that perceptions of masculinity contest cultures are a key missing piece of the puzzle.

Across three pre-registered studies (and a pre-registered pilot), we tested whether (i) fields or organizations that are perceived to value brilliance are also perceived to have a masculinity contest culture (Studies 1 and 2), and whether (ii) perceiving such a culture is in turn associated with lower interest and well-being (Studies 1–3). Importantly, we also tested whether

gender moderates these hypothesized relationships: If the perception of a masculinity contest culture is part of the mechanism through which brilliance-oriented domains undermine women's participation, as we hypothesize, then one or both of these relationships should be stronger for women than for men. That is, (i) women may be more likely than men to perceive undesirable, masculinity contest-type behaviors as a result of an emphasis on brilliance, and/or (ii) women may be more adversely affected by such perceptions than men.

To test the generalizability of our conclusions, we examined these hypothesized links across a wide range of academic fields (Pilot Study and Study 1), as well as in business settings (Studies 2 and 3). Similarly, we sampled both the general population (Pilot and Studies 2 and 3) and academics at various career stages from multiple universities (Study 1). To be able to speak to the causal mechanisms involved, we gathered not just correlational (Pilot and Study 1) but also experimental (Studies 2 and 3) data. Our findings across these studies highlight perceptions of a masculinity contest culture as a key mechanism by which an emphasis on brilliance undermines women's success in academia and industry.

Pilot Study

Method

Research Ethics and Open Science Practices

This investigation was approved by [blinded]'s Institutional Review Board. For all studies, including this pilot, results were not examined until data collection was complete. Throughout, we report all measures, manipulations, and exclusions. Pre-registered plans (AsPredicted.org), materials, data, and analytic scripts can be found on the Open Science Framework: https://osf.io/92vn6/?view_only=47a8dbb285bf4c2d97d42fd8209c1c54.

Participants

A convenience sample of 302 individuals (mean age = 33.57, *SD* = 10.05; 54.4% female; 72.6% White) participated via Amazon's Mechanical Turk (MTurk), an online crowd-sourcing platform (Buhrmester et al., 2011). Although the pilot participants are not *in* academia, their perceptions of academic fields served as an initial test of our hypotheses. Moreover, laypeople's beliefs on these topics could be consequential because they may be transmitted to and shape the attitudes of others (e.g., their children) (Gunderson et al., 2012; Simpkins et al., 2015). Additional recruitment details, including how sample size was determined, are reported in the Supplemental Material online.

Procedures and Measures

A detailed description of the procedure and measures used in the pilot is available in the Supplemental Material. Each participant answered 10 questions for each of 9 randomly assigned fields, including social sciences, humanities, and STEM disciplines (Leslie, Cimpian, et al., 2015; Meyer et al., 2015). Each of 27 fields was rated by approximately 100 participants. The questions for each field assessed its perceived emphasis on brilliance (two items from Meyer et al., 2015; $r = .66$, $p < .001$) and its perceived masculinity contest culture (six items from Glick et al., 2018; $\alpha = .86$). Two additional items allowed us to test two possible alternative explanations for the hypothesized relationship between a field's perceived emphasis on brilliance and its perceived masculinity contest culture: (a) Participants indicated how much they believed that each field required systemizing (thinking systematically and abstractly) over empathizing (understanding thoughts and emotions) (Baron-Cohen, 2002; Billington et al., 2007). Systemizing is a stereotypically male attribute that has been argued to influence career choices and success (e.g., Baron-Cohen, 2002), so fields that are perceived to emphasize it may also be perceived to display stronger masculinity contest norms. (b) Participants estimated the

percentage of all doctoral degrees in each field that were granted to women in 2018 in the United States. If a participant assumes, say, that there are few women in a field, they may use this as a basis for inferring both a strong emphasis on brilliance (Leslie, Cimpian, et al., 2015; Meyer et al., 2015) and a strong masculinity contest culture (Glick et al., 2018). Thus, adjusting for participants' estimates of the percentage of women PhDs in a field should account for a potential confound. For a similar reason, we also recorded the *actual* percentage of women PhDs in a field from authoritative sources (Association of American Medical Colleges, 2018; National Science Foundation, 2019) and used it as a covariate in our analyses. We observed a positive correlation between estimated and actual percentages of PhDs granted to women, $r = .41$, $p < .001$, suggesting modest levels of accuracy.

Analytic Strategy

Unless otherwise noted, all analyses across studies, including the pilot, were conducted in Stata 16 (StataCorp, 2019). We analyzed the pilot data both at the field level (aggregating responses across participants) and at the participant level (for details, see the Supplemental Materials). For this pilot and the subsequent study with academics (Study 1), we report standardized coefficients (βs) that indicate the fraction of a standard deviation (*SD*) by which the dependent variable changes in response to a 1 *SD* increase in a continuous predictor or a shift from one category to another in a categorical predictor. All coefficients are accompanied by 95% confidence intervals (CIs). Across all studies, predictors were mean-centered in models that included interaction terms, which facilitates interpretation of the lower-order coefficients. In the pilot and all studies, we report partial omega-squared (ω^2) as a measure of effect size, calculated either with the *estate esize* command in Stata 16 (for linear regressions) or with the *effectsize* package in R (for the mixed-effects models; Ben-Shachar et al., 2020). We chose partial ω^2

(which we will refer to simply as ω^2) over the more common partial η^2 because it is less biased (Albers & Lakens, 2018). We follow Field's (2013) guidelines for interpreting the magnitude of ω^2 (very small effect: $\omega^2 < 0.01$; small effect: $0.01 \leq \omega^2 < 0.06$; medium effect: $0.06 \leq \omega^2 < 0.14$; large effect: $\omega^2 \geq 0.14$). Because ω^2 corrects for bias, it can be negative; we report negative ω^2 values as 0.00.

Results

For the field-level data (n = 27 fields), a linear regression indicated that a stronger perceived emphasis on brilliance was associated with a stronger perceived masculinity contest culture (see Figure 1), $\beta = 0.69$, $SE = 0.14$, 95% CI [0.39, 0.99], $p < .001$, $\omega^2 = 0.44$ (a large effect). For the participant-level data (n = 302), a linear mixed-effects model with crossed random intercepts for participant and field indicated that a stronger perceived emphasis on brilliance was again associated with a stronger perceived masculinity contest culture, $\beta = 0.25$, $SE = 0.02$, 95% CI [0.22, 0.29], $p < .001$, $\omega^2 = 0.08$ (a medium effect). Participant gender (0 = man, 1 = woman) did not moderate this relationship, $\beta = -0.01$, $SE = 0.03$, 95% CI [−0.07, 0.05], $p = .73$, $\omega^2 = 0.00$. In addition, the relationship between perceived brilliance emphasis and perceived masculinity contest cultures remained significant when we included systemizing vs. empathizing scores and the estimated percentage of women PhDs or, in separate models, the actual percentage of women PhDs as covariates (see Tables S3 and S4 in the Supplemental Material).

In this pilot and all subsequent studies, we also examined the potential moderating roles of participant race, and (when relevant) the role of participant exposure to the different academic fields. There were no interactions with these variables, and the relationship between perceived emphasis on brilliance and perceived masculinity contest cultures remained significant in all

models (see Tables S5, S12, S19, and S25 in the Supplemental Material).

Study 1

The pre-registered pilot found support for the first link in the proposed mechanism in the context of academia with a lay sample. Specifically, we found that perceptions of an academic field's emphasis on brilliance were positively associated with perceptions of a masculinity contest culture in that field. This relationship was robust beyond the (actual or perceived) representation of women and the perceived importance of systemizing (over empathizing), and it emerged among both women and men. In Study 1, we recruited a large sample of academics from a wide range of fields, which provided a more ecologically valid test of the same relationship. This sample also allowed us to investigate the link between academics' perceptions of a masculinity contest culture in their field and their well-being (the second link in the hypothesized pathway), with a particular focus on belonging and impostor feelings.

Method

Participants

We contacted 43,607 academics using a previously assembled database of email addresses for faculty, postdoctoral fellows, and graduate students from nine public and private research-intensive (i.e., R1) universities across the United States (Muradoglu et al., 2021; see the Supplemental Material for details). We decided a priori to include any academic who accepts our invitation to participate and meets the preregistered criteria below. We obtained consent from 1,769 (4.06%) academics. Of those who consented, 146 individuals did not complete the study (provided no data). Of those who completed at least some portion of the study, we excluded participants who (a) did not select a field from our predefined set or who typed in a field that we could not place in this set (n = 120), (b) indicated that they were staff or an undergraduate

student or who did not indicate a position (n = 53), (c) indicated that some of their answers were jokes or random (n = 17), or (d) did not fill out our two key measures, perceived emphasis on brilliance and perceived masculinity contest culture (n = 86). Although we did not pre-register this last exclusion criterion, these participants were automatically dropped from analyses involving the two key variables, so we decided to exclude them to maintain a consistent sample size across analyses.

The final sample comprised 1,347 respondents (mean age = 43.90 years, SD = 15.66; 45.5% female; 78.4% White), including graduate students (29.2%), postdoctoral fellows (8.3%), medical residents (0.9%), non-tenure track faculty (25.7%), untenured tenure-track faculty (7.3%), tenured faculty (26.7%), and retired and emeriti faculty (1.9%). There were 30 non-medical academic disciplines represented (29.3% of respondents were in STEM; 35.3% in the social sciences; 12.3% in the humanities) and 33 medical fields (23.1% of respondents). The number of respondents per discipline is reported in Table S6 in the Supplemental Material.

Procedures and Measures

Participants selected their academic discipline from a pre-determined list and completed four measures, in random order: (a) perceived emphasis on brilliance in their field, (b) perceived masculinity contest culture in their field, (c) their own impostor feelings; and (d) their own sense of belonging. Items within each measure were presented randomly. Participants were then asked to estimate the percentage of doctoral degrees in their field granted to (a) women and (b) underrepresented minorities, in this order.

Perceived Emphasis on Brilliance. Participants indicated their agreement with the same two statements as in the pilot but with reference to their own discipline (Leslie, Cimpian, et al., 2015) from 1 (*strongly disagree*) to 7 (*strongly agree*). The two statements were, "*Being a top*

performer in my field requires a special aptitude that just can't be taught," and "*If you want to succeed in my field, hard work alone just won't cut it; you need to have an innate gift or talent.*" Participants rated each statement twice (i.e., four items total): once in regard to their own beliefs about their current field (self-ratings), and once in regard to the perceived beliefs of *other academics* in that field (other-ratings). Self- and other-items were presented randomly within two separate blocks in randomized order. We first averaged the two self-ratings and the two other-ratings separately; the resulting scores were moderately correlated, $r = .56$, $p < .001$. Similar patterns of results were observed in the models below when the self- and other-ratings were examined separately; thus, we combined the four items into a single measure of perceived emphasis on brilliance ($\alpha = .85$).

Perceived Masculinity Contest Culture. We used the six statements from the pilot to assess participants' perceptions that their current discipline is characterized by a masculinity contest culture (Glick et al., 2018). The items were modified to include the stem: "*In my field,*" and were rated from 1 (*not at all true of field*) to 5 (*entirely true of field*). We included two items each from the "show no weakness" subscale ("*Admitting you don't know the answer looks weak*;" "*Seeking others' advice is seen as weak*"); the "put work first" subscale ("*Taking days off is frowned upon*;" "*People with significant demands outside of work don't make it very far*"); and the "dog eat dog" subscale ("*One person's loss is another person's gain*;" "*If you don't stand up for yourself people will step on you*"). We did not include any items from the "strength and stamina" subscale because beliefs about physical strength and stamina are less relevant in academia. The two items within each subscale were significantly correlated, ranging from $r = .46$ to $r = .55$. We averaged the six items together ($\alpha = .81$).

Impostor Feelings. Participants reported their impostor feelings in their current field

with five items (α = .93) from Muradoglu et al. (2021), based on the Clance Impostor Phenomenon Scale (Clance & Imes, 1978; Simon & Choi, 2018), rated from 1 (*strongly disagree*) to 7 (*strongly agree*). A sample item is, "*Sometimes I'm afraid others will discover how much knowledge or ability I really lack.*"

Sense of Belonging. We measured participants' sense of belonging in their current field with eight items (α = .91) adapted from Good et al. (2012), rated from 1 (*strongly disagree*) to 7 (*strongly agree*). A sample item is, "*I feel accepted by other members in my field.*"

Alternative Explanation: Estimated Percent of PhDs Granted to Women and Underrepresented Minorities. As in the pilot, we examined whether the relationship between perceived emphasis on brilliance and perceived masculinity contest cultures might be explained by a third variable: a field's assumed gender balance. We asked participants to estimate the percentage of all doctoral degrees in their current field that were granted to women in 2018 in the United States, from 0 (*0% of PhD degrees to women*) to 100 (*100% of PhD degrees to women*). As in the pilot, we also examined the *actual* percentage of women PhDs as a covariate. Actual and estimated percentages were strongly correlated, $r = .70$, $p < .001$. Finally, we asked participants to estimate the percentage of all doctoral degrees in their current field that were granted to "members of racial/ethnic minority groups traditionally underrepresented in academia (e.g., Black, Latinx, Native American)" in 2018 in the United States, from 0 (*0% of PhD degrees to racial/ethnic minorities*) to 100 (*100% of PhD degrees to racial/ethnic minorities*).

Demographics and Debriefing. At the end of the study, participants indicated their current position (e.g., graduate student) and provided basic demographics (e.g., gender, race). Finally, participants were asked to type any thoughts they had about the study (open ended), and to indicate whether any of their answers were random or meant as jokes (yes/no).

Results

Means, standard deviations, and bivariate correlations between all study variables are reported in Table S7 in the Supplemental Material.

Link between Perceived Emphasis on Brilliance and Perceived Masculinity Contest Cultures

First, we conducted a linear mixed-effects model in which we regressed perceived masculinity contest culture on perceived emphasis on brilliance. The model included a random intercept for field to account for the nesting of participants in fields. Perceived emphasis on brilliance was positively associated with perceived masculinity contest cultures, $\beta = 0.17$, $SE = 0.03$, 95% CI [0.12, 0.23], $p < .001$, $\omega^2 = 0.03$ (a small effect). Next, we added participant gender to the mixed-effects model to test for moderation by this variable. Female (vs. male) academics were overall more likely to perceive a masculinity contest culture, $\beta = 0.39$, $SE = 0.05$, 95% CI [0.29, 0.50], $p < .001$, $\omega^2 = 0.04$. Critically, as seen in Figure 2, the model also revealed a significant two-way interaction between perceived emphasis on brilliance and respondent gender, $\beta = 0.19$, $SE = 0.05$, 95% CI [0.09, 0.30], $p < .001$, $\omega^2 = 0.01$: The association between perceived emphasis on brilliance and perceived masculinity contest cultures was significantly stronger among female academics, $\beta = 0.29$, $SE = 0.04$, 95% CI [0.22, 0.37], $p < .001$, $\omega^2 = 0.08$ (a medium effect), than among male academics, $\beta = 0.10$, $SE = 0.04$, 95% CI [0.03, 0.17], $p = .006$, $\omega^2 = 0.01$ (a small effect). These results did not change appreciably when we adjusted for participants' estimates of the percentage of PhDs granted to women and underrepresented minorities or the actual percentages of women PhDs in a discipline (see Table S8 in the Supplemental Material).

Perceived Masculinity Contest Cultures as Mediator between Perceived Emphasis on Brilliance and Well-Being

We hypothesized that (i) perceiving a stronger emphasis on brilliance in one's field would be associated with stronger perceptions of a masculinity contest culture, and that (ii) in turn, the latter perceptions would predict lower well-being. In addition, we hypothesized that one or both of these relationships would be stronger for women than for men. In the context of a mediation model, this set of hypotheses leads to the prediction of stronger indirect effects (via perceived masculinity contest cultures) for women than for men.

Consistent with this prediction, a moderated mediation analysis using the PROCESS module for SPSS (Hayes, 2015) (Model 8; see Figure 3) revealed that participant gender significantly moderated the indirect effect of a field's perceived emphasis on brilliance (*X*) through its perceived masculinity contest culture (*M*) on both impostor feelings (*Y*), *index of moderated mediation* = 0.06, *SE* = 0.02, 95% CI [0.03, 0.10], and sense of belonging (*Y*), *index of moderated mediation* = −0.11, *SE* = 0.03, 95% CI [−0.17, −0.05]. (Here and in the next study, the use of Model 8 was a deviation from our pre-registered analytic plans, as detailed in the Supplemental Material, including Tables S13 and S20.) The indirect effects of a field's perceived emphasis on brilliance were significantly stronger for women (impostor feelings, *ab* = 0.09, *SE* = 0.01, 95% CI [0.07, 0.13]; belonging, *ab* = −0.16, *SE* = 0.02, 95% CI [−0.21, −0.12]) compared to men (impostor feelings, *ab* = 0.03, *SE* = 0.01, 95% CI [0.01, 0.05]; belonging, *ab* = −0.05, *SE* = 0.02, 95% CI [−0.09, −0.02]). Note, however, that participant gender did not moderate the relationship between perceived masculinity contest cultures and the two outcomes (i.e., the *b* paths), β = −0.07, *SE* = 0.05, 95% CI [−0.17, 0.03], *p* = .170, ω^2 = 0.001, for impostor feelings; β = −0.07, *SE* = 0.04, 95% CI [−0.16, 0.01], *p* = .102, ω^2 = 0.001, for sense of belonging. These results did not change appreciably when we adjusted for the estimated percentage of women and underrepresented minorities with PhDs or for the actual percentages of PhDs granted to women

(see Table S9 and Table S10 in the Supplemental Material).

Ancillary Analysis: Low Self-Confidence as Alternative Explanation?

Finally, we investigated the possibility that the negative relationship between perceived masculinity contest cultures and sense of belonging is explained by an internalized lack of confidence, particularly among female academics. We used impostor feelings as a proxy for low confidence (e.g., Muradoglu et al., 2021) and examined whether the relationship between perceived masculinity contest cultures and sense of belonging emerged above and beyond any variance explained by impostor feelings. The results, reported in full in the Supplemental Material (Table S11), suggested that the relationship between perceived masculinity contest cultures and sense of belonging emerges *independently* of the variance explained by impostor feelings, among both female and male academics.

Discussion

Academics who thought that their field valued brilliance also perceived their work environments to be characterized by a masculinity contest culture. This relationship was stronger among female (vs. male) academics, unlike in the pilot with laypeople, where we found no moderation by gender: Perhaps more first-hand exposure to academia (Study 1) prompts women's and men's responses to diverge. In addition, women may be more sensitive than men to the effects that an emphasis on brilliance (a stereotypically masculine trait) has on others' behaviors because these behaviors often place women at a disadvantage (Cheryan & Markus, 2020). The results of Study 1 also revealed, as hypothesized, that the indirect effects of a field's perceived emphasis on brilliance on academics' well-being via their perception of a masculinity contest culture were stronger for female (vs. male) academics. We tested these relationships experimentally in Studies 2 and 3.

Study 2

In Study 2, we tested experimentally the first link in the proposed causal mechanism: namely, that a work environment that emphasizes brilliance (vs. not) licenses perceptions of a masculinity contest culture. We also measured participants' interest in working in this environment and their anticipated well-being, which afforded a (non-experimental) test of the second link: namely, that perceptions of a masculinity contest culture are associated with lower interest and well-being. As before, we expected one or both of these links to be moderated by gender, resulting in stronger indirect effects of the manipulation for women than men.

Method

Participants

Our target sample size was $n = 273$ based on a priori power analysis (G*Power 3.1; Faul et al., 2017) for a regression model with up to four predictors, assuming power = .80, $\alpha = .05$, and a small-to-medium effect size (f^2=.029), which was the average effect size reported by Bian et al. (2018). We increased the target sample size by 15% to account for exclusions, and recruited a convenience sample of 316 individuals via MTurk (Buhrmester et al., 2011). The study was available to workers in the U.S. with prior approval rates of 95% or higher, and participants received $0.55 for their time. In line with our pre-registered criteria, we excluded 24 participants who (a) indicated that some of their answers were jokes or random, (b) provided nonsense responses in an open-ended question described in the procedure, or (c) had duplicate IP addresses (final $n = 292$; mean age = 34.25 years, $SD = 11.04$; 55.3% female; 69.9% White).

Procedures and Measures

In Studies 2 and 3, we extended our investigation from academia to non-academic professional opportunities, where an emphasis on brilliance has similarly been found to

discourage women's participation (Bian et al., 2018). We employed an experimental manipulation adapted from Bian et al. (2018) to convey a focus on brilliance. Participants read information ostensibly from a company's website advertising new openings to join the company's workforce, which included a description of the types of attributes the company values in its employees (see OSF for full script). Half of the participants were randomly assigned to a "brilliance condition" in which the company advertisement emphasized candidates' exceptional intellectual ability (e.g., "a high IQ," "superior reasoning skills," "natural intelligence"). The other half of participants were assigned to a control condition in which the advertisement emphasized candidates' skills without reference to brilliance (e.g., "broad range of skills," "comfortable with a modern, dynamic workplace," "positive thinking and productivity"). Bian et al.'s (2018) results suggested that women's and men's attitudes toward the company described in the control condition were similar (i.e., this condition was gender-neutral).

After the manipulation, participants completed four measures in random order: (a) perceptions of a masculinity contest culture (Glick et al., 2018); (b) interest in working in the company; (c) anticipated impostor feelings (Clance & Imes, 1978); and (d) anticipated sense of belonging (Good et al., 2012). Item order was random within measures, and a manipulation check followed.

Perceived Masculinity Contest Culture. We assessed participants' perceptions that the company was characterized by a masculinity contest culture with the six statements from Study 1, adapted to the hypothetical scenario (i.e., "*In this company*…"). Statements were rated from 1 (*not at all true*) to 5 (*entirely true*). The two items within each of the three subscales were significantly correlated, ranging from $r = .50$ to $r = .58$. As before, we averaged all items to compute a masculinity contest culture score ($\alpha = .88$).

Interest in the Company. Participants answered three questions (α = .95) borrowed from Bian et al. (2018) to gauge their interest in the company (e.g., "*Assuming you were looking for a job, how likely would you be to apply for a position at this particular company?*"). Statements were rated from 1 (*not at all interested*) to 9 (*extremely interested*).

Anticipated Impostor Feelings. To measure participants' anticipated impostor feelings were they to work at the company, we used the five items (α = .94) from Study 1 (Clance & Imes, 1978; Simon & Choi, 2018), adapted to the hypothetical scenario (e.g., "*If I worked at this company, I would be afraid that people in the company may find out that I'm not as capable as they think I am*"). Items were rated from 1 (*strongly disagree*) to 7 (*strongly agree*).

Anticipated Sense of Belonging. We measured participants' anticipated sense of belonging were they to work at the company with the eight items (α = .92) from Study 1 (Good et al., 2012), adapted to the hypothetical scenario, as in Bian et al. (2018) (e.g., "*I would feel valued by other company employees*"). Items were rated from 1 (*strongly disagree*) to 7 (*strongly agree*).

Alternative Explanation: Estimated Percent of Women Employees. Similar to the pilot and Study 1, in Studies 2 and 3 we investigated whether the effects of the brilliance (Study 2) and workplace norms (Study 3) manipulations boiled down to an effect on participants' inferences about the company's gender composition, which by itself could influence women's and men's interest and sense of well-being (e.g., Heilman, 1979). We might expect, for example, that women would be more interested and anticipate higher well-being in contexts with a higher percentage of women through basic homophily effects (Holman & Morandin, 2019; McPherson et al., 2001). To measure this potential confound, we asked participants to estimate the percentage of all employees at the company who were women, from 0 (*0% of employees are*

women) to 100 (*100% of employees are women*).

Manipulation Check. Participants indicated their agreement with a single item, "*The company emphasizes employees' natural intelligence and inherent aptitude*," rated from 1 (*strongly disagree*) to 5 (*strongly agree*).

Demographics and Debriefing. The study ended by asking participants to type any thoughts they had about the study (open ended); provide demographic information (e.g., gender, race); and indicate whether any of their answers were random or jokes (yes/no).

Results

Means, standard deviations, and bivariate correlations between all study variables are reported in Table S14 in the Supplemental Material.

Manipulation Check

As intended, participants in the brilliance condition were significantly more likely to agree that the company emphasized employees' natural intelligence and inherent aptitude (M = 4.16, SD = 0.96) compared to participants in the control condition (M = 3.76, SD = 0.93), $F(1, 287) = 12.79$, $p < .001$, $\omega^2 = 0.04$. There was no significant main effect of participant gender, $F(1, 287) = 0.02$, $p = .894$, $\omega^2 = 0.00$, and no significant condition × participant gender two-way interaction, $F(1, 287) = 0.02$, $p = .882$, $\omega^2 = 0.00$.

Link between Brilliance Emphasis and Perceptions of a Masculinity Contest Culture

We regressed the perception of a masculinity contest culture on experimental condition (control = 0 vs. brilliance = 1), participant gender (man = 0 vs. woman = 1), and their interaction. As expected, the perception of a masculinity contest culture was significantly stronger in the brilliance condition (M = 3.31, SD = 0.89) compared to the control condition (M = 2.91, SD = 0.86), $b = 0.37$, $SE = 0.10$, 95% CI [0.17, 0.58], $p < .001$, $\omega^2 = 0.04$ (a small-to-medium effect).

There was no main effect of gender, $b = 0.06$, $SE = 0.10$, 95% CI [−0.14, 0.27], $p = .53$, $\omega^2 = 0.00$, but the condition × participant gender two-way interaction was significant, $b = 0.42$, $SE = 0.21$, 95% CI [0.17, 0.83], $p = .041$, $\omega^2 = 0.01$ (see Figure 4). The effect of condition on perception of masculinity contest norms was not significant for male participants, $b = 0.16$, $SE = 0.15$, 95% CI [−0.14, 0.47], $p = .29$, $\omega^2 = 0.00$, but was significant for female participants, $b = 0.59$, $SE = 0.14$, 95% CI [0.32, 0.86], $p < .001$, $\omega^2 = 0.11$ (a medium effect). These results did not change appreciably when we adjusted for the estimated percentage of female employees in the company (see Table S15 in the Supplemental Material).

Perceptions of a Masculinity Contest Culture as a Mediator between Emphasis on Brilliance and Downstream Outcomes

We expected to find stronger indirect relationships between experimental condition (*X*) and the three downstream outcomes (*Y*; interest in joining the company, anticipated impostor feelings, and anticipated sense of belonging) via perceptions of a masculinity contest culture (*M*) for female than for male participants. Indeed, participant gender significantly moderated the indirect effects for all three downstream outcomes (see Figure 5): interest in the company, *index of moderated mediation* = −0.44, *SE* = 0.22, 95% CI [−0.89, −0.01]; anticipated impostor feelings, *index of moderated mediation* = 0.39, *SE* = 0.19, 95% CI [0.02, 0.77]; and anticipated sense of belonging, *index of moderated mediation* = −0.23, *SE* = 0.12, 95% CI [−0.47, −0.004]. Specifically, these indirect relationships were significant for female participants: interest, *ab* = −0.61, *SE* = 0.15, 95% CI [−0.93, −0.33]; impostor feelings, *ab* = 0.54, *SE* = 0.13, 95% CI [0.29, 0.81]; sense of belonging, *ab* = −0.32, *SE* = 0.08, 95% CI [−0.50, −0.17]. However, for male participants, none of the three indirect pathways were significant: interest, *ab* = −0.17, *SE* = 0.17, 95% CI [−0.53, 0.16]; impostor feelings, *ab* = 0.15, *SE* = 0.15, 95% CI [−0.13, 0.45]; sense of

belonging, $ab = -0.09$, $SE = 0.09$, 95% CI [−0.28, 0.08]. These differences were largely due to the *a* paths (see Table 1); the *b* paths (from perceptions of a masculinity contest culture to outcomes) were not significantly different for women and men (see Table 2).

None of these results changed appreciably when adjusting for the estimated percentage of female employees in the company (see Tables S15–S17 in the Supplemental Material). Additionally, as in Study 1, the relationships between perceived masculinity contest cultures and interest and anticipated sense of belonging remained significant when adjusting for impostor feelings (see Table S18).

Discussion

When a company emphasized brilliance, participants expected it to have a stronger masculinity contest culture. This causal link emerged only among women, which is consistent with Study 1, where the correlation between perceptions of a field's brilliance orientation and its expected masculinity contest norms was stronger for female (vs. male) academics. Also consistent with Study 1, stronger perceptions of a masculinity contest culture were associated with more negative outcomes for both women and men.

Finally, the brilliance-emphasis manipulation had an indirect effect—via perceptions of a masculinity contest culture—on interest and well-being only for women. This finding provides support for the proposal that the perception of a masculinity contest culture functions as a mechanism by which an emphasis on brilliance discourages women's participation.

Study 3

In Study 3, we tested experimentally the second link in the proposed causal mechanism: namely, that work environments perceived to be characterized by a masculinity contest culture (vs. not) undermine interest and well-being. In this study, we kept the emphasis on brilliance

constant—and high—across conditions and manipulated only the perceived workplace norms, measuring their effects on participants' interest and anticipated well-being, as well as whether these effects differ for women vs. men. Although gender did not moderate the negative relationship between perceived masculinity contest cultures and these outcomes in Studies 1 and 2, Study 3 provides the first opportunity to investigate these potential moderation effects experimentally. Notably, this study also speaks to potential interventions: If an emphasis on brilliance is discouraging to women because it licenses the expectation of a masculinity contest culture, then it is important to know whether countering these expectations makes a brilliance-oriented workplace equally motivating and psychologically safe for women and men.

Method

Participants

As in Study 2, we based our target sample size (n = 273) on effect sizes from Bian et al. (2018) and an a priori power analysis (G*Power 3.1; Faul et al., 2017) for a regression model with up to four predictors, assuming power = .80, α = .05, and a small-to-medium effect size (f^2=.029), and increased the target sample size by 15% to account for exclusions. We recruited a convenience sample of 357 individuals via MTurk (Buhrmester et al., 2011). The study was available to workers in the U.S. with prior approval rates of 95% or higher, and participants received $0.55 for completing the study. In line with our pre-registered criteria, we excluded 81 participants who (a) indicated that some of their answers were jokes/random, (b) provided nonsense responses in an open-ended question described in the procedure, or (c) had duplicate IP addresses (final n = 276; mean age = 33.22 years, SD = 11.51; 55.8% female; 65.6% White). Gender information was missing for 3 participants.

Procedures and Measures

As in Study 2, participants read information ostensibly from a company's website advertising new openings to join the company's workforce. In Study 3, for all participants, the advertisement emphasized employees' exceptional intellectual ability (i.e., identical to the "brilliance condition" in Study 2). To manipulate perceptions of a masculinity contest culture (MCC) at the hypothetical company, we asked participants to imagine that they had an acquaintance currently employed at the company, and that they had sent this person an email asking what it was like to work there. Participants were randomly assigned either to a "high masculinity contest culture" (high-MCC) condition, in which the acquaintance's response suggested that the company was strongly characterized by a masculinity contest culture (e.g., "There's sometimes a sense here that admitting you don't know the answer or seeking others' advice looks weak"), or to a "low masculinity contest culture" (low-MCC) condition, in which the acquaintance's response indicated that the company was not characterized by a masculinity contest culture (e.g., "There's usually a sense here that admitting you don't know the answer or seeking others' advice is okay"). The full manipulation is reported in the Supplemental Material.

After the manipulation, participants completed the same three measures as in Study 2, in random order: (a) interest in working in the company ($\alpha = .93$); (b) anticipated impostor feelings ($\alpha = .92$); and (c) anticipated sense of belonging ($\alpha = .90$), followed by a question asking participants to estimate the percentage of all employees at the company who were women, as in Study 2. Item order was random within measures, and two manipulation checks followed.

Manipulation Checks. To confirm that our manipulation shaped perceptions of a masculinity contest culture as intended, participants indicated their agreement with the item, "*The company has a work environment of ruthless competition*" on a scale from 1 (*strongly disagree*) to 5 (*strongly agree*). In addition, we considered the possibility that the relationship

between brilliance emphasis and the perception of a masculinity contest culture might be bidirectional. Thus, to investigate whether the low-MCC (vs. high-MCC) condition inadvertently lowered the perception of an emphasis on brilliance (which would compromise our conclusions), we asked participants to indicate their agreement with a second manipulation-check item, "*The company emphasizes employees' natural intelligence and inherent aptitude*" (1 = *strongly disagree* to 5 = *strongly agree*).

Demographics and Debriefing. Study 3 ended by asking participants to type any thoughts they had about the study (open ended); provide demographic information (e.g., gender, race); and indicate whether any of their answers were random or jokes (yes/no).

Results

Means, standard deviations, and bivariate correlations between all study variables are reported in Table S21 in the Supplemental Material.

Manipulation Checks

As expected, participants in the high-MCC condition were significantly more likely to perceive a work environment of ruthless competition ($M = 4.24$, $SD = 0.88$) compared to participants in the low-MCC condition ($M = 2.05$, $SD = 1.07$), $F(1, 269) = 331.03$, $p < .001$, $\omega^2 = 0.56$ (a large effect). The effect of participant gender and its interaction with condition were not significant, $ps > .336$.

Contrary to our concerns, participants rated the company's emphasis on brilliance as being higher in the *low*-MCC condition ($M = 4.38$, $SD = 0.68$) compared to the high-MCC condition ($M = 4.13$, $SD = 1.00$), $F(1, 269) = 5.20$, $p = .023$, $\omega^2 = 0.01$ (a small effect). It is possible that this is a positivity spillover effect: If participants perceived the low-MCC company more positively as a result of its weak masculinity contest culture, they may have also inferred

that this company is able to attract the most competent people. Regardless of the reason for this difference, the important point is that it works *against* our ability to find the predicted effects. The effect of participant gender and its interaction with condition were not significant, *p*s > .55.

Link Between Perception of Masculinity Contest Cultures and Downstream Outcomes

First, we examined whether the MCC manipulation influenced the three downstream outcomes: (a) interest in the company, (b) anticipated impostor feelings, and (c) anticipated sense of belonging. To do this, we regressed each of the three outcome variables on MCC condition (low = 0 vs. high = 1). As expected, participants in the high-MCC condition reported lower interest in employment opportunities at the hypothetical company compared to those in the low-MCC condition, $b = -2.67$, $SE = 0.22$, 95% CI [−3.10, −2.24], $p < .001$, $\omega^2 = 0.35$ (a large effect). High-MCC participants also anticipated stronger impostor feelings, $b = 1.47$, $SE = 0.16$, 95% CI [1.15, 1.79], $p < .001$, $\omega^2 = 0.23$ (a large effect), and a lower sense of belonging, $b = -1.74$, $SE = 0.13$, 95% CI [−1.99, −1.49], $p < .001$, $\omega^2 = 0.40$ (a large effect).

Given the unexpected effect of the MCC manipulation on participants' perceptions of the company's emphasis on brilliance, we also tested whether the effects of MCC condition on interest and well-being emerged above and beyond these perceptions. (This analysis was not pre-registered.) Indeed, the effects of MCC condition remained significant for all outcomes (see Table S22 in the Supplemental Material).

Moderation by Gender

Next, we investigated whether the consequences of perceiving a masculinity contest culture in a brilliance-oriented organization varied based on respondent gender. For purposes of this analysis, we regressed each of the three outcome variables on MCC condition (low = 0 vs. high = 1), participant gender (male = 0 vs. female = 1), and their interaction. The results of these

models, reported in Table 3, revealed a significant condition × gender interaction on interest in the company, $b = -0.95$, $SE = 0.44$, 95% CI [−1.82, −0.09], $p = .031$, $\omega^2 = 0.01$. For the two other outcomes, this interaction was not significant (impostor feelings: $b = -0.03$, $SE = 0.33$, 95% CI [−0.68, 0.61], $p = .92$, $\omega^2 = 0.00$; belonging: $b = -0.22$, $SE = 0.26$, 95% CI [−0.72, 0.28], $p = .39$, $\omega^2 = 0.00$). Nevertheless, given our pre-registered analytic strategy, we examined the effect of condition separately for female and male participants for the three outcome variables. The condition differences were statistically significant for all three outcomes among both women and men (ps < .001). Numerically, the high- vs. low-MCC differences were greater among women than among men for interest (women: $b = -3.12$, $SE = 0.29$, 95% CI [−3.69, −2.55], $\omega^2 = 0.29$; men: $b = -2.16$, $SE = 0.33$, 95% CI [−2.82, −1.51], $\omega^2 = 0.13$) and belonging (women: $b = -1.84$, $SE = 0.17$, 95% CI [−2.17, −1.51], $\omega^2 = 0.30$; men: $b = -1.62$, $SE = 0.19$, 95% CI [−2.00, −1.24], $\omega^2 = 0.21$) but were virtually identical for impostor feelings (women: $b = 1.46$, $SE = 0.22$, 95% CI [1.03, 1.89], $\omega^2 = 0.14$; men: $b = 1.50$, $SE = 0.25$, 95% CI [1.01, 1.98], $\omega^2 = 0.12$). The results reported here did not change appreciably when we adjusted for the estimated percentage of female employees in the company and participants' perceptions of the company's emphasis on brilliance (see Table S23 in the Supplemental Material).

From a practical, intervention-focused perspective, we might also ask whether the outcomes for women and men were more similar when the brilliance-oriented company was portrayed as having low (vs. high) levels of a masculinity contest culture. With respect to interest, female (vs. male) participants reported lower scores in the high-MCC condition, $b = -0.72$, $SE = 0.31$, 95% CI [−1.32, −0.12], $p = .020$, $\omega^2 = 0.02$, but not in the low-MCC condition, $b = 0.23$, $SE = 0.32$, 95% CI [−0.40, 0.86], $p = .46$, $\omega^2 = 0.00$ (see Figure 6, Panel A). With respect to anticipated impostor feelings, gender differences were not significant in either

condition: high-MCC condition, $b = 0.38$, $SE = 0.23$, 95% CI [−0.07, 0.83], $p = .10$, $\omega^2 = 0.01$; low-MCC condition, $b = 0.41$, $SE = 0.24$, 95% CI [−0.05, 0.88], $p = .083$, $\omega^2 = 0.01$ (see Figure 6, Panel B). In both cases, women anticipated numerically stronger impostor feelings than men. With respect to anticipated sense of belonging, female (vs. male) participants reported lower scores in the high-MCC condition, $b = -0.38$, $SE = 0.18$, 95% CI [−0.73, −0.03], $p = .033$, $\omega^2 = 0.01$, but not in the low-MCC condition, $b = -0.16$, $SE = 0.18$, 95% CI [−0.52, 0.20], $p = .38$, $\omega^2 = 0.00$ (see Figure 6, Panel C). Similar to Study 2, the effects of MCC condition on interest and sense of belonging remained significant when we adjusted for impostor feelings (see Table S24).

Discussion

When a brilliance-oriented company was said to display high (vs. low) levels of a masculinity contest culture, participants showed lower interest in joining the company and were more likely to anticipate feeling like impostors who would not belong. These findings provide evidence for the second link in our hypothesized causal pathway—namely, that masculinity contest culture undermine interest and expected well-being. These links were only partially moderated by gender, consistent with what we observed in Studies 1 and 2, where the relationship between perceptions of workplace norms and psychological outcomes was similar in magnitude for women and men. Relevant to future interventions, when participants were led to believe that a brilliance-oriented company was not characterized by a masculinity contest culture, women were just as interested in this company as men were, and anticipated similar levels of belonging.

General Discussion

We proposed that contexts where brilliance is prized can be unwelcoming for women because the emphasis on brilliance—a stereotypically-male trait that is viewed as relatively

fixed—fosters the perception of a masculinity contest culture. The results of three pre-registered studies (and a pre-registered pilot) provided support for this proposal in the context of academia (Pilot and Study 1) and in a hypothetical industry context (Studies 2 and 3).

These findings contribute to the growing literature on field-specific ability beliefs by identifying a mechanism through which an emphasis on brilliance undermines gender diversity: namely, the perception of a negative work environment. Although the effect sizes in our studies were somewhat variable and may not generalize to academic or professional contexts outside of the US, the results as a whole indicate that perceptions of a masculinity contest culture may play a key role in the maintenance of gender disparities in brilliance-focused domains. Indeed, countering the perception of a masculine cultural ethos might be an effective way to increase the participation of women in domains where brilliance is prized (Study 3).

Our results also suggest that the gender composition of brilliance-focused contexts might not, by itself, be what makes these environments unwelcoming to women. In our studies, beliefs about what is valued in a context were consequential *beyond* the estimated gender ratios. Thus, it may be possible to foster a more inclusive environment in brilliance-oriented contexts by changing their work culture even if current gender ratios are still imbalanced. Similarly, it does not seem that an internalized lack of self-confidence is driving the negative effects of brilliance-focused contexts, for either women or men: We found the expected downstream effects on sense of belonging (Studies 1–3) and interest (Studies 2 and 3) through perceptions of a masculinity contest culture even when adjusting for participants' impostor feelings, which indicates that perceptions of the culture—rather than low confidence—drive the negative effects of an emphasis on brilliance.

In future investigations, it will be worthwhile to examine objective markers of a

masculinity contest culture (rather than individual perceptions) and to investigate precisely *why* emphasizing brilliance leads the negative elements of stereotypic masculinity (e.g., dominance, competition) to become the norm. In particular, it would be informative to disentangle the role of stereotypically masculine standards (i.e., the association of brilliance with men; Cheryan & Markus, 2020) from the role of fixed mindsets (i.e., the tendency to view brilliance as innate and unchangeable; Rattan et al., 2012). Future research should also explore why women have a lower threshold for anticipating an undesirable workplace culture from an emphasis on brilliance. Although we found that both men and women perceive masculinity contest cultures in contexts that emphasize brilliance, women also appeared to be more sensitive to this connection (Study 2). To some extent, this lower threshold seems to be a function of women's prior experiences (e.g., compare non-academic vs. academic women's perceptions of academia in the Pilot vs. Study 1, respectively), but which aspects of experience are relevant remains to be determined.

To summarize, an emphasis on brilliance leads individuals to perceive an environment characterized by a competitive struggle for intellectual dominance. Women seem particularly attuned to this link, and because perceiving such an environment is generally demotivating, professions in which brilliance is prized continue to confront gender gaps.

References

Albers, C., & Lakens, D. (2018). When power analyses based on pilot data are biased: Inaccurate effect size estimators and follow-up bias. *Journal of Experimental Social Psychology, 74*, 187-195. https://doi.org/10.1016/j.jesp.2017.09.004

Association of American Medical Colleges [AAMC]. (2018). *Faculty Roster: U.S. Medical School Faculty.* Available at: https://www.aamc.org/data-reports/faculty-institutions/interactive-data/data-reports/faculty-institutions/interactive-data/2018-us-medical-school-faculty

Baron-Cohen, S. (2002). The extreme male brain theory of autism. *Trends in Cognitive Sciences*, *6*(6), 248–254. https://doi.org/10.1016/s1364-6613(02)01904-6

Ben-Shachar M, Lüdecke D, Makowski D (2020). effectsize: Estimation of Effect Size Indices and Standardized Parameters. *Journal of Open Source Software, 5*(56), 2815. https://doi.org/10.21105/joss.02815

Berdahl, J. L., Cooper, M., Glick, P., Livingston, R. W., & Williams, J. C. (2018). Work as a masculinity contest. *Journal of Social Issues*, *74*(3), 422–448. https://doi.org/10.1111/josi.12289

Bian, L., Leslie, S. J., & Cimpian, A. (2017). Gender stereotypes about intellectual ability emerge early and influence children's interests. *Science*, *355*(6323), 389–391. https://doi.org/10.1126/science.aah6524

Bian, L., Leslie, S. J., Murphy, M. C., & Cimpian, A. (2018). Messages about brilliance undermine women's interest in educational and professional opportunities. *Journal of Experimental Social Psychology*, *76*, 404–420. https://doi.org/10.1016/j.jesp.2017.11.006

Billington, J., Baron-Cohen, S., & Wheelwright, S. (2007). Cognitive style predicts entry into

physical sciences and humanities: Questionnaire and performance tests of empathy and systemizing. *Learning and Individual Differences*, *17*(3), 260–268. https://doi.org/10.1016/j.lindif.2007.02.004

Buhrmester, M., Kwang, T., & Gosling, S. D. (2011). Amazon's Mechanical Turk: A new source of inexpensive, yet high-quality, data? *Perspectives on Psychological Science*, *6*(1), 3–5. https://doi.org/10.1037/e527772014-223

Canning, E. A., Murphy, M. C., Emerson, K. T. U., Chatman, J. A., Dweck, C. S., & Kray, L. J. (2020). Cultures of genius at work: Organizational mindsets predict cultural norms, trust, and commitment. *Personality and Social Psychology Bulletin*, *46*(4), 626–642. https://doi.org/10.1177/0146167219872473

Cheryan, S., & Markus, H. R. (2020). Masculine defaults: Identifying and mitigating hidden cultural biases. *Psychological Review, 127*(6), 1022–1052. https://doi.org/10.1037/rev0000209

Cheryan, S., Ziegler, S. A., Montoya, A. K., & Jiang, L. (2017). Why are some STEM fields more gender balanced than others? *Psychological Bulletin, 143*(1), 1–35. http://dx.doi.org/10.1037/bul0000052

Clance, P. R., & Imes, S. A. (1978). The imposter phenomenon in high achieving women: Dynamics and therapeutic intervention. *Psychotherapy: Theory, Research & Practice*, *15*(3), 241–247. https://doi.org/10.1037/h0086006

Deiglmayr, A., Stern, E., & Schubert, R. (2019). Beliefs in "brilliance" and belonging uncertainty in male and female STEM students. *Frontiers in Psychology, 10*, 1114. doi.org/10.3389/fpsyg.2019.01114

Dweck, C. S. (2008). *Mindset: The new psychology of success*. New York: Random House.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2017). GPower version 3.1.9.2 [Computer software]. Retrieved from http://www.gpower.hhu.de/en.html.

Field, A. (2013). *Discovering Statistics Using IBM SPSS Statistics*. Thousand Oaks, CA: Sage.

Glick, P., Berdahl, J. L., & Alonso, N. M. (2018). Development and validation of the masculinity contest culture scale. *Journal of Social Issues*, *74*(3), 449–476. https://doi.org/10.1111/josi.12280

Good, C., Rattan, A., & Dweck, C. S. (2012). Why do women opt out? Sense of belonging and women's representation in mathematics. *Journal of Personality and Social Psychology*, *102*(4), 700–717. https://doi.org/10.1037/a0026659

Gunderson, E. A., Ramirez, G., Levine, S. C., & Beilock, S. L. (2012). The role of parents and teachers in the development of gender-related math attitudes. *Sex Roles, 66*(3), 153–166. https://doi.org/10.1007/s11199-011-9996-2

Hayes, A. F. (2015). An index and test of linear moderated mediation. *Multivariate Behavioral Research, 50*(1), 1–22. https://doi.org/10.1080/00273171.2014.962683

Heatherington, L., Daubman, K. A., Bates, C., Ahn, A., Brown, H., & Preston, C. (1993). Two investigations of "female modesty" in achievement situations. *Sex Roles, 29*(11), 739–754. https://doi.org/10.1007/BF00289215

Heilman, M. E. (1979). High school students' occupational interest as a function of projected sex ratios in male-dominated occupations. *Journal of Applied Psychology, 64*(3), 275. https://doi.org/10.1037/0021-9010.64.3.275

Holman, L., & Morandin, C. (2019). Researchers collaborate with same-gendered colleagues more often than expected across the life sciences. *PloS One*, 14(4), e0216128. https://doi.org/10.1371/journal.pone.0216128

Kupers, K. A. (2005). Toxic masculinity as a barrier to mental health treatment in prison. *Journal of Clinical Psychology, 61*(6), 713–724. https://doi.org/10.1002/jclp.20105

Leslie, S. J., Cimpian, A., Meyer, M., & Freeland, E. (2015). Expectations of brilliance underlie gender distributions across academic disciplines. *Science*, *347*(6219), 262–265. https://doi.org/10.1126/science.1261375

McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology, 27*(1), 415-444. https://doi.org/10.1146/annurev.soc.27.1.415

Meyer, M., Cimpian, A., & Leslie, S. J. (2015). Women are underrepresented in fields where success is believed to require brilliance. *Frontiers in Psychology*, *6*, 235. https://doi.org/10.3389/fpsyg.2015.00235

Muradoglu, M., Horne, Z., Hammond, M. D., Leslie, S. J., & Cimpian, A. (2021). Women—particularly underrepresented minority women—and early-career academics feel like impostors in fields that value brilliance. *Journal of Educational Psychology.* https://doi.org/10.1037/edu0000669

National Science Foundation. (2019). *Doctorate Recipients from U.S. Universities: 2018. Special Report NSF 20-301*. Alexandria, VA. Available at https://ncses.nsf.gov/pubs/nsf20301/.

Prentice, D. A., & Carranza, E. (2002). What women and men should be, shouldn't be, are allowed to be, and don't have to be: The contents of prescriptive gender stereotypes. *Psychology of Women Quarterly, 26*(4), 269–281. https://doi.org/10.1111/1471-6402.t01-1-00066

Rattan, A., Savani, K., Naidu, N. V. R., & Dweck, C. S. (2012). Can everyone become highly intelligent? Cultural differences in and societal consequences of beliefs about the

universal potential for intelligence. *Journal of Personality and Social Psychology, 103*(5), 787–803. https://doi.org/10.1037/a0029263

Reid, E. M., O'Neill, O. A., & Blair-Loy, M. (2018). Masculinity in male-dominated occupations: How teams, time, and tasks shape masculinity contests. *Journal of Social Issues*, *74*(3), 579–606. https://doi.org/10.1111/josi.12285

Simon, M., & Choi, Y. J. (2018). Using factor analysis to validate the Clance Impostor Phenomenon Scale in sample of science, technology, engineering and mathematics doctoral students. *Personality and Individual Differences*, *121*, 173–175. https://doi.org/10.1016/j.paid.2017.09.039

Simpkins, S. D., Fredricks, J. A., & Eccles, J. S. (2015). The role of parents in the ontogeny of achievement-related motivation and behavioral choices. *Monographs of the Society for Research in Child Development, 80*(2), 1–169. https://doi.org/10.1111/mono.12165

Spence, J. T., Helmreich, R. L., & Holahan, C. K. (1979). Negative and positive components of psychological masculinity and femininity and their relationships to self-reports of neurotic and acting out behaviors. *Journal of Personality and Social Psychology, 37*(10), 1673–1682. https://doi.org/10.1037/0022-3514.37.10.1673

StataCorp. 2019. *Stata Statistical Software: Release 16*. College Station, TX: StataCorp LLC.

Storage, D., Charlesworth, T.E.S., Banaji, M. R., & Cimpian, A. (2020). Adults and children implicitly associate brilliance with men more than women. *Journal of Experimental Social Psychology, 90*, 104020. https://doi.org/10.1016/j.jesp.2020.104020

Storage, D., Horne, Z., Cimpian, A., & Leslie, S. J. (2016). The frequency of "brilliant" and "genius" in teaching evaluations predicts the representation of women and African Americans across fields. *PLOS ONE*, *11*(3), e0150194.

https://doi.org/10.1371/journal.pone.0150194

Williams, M. J., & Tiedens, L. Z. (2016). The subtle suspension of backlash: A meta-analysis of penalties for women's implicit and explicit dominance behavior. *Psychological Bulletin, 142*(2), 165–197. https://doi.org/10.1037/bul0000039

Table 1

Regression Models Predicting Downstream Outcomes (Interest in Company, Anticipated Impostor Feelings, and Anticipated Sense of Belonging) as a Function of Participant Gender and Experimental Condition in Study 2.

DV: Interest in company				
Predictor				
	b (95% CI)	*SE*	*p*	ω^2
Participant gender (0 = male, 1 = female)	−0.42 (−0.91, 0.07)	0.25	.097	0.01
Experimental condition (0 = control, 1 = brilliance)	−1.03 (−1.52, −0.54)	0.25	< .001	0.05
Participant gender × Experimental condition	−1.13 (−2.12, −0.15)	0.50	.024	0.01
DV: Anticipated impostor feelings				
Predictor				
	b (95% CI)	*SE*	*p*	ω^2
Participant gender (0 = male, 1 = female)	0.14 (−0.22, 0.50)	0.18	.443	0.00
Experimental condition (0 = control, 1 = brilliance)	0.61 (0.24, 0.97)	0.18	.001	0.03
Participant gender × Experimental condition	0.85 (0.12, 1.58)	0.37	.022	0.01
DV: Anticipated sense of belonging				
Predictor				
	b (95% CI)	*SE*	*p*	ω^2
Participant gender (0 = male, 1 = female)	−0.08 (−0.33, 0.18)	0.13	.548	0.00
Experimental condition (0 = control, 1 = brilliance)	−0.59 (−0.85, −0.34)	0.13	< .001	0.06
Participant gender × Experimental condition	−0.44 (−0.95, 0.07)	0.26	.089	0.01

Note. Predictors were mean-centered to facilitate interpretation of the coefficients. The coefficients of participant gender and experimental condition in this table can be interpreted as one would interpret the main effects in an ANOVA table. The table reports unstandardized coefficients. These results did not change appreciably when adjusting for the estimated percentage of female employees in the company (see Table S15 in the Supplemental Material).

Table 2

Regression Models Predicting Downstream Outcomes (Interest in Company, Anticipated Impostor Feelings, and Anticipated Sense of Belonging) as a Function of Participant Gender and Masculinity Contest Culture (MCC) Ratings in Study 2.

DV: Interest in company				
Predictor				
	b (95% CI)	*SE*	*p*	ω^2
Participant gender (0 = male, 1 = female)	−0.33 (−0.78, 0.12)	0.23	.151	0.003
MCC	−1.15 (−1.40, −0.90)	0.13	< .001	0.22
Participant gender × MCC	0.03 (−0.47, 0.53)	0.25	.915	0.00
DV: Anticipated impostor feelings				
Predictor				
	b (95% CI)	*SE*	*p*	ω^2
Participant gender (0 = male, 1 = female)	0.07 (−0.24, 0.39)	0.16	.642	0.00
MCC	0.96 (0.79, 1.14)	0.09	< .001	0.29
Participant gender × MCC	−0.01 (−0.36, 0.34)	0.18	.948	0.00
DV: Anticipated sense of belonging				
Predictor				
	b (95% CI)	*SE*	*p*	ω^2
Participant gender (0 = male, 1 = female)	−0.03 (−0.26, 0.20)	0.12	.785	0.00
MCC	−0.60 (−0.73, −0.47)	0.06	< .001	0.22
Participant gender × MCC	−0.09 (−0.35, 0.17)	0.13	.500	0.00

Note. Predictors were mean-centered to facilitate interpretation of the coefficients. The coefficients of participant gender and MCC in this table can be interpreted as one would interpret the main effects in an ANOVA table. The table reports unstandardized coefficients. These results did not change appreciably when adjusting for the estimated percentage of female employees in the company (see Table S16 in the Supplemental Material).

Table 3

Regression Models Predicting Downstream Outcomes (Interest in Company, Anticipated Impostor Feelings, and Anticipated Sense of Belonging) as a Function of Participant Gender and Masculinity Contest Culture (MCC) Condition in Study 3.

DV: Interest in company				
Predictor				
	b (95% CI)	*SE*	*p*	ω^2
Participant gender (0 = male, 1 = female)	−0.26 (−0.69, 0.17)	0.22	.241	0.001
MCC condition (0 = low, 1 = high)	−2.70 (−3.13, −2.27)	0.22	< .001	0.36
Participant gender × MCC	−0.95 (−1.82, −0.09)	0.44	.031	0.01
DV: Anticipated impostor feelings				
Predictor				
	b (95% CI)	*SE*	*p*	ω^2
Participant gender (0 = male, 1 = female)	0.39 (0.07, 0.72)	0.16	.018	0.02
MCC condition (0 = low, 1 = high)	1.48 (1.15, 1.80)	0.16	< .001	0.23
Participant gender × MCC	−0.03 (−0.68, 0.61)	0.33	.916	0.00
DV: Anticipated sense of belonging				
Predictor				
	b (95% CI)	*SE*	*p*	ω^2
Participant gender (0 = male, 1 = female)	−0.27 (−0.53, −0.02)	0.13	.032	0.01
MCC condition (0 = low, 1 = high)	−1.75 (−1.99, −1.50)	0.13	< .001	0.41
Participant gender × MCC	−0.22 (−0.72, 0.28)	0.25	.391	0.00

Note. Predictors were mean-centered to facilitate interpretation of the coefficients. The coefficients of participant gender and MCC condition in this table can be interpreted as one would interpret the main effects in an ANOVA table. The table reports unstandardized coefficients. These results did not change appreciably when we adjusted for the estimated percentage of female employees in the company and participants' perceptions of the company's emphasis on brilliance (see Table S23 in the Supplemental Material).

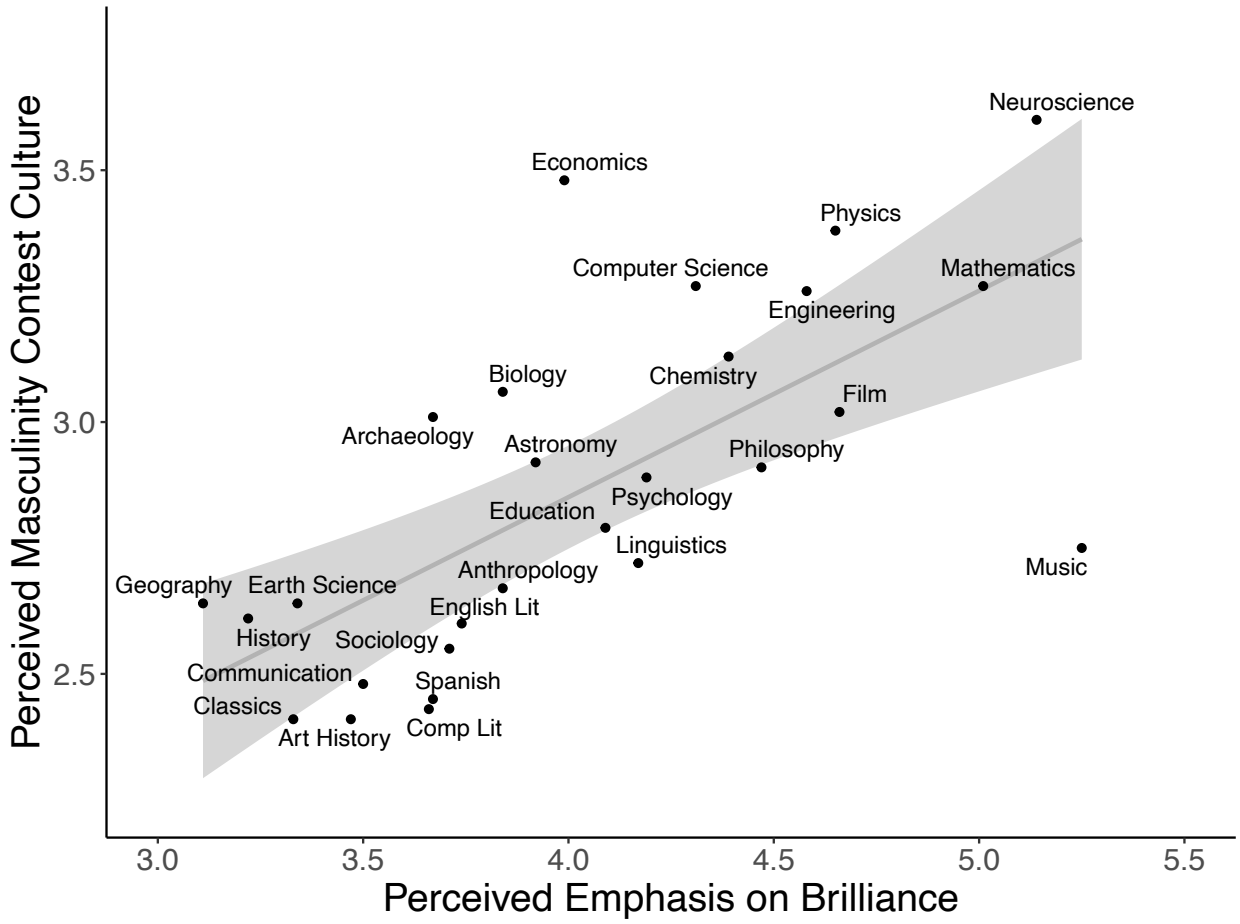

Figure 1. The relationship between perceived emphasis on brilliance and perceptions of a masculinity contest culture at the field level in the pilot study. Band represents ± 1 *SE*.

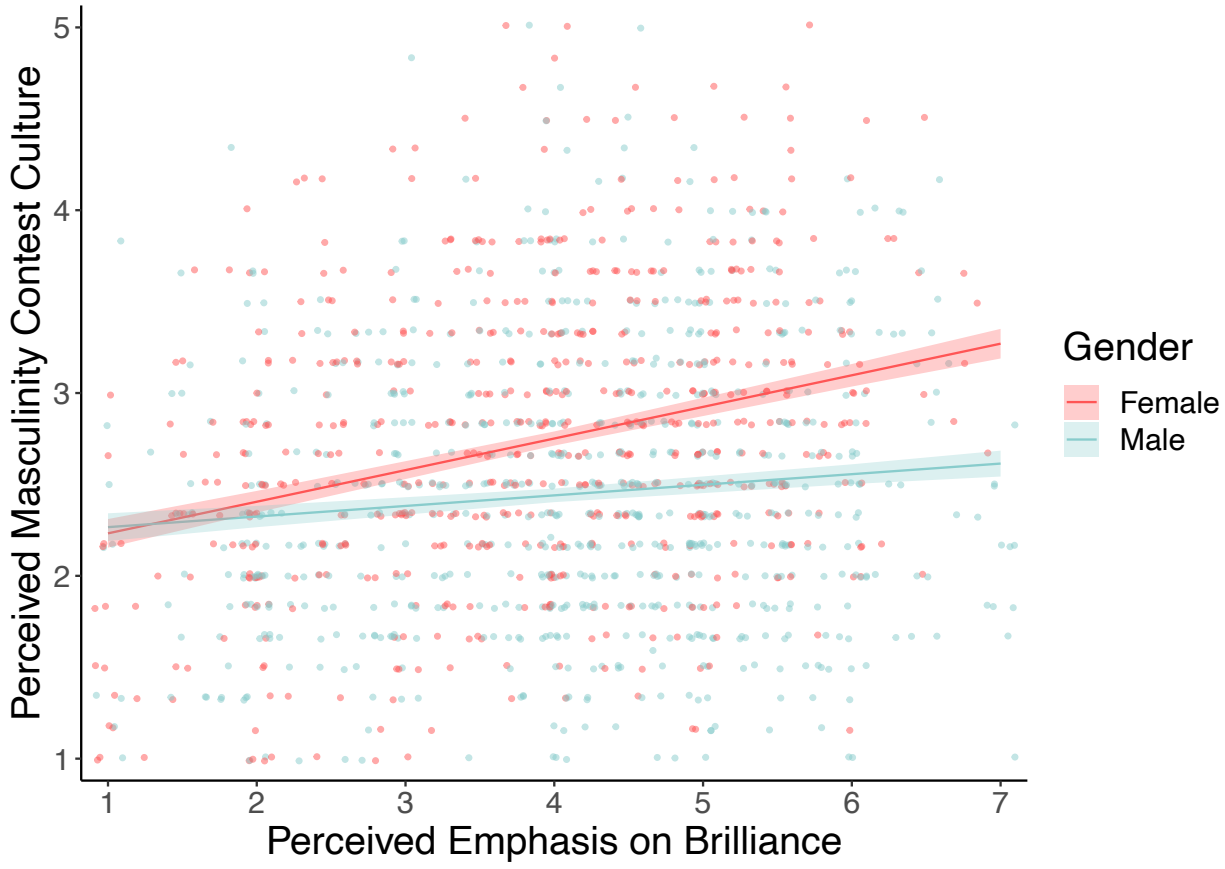

Figure 2. The relationship between perceived emphasis on brilliance and perceived masculinity contest cultures by participant gender among academics in Study 1. Bands represent ± 1 *SE*.

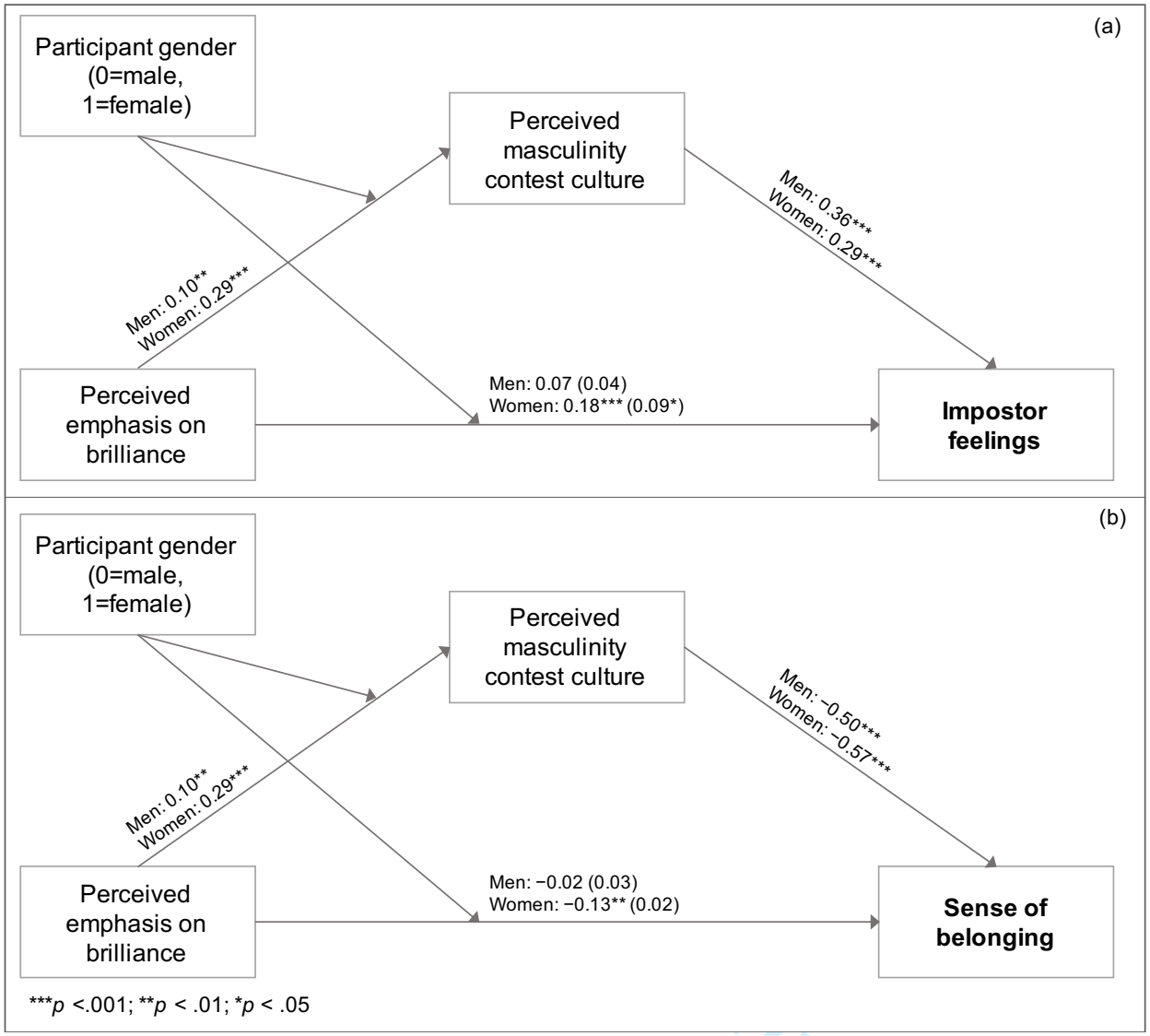

Figure 3. Moderation by participant gender of the indirect effects of perceived emphasis on brilliance through perceived masculinity contest culture on (a) impostor feelings and (b) sense of belonging in Study 1. The figure reports standardized coefficients.

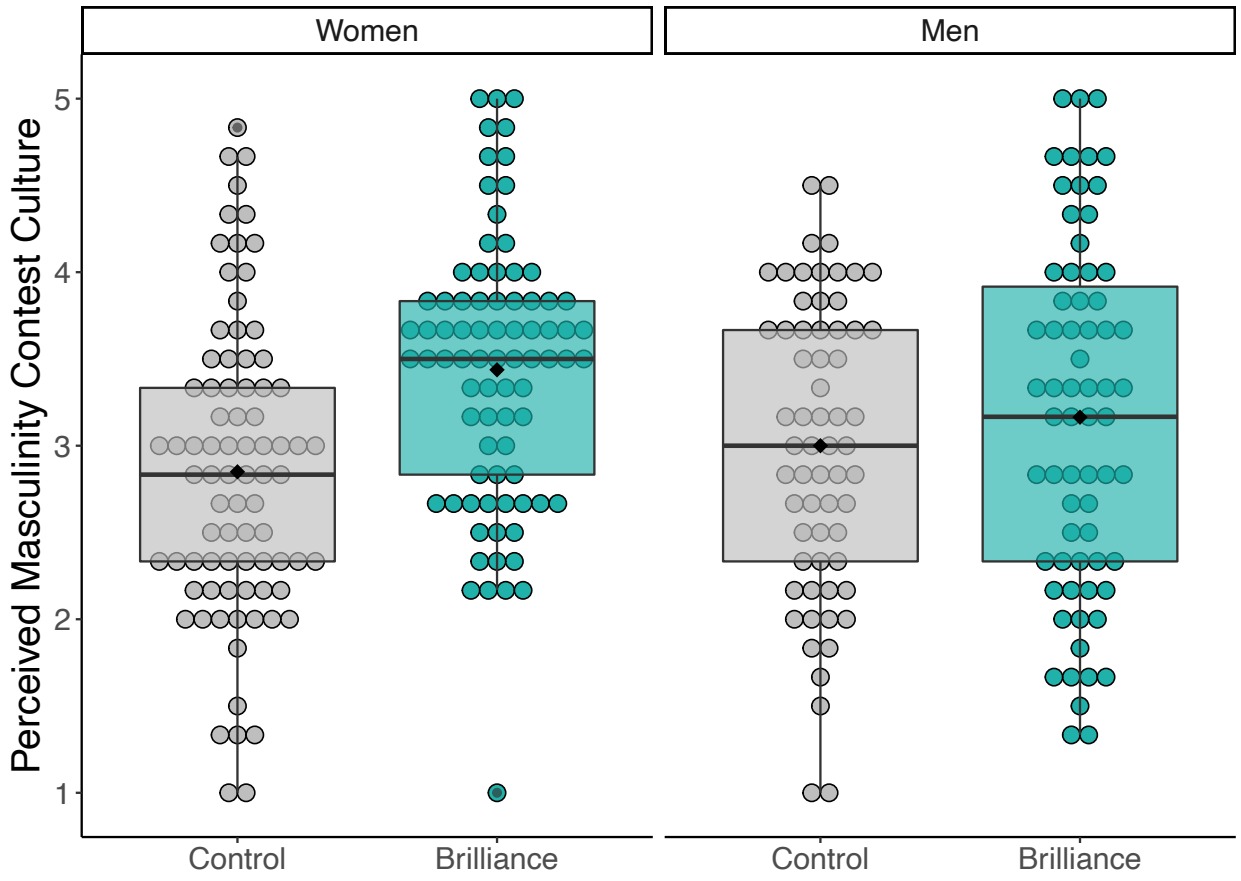

Figure 4. Effect of experimental condition on perception of masculinity contest cultures by participant gender in Study 2. Each dot represents an individual participant's response; a box plot is overlaid on the individual data points. Within each box plot, the solid line in the middle represents the median, and the diamond represents the mean.

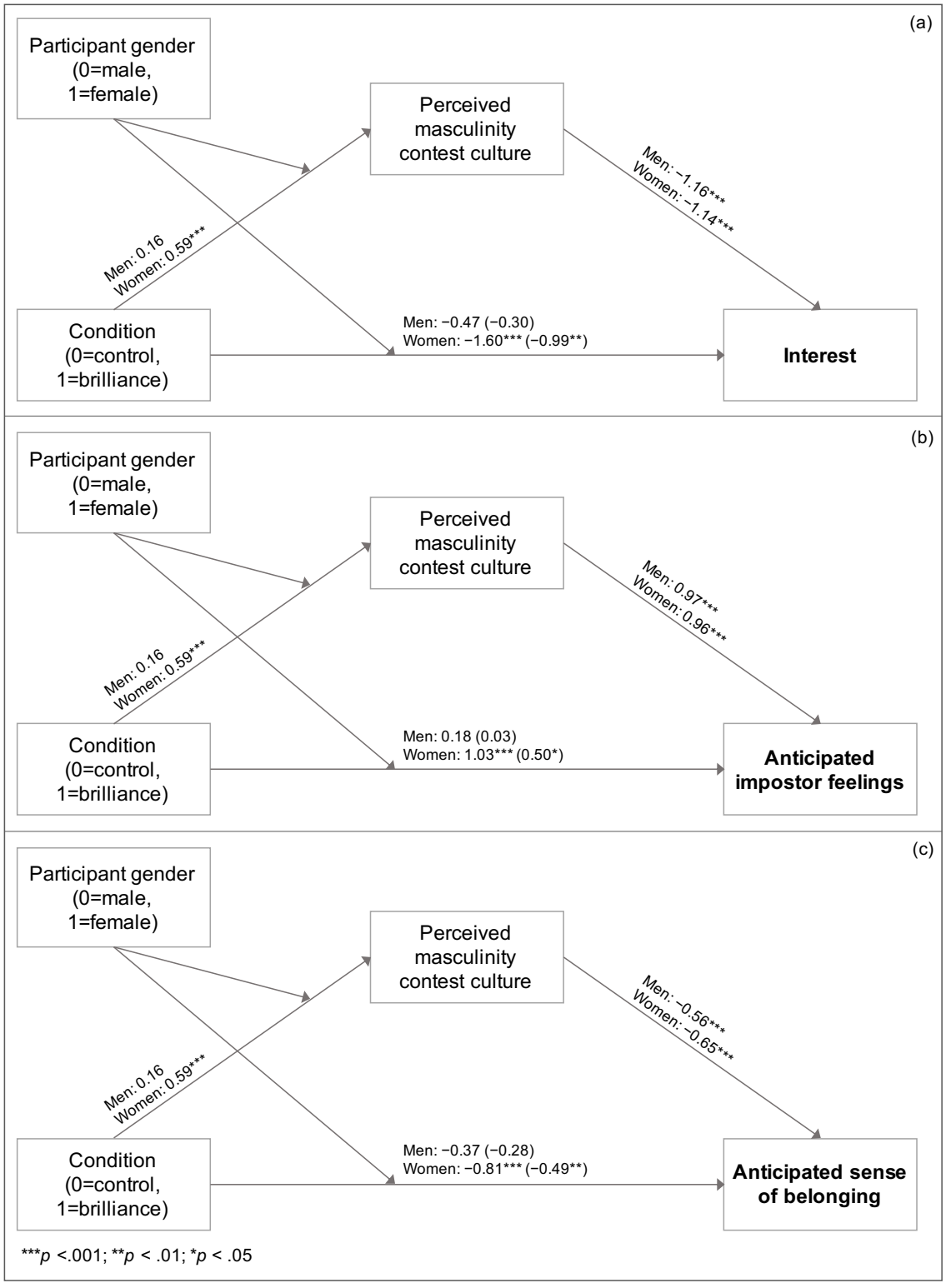

Figure 5. Moderation by participant gender of the indirect effects of experimental condition through perception of a masculinity contest culture on (a) interest, (b) anticipated impostor feelings, and (c) anticipated sense of belonging in Study 2. The figure reports unstandardized coefficients.

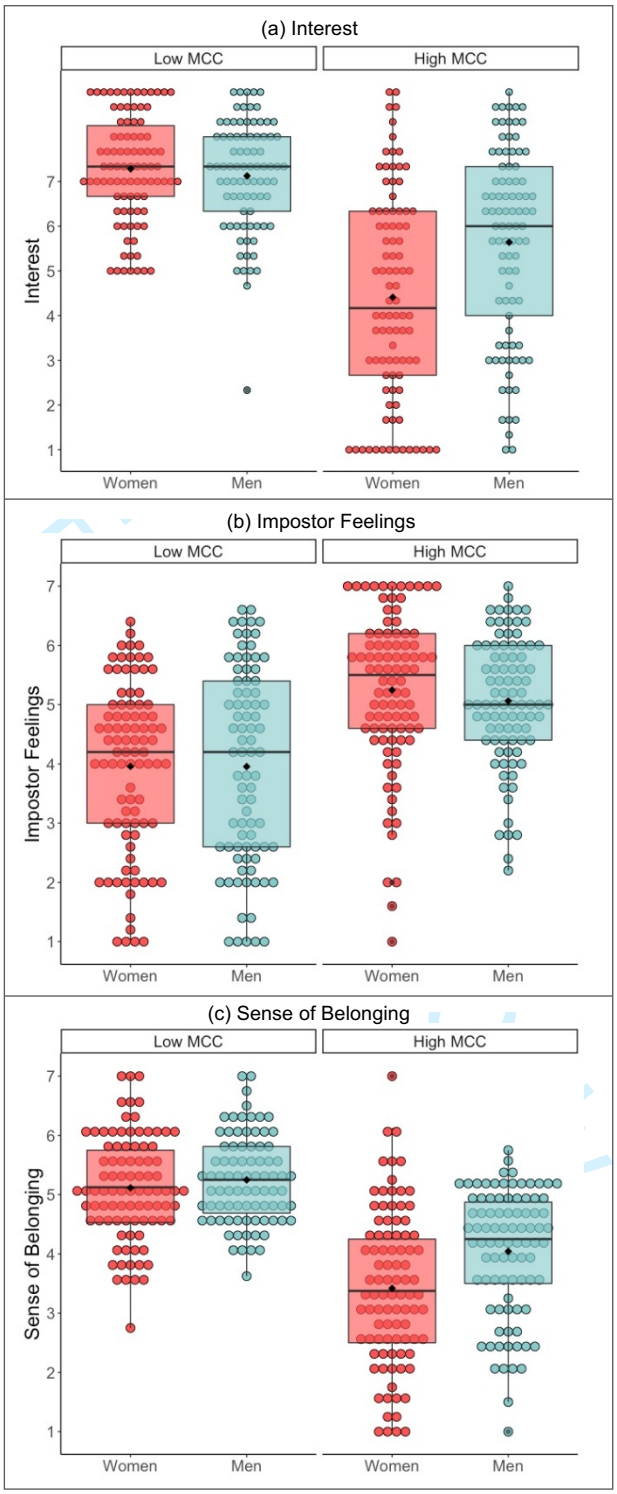

Figure 6. Effect of experimental condition (high- vs. low-MCC) as a function of participant gender on (a) interest, (b) anticipated impostor feelings, and (c) anticipated sense of belonging in Study 3. Each dot represents an individual participant's response; a box plot is overlaid on the individual data points. Within each box plot, the solid line in the middle represents the median, and the diamond represents the mean.