

# A Gender Bias in the Attribution of Creativity: Archival and Experimental Evidence for the Perceived Association Between Masculinity and Creative Thinking

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## Abstract

We propose that the propensity to think creatively tends to be associated with independence and self-direction—qualities generally ascribed to men—so that men are often perceived to be more creative than women. In two experiments, we found that “outside the box” creativity is more strongly associated with stereotypically masculine characteristics (e.g., daring and self-reliance) than with stereotypically feminine characteristics (e.g., cooperativeness and supportiveness; Study 1) and that a man is ascribed more creativity than a woman when they produce identical output (Study 2). Analyzing archival data, we found that men’s ideas are evaluated as more ingenious than women’s ideas (Study 3) and that female executives are stereotyped as less innovative than their male counterparts when evaluated by their supervisors (Study 4). Finally, we observed that stereotypically masculine behavior enhances a man’s perceived creativity, whereas identical behavior does not enhance a woman’s perceived creativity (Study 5). This boost in men’s perceived creativity is mediated by attributions of agency, not competence, and predicts perceptions of reward deservingness.

## Keywords

stereotyped attitudes, social perception, prejudice, sex-role attitudes

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Here’s to the crazy ones. The misfits. The rebels. The troublemakers. The round pegs in the square holes. The ones who see things differently. They’re not fond of rules. And they have no respect for the status quo.

—*Apple Think Different ad (1997) (2012)*

Consider the archetype of the eminently creative thinker—a figure in possession of a mind that works in ways that diverge from the normative, a figure characterized by great independence and uniqueness of thought and action. Apple’s iconic “think different” campaign keenly articulated this idealized image, not only in its narrative, but also in the creative personalities that were featured—Albert Einstein, Alfred Hitchcock, Bob Dylan, Frank Lloyd Wright, and Pablo Picasso, among others. These individuals are popular exemplars of the archetypical creative persona, typified by a divergent way of responding to the world

and a propensity to think “outside the box”—qualities that reflect prevailing understandings of the essence of what it means to think creatively. Here, we suggest that this dominant conception of the creative thinker presents a highly masculinized construal of the creative thought process. That is, we propose that creative thinking tends to be associated with agentic qualities more typically ascribed to men than to women, and that the perceived connection between creative thinking and these stereotypically masculine characteristics produces bias in the way in which men’s and women’s creativity is evaluated, perpetuating gender inequality.

Although women now make up more than half of the U.S. labor force (Bureau of Labor Statistics, 2015), they

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remain largely absent from its top tiers, despite striving to work at such levels and using many of the same career-advancement strategies as men (Carter & Silva, 2011; Catalyst, 2015). At the same time as progress toward gender equality has conspicuously stalled, the United States has shifted toward an increasingly knowledge-based economy emphasizing new ideas and innovation (Andrew, Manget, Michael, Taylor, & Zablit, 2010; Powell & Snellman, 2004). This economic landscape is reflected in the increasing value placed on individual creativity in the modern workforce, as evidenced by a recent survey of 400 executives, who deemed “creative thinking” one of the abilities they valued most (Accenture, 2013), and another survey of 1,500 CEOs, who identified creativity as the most important skill for the future (Lombardo & Roddy, 2010). In a society that considers creativity to be a highly valuable form of capital, individuals deemed to possess genuinely innovative, cutting-edge ideas are likely to be increasingly rewarded.

We propose that stereotypical expectations about the differing propensities of men and women to enact certain forms of agency play a critical role in the formation of judgments about their creativity, thus suggesting an unexplored social-psychological contributor to the persistent dearth of women in the labor force’s elite ranks. Drawing from research on gender stereotypes related to the dimension of agency-communality (Eagly & Steffen, 1984), we suggest that assumptions regarding men’s propensity to assert their autonomy from other people and engage in self-direction—qualities that correspond to dominant understandings of the creative thought process—may lead perceivers to attribute greater creativity to men than to women.

We investigated this prediction using a multimethod approach, combining experiments with analyses of archival data to test for evidence of the masculinization of creative thinking within the upper echelons of the workforce and to examine the psychological mechanisms underlying this proposed phenomenon. We tested our proposal that differential judgments of men’s and women’s creativity are not solely explained by the stereotypical belief that men are more intelligent or more competent than women (Cuddy, Fiske, & Glick, 2008), but may emerge as a consequence of the assumption that men are more likely than women to engage in a masculine-agentic style of thinking.

## Masculinity and Creative Thinking

Popular understandings of the creative thought process link it to the concept of “divergent thinking”—a method by which creative solutions are reached via consideration of perspectives that diverge from norms (Cropley, 2006). This conception of creativity pervades popular and academic discourse, both in the ubiquitous tendency of

how-to guides to associate creativity with the metaphor of “thinking outside the box” (e.g., Kanter, 2010; Strauss, 2012), and in the common ways that creativity is measured (e.g., Duncker, 1945; Ward, 1994).

Meanwhile, representations of masculinity-femininity reflect constellations of attributes associated with men and women (Bem, 1981; Constantinople, 1973; Spence, Helmreich, & Holahan, 1979). Of particular relevance are traits along the dimension of agency-communality. Agency, which is seen as masculine, refers to self-directed behavior and is associated with traits such as adventurousness and self-reliance; communality, which is seen as feminine, refers to concern for others and is associated with traits such as social sensitivity and cooperativeness (Abele, 2003; Bakan, 1966; Eagly & Steffen, 1984; Spence & Buckner, 2000).

Two social orientations emerge from the agency-communality distinction—a “masculinized” orientation focused on exerting independence and distinctiveness and a “feminized” orientation focused on maintaining social harmony and interconnectedness (Abele & Wojciszke, 2007). We suggest that this masculinized-agentic orientation is, in many ways, akin to a divergent style of responding to the world and closely resembles popular understandings of creative thinking. Although competence, or general aptitude or ability, is also stereotypically masculine (Cuddy et al., 2008; Cuddy, Fiske, & Glick, 2004), and intelligence and creativity are undoubtedly perceived as correlated, we predicted that perceived agency would drive attributions of creativity, even in analyses statistically controlling for competence, as measured by various proxies for general aptitude.

## Overview of the Current Research

Using experimental and archival data, we tested whether men and their output are evaluated as more creative than women and their output and whether this effect may be explained by the perceived association between masculine-agentic characteristics and creative thinking. Following the guidelines suggested by Simmons, Nelson, and Simonsohn (2011), we decided on the rule for terminating data collection for our experimental studies before data collection began. Specifically, we determined *ex ante* that we would aim to recruit 40 participants per experimental group (i.e., twice the minimum sample size per cell recommended by Simmons et al.).

### Pretest

#### *Method*

Before testing our main hypotheses, we needed to ensure that our assumption that creativity is popularly understood as divergence was justified. Hence, we checked

whether people do in fact think creativity is best achieved via divergent thinking. We asked participants to consider a series of choices between divergent and nondivergent processes, selecting which option in each choice would most likely result in the generation of “creative” ideas. Choices were made separately for two domains. Participants in a comparison condition considered these same processes, in the same domains, but considered which would most likely result in the generation of “high quality” ideas. We predicted that divergence would be understood as the process more likely to produce creative ideas and that divergence would be more strongly implicated in the generation of creative ideas than in the generation of high-quality ideas.

**Participants.** Eighty-three participants (40% female, U.S. residents) were recruited from Amazon Mechanical Turk (for additional demographic information, see Table S1 in the Supplemental Material available online). Demographic variables did not moderate the results.

**Materials and procedure.** Participants were randomly assigned to consider either which processes were most likely to generate a “creative” idea or which processes were most likely to generate a “high quality” idea. Participants in both conditions read two scenarios (fine arts and business), presented in a random order:

Imagine that you are a [composer/consultant]. Your job is to come up with a [creative/high quality] [piece of music/product]. Select the approaches below that you think would most likely result in the generation of a [creative/high quality] [piece of music/product].

After reading each scenario, participants responded to a series of items in which they chose between a divergent approach and a nondivergent approach. The order of the items and of the options within each item were randomized. The items were “connecting the dots” versus “thinking outside the box,” “building on tradition” versus “disregarding tradition,” “following what others have done” versus “going against what others have done,” and “bringing others’ perspectives together” versus “adopting a perspective that is distinct from others’ perspectives.” Each item for which the nondivergent approach was chosen was scored as  $-1$ , and each item for which the divergent approach was chosen was scored as  $+1$ . For each participant, we calculated separate summed scores for the fine-arts domain and the business domain; the possible range for each score was  $-4$  to  $+4$ , with scores greater than zero indicating that more divergent than nondivergent approaches were selected and scores less than zero indicating that more nondivergent than divergent approaches were selected.

## Results

Within the creative-idea condition, scores were, on average, positive and significantly different from zero in both the fine-arts domain,  $M = 1.58$ ,  $SD = 2.71$ ,  $t(42) = 3.83$ ,  $p < .001$ , 95% confidence interval (CI) = [0.75, 2.42], and the business domain,  $M = 1.91$ ,  $SD = 2.18$ ,  $t(42) = 5.74$ ,  $p < .001$ , 95% CI = [1.23, 2.58]. These results indicate that the generation of creative ideas was associated with divergence more than with nondivergence, and they support the notion that creativity is understood as a tendency to generate outside-the-box ideas that differ from the status quo. Within the high-quality-idea condition, participants’ scores did not differ significantly from zero in either the fine-arts domain,  $M = 0.70$ ,  $SD = 2.58$ ,  $t(39) = 1.71$ ,  $p = .095$ , 95% CI =  $[-0.13, 1.53]$ , or the business domain,  $M = 0.55$ ,  $SD = 2.68$ ,  $t(39) = 1.30$ ,  $p = .20$ , 95% CI =  $[-0.31, 1.41]$ .

To test whether, across domains, the generation of creative ideas was associated more with divergent approaches than was the generation of high-quality ideas, we conducted a mixed-model analysis of variance (ANOVA) with idea type as the between-subjects factor and domain as the within-subjects factor. There was no Idea Type  $\times$  Domain interaction,  $F(1, 81) = 0.48$ ,  $p = .49$ ,  $\eta_p^2 = .01$ , and no main effect of domain,  $F(1, 81) = 0.07$ ,  $p = .80$ ,  $\eta_p^2 = .00$ , but there was a predicted main effect of idea type,  $F(1, 81) = 6.46$ ,  $p = .013$ ,  $d = 0.56$ ; scores were higher in the creative-idea condition ( $M = 1.74$ ,  $SD = 2.01$ ) than in the high-quality-idea condition ( $M = 0.62$ ,  $SD = 2.00$ ), which suggests a unique association between creativity and divergence.

## Study 1

In Study 1, we investigated whether the creative thought process tends to be masculinized. That is, we examined whether masculine-agentic traits are perceived as more central to creative thinking than are feminine-communal traits, and whether this association is strongest when the divergent nature of creative thinking is emphasized.

## Method

**Participants.** Eighty participants (49% female, U.S. residents) were recruited from Amazon Mechanical Turk (see Table S1 in the Supplemental Material for additional demographic information). Demographic variables did not moderate the results.

**Materials and procedure.** Participants were randomly assigned to one of two conditions. Participants in the divergent-thinking condition read a passage describing creativity as the ability to “think outside the box,” see the world differently than the average person does, and create things that do not conform to traditions. Participants

in the convergent-thinking condition read that creativity is the ability to “connect the dots,” see the connections between disparate ideas, and create things that bring ideas together in a unique way (see the Supplemental Material for the text used for this manipulation).

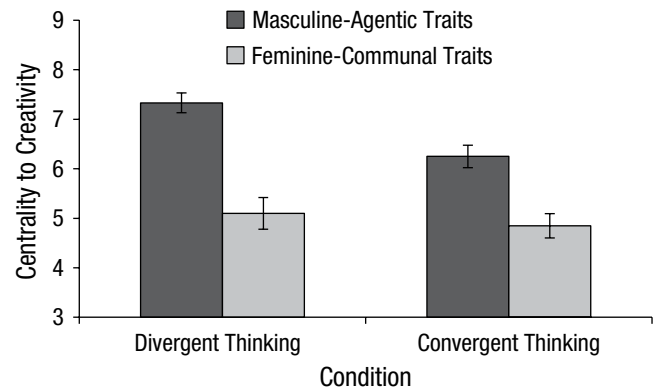
Participants then rated, on a 9-point scale, how central 16 personality traits were to creativity, as described in the passage. Eight of the traits were stereotypically masculine-agentic (decisive, competitive, self-reliant, willing to take risks, ambitious, daring, adventurous, courageous), and 8 were stereotypically feminine-communal (sensitive, cooperative, understanding of others, helpful to others, sympathetic, nurturing, warm in relations with others, and supportive; cf. Prentice & Carranza, 2002). An exploratory factor analysis with varimax rotation revealed a two-factor structure. The 8 masculine-agentic traits loaded onto one factor, so ratings of these traits were combined ( $\alpha = .88$ ). The 8 feminine-communal traits loaded onto the other factor, so ratings of these traits were combined ( $\alpha = .92$ ).

## Results

A mixed-model ANOVA with condition as the between-subjects factor and trait type as the within-subjects factor revealed a main effect of trait type,  $F(1, 78) = 75.02, p < .001, \eta_p^2 = .49$ , qualified by a marginally significant interaction between trait type and condition,  $F(1, 78) = 3.05, p = .084, \eta_p^2 = .04$  (see Fig. 1). Follow-up tests revealed that participants associated creativity more with stereotypically masculine-agentic personality traits than with stereotypically feminine communal personality traits in both the divergent-thinking condition ( $M = 7.22, SD = 1.26$ , vs.  $M = 5.10, SD = 2.04$ ),  $F(1, 78) = 54.18, p < .001, d = 1.25$ , and the convergent-thinking condition ( $M = 6.26, SD = 1.43$ , vs.  $M = 4.85, SD = 1.56$ ),  $F(1, 78) = 23.90, p < .001, d = .94$ . Furthermore, the masculine traits were perceived as more central to creativity when divergence was emphasized, rather than convergence,  $F(1, 78) = 10.21, p = .002, d = 0.71$ , which indicates that the association between creative thinking and masculinity is most pronounced when creativity is conceptualized as seeing the world differently than other people do and as generating ideas that diverge from norms and traditions. There was no effect of condition on the perceived centrality of the feminine traits,  $F < 1, p = .536$ .

## Study 2

In Study 2, we examined whether the perceived connection between stereotypically masculine-agentic qualities and creativity might result in male creative professionals being evaluated as more creative than their female counterparts. We also explored moderation by domain: We



**Fig. 1.** Results from Study 1: effect of condition on ratings of the centrality of masculine-agentic and feminine-communal traits to creativity. Error bars indicate  $\pm 1$  SEM.

did not expect to observe the gender difference in domains in which it is difficult to envision stereotypical males operating, because any male envisioned in such a domain would not carry with him the usual stereotype content (Kunda & Spencer, 2003). We therefore compared the effects of the target's gender on perceived creativity in an aesthetic domain in which stereotypes related to masculinity are reasonably applicable (architecture) and in an aesthetic domain in which they are less applicable (fashion design).

## Method

**Participants.** One hundred sixty-nine participants (36% female, U.S. residents) were recruited from Amazon Mechanical Turk, in accord with our goal of recruiting 40 participants per experimental group (see Table S1 in the Supplemental Material for demographic information). Demographic variables did not moderate the results.

**Materials and procedure.** Participants were randomly assigned to one of four experimental conditions in which they read background information about either an architect (male or female) or a fashion designer (male or female). All information was identical across conditions except for the target's profession and gender (which was manipulated by varying the first name; see the Supplemental Material for the text used for the manipulation). Participants were then instructed to examine the target's work, which was identical in the two gender conditions. In the architecture condition, participants saw three images of houses. Two of the images were of Villa Freundorf (designed by Project A01 Architects), and one of the images was of Home Spa (designed by architektsk). In the fashion-design condition, participants saw three images of fashion designs from the 2013 Pratt Fashion Show (designs were by Sam O'Brien, Jefferson Musanda,

and Raya Kassisieh, respectively). After viewing one of these sets of images, participants assessed the target's creativity, originality, and outside-the-box thinking; these ratings were combined to form a composite score for creativity ( $\alpha = .84$ ). Participants also assessed how talented and gifted the target was; these ratings were combined to form a composite score for competence ( $r = .92$ ,  $p < .001$ ; see the Supplemental Material for the six creativity and competence items).

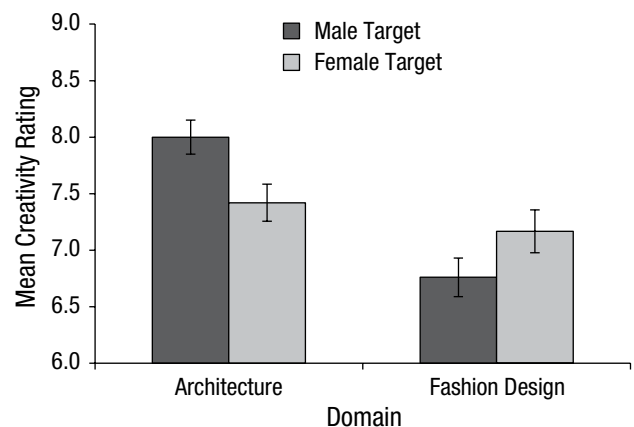
## Results

We conducted a 2 (target's gender: male vs. female)  $\times$  2 (domain: architecture vs. fashion design) between-subjects ANOVA with creativity ratings as the dependent measure to examine whether the male target was judged as more creative than the female target, and whether domain moderated this effect. A main effect of domain,  $F(1, 159) = 18.87$ ,  $p < .001$ ,  $\eta_p^2 = .11$ , was qualified by the predicted interaction between target's gender and domain,  $F(1, 159) = 8.24$ ,  $p = .005$ ,  $\eta_p^2 = .05$  (see Fig. 2). As predicted, the male architect was evaluated as more creative ( $M = 8.00$ ,  $SD = 1.00$ ) than the female architect ( $M = 7.41$ ,  $SD = 1.03$ ),  $F(1, 159) = 5.87$ ,  $p = .016$ ,  $d = 0.58$ ; however, when the targets were fashion designers, this creativity boost disappeared,  $F(1, 159) = 2.70$ ,  $p = .10$ . The male architect was also evaluated as more creative than the male fashion designer,  $F(1, 159) = 25.76$ ,  $p < .001$ ,  $d = 1.23$ . There was no effect of domain for the female target,  $p = .30$ .

A Target's Gender  $\times$  Domain interaction remained after we controlled for perceived competence,  $F(1, 158) = 6.61$ ,  $p = .011$ ,  $\eta_p^2 = .04$ . In these analyses, the female architect was judged as less creative than the female fashion designer  $F(1, 158) = 10.83$ ,  $p = .001$ ,  $d = 0.75$ , but there was no effect of domain for the male target,  $F < 1$ ,  $p = .947$ ; however, the significance of the gender effect within the architecture domain and the lack of a significant gender effect within the fashion-design domain remained the same as in the analyses without this control.

## Study 3

If our proposed effect is real, men should be perceived as more creative than women in naturalistic settings in which high-level professionals share their ideas. As a first attempt to look for evidence of this, in Study 3 we examined archival data on viewers' evaluations of talks posted on TED.com. Although this data source allowed us only to examine viewers' choice of preselected descriptors (only one of which, "ingenious," corresponds to dictionary definitions of creativity) to evaluate preselected TED speakers, it provided a rich context to test if, when male



**Fig. 2.** Results from Study 2: effect of target's gender and domain on creativity ratings. Error bars indicate  $\pm 1$  SEM.

and female experts shared their ideas, ideas put forward by men were more often characterized as ingenious compared with ideas put forward by women. In the archival and experimental studies that followed Study 3, we aimed to rule out alternative explanations of the effect of gender on perceived creativity. We also aimed to provide more evidence regarding the underlying process.

## Method

Data were collected on February 12, 2015. Viewers of each talk posted on TED.com can select up to 3 of the following words to describe the talk: "beautiful," "confusing," "courageous," "fascinating," "funny," "informative," "ingenious," "inspiring," "jaw-dropping," "longwinded," "obnoxious," "OK," "persuasive," and "unconvincing." For each talk, a percentage value is visible for each of the 14 descriptors, indicating the percentage of raters who selected that descriptor (if a rater selects only 1 descriptor, it is counted three times). We aggregated these data for the 100 most viewed talks on TED.com (range: 3 million to 30 million views). These talks included 28 female speakers. Speaker's gender was independently determined by two coders and corroborated to ensure accuracy. We conducted a pretest, confirming that "ingenious" was the descriptor best capturing outside-the-box creativity (see the Supplemental Material).

## Results

As predicted, the percentage of viewers who described talks as ingenious was greater for the talks given by male speakers ( $M = 7.49$ ,  $SD = 6.13$ ) than for the talks given by female speakers ( $M = 4.43$ ,  $SD = 4.29$ ),  $t(98) = 2.41$ ,  $p = .018$ ,  $d = 0.57$  (Table S3 in the Supplemental Material presents complete data on all descriptors for male and female speakers). Speaker's gender predicted the percentage of

“ingenious” ratings even after we controlled for proxies for speaker’s competence (i.e., percentage of “informative” and “persuasive” ratings),  $b = -3.24$ ,  $SE = 1.20$ ,  $t(96) = 2.70$ ,  $p = .008$  (see Table 1 for a summary of the regression results).

The observed effect of speaker’s gender on “ingenious” ratings could be explained by the men and women in the 100 most viewed talks giving talks on different topics. Therefore, we also aggregated ratings of the 100 most viewed TED talks within each of TED.com’s six suggested “Popular Topics”: technology, entertainment, design, business, science, and global issues. This allowed us to assess whether men’s talks were evaluated as more ingenious than women’s talks when the topic was held constant. It also allowed us to examine the robustness of the effect across multiple creative domains.

TED.com highlights these six topics as their most popular, and visitors to TED.com can search for the 100 most viewed talks within each of these six categories. An individual talk may be classified under more than one category. Data were collected between April 22 and April 25, 2015. One talk given by men and women together was excluded from the analyses for technology, design, and business; 2 such talks were excluded from the analysis for entertainment. Including these talks in the analyses, whether they were considered as given by male speakers or female speakers, did not change the statistical significance of results.

As reported in Table 2, the effect of speaker’s gender on the percentage of “ingenious” ratings was robust across five of the six topics. That is, when we controlled for the percentages of “persuasive” and “informative” ratings, men’s talks were evaluated as more ingenious than women’s talks in the domains of technology, entertainment, business, science, and global issues. We did not observe a statistically significant gender difference within the design category.

## Study 4

In Study 4, we analyzed workplace evaluations of high-level male and female employees, examining whether men tended to be stereotyped as more innovative in their thinking compared with women. These real-world evaluations were an improvement on those of Study 3 because they came from two sources: the targets’ supervisors and the people who reported directly to the targets (*direct reports*). Given that people occupying high-power positions tend to rely on stereotypes when making judgments about others more than people occupying low-power positions do (Fiske & Dépret, 1996), we expected that if men are viewed as more innovative in their thinking compared with women because of stereotypes rather than actual creativity, any gender difference in creativity

**Table 1.** Results From Study 3: Regression Analysis Predicting the Percentage of “Ingenious” Ratings for the 100 Most Viewed TED Talks

Predictor	<i>b</i>	<i>SE</i>	<i>t</i> (96)	<i>p</i>
Step 1 ( $R^2 = .11$ )				
“Informative” ratings	−0.05	0.07	−0.75	.45
“Persuasive” ratings	−0.26	0.09	−2.92	.004**
Step 2 ( $R^2 = .18$ )				
Speaker’s gender	−3.24	1.20	−2.70	.008**

Note: Speaker’s gender was coded 0 for male and 1 for female.

\*\* $p < .01$ .

ratings would be more robust in evaluations submitted by targets’ supervisors than in evaluations submitted by targets’ direct reports. The data set also included control variables that allowed us to eliminate a range of alternative explanations for our proposed effect.

## Method

**Sample.** Our sample consisted of evaluations of 134 M.B.A. students who were senior-level executives (100 men and 34 women) concurrently employed in their regular full-time jobs. The data set included 403 evaluations by direct reports and 187 evaluations by supervisors.

**Measures.** As part of the executives’ M.B.A. curriculum, their supervisors and direct reports anonymously evaluated them on several dimensions. The item we focused on was “[target’s name] thinks about things in innovative ways,” which was rated from 1, *never*, to 6, *almost always* (Lind & Sitkin, 2009). The data set also included relevant control variables: rater’s gender, rater’s job level, target’s

**Table 2.** Results From Study 3: Speaker’s Gender as a Predictor of the Percentage of “Ingenious” Ratings for the 100 Most Viewed TED Talks Within Each of the Top Six Topics

Topic	Talks by		<i>b</i>	<i>SE</i>	<i>t</i> <sup>a</sup>	<i>p</i>
	women	( <i>n</i> )				
Technology	14	14	−4.36	1.90	−2.30	.024*
Entertainment	23	23	−3.59	1.35	−2.66	.009*
Design	13	13	−3.37	2.06	−1.63	.11
Business	24	24	−4.62	1.25	−3.69	< .001*
Science	22	22	−2.38	1.05	−2.27	.025*
Global issues	24	24	−3.03	1.29	−2.35	.021*

Note: The regression models controlled for the percentages of “persuasive” and “informative” ratings given to the talks. Speaker’s gender was coded 0 for male and 1 for female.

<sup>a</sup>The degrees of freedom were as follows: 94 for entertainment; 95 for technology, design, and business; and 96 for science and global issues.

\* $p < .05$ .

job level, and two measures of perceived competence (“[target’s name] can be relied upon in important matters” and “[target’s name] helps team members understand complex issues”; see the Supplemental Material for details on the control variables).

**Analysis strategy.** We tested for an interaction between target’s gender (male vs. female) and rater’s relationship to the target (direct report vs. supervisor) following the multilevel-modeling approach suggested by Raudenbush and Bryk (2002) to account for nesting of data from observers within targets. Predictors were dummy-coded (target’s gender: 0 = female, 1 = male; rater’s relationship to target: 0 = direct report, 1 = supervisor; see the Supplemental Material for details about the analytic strategy).

## Results

Table 3 presents means and standard deviations for supervisors’ and direct reports’ ratings of male and female targets’ innovative thinking. Our analysis without control variables revealed a main effect of rater’s relationship,  $b = -0.48$ ,  $SE = 0.20$ ,  $p = .02$ , qualified by a Target’s Gender  $\times$  Rater’s Relationship interaction,  $b = 0.45$ ,  $SE = 0.22$ ,  $p = .046$ , intraclass correlation coefficient (ICC) = .12. As predicted, when evaluated by their supervisors, the female executives were judged as less innovative in their thinking than their male counterparts were,  $b = 0.41$ ,  $SE = 0.20$ ,  $t(586) = 2.03$ ,  $p = .04$ . However, no gender difference emerged in the direct report’s ratings,  $b = -0.04$ ,  $SE = 0.15$ ,  $t(586) = -0.26$ ,  $p = .80$ . This suggests that the difference in supervisors’ ratings is explained by perceived, rather than actual, differences in the targets’ creative thinking. The female executives were judged as less innovative by their supervisors than by their direct reports,  $b = -0.48$ ,  $SE = 0.19$ ,  $t(586) = -2.45$ ,  $p = .016$ , but no such difference emerged for the male targets,  $b = -0.03$ ,  $SE = 0.11$ ,  $t(586) = -0.25$ ,  $p = .80$ . Including the control variables in this model, we replicated our results, again finding a main effect of rater’s relationship,  $b = -0.43$ ,  $SE = 0.18$ ,  $p = .02$ , qualified by a Target’s Gender  $\times$  Rater’s Relationship interaction,  $b = 0.46$ ,  $SE = 0.20$ ,  $p = .022$ , ICC = .14.

## Study 5

Studies 2 through 4 indicate that gender stereotypes may influence an individual’s perceived creativity, with the male gender category signaling a more innovative style of thinking than the female gender category. Study 1 suggests that the association between masculine-agentic qualities and creative thinking might explain this phenomenon. In Study 5, we tested this process-based account. If our logic is correct, a behavioral display of

**Table 3.** Results From Study 4: Means and Standard Deviations for Supervisors’ and Direct Reports’ Ratings of the Male and Female Executives’ Innovative Thinking

	Relationship of the rater to the target			
	Supervisor		Direct report	
Target’s gender	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Male	4.99	1.04	5.00	1.09
Female	4.53	1.32	5.11	1.07

masculinity should enhance perceptions of a target’s creativity via the attribution of agentic qualities. Given that expectations based on social categories often constrain the meaning of behavior (Kunda & Thagard, 1996), we also expected that whereas a man’s engagement in stereotypically masculine behavior would be recognized as an expression of his masculinity and agency, thus possibly enhancing his perceived creativity, a woman’s engagement in identical behavior would be less likely to be interpreted in this way and thus might not increase her perceived creativity.

## Method

Participants read about a male or female manager whose decision making was described in more or less masculine ways (i.e., as risky or not; see Prentice & Carranza, 2002). They then rated the manager’s agency, competence, and creativity, as well as the extent to which the manager deserved certain rewards. We predicted that the target’s gender would moderate the effect of masculine-agentic behavior on participants’ perceptions of the target’s creativity, with risk taking specifically enhancing a male manager’s creativity compared with baseline. We further predicted that attributions of masculine-agentic qualities would mediate the interactive effect of target’s gender and risk taking on creativity judgments, even when we accounted for attributions of competence. Finally, in keeping with our interest in understanding whether gender biases in attributions of creativity may contribute to the proliferation of inequality, we explored whether creativity judgments predicted participants’ evaluations of the target’s reward deservingness.

**Participants.** One hundred twenty-five participants (50% female, U.S. residents, all employed) were recruited from Clearvoice, a national online panel (see Table S1 in the Supplemental Material for demographic information). Demographic variables did not moderate the results. This study was initially conducted for a different project (see the next paragraph), in which a sample size of 30 participants per experimental condition was targeted.

**Materials and procedure.** Originally, this study was designed to examine the effect of risk taking and gender on receipt of rewards. Because the study included filler items measuring perceived creativity, as well as measures of perceived agency and competence, we reanalyzed the data to test our current hypotheses.

Participants were randomly assigned to read about either a male or a female manager devising his or her division's strategic plan. Gender was manipulated using the target's first name; all other information was identical in the two gender conditions. Participants were also randomly assigned to one of two decision conditions. Participants in the baseline condition read that the target chose a plan focused on achieving growth (see the Supplemental Material for the text of the scenario). Participants in the risky-decision condition read exactly the same information except that an additional sentence described the target's choice as risky: "[John/Katherine] is taking a big chance by adopting this plan, hoping that it will result in a high payoff."

Participants then rated the extent to which the target possessed a number of traits, using a scale from 1, *not at all*, to 7, *very much so*. Ratings of how creative and imaginative the target was were combined to form a composite score for creativity ( $r = .78$ ,  $p < .001$ ). Ratings of the target's competitiveness, independence, confidence, determination, ambition, ability to work well under pressure, daring, adventurousness, aggressiveness, and courage were combined to form a composite score for agency ( $\alpha = .92$ ). Ratings of how competent, intelligent, and analytical the target was formed a composite score for competence ( $\alpha = .88$ ). (Participants also rated the target on the following items: self-disciplined, likeable, friendly, popular, warm, perceptive, and intuitive.) Next, participants used the same 7-point scale to rate how deserving the target was of a bonus, a raise, and a promotion; these ratings were combined to form a composite score for reward deservingness ( $\alpha = .95$ ). Finally, participants completed a manipulation check: "How risky was [John/Katherine]'s decision?" (scale from 1, *not risky at all*, to 7, *extremely risky*).

## Results

The target's behavior was perceived as more risky in the risky-decision condition ( $M = 5.14$ ,  $SD = 1.30$ ) than in the baseline condition ( $M = 4.45$ ,  $SD = 1.29$ ),  $F(1, 123) = 6.60$ ,  $p = .011$ ,  $d = 0.53$ .

To examine whether stereotypically masculine behavior enhanced the perceived creativity of the target and whether this effect was moderated by the target's gender, we conducted a 2 (target's gender: female vs. male)  $\times$  2 (decision condition: baseline vs. risky) between-subjects ANOVA with creativity ratings as the dependent measure.

A Target's Gender  $\times$  Decision Condition interaction emerged,  $F(1, 121) = 5.66$ ,  $p = .019$ ,  $\eta_p^2 = .05$  (see Fig. 3). As predicted, the male target was evaluated as more creative when his behavior was construed as risky (i.e., when he acted in a stereotypically masculine way;  $M = 5.77$ ,  $SD = 1.02$ ) than when it was not (i.e., baseline;  $M = 5.08$ ,  $SD = 1.26$ ),  $F(1, 121) = 4.10$ ,  $p = .045$ ,  $d = 0.60$ . In contrast, no effect of condition emerged for the female target who acted in an identical way (risky-decision condition:  $M = 4.98$ ,  $SD = 1.57$ ; baseline condition:  $M = 5.41$ ,  $SD = 1.57$ ),  $F(1, 121) = 1.74$ ,  $p = .19$ . Furthermore, although no gender effect emerged in the baseline condition,  $F(1, 121) = 1.06$ ,  $p = .30$ , the male target was evaluated as more creative than the female target in the risky-decision condition,  $F(1, 121) = 5.18$ ,  $p = .025$ ,  $d = 0.60$ .

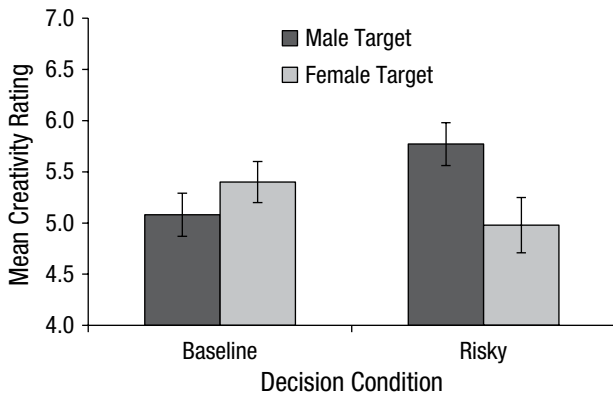
Next, we examined attributions of agency and competence as mediators of the interactive effect of target's gender and risk taking on creativity perceptions. We ran a moderated mediation model using Hayes's (2013) PROCESS macro (Model 7), with 5,000 biased bootstrap samples. Decision condition (baseline = 0, risky = 1) was entered as the independent variable, target's gender (female = 0, male = 1) as the moderator, and competence rating and agency rating as parallel mediators; creativity rating was the dependent variable.

As predicted, for the male target, perceived agency mediated the effect of risk taking on perceived creativity, indirect effect = 0.20,  $SE = 0.13$ , 95% CI = [0.02, 0.58], but perceived competence was not a significant mediator, indirect effect = 0.10,  $SE = 0.17$ , 95% CI = [-0.17, 0.53]. For the female target, perceived agency and competence were not significant mediators—agency: indirect effect = -0.05,  $SE = 0.13$ , 95% CI = [-0.36, 0.17]; competence: indirect effect = -0.18,  $SE = 0.18$ , 95% CI = [-0.67, 0.08]. These results suggest that a stereotypically masculine style of decision making, at least when enacted by a man, is perceived to be associated with creativity, and that this association is explained by attributions of agency—that is, the belief that masculine men are adventurous, daring, and courageous.

Finally, we explored whether the target's gender, via attributions of agency and thus creativity, predicted ratings of the target's reward deservingness within each decision condition. For each decision condition (baseline and risky), we ran a serial mediation model using Hayes's (2013) PROCESS macro (Model 6), with 10,000 biased bootstrap samples. Target's gender (female = 0, male = 1) was entered as the independent variable, agency rating as the first mediator, and creativity rating as the second mediator; rating of reward deservingness was the dependent variable.

In the baseline condition, there was no evidence of serial mediation, indirect effect = 0.01,  $SE = 0.08$ , 95% CI = [-0.15, 0.18]. This result is consistent with a lack of





**Fig. 3.** Results from Study 5: effect of target’s gender and decision condition on creativity ratings. Error bars indicate  $\pm 1$  SEM.

a gender difference in perceived creativity. However, as Figure 4 illustrates, in the risky-decision condition, the boost in the male manager’s perceived agency and thus creativity, as compared with the female manager, predicted greater reward deservingness, indirect effect = 0.38,  $SE = 0.23$ , 95% CI = [0.06, 1.00]. This result suggests that gender bias in creativity judgments may affect tangible economic outcomes for men and women in the workplace. Rerunning this model with creativity rating as the first mediator and agency rating as the second mediator in the series did not reveal significant mediation, indirect effect =  $-0.01$ ,  $SE = 0.15$ , 95% CI =  $[-0.42, 0.23]$ .

**General Discussion**

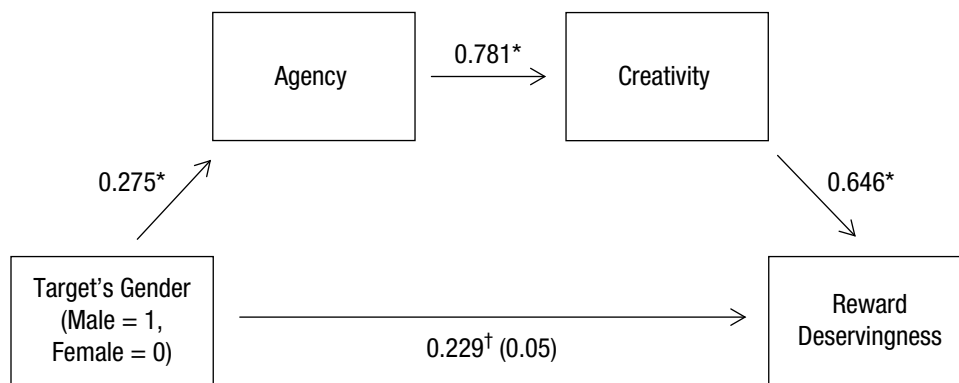
Five studies provide converging evidence that lay conceptions of creative cognition (i.e., beliefs regarding what it takes to “think creatively”) overlap substantially with the unique content of male stereotypes, engendering systematic bias in the way that men’s and women’s creativity

is evaluated. We found that creativity is strongly associated with stereotypically masculine-agentic qualities (Study 1), and both experimental and archival data indicated that men are judged as more creative than women (Studies 2–4). Finally, we found that attributions of agency mediate differential judgments of men’s and women’s creativity (Study 5).

**Limitations and future directions**

Our archival studies cannot definitively rule out actual differences in the creativity of the men and women who were evaluated. Although the pattern of ratings across supervisors and direct reports in Study 4 strongly suggests gender-based stereotyping, the TED talks rated in Study 3 vary vastly (even within topic) on multiple dimensions other than the speaker’s gender. Thus, the possibility of objective creativity differences between male and female speakers’ talks cannot be eliminated. Although men, in general, do not outperform women in creativity (Baer & Kaufman, 2008), and our experimental results indicate that, holding actual creativity constant, perceivers do tend to stereotype men as more creative than women, our findings in Study 3 must be interpreted as suggestive (rather than conclusive) evidence of gender stereotyping in creativity judgments.

Furthermore, our research focused specifically on outside-the-box creativity. Future research is needed to explore boundary conditions in the application of this lay definition. Men may not be stereotyped as more creative than women when creativity is understood as a social process that emphasizes collaboration and integration of perspectives or, as some of our data suggest, in domains such as design, in which creativity may be assessed via stereotypically feminine attributes such as refinement and elegance.



**Fig. 4.** Results from Study 5: serial mediation model for the risky-decision condition, showing the indirect effect of the target’s gender on the target’s deservingness of reward as mediated by perceived agency and then perceived creativity. Standardized regression coefficients are shown ( $†p = .087$ ,  $*p < .05$ ). The value inside parentheses indicates the coefficient when mediators were included in the model.

## Implications

We have presented evidence for a novel mechanism by which agency-based stereotypes contribute to discrimination against women in the workforce (cf. Heilman, 2001; Rudman & Glick, 2001). In suggesting that women are less likely than men to have their creative thinking recognized, our research not only points to a unique reason why women may be passed over for corporate leadership positions, but also suggests why women remain largely absent from elite circles within creative industries, such as film and advertising (Lauzen, 2014; Windels, 2008), and creative professions, such as architecture (Chang, 2014). Our research may also help explain the dearth of women reaching the upper echelons of science, technology, engineering, and mathematics fields—and in particular, the technology sector, which is projected to become an increasingly large part of the U.S. labor market (Hathaway & Kallerman, 2012). Our findings complement research examining reasons why women may not want to enter these fields, suggesting that biases about the cognitive processes women adopt can pile up on other impediments (Diekmann, Brown, Johnston, & Clark, 2010; Kennedy & Kray, 2014). In addition to its significant implications for gender inequality, our research complements recent work by Mueller, Wakslak, and Krishnan (2014) in suggesting a novel social psychological bias that may inhibit the detection of truly innovative ideas.

## Author Contributions

D. Proudfoot developed the study concept. D. Proudfoot and A. C. Kay designed the studies. Data collection was performed by D. Proudfoot. D. Proudfoot and C. Z. Koval performed the data analysis and interpretation under the supervision of A. C. Kay. D. Proudfoot drafted the manuscript, and A. C. Kay provided critical revisions. All authors approved the final version of the manuscript.

## Declaration of Conflicting Interests

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

## Supplemental Material

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

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