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# Messages about brilliance undermine women's interest in educational and professional opportunities

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## ABSTRACT

Pervasive cultural stereotypes associate brilliance with men, not women. Given these stereotypes, messages suggesting that a career requires brilliance may undermine women's interest. Consistent with this hypothesis, linking success to brilliance lowered women's (but not men's) interest in a range of educational and professional opportunities introduced via hypothetical scenarios (Experiments 1–4). It also led women more than men to expect that they would feel anxious and would not belong (Experiments 2–5). These gender differences were explained in part by women's perception that they are different from the typical person in these contexts (Experiments 5 and 6). In sum, the present research reveals that certain messages—in particular, those suggesting that brilliance is essential to success—may contribute to the gender gaps that are present in many fields.

## 1. Introduction

Notions of brilliance and genius are stereotypically associated with men, not women (e.g., Bian, Leslie, & Cimpian, 2017; Bennett, 1996, 1997; Elmore & Luna-Lucero, 2017; Kirkcaldy, Noack, Furnham, & Siefen, 2007; Lecklider, 2013; Stephens-Davidowitz, 2014; Tiedemann, 2000; Upson & Friedman, 2012). These cultural notions are likely to affect women's involvement in a variety of professions. In particular, the idea that “brilliance = men” may discourage women from pursuing activities that are believed to require high levels of intellectual ability. The six experiments reported here support this proposal and provide clues regarding the mechanisms involved.

## 1.1. The theoretical model

The present research investigates the Field-specific Ability Beliefs (FAB) model (see Fig. 1 for a schematic depiction), which was proposed to explain the distribution of gender gaps in representation across a wide range of fields (Cimpian & Leslie, 2015, 2017; Leslie, Cimpian, Meyer, & Freeland, 2015; Meyer, Cimpian, & Leslie, 2015; Storage, Horne, Cimpian, & Leslie, 2016). According to this model, women's involvement in a field is influenced by the *ability beliefs* prevalent in that field (see Fig. 1, right)—the beliefs shared by its members concerning

which characteristics are important for success. In particular, the model focuses on a field's beliefs about whether exceptional intellectual ability (“brilliance”) is needed to make meaningful contributions to the field. Messages suggesting that brilliance is important for success in a field are likely to affect women more than men in part because of the stereotype that associates this characteristic with men (Fig. 1, left; e.g., Bennett, 1996, 1997; Kirkcaldy et al., 2007).

Consistent with this model, Leslie, Cimpian, and their colleagues (2015) found that academic fields whose practitioners believed that success depends on brilliance had fewer women PhDs (see also Cimpian & Leslie, 2015; Meyer et al., 2015; Storage et al., 2016). This was true both for fields in the natural sciences and engineering (STEM) and for fields in the social sciences and humanities. Leslie, Cimpian, et al. (2015) also found that a field's beliefs about ability predicted women's representation above and beyond other variables commonly invoked as explanations for gender gaps, such as differences among fields in work-life balance or the extent to which they focus on people vs. abstract systems (e.g., Ceci, Ginther, Kahn, & Williams, 2014; Ferriman, Lubinski, & Benbow, 2009). Subsequent work replicated these results with a different measure of a field's emphasis on brilliance: namely, the frequency of the words “brilliant” and “genius” in anonymous reviews of college instructors on [RateMyProfessors.com](http://RateMyProfessors.com) (Storage et al., 2016).

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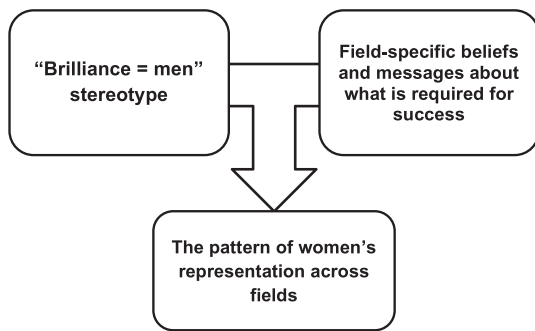


Fig. 1. Diagram of the Field-specific Ability Beliefs (FAB) theoretical model.

## 1.2. Do messages about brilliance undermine women's interest?

Although beliefs about brilliance predict women's participation across a wide range of fields, the evidence to date leaves open the crucial question of whether these beliefs *cause* gender gaps in participation. The experiments reported here begin to investigate this issue by testing whether brilliance-focused messages undermine women's *interest* in a field. Interest is a crucial precursor to participation in a field (e.g., Cheryan & Plaut, 2010; Cheryan, Ziegler, Montoya, & Jiang, 2017; Hulleman & Harackiewicz, 2009; Malgwi, Howe, & Burnaby, 2005; Morgan, Isaac, & Sansone, 2001; Wigfield & Eccles, 1992). Moreover, differences between men and women in their level of interest in various fields emerge early and contribute to some of the largest and most persistent gender gaps in academia and industry (e.g., Cheryan et al., 2017; Dasgupta & Stout, 2014; Wigfield & Eccles, 1992). Thus, examining whether men's and women's interest is differentially affected by whether an activity is said to require brilliance provides an important test of the FAB model.

The model predicts that messages that link success in a field to brilliance will undermine women's interest in that field, in part because of the cultural association between brilliance and men (e.g., Bian et al., 2017; Kirkcaldy et al., 2007). Moreover, the model predicts that messages about brilliance will have these effects regardless of the actual content of the field. In prior work, an emphasis on this trait predicted women's underrepresentation both in STEM and in the social sciences and humanities (Leslie, Cimpian, et al., 2015).

In addition to testing for a causal effect of brilliance-focused messages on women's interest, the present studies explored the psychological mechanisms underlying this effect. Specifically, we investigated two possible mechanisms: one that operates via judgments of (dis)similarity with relevant others (i.e., prototype matching; Niedenthal, Cantor, & Kihlstrom, 1985) and another that operates via the threat of being negatively stereotyped (i.e., stereotype threat; Steele, 2013).

### 1.2.1. Potential mechanism #1: (mis)matching a prototype

One reason why messages about brilliance might lower women's interest is that women may perceive themselves to be dissimilar to the people in fields where brilliance is valued (e.g., Eagly & Karau, 2002; Heilman, 1983, 2012; Ibarra & Petriglieri, 2017; Niedenthal et al., 1985; Oyserman, 2008). According to *self-to-prototype matching theory* (e.g., Niedenthal et al., 1985; Setterlund & Niedenthal, 1993), many important life choices (e.g., about which careers to pursue) are informed by a comparison between the self and the prototypical person in the context being considered. Given that the cultural prototype of the “brilliant person” excludes women, they are likely to perceive a mismatch with the members of brilliance-oriented fields. This mismatch might lead women to be apprehensive about joining such fields; it might also raise concerns about belonging. Anxiety and lack of belonging could ultimately undermine women's interest (e.g., Cheryan & Plaut, 2010; Cheryan, Plaut, Davies, & Steele, 2009; Dasgupta, 2011; Good, Rattan, & Dweck, 2012; Hannover & Kessels, 2004; Walton &

Cohen, 2007, 2011; Walton, Cohen, Cwir, & Spencer, 2012).

### 1.2.2. Potential mechanism #2: stereotype threat

Just as comparisons between the self and the prototypical person in a field can influence interest, so can judgments about whether one's *group* is likely to be welcome and valued in a field. Messages about the importance of brilliance may act as a situational cue to *stereotype threat*—the threat of being judged through the lens of a negative stereotype about one's group (e.g., Davies, Spencer, Quinn, & Gerhardtstein, 2002; Emerson & Murphy, 2015; Murphy, Steele, & Gross, 2007; Steele, 2013). As with the prototype matching mechanism, the threat of being stereotyped might give rise to feelings of anxiety (e.g., Murphy et al., 2007; Osborne, 2007) and of not belonging (e.g., Good et al., 2012), which might in turn lower women's interest.

### 1.3. Relation to prior findings

Several prior studies have investigated whether women's aspirations are influenced by “environmental” beliefs about success—that is, by what they perceive to be common ideas regarding the characteristics one needs to succeed. We briefly summarize these findings and then outline how our research contributes to this literature.

A longitudinal study by Good et al. (2012) revealed that female calculus students who perceived others in their class to have a *fixed mindset* about mathematical ability (viewing it as a stable trait; see Dweck, 1999, 2006) reported lower belonging and weaker intentions to take mathematics courses after a semester—especially if they also perceived others to endorse negative stereotypes about women's mathematical abilities. Similarly, Emerson and Murphy (2015) found that when women imagined being in a consulting firm that espoused a fixed (vs. growth) mindset, they anticipated being judged on the basis of their gender and, as a result, exhibited less trust and more defensive behavior in the face of negative feedback from the company. Consistent with these other studies, Smith, Lewis, Hawthorne, and Hodges (2013) found that when women considered an unfamiliar STEM major that espoused a growth mindset (i.e., that considerable effort is required of anyone who wants to succeed), they expressed more interest in this major and felt a greater sense of belonging in it relative to a no-information control condition.

The present research, and our theoretical model more generally, extends this prior work in four respects. First, it investigates a distinct set of environmental beliefs: namely, beliefs about the importance of brilliance to success. Lay notions of brilliance are conceptually distinct—and empirically distinguishable—from lay notions of mathematical ability and general intelligence (Cimpian & Leslie, 2015; Meyer et al., 2015; Rattan, Savani, Naidu, & Dweck, 2012). For instance, the idea that exceptional intellectual ability (which is what we term “brilliance”) is in part a matter of genetic potential and therefore identifiable at a young age (e.g., child prodigies) is considerably more common than the idea that general intelligence is fixed and immutable (e.g., Rattan, Savani, et al., 2012). In fact, these beliefs are only weakly correlated among US participants,  $r \approx 0.20$  (Rattan, Savani, et al., 2012). (Note that people are able to conceive of brilliance without assuming a genetic basis; our claim here is simply that in our culture the “default,” most accessible conception of brilliance has a biological component.) Thus, prior research on environmental beliefs about intelligence may not be straightforwardly informative about the effects of environmental beliefs about brilliance.

Second, the present research is novel because it investigates environmental beliefs about exceptional ability, whereas prior work has focused mainly on beliefs about “typical” ability. However, possessing ability at the “one in 10,000” level (i.e., the right tail of the distribution) is often claimed to be a prerequisite for success in many prestigious careers in academia and beyond (e.g., Summers, 2005), so investigating the effects of environmental messages about such top-level ability on women's aspirations fills an important gap in the literature.

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