Journal of Experimental Psychology: General

ISSN: 0096-3445

2024, Vol. 153, No. 1, 1–14
https://doi.org/10.1037/xge0001466

Checking Gender Bias: Parents and Mentors Perceive Less Chess Potential in Girls

Sophie H. Arnold[1], April H. Bailey[2], Wei Ji Ma[1], Jennifer Shahade[3], and Andrei Cimpian[1]
[1] Department of Psychology, New York University
[2] Department of Psychology, University of New Hampshire
[3] Independent Scholar, Philadelphia, Pennsylvania, United States

Girls and women are underrepresented in chess. Here, we explored the role of *gender bias* in this phenomenon. Specifically, we investigated whether parents and mentors (e.g., coaches) show bias against the female youth players in their lives. Parents and mentors ($N = 286$; 90.6% men) recruited through the U.S. Chess Federation reported their evaluations of and investment in youth players ($N = 654$). We found evidence of bias on some, but not all, measures. Most strikingly, parents and mentors thought that female youth players' highest potential chess ratings were on average lower than male players', a bias that was exacerbated among parents and mentors who believed that success in chess requires brilliance. In addition, mentors who endorsed (vs. rejected) this belief also reported that female mentees were more likely to drop out of chess due to low ability. These findings provide the first large-scale evidence of bias against youth female players and hold implications for the role of parents and mentors in other domains that, like chess, are culturally associated with intellectual ability and exhibit substantial gender imbalances (e.g., science and technology).

Public Significance Statement
The Queen's Gambit was an incredibly popular show in 2020 that followed fictional Beth Harmon, a woman whose chess brilliance (and obsessive nature) brought chess back in the spotlight of our attention. While it is inspiring to see a fictional woman winning in a space dominated by men, real-world women remain underrepresented in chess. Why? Here, we identify one plausible reason: Parents and mentors are biased against female youth players. For example, parents and mentors thought female youth players have lower potential than male players. This bias was stronger among those who thought that brilliance is required for success in chess. These beliefs are likely to be harmful both to girls who already play chess and to those who could want to: Would you be interested in participating in a sport where your potential is downgraded by your parents and by your coaches before you have even started?

Keywords: gender bias, gender segregation, field-specific ability beliefs, chess, parents

Supplemental materials: https://doi.org/10.1037/xge0001466.supp

In 2020, only 14% of all U.S. Chess Federation players were girls or women (U.S. Chess Federation, n.d.). Why? Past research has focused on how individual men and women perform in tournaments as an explanation (e.g., Howard, 2005). In contrast, much less research has been devoted to understanding the broader structural factors that contribute to gender disparities in chess. Identifying and addressing these factors will likely be essential to any future efforts to make chess more gender-balanced. Here, we focus on the role of parents and mentors (e.g., chess coaches) in the emergence of gender disparities in chess. Specifically, we examine parents' and mentors' possible bias against female youth players by measuring how they evaluate and invest in them relative to their male counterparts. We additionally examine two potential moderators of this bias: the belief that being a great chess player requires

This article was published Online First October 5, 2023.
Sophie H. Arnold https://orcid.org/0000-0002-5868-0542
This research is based upon work supported by the National Science Foundation Graduate Research Fellowship under Grant DGE-2234660. We are grateful for the partnership of U.S. Chess in this research. Additionally, we thank the members of the Cognitive Development Lab and the Ma Lab at New York University for their helpful feedback on previous drafts of this article. Data, materials, and analysis scripts can be found at: https://osf.io/t3f7g/?view_only=82527dc0248e44729443c109b3721c82.

Sophie H. Arnold served as lead for data curation, formal analysis, investigation, project administration, visualization, and writing–original draft. Jennifer Shahade contributed equally to resources and served in a supporting role for writing–review and editing. Andrei Cimpian served as lead for supervision and writing–review and editing. Sophie H. Arnold, April H. Bailey, Wei Ji Ma, Jennifer Shahade, and Andrei Cimpian contributed equally to conceptualization and methodology. April H. Bailey and Wei Ji Ma contributed equally to writing–review and editing.

Correspondence concerning this article should be addressed to Sophie H. Arnold, Department of Psychology, New York University, 6 Washington Place, New York, NY 10003, United States. Email: sophie.arnold@nyu.edu or sophie.h.arnold@gmail.com

chess talent ("brilliance") and the belief that men are more brilliant at chess than women. Biases against female youth players may be stronger among parents and mentors who endorse either of these beliefs.

Why Are There So Few Girls and Women in Chess?

Past work on gender disparities in chess has largely focused on determining whether men's overrepresentation among top chess players is due to gender differences in certain personal attributes that affect performance. Three types of gender differences are commonly invoked as explanations: differences in various cognitive abilities (e.g., visuospatial ability; Howard, 2005, 2014a, 2014b), personality traits (e.g., agreeableness; Vollstädt-Klein et al., 2010; see also Bilalić et al., 2007; Gerdes & Gränsmark, 2010), and deliberate practice (Blanch et al., 2015; de Bruin et al., 2008). For example, Howard (2005, 2014a, 2014b) argued that the gap between the top men and women players can be attributed at least in part to cognitive abilities that are higher on average in men than women (e.g., visuospatial ability; Halpern & Collaer, 2005; Voyer et al., 2017). Notably, however, Howard did not measure the cognitive abilities of actual chess players. Moreover, other research has suggested that the cognitive abilities in which gender differences are observed are largely unrelated to chess performance (Burgoyne et al., 2016; Frydman & Lynn, 1992; Waters et al., 2002).

Much less work has examined how structural factors (e.g., bias, discrimination) contribute to the underrepresentation of women in chess. One line of research on this topic used data from chess tournaments to argue that stereotype threat (Schmader et al., 2008; Spencer et al., 2016) contributes to girls' and women's underperformance against male players compared to other female players (Backus et al., 2016; Maass et al., 2008; Rothgerber & Wolsiefer, 2014). Other relevant work used semistructured interviews to explore the barriers to playing chess that girls and women often encounter (Baasanjav, 2017; Galitis, 2002). For instance, Galitis (2002) interviewed 18 girls who dropped out of their elementary school's newly formed coed chess club. She found that girls had been treated poorly by boys when playing together and largely ignored by the coach. This evidence is consistent with anecdotal reports of harassment and discrimination from women who play chess competitively (e.g., Beck, 2019; Gillet, 2022; Hadden, 2020; Ingle, 2021; Meirom & Shahade, 2019).

Examining Parents' and Mentors' Biases Against Female Youth Players

Building on past research, here we provide the first large-scale quantitative investigation of the obstacles that girls and women encounter in chess. Specifically, we investigate whether parents and mentors (e.g., coaches) display bias when evaluating the potential of female and male youth players and when deciding how much to invest in these players. We also investigate whether parents and mentors perceive the environment in chess to be biased against female youth players.

The focus on the obstacles that *youth players* encounter is motivated by the statistics suggesting that the gender gap in chess participation emerges among children and is relatively stable afterward (e.g., FIDE International Chess Federation, 2015; see also Bilalić et al., 2009). Because expertise in chess takes many years to develop, redressing the gender balance among top adult players will be difficult, if not impossible, without an understanding of the problems with the early chess "pipeline." Our focus on youth players is also important because at this stage in their chess careers there is considerable ambiguity about their long-term potential. Gender bias is especially likely to arise when there is ambiguity about an individual's ability (e.g., Heilman, 2012; Koch et al., 2015), so this early period may be one of the most vulnerable parts of a player's trajectory in chess.

The focus on *parents and mentors* is motivated by the fact that these individuals have the power to shape a young player's chess career by providing or withholding encouragement, resources, training, and so on. Indeed, prior research has documented parents' and teachers' outsize role in the academic and extracurricular activities children pursue (e.g., Bodovski & Farkas, 2008; Lareau, 2003), as well as in the emergence of gender differences in these activities (e.g., Bussey & Bandura, 1999; Eccles et al., 1990; Jacobs & Eccles, 1992; Stromquist, 2007; Swinson & Harrop, 2009).

Potential Moderators of Parents' and Mentors' Gender Biases in Chess

In the cultural imagination, chess is usually associated with intellectual talent. This association guided our selection of potential moderators of the hypothesized bias against female youth players. The first moderator we investigated was parents' and mentors' *field-specific ability beliefs* (FABs) about chess. Fields and occupations differ in the extent to which intellectual talent ("brilliance") is seen as necessary for success (for a review, see Muradoglu et al., 2023). Contexts with more brilliance-oriented FABs are less welcoming to women, in part because of greater prejudice against them (Bian et al., 2018; Hannak et al., 2023; Leslie et al., 2015). Extrapolating to chess, we might see that parents and mentors with more brilliance-oriented FABs about chess are particularly likely to underestimate the potential of and underinvest in female (vs. male) youth players at this ambiguous (but pivotal) early stage.

The second potential moderator of the hypothesized bias against female youth players is related to the first: Whereas negative stereotypes about women's competence have weakened in recent years (e.g., Eagly et al., 2020), the cultural stereotype that associates men more than women with extreme intellectual ability—brilliance, genius, giftedness, etc.—persists and is in fact acquired relatively early in life (Bian et al., 2017, 2018; Storage et al., 2020; Zhao et al., 2022), fueled in part by media portrayals of intellectual ability (Boutyline et al., 2023; Gálvez et al., 2019) and interactions at home and at school (Musto, 2019; Zhao et al., 2022). Extrapolating to chess, perhaps the tendency to undervalue and underinvest in female (vs. male) youth players will be largest among parents and mentors who endorse this "brilliance = men" stereotype.

Theoretical Contributions Beyond Chess

Our investigation of the structural barriers to girls' and women's participation in chess has implications that extend beyond this specific domain. For instance, the present work informs theory about FABs as an explanation for occupational gender segregation (e.g., Muradoglu et al., 2023) by testing the generality of the FAB model in explaining gender segregation beyond educational or academic pursuits (e.g., Hannak et al., 2023; Leslie et al., 2015; Muradoglu et al., 2022) and at the individual rather than group level: Although research

inspired by the FAB account has documented a link between brilliance-oriented FABs and prejudice against women at the *group* level (e.g., more brilliance-oriented fields also show stronger biases against women; Hannak et al., 2023; Leslie et al., 2015; Meyer et al., 2015), no research to date has examined whether this link is also observed at the *individual* level. Finally, no evidence thus far speaks to whether brilliance-related beliefs relate to parents' and mentors' attitudes toward *their own* children and mentees, respectively. Finding such a relation would highlight one of the more insidious ways in which brilliance-related beliefs contribute to differential outcomes for girls and boys.

More generally, the knowledge we gain from studying gender bias in chess has the potential to enhance our understanding of the root causes of gender inequities in other fields where intellectual ability is valued, such as science, technology, engineering, and mathematics (STEM). It is widely recognized that the disparities observed among adults in these contexts can be attributed, at least in part, to factors that originate in childhood experiences (e.g., Cheryan et al., 2015; Heck et al., 2021). Given the shared emphasis on intellectual ability and the similar early decline in girls' interest and participation, chess—with its smaller population and wealth of publicly available data (e.g., Elo ratings)—could serve as a valuable "model domain" (similar to how biologists use "model organisms") for understanding the complex dynamics that contribute to gender gaps in STEM.

The Present Research

In the present study, we investigated the presence and extent of gender bias within the chess community. Specifically, we focused on whether parents and mentors demonstrate bias against the female youth players in their lives. Our sample consisted of parents and mentors who were affiliated with U.S. Chess Federation. Participants were asked to evaluate their chess-playing children (for parents) and mentees (for mentors) on several dimensions such as their potential and inherent ability; participants also reported how much they invest in these youth players (e.g., parents reported how much they would be willing to pay for lessons). By revealing parents' and mentors' perceptions and degree of investment in female versus male youth players, this research has implications for promoting gender equity in not only chess but also other domains of activity that are culturally associated with intellectual ability.

Method

Open and Transparent Scientific Practices

The hypotheses, methods, exclusion criteria, and analyses of this study were preregistered on AsPredicted.org: https://aspredicted.org/m8wg3.pdf. The data reported here were part of a larger project. The other components of this project, which are also described in the preregistration, will be reported separately, along with data from ongoing investigations. Any deviations from the preregistered plan are marked transparently below. The raw data and analytic scripts are shared on the Open Science Framework (OSF): https://osf.io/t3f7g/?view_only=82527dc0248e44729443c109b3721c82.

Participants

A total of 325 parents and/or mentors of chess players were recruited through two emails sent to a mailing list for members of the U.S. Chess Federation (also known as U.S. Chess or formally as USCF). U.S. Chess is the main organizing body of rated chess tournaments in the United States. One must be a U.S. Chess member to play in a U.S. Chess-rated tournament, but not all members play chess competitively. Of the parents and mentors who responded to our invitation, 39 were excluded due to preregistered criteria (namely, they did not complete at least half of the items in the FABs or "brilliance = men" stereotype measures; see below), resulting in a final sample size of 286 participants (248 men, 25 women, 2 nonbinary, 11 unreported). The gender balance in our sample (90.6% men) was similar to that of the U.S. Chess members mailing list (90.2% men), as reported in the most recent US Chess Federation Membership Survey (2016). (The percentage of women *members* in U.S. Chess, 9.4%, is slightly lower than the percentage of girl and women *players*, 14%, because players tend to skew younger than members, and the chess community becomes increasingly male-dominated the later in life one looks.)

We preregistered a sample size of at least 1,000 participants for the larger project that these data are part of. We reached this target sample size ($N = 1{,}234$). Here, however, we focus specifically on the subset of participants who were parents and/or mentors of chess players. A sensitivity analysis conducted on the total number of children and mentees rated by the 286 participants in our final analytic sample ($N = 654$ youth players; see below) indicated that we had 80% power to detect a within-participant difference (two-tailed, $\alpha = .05$) between female and male youth players as small as $d = 0.11$ (Faul et al., 2007).

Procedure

Participants received an email through the U.S. Chess mailing list and were invited to complete an online survey about the "factors that are important to success in chess" (see Section 1 in the online supplemental materials for the full text of the invitation email). We did not mention gender in our invitation email to avoid overrecruiting U.S. Chess members who are concerned about the gender imbalance in chess. The invitation email was signed "The Chess Survey Research Team" to avoid connecting the study with the researchers conducting it, whose identities could be used to infer that the goal of the research pertained to gender. A reminder email was sent approximately 1 week later.

Participants indicated whether they were a parent of a chess player ($n = 124$), mentor of a chess player ($n = 98$), or both ($n = 64$). Here, we refer to anyone who indicated that they coached or mentored a youth chess player as a "mentor." Mentors were paid or unpaid individuals who provided direct chess instruction to chess players.

If a participant was a *parent* of a chess player ($n_{\text{parents}} = 178$; $M_{\text{age}} = 54.4$ years; $SD_{\text{age}} = 11.8$ years; 150 men, 21 women, 7 unreported), regardless of whether the player was U.S. Chess-affiliated or otherwise, they were asked how many of their children play chess. Participants were allowed to indicate between one and three children ($n_{\text{children}} = 229$; $M_{\text{age}} = 19.0$ years; $Mdn_{\text{age}} = 17$ years; $SD_{\text{age}} = 10.0$ years; 175 males, 54 females). We set the maximum at three to keep the study at a reasonable length for participants, who subsequently had to answer a number of questions about each child (see below). An additional three gender-nonbinary children were reported by parents; due to the small size of the nonbinary group, it was not included in analyses comparing gender groups.

If a participant was a *mentor* of a chess player ($n_{\text{mentors}} = 156$; $M_{\text{age}} = 54.7$ years; $SD_{\text{age}} = 15.4$ years; 144 men, 7 women, 2

nonbinary, 3 unreported), regardless of whether the player was U.S. Chess-affiliated or otherwise, they were asked how many chess mentees they had. If they indicated that they had more than three mentees, they were asked to only think about the three players they gave lessons to most recently. This criterion of recent (e.g., vs. best) players was used to maximize the probability that we would capture a random sample of mentees. In addition, this criterion was gender-neutral and thus avoided drawing mentors' attention to our focus on gender. The maximum number of mentees was set at three again, for the same reasons as for parents. Mentors then responded to questions (detailed below) evaluating each of their mentees one at a time ($n_{\text{mentees}} = 425$; $M_{\text{age}} = 21.8$ years; $Mdn_{\text{age}} = 15$ years; $SD_{\text{age}} = 17.2$ years; 353 males, 72 females). There was one additional gender-nonbinary mentee who was not included in our analytic sample. If a participant was both a parent and a mentor ($n = 64$), they answered questions as a parent about their children before answering questions as a mentor about their mentees.

After evaluating youth players, parents were asked to report whether or not they had any children who did not play chess. If they did, they were asked to report those children's gender, age, and indicate the reason(s) why they did not play chess: too young to play chess, not interested in chess, low chess ability, and/or other. Parents were more likely to report that their sons (vs. daughters) did not play chess because they were too young and that their daughters (vs. sons) did not play chess because of low interest or ability (see Section 7 in the online supplemental materials for more details).

After answering questions about youth chess players (and nonplayers, for parents), all participants reported their FABs about chess and their "brilliance = men" stereotypes about chess. Participants were also asked to report the extent to which they perceived the broader chess community to endorse these beliefs. The order of questions within blocks (e.g., participants' own FABs) was randomized, and the order of the blocks was fixed: Participants first responded to all questions about their own endorsement of FABs, then they indicated their estimation of the chess community's FABs, then their own endorsement of "brilliance = men" stereotypes, and finally their estimation of the chess community's "brilliance = men" stereotypes.

After completing the survey, participants were debriefed. The median completion time was 21 min. We compensated the first 100 participants with a $10 Amazon gift card. All participants were told at the outset about this selection procedure for receiving compensation.

Measures

Parents and mentors were asked to (a) evaluate youth players on several dimensions (e.g., potential), (b) evaluate several reasons why youth players might drop out of chess (e.g., lack of ability), and (c) report how much they invest in their youth players. These sets of questions were asked in one of two random orders. Before detailing these measures, we articulate the logic of our investigation of gender bias.

The Logic of the Present Investigation of Gender Bias

In principle, parents and mentors could evaluate male (vs. female) youth players more positively for any number of reasons, only some of which would speak to gender bias. For example, if we asked participants whether male youth players have higher ratings on average, the vast majority would answer "yes" because that is the current reality in chess. (Indeed, this was true in our sample as well.) However, a participant who reports this reality is not necessarily biased against female players. For this reason, we worded our questions to as much as possible bypass the current reality in chess and instead gauge whether parents and mentors believe girls could in principle achieve at the same levels in chess as boys. We generated a range of questions that have this property. For example, we asked about players' ultimate *potential* under the assumption that they continue playing chess (to block the possible assumption that girls drop out earlier). Similarly, we asked about players' *inherent* ability and interest in chess, which presumably do not reduce to their current rating only. We also asked participants to reason about hypothetical scenarios: If a player were to drop out of chess, would their ability be the primary reason? Again, the answer to this question requires a broader, holistic judgment about a player's potential and trajectory, not merely a "readout" of their current skill.

Evaluations of Youth Players

All participants responded to a series of questions eliciting their evaluations of youth players. These questions were the same for parents evaluating their children and mentors evaluating their mentees. The only slight variations in wording occurred depending on whether the youth were still competing in chess, had never competed, or had competed at some point but stopped. When providing examples below, we use the wording for youth still competing in chess. The notes for Table 1 and Section 2 in the online supplemental materials list all possible wordings.

Parents and mentors responded to four questions evaluating each youth chess player with respect to (a) the player's highest potential U.S. Chess rating, (b) the player's inherent chess ability, (c) the player's inherent interest in chess, and (d) how supportive the player's chess environment is (see Table 1 for full question wording). Whereas the first three questions examine parents' and mentors' *own* gender biases, the last question assesses whether parents and mentors *perceive* gender bias in the chess community. These questions were asked in one of two random orders.

Youth Players' Highest Potential U.S. Chess Rating. To assess parents' and mentors' perceptions of youth players' potential, we explicitly prompted them to think about the players' "chess potential" and then asked, "Assuming [child/mentee] continues with chess, what is the highest U.S. chess rating you think [child/mentee] could achieve in their chess career?" We asked participants to evaluate youth players' potential premised on the assumption that they "continue with chess" to minimize the possibility that participants' evaluations are contaminated by an expectation that girls would drop out of chess before boys. In our estimation, this addition makes the question a better means of gauging gender *bias* per se.

U.S. Chess ratings are based on match outcomes and are binned into classes at every 200 points. Participants responded on a scale from 1 = *100–399 (Class J or I)* to 13 = *Grandmaster*. All scale points except the lowest mapped onto a single rating class. We lumped together the two lowest rating classes into the lowest scale point because we reasoned that parents and mentees are unlikely to report that the highest rating a player could possibly achieve is in one of these classes.

Table 1
Chess Survey Items for Parents and Mentors of Chess Youth

Measure	Question wording	Scale endpoints
Evaluations of youth players	Assuming [child/mentee] continues with chess, what is the highest U.S. Chess rating you think [child/mentee] could achieve in their chess career?[a]	*100–399 (Class J or I)* (1), *Grandmaster* (13)
	How inherently interested in chess is [child/mentee]?	*Not at all interested* (0), *extremely interested* (100)
	What is [child/mentee]'s inherent chess ability?	*Very low ability* (0), *very high ability* (100)
	How supportive is [child/mentee]'s chess environment?	*Not at all supportive* (0), *extremely supportive* (100)
Reasons youth players drop out of chess	How responsible would each of the following be for [child/mentee]'s decision to stop playing chess competitively?[a] Lack of interest in chess Lack of chess ability Unsupportive chess environment	*Not at all responsible* (0), *completely responsible* (100)
Investment in youth players	How much do you pay (per hour) for private lessons for [child]?[c]	*Less than $30* (1), *$100 or more* (9)
	How often are the free private lessons for [child]?[c]	*Less frequently than once a month* (1), *more than once per week* (4)
	What is the largest amount you would be willing to pay per lesson for one hour, weekly chess lessons for [child]?[c]	*Less than $30* (1), *$100 or more* (9)
	How often do you typically travel for [child] to compete in U.S. Chess tournaments?[c]	*We do not travel* (1), *more than once a month* (6)
	What is the maximum amount you would be willing to travel for [child] to compete in U.S. Chess tournaments?[c]	*I would not be willing to travel* (1), *more than once a month* (6)
	Even though you are paid to give private lessons for [mentee], have you ever provided unpaid mentorship? For example, an extra free lesson before a tournament?[b,d]	*Never* (0), *frequently* (100)
	Do you encourage [mentee] to play in U.S. Chess Federation tournaments?[d]	*Never* (0), *frequently* (100)
	Do you suggest additional resources to improve [mentee]'s chess knowledge?[d]	*Never* (0), *frequently* (100)
	In lessons, how often do you present [mentee] with positions that you thought were beyond their ability to solve?[d]	*Never* (0), *frequently* (100)
	How invested are you in [mentee]'s chess playing?[d]	*Not at all* (0), *extremely* (100)
	How proud are you that [mentee] is your mentee?[d]	*Not at all* (0), *extremely* (100)
	Do you think that [mentee] has the potential to outgrow you?[d]	*Definitely no* (0), *definitely yes* (100)

Note. The list of the questions above contains the questions that parents and mentors responded to about their children and mentees, respectively. There were two question orders, randomized across participants. The first is as above: evaluations of youth players, reasons youth players drop out of chess, and investment in youth players. The second is as follows: investment in youth players, evaluation of youth players, and the reasons youth players drop out of chess. Participants saw all questions about one youth player before responding to the questions for other youth players (in the same order).
[a] These questions were asked in different ways depending on the child/mentee's current chess status. The table displays the question wording for children/mentees who were competing in tournaments, but the wording was different if the child/mentee had never played chess competitively or had stopped playing chess competitively. For potential: "Assuming [child/mentee] starts competing in U.S. Chess tournaments, what is the highest U.S. Chess rating you think [child/mentee] could achieve in their chess career?" and "Assuming [child/mentee] started competing in U.S. Chess tournaments again, what is the highest U.S. Chess rating you think [child/mentee] could achieve in their chess career?", respectively. For reasons to drop out of chess: "How responsible would each of the following be for [child/mentee]'s decision to never play chess competitively?" and "How responsible were each of the following for [child/mentee]'s decision to stop playing chess competitively?", respectively. [b] The table displays the question wording for mentors who were paid. Mentors who only provided unpaid mentorship responded to the following question: "You indicated that you are not paid to give chess lessons to [mentee]. Have you ever provided [mentee] extra mentorship?" [c] These questions were only asked of parents about their investment in their children. [d] These questions were only asked of mentors about their investment in their mentees.

Youth Players' Inherent Ability in Chess. To assess parents' and mentors' perceptions of youth players' inherent chess ability, we asked, "What is [child/mentee]'s inherent chess ability?" Participants responded on a scale from 0 = *very low ability* to 100 = *very high ability*. We asked participants to evaluate youth players' *inherent* ability to discourage them from responding on the basis of players' current chess skill, which would not necessarily speak to gender *bias* and would also introduce substantial noise in our estimates (e.g., younger players know less than older players).

Youth Players' Inherent Interest in Chess. To assess parents' and mentors' perceptions of youth players' level of interest in chess, we asked, "How inherently interested in chess is [child/mentee]?" Participants responded on a scale from 0 = *not at all interested* to 100 = *extremely interested*. The use of the adjective *inherent* was motivated by similar reasons as above.

Supportiveness of Youth Players' Chess Environment. To assess parents' and mentors' perceptions of how supportive the chess environment is for youth players, we asked, "How supportive is [child/mentee]'s chess environment (e.g., sufficient mentorship, friends who are supportive, a positive atmosphere in chess tournaments)?" Participants responded on a scale from 0 = *not at all supportive* to 100 = *extremely supportive*. To reiterate, lower scores for female (vs. male) youth on this measure indicate stronger *perceptions* of bias in

the community, not stronger bias on the part of the participants themselves.

Reasons Youth Players Drop Out of Chess

Most youth players drop out of chess before they reach adulthood (e.g., FIDE International Chess Federation, 2015), so it is important to understand how parents and mentors think about the reasons why girls and boys drop out. Specifically, we assessed the extent to which parents and mentors agreed with three potential reasons why youth players would (or did) drop out of chess: (a) a lack of chess ability, (b) a lack of chess interest, and (c) an unsupportive chess environment. Participants rated how responsible these three reasons were for player dropout on a scale from 0 = *not at all responsible* to 100 = *completely responsible*. These questions were the same for both parents evaluating their children and mentors evaluating their mentees. Whereas the first two questions examine parents' and mentors' *own* gender biases, the last question assesses whether parents and mentors *perceive* gender bias in the chess community. They were asked in one of two random orders.

Investment in Youth Players

All participants responded to a series of questions about their investment in youth players. Because parents' investment in their children often takes a different form from mentors' investment in their mentees, we asked different questions of parents and mentors. Within each set, the questions were asked in one of two random orders.

Parents. Parents responded to five questions about chess lessons and U.S. Chess tournament travel (e.g., "What is the largest amount you would be willing to pay per lesson for one hour, weekly chess lessons for [child]?"; see Table 1 for all questions and scale endpoints). As preregistered, we conducted dimension reduction analyses on these different aspects of investment. A parallel analysis (Horn, 1965) indicated that the items measuring parents' investment should be grouped into two components (see Section 5 in the online supplemental materials): Lesson frequency, current tournament travel, and potential tournament travel loaded onto the first component, while current money spent on lessons and potential money spent on lessons loaded onto the second component. Because these factor groupings corresponded to the response format of the questions (i.e., the questions with time intervals vs. monetary amounts as response options loaded onto different factors) rather than being theoretically informative, we deviated from our preregistration and averaged all the items together to create our parent investment measure ($\alpha = .58$). The items were standardized before averaging to bring them on the same scale. Analyses with the two separate component scores are largely consistent with the results reported here (see Table S12 in the online supplemental materials for full model outputs).

Mentors. Mentors responded to seven questions about their current and potential investment in their mentees' chess playing (e.g., "Do you suggest additional resources to improve [mentee]'s chess knowledge?"; see Table 1 for all questions and scale endpoints). Mentors responded to all investment questions on a scale from 0 (e.g., *never*) to 100 (e.g., *frequently*). A parallel analysis indicated that there was one underlying component of mentors' investment (see Section 5 in the online supplemental materials; $\alpha = .76$). As preregistered, we averaged these items into a mentor investment composite.

Field-Specific Ability Beliefs

All participants responded to questions assessing their FABs about chess—that is, the extent to which they thought that brilliance is required to be successful in chess. This four-item measure was adapted from Leslie et al. (2015) by replacing mentions of academic fields with mentions of chess (e.g., "Being a Chess Master requires a special aptitude that just can't be taught"; see Section 2 in the online supplemental materials for all items). Participants reported their own FABs about chess ($\alpha = .75$) and the FABs that they perceive the broader chess community to have ($\alpha = .72$). We considered combining these two measures, but their correlation did not meet our preregistered criterion ($r_{observed} = .12 < r_{preregistered} = .50$). We had not preregistered a contingency plan, so we decided to use participants' own FABs for the analyses reported in the main text and included the results with the community's FABs in Section 3 in the online supplemental materials; the latter results were similar to those reported in the main text.

"Brilliance = Men" Stereotype

All participants responded to questions assessing their "brilliance = men" stereotype about chess. This eight-item measure was adapted from Bian et al. (2018) by including mention of chess in all items. For instance, participants indicated their agreement with the statement, "Extreme chess brilliance is more common in men than in women" on a scale from 1 = *strongly disagree* to 7 = *strongly agree* (see Section 2 in the online supplemental materials for all items). Participants reported their own "brilliance = men" stereotypes ($\alpha = .90$) and also estimated the chess community's "brilliance = men" stereotypes ($\alpha = .92$). We again did not combine these two measures because their correlation did not meet our preregistered criterion ($r_{observed} = .30 < r_{preregistered} = .50$). Thus, we used participants' own "brilliance = men" stereotypes for the analyses reported in the main text and included the results with the community's "brilliance = men" stereotypes in Section 3 in the online supplemental materials; the latter results were similar to those reported in the main text.

Analytic Strategy

We used linear mixed-effects regressions to analyze our data. All analyses had the following predictor variables unless otherwise specified: participants' FABs, their "brilliance = men" stereotypes, the youth players' gender (*man/boy* = 0, *woman/girl* = 1), whether the participant is evaluating as a parent or mentor (*parent* = 0, *mentor* = 1), and all interaction terms. We included a random intercept for participant in all models. All predictor variables were mean-centered to facilitate the interpretation of lower-order effects. Participant-level predictors (FABs, "brilliance = men" stereotypes) were mean-centered at the participant level. Youth player-level predictors (player gender, the participant's relationship to the player) were mean-centered at the observation level. The mixed-effects models were computed with the package *lme4* Version 1.1.28 (Bates et al., 2015) in R Version 4.0.5 (R Core Team, 2021). The means reported below are all marginal means from these models. All marginal means and tests were calculated using Stata 17.0 (StataCorp, 2021).

We preregistered that we would analyze parents' and mentors' responses in separate regressions. However, because the samples of parents and mentors were each smaller than anticipated, we included both groups in the same analysis to maximize power. To

investigate potential differences between these groups, we included in our mixed-effects model a variable corresponding to the parent versus mentor distinction (*parent* = 0, *mentor* = 1), as well as its interactions with the other variables, as outlined above.

We include analyses with additional covariates (namely, participant and youth player age, participant and youth player U.S. Chess rating, and participant gender) in the online supplemental materials (see Tables S4–S7 in Section 4). These additional analyses are largely consistent with the results reported below, but only 52% of our observations had nonmissing values of all these covariates, reducing the sample size and therefore our statistical power.

All coefficients for all models can be found in Tables 2–4. Given the large number of coefficients in these models, in the Results section, we describe only the findings involving youth player gender, which allow us to examine gender bias in evaluations and investment, and the interactions of youth gender with FABs and/or "brilliance = men" stereotypes, which allow us to examine how these brilliance-related beliefs moderate gender bias.

To facilitate comparison across dependent variables and as a measure of effect size, we additionally provide standardized coefficients. That is, we standardized the continuous predictors and dependent variables (but not the dichotomous variables—namely, youth gender and adults' role as parents vs. mentors). With this scaling, the coefficients of FAB and "brilliance = men" stereotypes can be interpreted as the fraction of a *SD* by which the dependent variable changed in response to a 1 *SD* increase in the relevant predictor variable. The coefficients of dichotomous variables (e.g., youth gender) can be interpreted as an approximate equivalent to Cohen's *d*s (e.g., Robinson & Lubienski, 2011).

Results

Evaluations of Youth Players

We first ask whether parents' and mentors' evaluations of youth players show gender bias with respect to (a) the highest potential U.S. Chess rating players could achieve, (b) players' inherent chess ability, (c) players' inherent interest in chess, and (d) how supportive players' chess environment is. If parents and mentors evaluate female youth players as having lower potential U.S. Chess ratings, lower inherent chess ability, and/or lower inherent chess interest than male players, that would suggest they exhibit gender bias. In contrast, if parents and mentors report that their female (vs. male) players have a less supportive environment, that would suggest that participants *perceive* more bias against female (vs. male) youth players. Given the discrimination and harassment that many women players anecdotally report (Beck, 2019; Gillet, 2022; Hadden, 2020; Ingle, 2021; Meirom & Shahade, 2019), we expect parents and mentors to at least perceive gender bias in the community, whether or not they show it themselves. Finally, we predict that participants with more brilliance-oriented FABs about chess and/or who more strongly endorse the "brilliance = men" stereotype with respect to chess will have more gender-biased evaluations of youth players.

Evaluation: Highest Potential U.S. Chess Rating

Parents and mentors thought female youth players' highest potential U.S. Chess rating was lower than male youth players', $b = -0.74$, $SE = 0.21$, $p < .001$ (see Table 2 for full model output). This difference amounts to 0.32 *SD*s. Parents' and mentors' bias was moderated by their FABs about chess, $b = -0.21$, $SE = 0.09$, $p = .029$, $\beta = -0.21$ (see Figure 1). For parents and mentors with more brilliance-oriented FABs (1 *SD* above the average FAB), there was a 0.53 *SD* gap in the evaluation of youths' chess potential favoring male ($M = 8.93$) over female ($M = 7.72$) youth players ($p < .001$). Roughly, this difference translates into an advantage of 1 rating bracket for male versus female players. In contrast, among parents and mentors with less brilliance-oriented FABs (1 *SD* below the average FAB), there was only a 0.12 *SD* gap in the evaluation of youths' chess potential favoring male ($M = 9.45$) over female ($M = 9.19$) youth players ($p = .36$).

It is important to consider whether parents and mentors who thought that brilliance was important in chess *overestimated* boys' highest potential rating or *underestimated* girls' highest potential rating. The means above, as well as the overall shape of the FAB × Player Gender interaction depicted in Figure 1, suggest underestimation of female youth players: The estimate of girls' highest potential rating by parents and mentors with brilliance-oriented FABs was the "odd one out"—it stood out as particularly low compared to boys' estimated highest potential rating (regardless of their parents' and mentors' FABs) and the estimate of girls' highest potential rating by parents and mentors who were low in brilliance-oriented FABs. If, hypothetically, boys' potential had been overestimated by parents and mentors with brilliance-oriented FABs, this estimate should have stood out as particularly high relative to the others, but this is not what we observed.

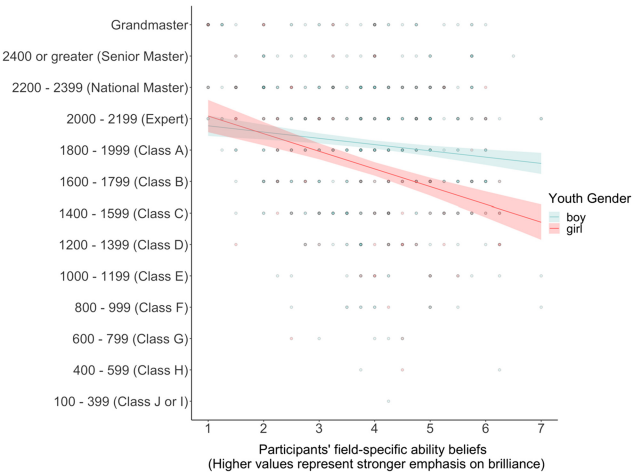
In summary, parents and mentors, on average, thought that girls and young women have lower chess potential than boys and young men. This devaluation of girls' potential was particularly pronounced for parents and mentors who believed that brilliance is required to be good at chess.

Evaluation: Inherent Chess Ability

Parents and mentors did not evaluate female and male youth players' inherent chess ability as being different (see Table 2 for full

Figure 1

Participants' Evaluations of Youth Players' Chess Potential



Note. Parents' and mentors' evaluations of youth players' highest potential U.S. Chess rating. Lines are predicted means, ribbons are *SE*s, and circles represent individual evaluations of youth players. See the online article for the color version of this figure.

Table 2
Linear Mixed-Effects Regressions: Participants' Evaluations of Youth Players' Potential, Ability, Interest, and Environment

	Potential			Ability			Interest			Environment		
Predictor	Estimate	*SE*	*p*	Estimate	*SE*	*p*	Estimate	*SE*	*p*	Estimate	*SE*	*p*
Intercept	9.05	0.12	<.001	69.96	1.04	<.001	67.68	1.17	<.001	71.43	1.29	<.001
Girl (*girl* = 1, *boy* = 0)[a]	−0.74	0.21	**.001**	−2.56	2.08	.219	−1.80	2.53	.477	−1.40	2.16	.440
FAB	−0.27	0.10	**.006**	0.03	0.81	.967	−0.08	0.92	.928	−0.82	1.06	.642
B = M	−0.21	0.09	**.018**	−2.32	0.75	**.002**	−0.92	0.85	.281	−0.46	0.99	.999
Mentor (*mentor* = 1, *parent* = 0)[a]	−0.29	0.18	.113	−2.05	1.74	.239	7.25	2.08	**.001**	−7.68	2.16	**<.001**
Girl × FAB	−0.36	0.16	**.029**	−0.02	1.61	.988	−1.92	1.95	.326	−1.30	1.68	.440
Girl × B = M	0.06	0.14	.657	−1.60	1.41	.257	−3.44	1.70	**.043**	2.38	1.45	.103
FAB × B = M	0.11	0.06	.064	−0.34	0.52	.517	−1.79	0.59	**.003**	−0.10	0.68	.881
Girl × Mentor	−0.27	0.42	.526	−0.22	4.14	.957	6.69	5.02	.183	12.35	4.31	**.004**
FAB × Mentor	−0.02	0.15	.876	−2.16	1.41	.125	−5.18	1.69	**.002**	2.54	1.75	.146
B = M × Mentor	0.01	0.13	.918	0.75	1.24	.543	3.61	1.48	**.015**	0.28	1.53	.854
Girl × FAB × B = M	0.05	0.09	.534	−0.14	0.87	.872	−0.27	1.05	.799	−0.29	0.90	.748
Girl × FAB × Mentor	0.18	0.32	.573	−1.24	3.20	.698	2.75	3.91	.481	−5.03	3.32	.130
Girl × B = M × Mentor	−0.09	0.27	.728	1.84	2.67	.491	−1.49	3.24	.647	0.09	2.75	.973
FAB × B = M × Mentor	0.09	0.09	.346	0.08	0.87	.926	−0.54	1.05	.603	0.20	1.09	.857
Girl × FAB × B = M × Mentor	−0.02	0.18	.921	−1.39	1.76	.429	−1.43	2.15	.506	−4.82	1.82	**.008**
	SD			*SD*			*SD*			*SD*		
Participant random intercept	1.52			11.02			11.00			16.08		
N	269			268			269			267		
Observations	652			650			652			651		
Marginal R^2/conditional R^2	.090/.511			.044/.328			.075/.271			.037/.500		

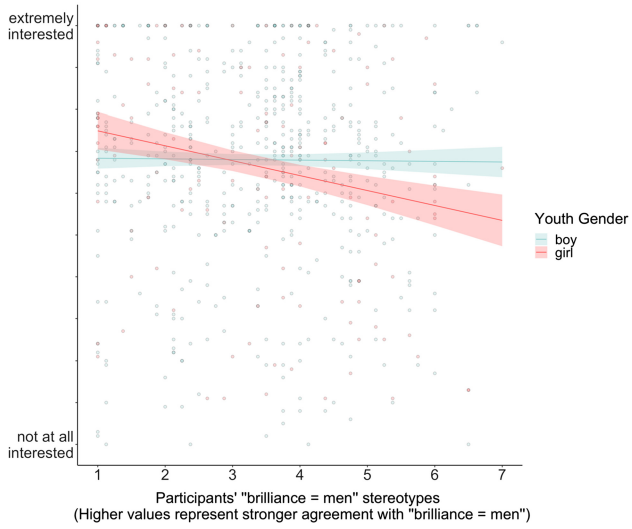
Note. Estimates (with *SE*s and *p* values) and goodness-of-fit statistics for the four separate linear mixed-effects models regressing parents' and mentors' evaluations of youth players' potential U.S. Chess rating, inherent chess ability, inherent chess interest, and environment, respectively, on the youth player's gender (*girls* = 1, *boys* = 0), participants' field-specific ability beliefs (FAB), participants' "brilliance = men" stereotype (B = M), participants' relationship to the youth player (*mentors* = 1, *parents* = 0), and all interactions. All variables are mean-centered to facilitate interpretation of lower order effects. Bolded *p* values indicate statistical significance ($p < .05$); we did not use bolding for the intercepts.
[a] Dichotomous variables were mean-centered, as were all other variables.

model output). It is interesting to consider the contrast between this result and the evidence just described that parents and mentors estimate the highest rating a youth player could achieve in their career to be lower for female (vs. male) players. Perhaps parents and mentors perceive more barriers to success for female than male youth players, which would constrain female youth players' highest potential. We return to this explanation when we discuss participants' perceptions of bias below.

Evaluation: Inherent Chess Interest

We found a significant interaction between youth players' gender and participants' endorsement of the "brilliance = men" stereotype predicting participants' evaluations of players' inherent interest in chess, $b = -3.44$, $SE = 1.70$, $p = .043$, $\beta = -0.20$ (see Table 2 for full model output and Figure 2 for visualization). For parents and mentors who more strongly endorsed the notion that men (vs. women) are brilliant at chess (1 *SD* above the average "brilliance = men" stereotype), there was a 0.27 *SD* gap in interest ratings favoring male ($M = 67.7$, on a scale from 0 = *not at all interested* to 100 = *extremely interested*) over female ($M = 61.0$) youth players ($p = .054$). In contrast, parents and mentors who were more gender-equitable in their views of chess ability (1 *SD* below the average "brilliance = men" stereotype) evaluated the female and male youth players as having a similar inherent interest in chess (*M*s = 71.4 and 68.4, respectively; a 0.12 *SD* difference favoring girls, $p = .37$). The shape of this interaction again suggests that girls' interest was underestimated (vs. boys' interest being overestimated) at higher levels of the "brilliance = men" stereotype. In summary, parents and mentors who more strongly endorsed a "brilliance = men" stereotype about chess also underestimated female (vs. male) youth players' inherent chess interest.

Figure 2
Participants' Evaluations of Youth Players' Inherent Chess Interest



Note. Parents' and mentors' evaluations of youth players' inherent chess interest. Lines are predicted means, ribbons are *SE*s, and circles represent individual evaluations of youth players. See the online article for the color version of this figure.

Table 3
Linear Mixed-Effects Regressions: Participants' Endorsement of Reasons Why Youth Players Would Drop Out of Chess

Predictor	Drop out due to lack of ability			Drop out due to lack of interest			Drop out due to lack of supportive environment		
	Estimate	*SE*	*p*	Estimate	*SE*	*p*	Estimate	*SE*	*p*
Intercept	34.64	1.54	<.001	55.76	1.72	<.001	43.72	1.87	<.001
Girl (*girl* = 1, *boy* = 0)[a]	4.41	2.79	.115	4.65	3.03	.125	−0.03	3.01	.993
FAB	1.73	1.21	.153	−0.51	1.35	.706	0.26	1.47	.859
B = M	2.41	1.12	**.032**	0.72	1.25	.566	−0.75	1.35	.579
Mentor (*mentor* = 1, *parent* = 0)[a]	7.36	2.41	**.002**	−3.94	2.61	.131	7.02	2.65	**.008**
Girl × FAB	1.72	2.17	.429	2.06	2.34	.379	−4.21	2.34	.072
Girl × B = M	0.97	1.89	.606	3.01	2.04	.141	−0.98	2.02	.630
FAB × B = M	0.44	0.77	.566	2.59	0.86	**.003**	0.85	0.93	.362
Girl × Mentor	−2.12	5.55	.702	−8.96	6.02	.138	4.18	6.02	.487
FAB × Mentor	1.15	1.95	.554	3.07	2.10	.144	1.47	2.14	.492
B = M × Mentor	−1.40	1.70	.410	2.23	1.83	.224	−1.48	1.86	.425
Girl × FAB × B = M	−0.34	1.16	.773	−0.85	1.25	.497	−1.11	1.25	.372
Girl × FAB × Mentor	8.71	4.27	**.042**	−6.79	4.62	.143	8.04	4.61	.082
Girl × B = M × Mentor	−5.74	3.56	.107	4.09	3.85	.289	−1.02	3.82	.791
FAB × B = M × Mentor	0.27	1.20	.822	−0.66	1.30	.614	3.79	1.32	**.004**
Girl × FAB × B = M × Mentor	−2.34	2.34	.318	0.97	2.53	.703	0.41	2.52	.870
		SD			*SD*			*SD*	
Participant random intercept		18.23			20.83			23.87	
N		268			269			267	
Observations		648			648			647	
Marginal R^2/conditional R^2		.057/.442			.047/.465			.042/.540	

Note. Estimates (with *SE*s and *p* values) and goodness-of-fit statistics for the three separate linear mixed-effects models regressing parents' and mentors' evaluations of youth players' reasons to drop out of chess on the youth player's gender (*girls* = 1, *boys* = 0), participants' field-specific ability beliefs (FAB), participants' "brilliance = men" stereotype (B = M), participants' relationship to the youth player (*mentors* = 1, *parents* = 0), and all interactions. All variables are mean-centered to facilitate interpretation of lower order effects. Bolded *p* values indicate statistical significance ($p < .05$); we did not use bolding for the intercepts.
[a] Dichotomous variables were mean-centered, as were all other variables.

Evaluation: Supportiveness of Chess Environment

Overall, participants did not rate the environment in chess as being less supportive for female (vs. male) youth players (see Table 2 for full model output). This result suggests that the overall lower ratings of chess potential for female (vs. male) players documented earlier were unlikely to be due to a perception that female (vs. male) players face greater barriers in chess.

However, we did find a significant interaction between youth players' gender and participants' relationship to the players (parents vs. mentors), $b = 12.35$, $SE = 4.31$, $p = .004$, $\beta = 0.53$. Mentors rated the chess environments of their female and male mentees as similarly supportive (Ms = 71.9 and 69.0, respectively, on a scale from 0 = *not at all supportive* to 100 = *extremely supportive*; a 0.13 *SD* difference favoring female mentees, $p = .28$). In contrast, parents thought that the chess environment was more supportive of their sons ($M = 76.7$) than their daughters ($M = 67.3$), a 0.40 *SD* difference ($p = .005$).

This two-way interaction was in turn qualified by participants' FABs and "brilliance = men" stereotypes (i.e., we observed a four-way interaction), $b = -4.82$, $SE = 1.82$, $p = .008$, $\beta = -0.38$. We include in Section 8 in the online supplemental materials a figure illustrating the pattern of results for interested readers, but we do not interpret this result further, both because we did not have any a priori predictions about four-way interactions and because our sample is modest enough in size that such a complex pattern of differences (involving small subsets of the data) might not be replicable.

Reasons Youth Players Drop Out of Chess

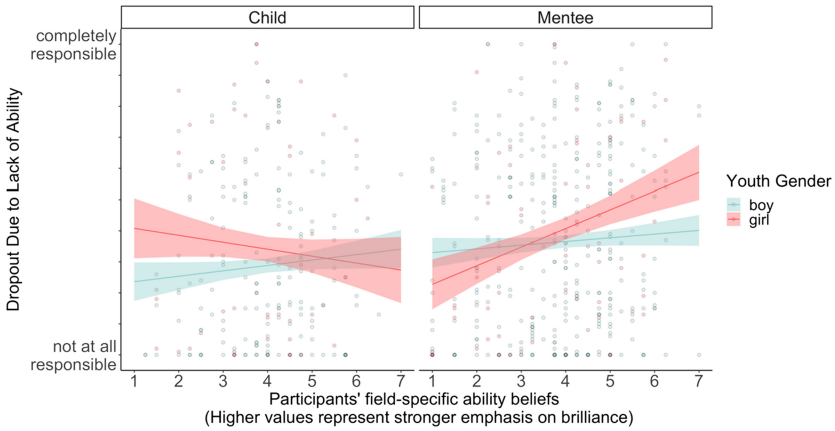
Parents' and mentors' explanations for why youth players would drop out of chess provide another window into their potential gender biases. We elicited parents' and mentors' agreement with three potential reasons why youth chess players might drop out of chess: lack of chess ability, lack of chess interest, and an unsupportive chess environment. If parents and mentors judge it more likely that female youth players drop out of chess due to a lack of ability or interest than male youth players, that would suggest they exhibit gender bias. In contrast, if parents and mentors judge it more likely that female players drop out of chess due to an unsupportive environment, that would suggest that they perceive gender bias in the chess community. With respect to moderators, we predict that participants with more brilliance-oriented FABs about chess and/or who more strongly endorse the "brilliance = men" stereotype with respect to chess will have more biased estimates of the reasons why female (vs. male) youth players would drop out of chess.

Reason for Dropping Out: Lack of Chess Ability

We first analyzed agreement with lack of ability as an explanation for youth players' dropping out of chess. We found a three-way interaction between youth player gender, participants' FABs, and participants' relationship to the youth (mentors vs. parents), $b = 8.71$, $SE = 4.27$, $p = .042$, $\beta = 0.39$ (see Table 3 for full

Figure 3

Participants' Evaluations of Youth Players' Likelihood of Dropping Out of Chess Due to Lack of Ability



Note. Parents' estimation of their children's (left panel) and mentors' estimation of their mentees' (right panel) likelihood of dropping out of chess due to lack of ability. Lines are predicted means, ribbons are *SE*s, and circles represent individual evaluations of youth players. On the *y* axis, higher values indicate that parents (left) and mentors (right) thought that ability was a more probable reason why youth players would drop out of chess. See the online article for the color version of this figure.

model output and Figure 3 for visualization). To interpret this interaction, we computed the simple slopes of FABs predicting agreement with lack of ability as a reason for player dropout separately for male and female youth players and for parents/children and mentors/mentees. The observed three-way interaction was due to the fact that only one slope out of these four was statistically significant: For *mentors* reasoning about *female* youth players, the more the mentors endorsed brilliance-oriented FABs about chess, the more they agreed that their female mentees would drop out due to lack of ability, $b = 6.00$, $SE = 2.56$, $p = .019$, $\beta = 0.27$. The other three slopes (i.e., the relation of FABs with parents' evaluations of their daughters and sons, and with mentors' evaluations of their male mentees) were not significant, *p*s $> .36$. In other words, more brilliance-oriented FABs exacerbated mentors' bias against their female mentees. Consistent with this interpretation, among mentors who endorsed brilliance-oriented FABs (1 *SD* above the mean), agreement with lack of ability as an explanation for female player dropout was approximately 10 points higher ($M = 48.0$ on a scale from 0 = *not at all responsible* to 100 = *completely responsible*) than the levels of agreement with this explanation, for either female or male player dropout, of any other (sub)group of participants.

Table 4

Linear Mixed-Effects Regressions: Parents' and Mentors' Investment in Youth Players

	Parents			Mentors		
Predictor	Estimate	*SE*	*p*	Estimate	*SE*	*p*
(Intercept)	−0.08	0.06	.145	66.45	1.45	<.001
Girl (*girl* = 1, *boy* = 0)[a]	−0.06	0.09	.475	−1.94	1.83	.290
FAB	−0.09	0.05	.063	−2.68	1.09	**.015**
B = M	−0.02	0.04	.640	−0.58	1.04	.580
Girl × FAB	0.03	0.08	.656	−1.02	1.35	.448
Girl × B = M	−0.09	0.05	.103	−1.04	1.28	.418
FAB × B = M	0.03	0.03	.322	−0.66	0.70	.347
Girl × FAB × B = M	0.03	0.04	.452	0.36	0.70	.607
	SD			*SD*		
Participant random intercept	0.68			15.65		
N	175			155		
Observations	229			425		
Marginal R^2/conditional R^2	.041/.882			.050/.706		

Note. Estimates (with *SE*s and *p* values) and goodness-of-fit statistics for the two separate linear mixed-effects models regressing parents' and mentors' investment in youth players on the youth player's gender (*girls* = 1, *boys* = 0), participants' field-specific ability belief (FAB), participants' "brilliance = men" stereotypes (B = M), and all interactions. All variables are mean-centered to allow for interpretation of lower order effects. Bolded *p* values indicate statistical significance ($p < .05$); we did not use bolding for the intercepts.

[a] Dichotomous variables were mean-centered, as were all other variables.

Reason for Dropping Out: Lack of Chess Interest

Parents and mentors did not think that lack of interest was differentially responsible for the dropout of female versus male youth players (see Table 3 for full model output).

Reason for Dropping Out: Unsupportive Chess Environment

Parents and mentors did not think that an unsupportive chess environment was differentially responsible for the dropout of female versus male youth players (see Table 3 for full model output). Notably, this result also speaks against the possibility that the lower ratings of chess potential for female (vs. male) players, described above, were due to a perception of greater bias against female (vs. male) players.

Investment in Youth Players

Parents' and mentors' bias against female youth players might also manifest in lower investment in these players (vs. their male counterparts). However, parents and mentors did not report investing differently in female versus male youth players (see Table 4 for full model output).[1]

Discussion

Despite long-standing attention to this issue, women and girls are still underrepresented in chess. Here, we examined how gender bias might contribute to this phenomenon. Specifically, we investigated whether parents and mentors—the adults with the power to guide youth players' chess careers and the motivation to accurately assess youth players' abilities—are biased against female youth players, as well as whether this bias is magnified by the beliefs that brilliance is required to succeed in chess and that men are more brilliant at chess than women.

Summary and Interpretation of Results

We uncovered evidence that parents and mentors devalue female (vs. male) youth players on some, but not all, of our measures. First, parents and mentors (90.6% men) thought that female youth players' highest potential rating was lower than male players'—a bias that was exacerbated among parents and mentors who believed that brilliance is required to succeed in chess. Second, mentors who endorsed (vs. rejected) this belief also reported that female mentees were more likely to drop out of chess due to low ability. A supplemental finding that is worth highlighting here is that when parents reported the reasons why some of their other children did not play chess, the only children for whom lack of ability was reported as a reason were six girls (out of 52 girls and 28 boys; see Section 7 in the online supplemental materials). Third, parents and mentors who endorsed a "brilliance = men" stereotype about chess perceived female (vs. male) youth players to be less interested in chess. At the same time, we did not find evidence of gender bias on several other measures, such as parents' and mentors' ratings of youth players' ability or their investment in youth players.

It is interesting to consider why parents and mentors reported that female youth players had lower potential but not lower ability. One interpretation of these seemingly contradictory results is that adults think female and male youth players are equally capable but anticipate more barriers for female youth players and as a result downgrade their estimate of these players' potential U.S. Chess rating. However, evidence for this interpretation was weak: Although parents did report that their daughters had a less supportive chess environment than their sons, mentors did not, and neither parents nor mentors thought that female (vs. male) players were more likely to drop out of chess due to an unsupportive environment. Therefore, it seems unlikely that the discrepancy between the questions about potential and ability is due to perceptions of gender bias.

Another, more plausible explanation for the underestimation of female (vs. male) players' potential but not ability is suggested by the fact that the question about potential uses a more objective metric than the question about ability: U.S. Chess ratings are based on tournament outcomes and are calculated in the same way for all players; in contrast, the standard for judging low versus high ability is murkier. Some parents and mentors may have compared female youth players' ability against that of other *female* players, resulting in inflated ability estimates ("she has very high chess ability—*for a girl*"). This shifting of the comparison group has been documented in other male-dominated domains (e.g., sports), where participants often show the expected gender bias on objective but not subjective questions (*shifting standards*; Biernat & Fuegen, 2001; Biernat & Manis, 1994; Biernat & Vescio, 2002). Further research is needed to test whether parents and mentors indeed shift their comparison group when evaluating female youth players' potential versus ability.

In addition to measuring parents' and mentors' own bias against female players, we measured their *perceptions* of bias through their evaluations of female (vs. male) players' environment. First-person reports from many women players (e.g., Beck, 2019; Gillet, 2022; Hadden, 2020; Ingle, 2021; Meirom & Shahade, 2019), as well as qualitative studies of youth playing chess in school (e.g., Galitis, 2002), suggest that the environment in chess is less welcoming to women than men. Perceiving the obstacles that female players face is a prerequisite to confronting and removing them. However, perceptions of gender bias were generally low among the parents and mentors in our sample. While parents showed some perception of bias on one measure, the preponderance of the evidence suggested that the adults in children's chess lives are unaware of or unwilling to see the barriers to female players' success.

Overall, the present research underscores the continued presence of gender bias among some parents and mentors in chess, as well as a potential blind spot for the obstacles that female youth players encounter, indicating a need for greater awareness and efforts to promote gender equity in this domain. By recognizing and addressing these biases, it may be possible to create a more inclusive and supportive environment for female players and, in the long run, reduce the gender imbalances in chess.

[1] Because many parents and mentors reported on their investment in *multiple* youth players, it is possible that they felt uncomfortable admitting publicly that they treat their children (for parents) or mentees (for mentors) differently. If so, we might see more gender bias if we look just at the *first* youth player participants reported on. However, the results do not meaningfully change when just looking at the first child (for parents) or mentee (for mentors) for whom participants reported their investment (see Section 9 in the online supplemental materials for further details).

Theoretical Contributions Beyond Chess

From a theoretical standpoint, the present findings contribute to theories of gender segregation. They are particularly relevant to the FAB account of this phenomenon, according to which contexts in which brilliance is prized are less conducive to women's participation, due in part to the prejudice that women encounter in these contexts (e.g., Bian et al., 2018; Hannak et al., 2023). First, it is noteworthy that no prior work tested the predictions of the FAB account in a leisure domain. The present evidence demonstrates the generalizability of the FAB model beyond formal settings such as education and employment to other contexts where brilliance is prized. Second, the present research is the first to identify a role for individual differences (rather than field-averaged differences) in beliefs about brilliance, underscoring the powerful role of these beliefs in perpetuating gender segregation across domains. Third, and consistent with the preceding point about the power of brilliance-related beliefs, the present evidence reveals that these beliefs shape attitudes *within the context of close personal relationships* (namely, parent–child and mentor–mentee relationships; see also Kirkcaldy et al., 2007), which one might naively assume to be immune from these biases. If even a parent's view of their child's chess potential, for instance, is influenced by cultural beliefs about brilliance in chess, it is reasonable to expect similar (or stronger) biases from others in the chess community who may be less familiar with the child (e.g., Rubinstein et al., 2018).

Another noteworthy finding relevant to the FAB framework was that brilliance-related beliefs related more strongly to parents' and mentors' view of female (vs. male) youth players (see Figures 1–3). This finding is consistent with prior work that finds, for example, that FABs are a stronger predictor of women's (vs. men's) career trajectories in academia (Hannak et al., 2023); that women's sense of being an "impostor" in their professional lives increases more steeply than men's as a function of their fields' emphasis on brilliance (Muradoglu et al., 2022); and that experimentally framing a job or internship as requiring brilliance undermines women's, but not men's, interest in that opportunity (Bian et al., 2018). A possible explanation for these parallels is that higher status individuals (in this case, men and boys) are more likely to act in accord with their own preferences and are less sensitive to information in their social environments (e.g., Guinote et al., 2012; Johnson & Lammers, 2012; Overbeck & Droutman, 2013). Interestingly, however, the present results also suggest that *perceptions* of higher status individuals are less likely to be modulated by social factors (in our case, cultural beliefs and stereotypes about brilliance).

Finally, we reiterate that studying chess can provide valuable insights into the underlying causes of gender disparities in other domains that value intellectual ability, such as STEM. Extrapolating from the present findings, it seems worthwhile to examine whether individual differences in brilliance-related beliefs about STEM relate to parents' and teachers' evaluations of their children's and students' potential in this domain, respectively, as well as to the degree of investment in youths' STEM success (e.g., paying for extra tutoring or other enrichment activities). While prior work has suggested that parents and teachers tend to endorse brilliance-related beliefs (including about mathematics; e.g., Heyder et al., 2020; Zhao et al., 2022), there is no research we are aware of that examines whether these beliefs shape attitudes within the context of parent–child and teacher–student relationships, as they seem to do in chess (but see Eccles et al., 1990). Exploring this question in future research seems worthwhile.

Limitations and Constraints on Generality

Regarding constraints on generality, one limitation of the present research is that we did not study a random sample of the U.S. Chess community. While the gender composition of our sample appears similar to that of the broader U.S. Chess community, it is unclear whether our sample matches this community in other respects. Thus, we cannot rule out the possibility of selection bias. However, we note that the ratings of female youth players in our study were provided by parents with chess-playing daughters and chess mentors with female mentees. As a result, it is possible we are *underestimating* the magnitude of gender bias in chess—the most biased individuals would likely discourage their daughters from taking up chess or decline to mentor girls in the first place, so they would be absent from among the participants who rated female youth players in our study.

Another constraint on generality is that all participants in this study were already parents and mentors of youth chess players who were invested enough in chess to be a part of U.S. Chess. Therefore, our sample consists of participants who are already connected to the chess community and have shown significant investment in young players' performance. It is possible that brilliance-related beliefs play a stronger role in the decision to initially engage with chess and/or at lower levels of the game, where parents are less invested in their children's chess lives. It is also an open question as to how parents with no children in chess estimate their girls' and boys' relative chess potential.

A notable limitation of this work is that our inferences about gender bias were necessarily indirect because we were not able to compare parents' and mentors' responses to an objective ground truth. For instance, we did not (and could not) have access to the *actual* highest future potential U.S. Chess rating of the youth players being evaluated, nor did we have a measure of how supportive the chess environment *actually* was for these individuals. As a result, we cannot completely rule out the possibility that parents' and mentors' responses were accurate. However, considering the lack of compelling evidence supporting inherent, biological sex/gender differences related to chess performance (e.g., Burgoyne et al., 2016; Frydman & Lynn, 1992; Waters et al., 2002) and the numerous testimonials from top female players about the toxic nature of the chess environment for women (e.g., Beck, 2019; Gillet, 2022; Hadden, 2020; Ingle, 2021; Meirom & Shahade, 2019), we argue that the most plausible interpretation of the present findings is that they indeed reveal gender bias among some parents and mentors, as well as a blind spot for the structural obstacles in the way of female youth players' success in chess.

Conclusion

To conclude, the present research provides initial evidence that the most important adults in young chess players' lives—their parents and mentors—think that female youth players have less potential than male youth players. This bias was especially pronounced when parents and mentors believed that success in chess requires brilliance. The present results highlight the value of investigating how the chess community itself contributes to the underrepresentation of girl and women players. More broadly, studying gender bias in chess has the potential to enhance our understanding of gender inequities in fields such as STEM, as chess serves as a valuable model domain for exploring the dynamics contributing to gender gaps.

References

Baasanjav, U. B. (2017). "A girl move": Negotiating gender and technology in chess online and offline. In *Discrimination and diversity: Concepts, methodologies, tools, and applications* (pp. 1450–1463). IGI Global.

Backus, P., Cubel, M., Guid, M., Sanchez-Pages, S., & Manas, E. (2016). *Gender, competition and performance: Evidence from real tournaments* (IEB Working Paper 2016/27). https://doi.org/10.2139/ssrn.2858984

Bates, D., Maechler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, *67*(1), 1–48. https://doi.org/10.18637/jss.v067.i01

Beck, J. (2019, September 13). *Befriending the queen of chess*. *The Atlantic*. https://www.theatlantic.com/family/archive/2019/09/female-chess-masters-talk-sexism-and-friendship/598003/

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., & Cimpian, A. (2018). Evidence of bias against girls and women in contexts that emphasize intellectual ability. *American Psychologist*, *73*(9), 1139–1153. https://doi.org/10.1037/amp0000427

Biernat, M., & Fuegen, K. (2001). Shifting standards and the evaluation of competence: Complexity in gender-based judgment and decision making. *Journal of Social Issues*, *57*(4), 707–724. https://doi.org/10.1111/0022-4537.00237

Biernat, M., & Manis, M. (1994). Shifting standards and stereotype-based judgments. *Journal of Personality and Social Psychology*, *66*(1), 5–20. https://doi.org/10.1037/0022-3514.66.1.5

Biernat, M., & Vescio, T. K. (2002). She swings, she hits, she's great, she's benched: Implications of gender-based shifting standards for judgment and behavior. *Personality and Social Psychology Bulletin*, *28*(1), 66–77. https://doi.org/10.1177/0146167202281006

Bilalić, M., McLeod, P., & Gobet, F. (2007). Personality profiles of young chess players. *Personality and Individual Differences*, *42*(6), 901–910. https://doi.org/10.1016/j.paid.2006.08.025

Bilalić, M., Smallbone, K., McLeod, P., & Gobet, F. (2009). Why are (the best) women so good at chess? Participation rates and gender differences in intellectual domains. *Proceedings of the Royal Society B: Biological Sciences*, *276*(1659), 1161–1165. https://doi.org/10.1098/rspb.2008.1576

Blanch, A., Aluja, A., & Cornadó, M. P. (2015). Sex differences in chess performance: Analyzing participation rates, age, and practice in chess tournaments. *Personality and Individual Differences*, *86*, 117–121. https://doi.org/10.1016/j.paid.2015.06.004

Bodovski, K., & Farkas, G. (2008). "Concerted cultivation" and unequal achievement in elementary school. *Social Science Research*, *37*(3), 903–919. https://doi.org/10.1016/j.ssresearch.2008.02.007

Boutyline, A., Arseniev-Koehler, A., & Cornell, D. J. (2023). School, studying, and smarts: Gender stereotypes and education across 80 years of American print media, 1930–2009. *Social Forces*, *102*(1), 263–286. https://doi.org/10.1093/sf/soac148

Burgoyne, A. P., Sala, G., Gobet, F., Macnamara, B. N., Campitelli, G., & Hambrick, D. Z. (2016). The relationship between cognitive ability and chess skill: A comprehensive meta-analysis. *Intelligence*, *59*, 72–83. https://doi.org/10.1016/j.intell.2016.08.002

Bussey, K., & Bandura, A. (1999). Social cognitive theory of gender development and differentiation. *Psychological Review*, *106*(4), 676–713. https://doi.org/10.1037/0033-295X.106.4.676

Cheryan, S., Master, A., & Meltzoff, A. N. (2015). Cultural stereotypes as gatekeepers: Increasing girls' interest in computer science and engineering by diversifying stereotypes. *Frontiers in Psychology*, *6*, Article 49. https://doi.org/10.3389/fpsyg.2015.00049

de Bruin, A. B., Smits, N., Rikers, R. M., & Schmidt, H. G. (2008). Deliberate practice predicts performance over time in adolescent chess players and drop-outs: A linear mixed models analysis. *British Journal of Psychology*, *99*(4), 473–497. https://doi.org/10.1348/000712608X295631

Eagly, A. H., Nater, C., Miller, D. I., Kaufmann, M., & Sczesny, S. (2020). Gender stereotypes have changed: A cross-temporal meta-analysis of U.S. public opinion polls from 1946 to 2018. *American Psychologist*, *75*(3), 301–315. https://doi.org/10.1037/amp0000494

Eccles, J. S., Jacobs, J. E., & Harold, R. D. (1990). Gender role stereotypes, expectancy effects, and parents' socialization of gender differences. *Journal of Social Issues*, *46*(2), 183–201. https://doi.org/10.1111/j.1540-4560.1990.tb01929.x

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*(2), 175–191. https://doi.org/10.3758/BF03193146

FIDE International Chess Federation. (2015). *Standard ratings 1999–2015*. https://ratings.fide.com/download_lists.phtml

Frydman, M., & Lynn, R. (1992). The general intelligence and spatial abilities of gifted young Belgian chess players. *British Journal of Psychology*, *83*(2), 233–235. https://doi.org/10.1111/j.2044-8295.1992.tb02437.x

Galitis, I. (2002). Stalemate: Girls and a mixed-gender chess club. *Gender and Education*, *14*(1), 71–83. https://doi.org/10.1080/09540250120098898

Gálvez, R. H., Tiffenberg, V., & Altszyler, E. (2019). Half a century of stereotyping associations between gender and intellectual ability in films. *Sex Roles*, *81*(9-10), 643–654. https://doi.org/10.1007/s11199-019-01019-x

Gerdes, C., & Gränsmark, P. (2010). Strategic behavior across gender: A comparison of female and male expert chess players. *Labour Economics*, *17*(5), 766–775. https://doi.org/10.1016/j.labeco.2010.04.013

Gillet, F. (2022, September 28). *Ilya Smirin: Chess commentator sacked for sexist comments during match. BBC News*. https://www.bbc.com/news/world-63062092

Guinote, A., Weick, M., & Cai, A. (2012). Does power magnify the expression of dispositions? *Psychological Science*, *23*(5), 475–482. https://doi.org/10.1177/0956797611428472

Hadden, J. (2020, December 24). *A female chess influencer says the sport is even more sexist than its portrayal in Netflix's "The Queen's Gambit." Insider*. https://www.insider.com/how-chess-was-more-sexist-than-its-portrayal-queens-gambit-2020-12

Halpern, D. F., & Collaer, M. L. (2005). *Sex differences in visuospatial abilities: More than meets the eye*. Cambridge University Press.

Hannak, A., Joseph, K., Larremore, D. B., & Cimpian, A. (2023). Field-specific ability beliefs as an explanation for gender differences in academics' career trajectories: Evidence from public profiles on ORCID.org. *Journal of Personality and Social Psychology*. Advance online publication. https://doi.org/10.1037/pspa0000348

Heck, I. A., Santhanagopalan, R., Cimpian, A., & Kinzler, K. D. (2021). Understanding the developmental roots of gender gaps in politics. *Psychological Inquiry*, *32*(2), 53–71. https://doi.org/10.1080/1047840X.2021.1930741

Heilman, M. E. (2012). Gender stereotypes and workplace bias. *Research in Organizational Behavior*, *32*, 113–135. https://doi.org/10.1016/j.riob.2012.11.003

Heyder, A., Weidinger, A. F., Cimpian, A., & Steinmayr, R. (2020). Teachers' belief that math requires innate ability predicts lower intrinsic motivation among low-achieving students. *Learning and Instruction*, *65*, Article 101220. https://doi.org/10.1016/j.learninstruc.2019.101220

Horn, J. L. (1965). A rationale and test for the number of factors in factor analysis. *Psychometrika*, *30*(2), 179–185. https://doi.org/10.1007/BF02289447

Howard, R. W. (2005). Are gender differences in high achievement disappearing? A test in one intellectual domain. *Journal of Biosocial Science*, *37*(3), 371–380. https://doi.org/10.1017/S0021932004006868

Howard, R. W. (2014a). Explaining male predominance at the apex of intellectual achievement. *Personality and Individual Differences*, *68*, 217–220. https://doi.org/10.1016/j.paid.2014.04.023

Howard, R. W. (2014b). Gender differences in intellectual performance persist at the limits of individual capabilities. *Journal of Biosocial Science*, *46*(3), 386–404. https://doi.org/10.1017/S0021932013000205

Ingle, S. (2021, November 29). "*It is not biology": Women's chess hindered by low numbers and sexism*. *The Guardian*. https://www.theguardian.com/sport/2021/nov/29/womens-chess-sexism-misogyny

Jacobs, J. E., & Eccles, J. S. (1992). The impact of mothers' gender-role stereotypic beliefs on mothers' and children's ability perceptions. *Journal of Personality and Social Psychology*, *63*(6), 932–944. https://doi.org/10.1037/0022-3514.63.6.932

Johnson, C. S., & Lammers, J. (2012). The powerful disregard social comparison information. *Journal of Experimental Social Psychology*, *48*(1), 329–334. https://doi.org/10.1016/j.jesp.2011.10.010

Kirkcaldy, B., Noack, P., Furnham, A., & Siefen, G. (2007). Parental estimates of their own and their children's intelligence. *European Psychologist*, *12*(3), 173–180. https://doi.org/10.1027/1016-9040.12.3.173

Koch, A. J., D'Mello, S. D., & Sackett, P. R. (2015). A meta-analysis of gender stereotypes and bias in experimental simulations of employment decision making. *Journal of Applied Psychology*, *100*(1), 128–161. https://doi.org/10.1037/a0036734

Lareau, A. (2003). *Unequal childhoods: Class, race, and family life*. University of California Press.

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

Maass, A., D'Ettole, C., & Cadinu, M. (2008). Checkmate? The role of gender stereotypes in the ultimate intellectual sport. *European Journal of Social Psychology*, *38*(2), 231–245. https://doi.org/10.1002/ejsp.440

Meirom, D., & Shahade, J. (2019). *Not particularly beautiful II [Scratchboard, clay board, and ink]*. World Chess Hall of Fame.

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

Muradoglu, M., Arnold, S. H., Leslie, S. J., & Cimpian, A. (2023). "What does it take to succeed here?" The belief that success requires brilliance is an obstacle to diversity. *Current Directions in Psychological Science*. Advance online publication. https://doi.org/10.1177/09637214231173361

Muradoglu, M., Horne, Z., Hammond, M. D., Leslie, S. J., & Cimpian, A. (2022). Women—particularly underrepresented minority women—and early-career academics feel like impostors in fields that value brilliance. *Journal of Educational Psychology*, *114*(5), 1086–1100. https://doi.org/10.1037/edu0000669

Musto, M. (2019). Brilliant or bad: The gendered social construction of exceptionalism in early adolescence. *American Sociological Review*, *84*(3), 369–393. https://doi.org/10.1177/0003122419837567

Overbeck, J. R., & Droutman, V. (2013). One for all: Social power increases self-anchoring of traits, attitudes, and emotions. *Psychological Science*, *24*(8), 1466–1476. https://doi.org/10.1177/0956797612474671

R Core Team. (2021). *R: A language and environment for statistical computing* (version 4.0.5) [Computer software]. R Foundation for Statistical Computing. https://www.R-project.org/

Robinson, J. P., & Lubienski, S. T. (2011). The development of gender achievement gaps in mathematics and reading during elementary and middle school: Examining direct cognitive assessments and teacher ratings. *American Educational Research Journal*, *48*(2), 268–302. https://doi.org/10.3102/0002831210372249

Rothgerber, H., & Wolsiefer, K. (2014). A naturalistic study of stereotype threat in young female chess players. *Group Processes & Intergroup Relations*, *17*(1), 79–90. https://doi.org/10.1177/1368430213490212

Rubinstein, R. S., Jussim, L., & Stevens, S. T. (2018). Reliance on individuating information and stereotypes in implicit and explicit person perception. *Journal of Experimental Social Psychology*, *75*, 54–70. https://doi.org/10.1016/j.jesp.2017.11.009

Schmader, T., Johns, M., & Forbes, C. (2008). An integrated process model of stereotype threat effects on performance. *Psychological Review*, *115*(2), 336–356. https://doi.org/10.1037/0033-295X.115.2.336

Spencer, S. J., Logel, C., & Davies, P. G. (2016). Stereotype threat. *Annual Review of Psychology*, *67*(1), 415–437. https://doi.org/10.1146/annurev-psych-073115-103235

StataCorp. (2021). *Stata statistical software: Release 17* [Computer software]. https://www.stata.com/

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

Stromquist, N. P. (2007). *The gender socialization process in schools: A cross-national comparison*. https://unesdoc.unesco.org/ark:/48223/pf0000155587

Swinson, J., & Harrop, A. (2009). Teacher talk directed to boys and girls and its relationship to their behaviour. *Educational Studies*, *35*(5), 515–524. https://doi.org/10.1080/03055690902883913

U.S. Chess Federation. (n.d.) *Girl Power!* Retrieved November 1, 2022 from https://new.uschess.org/womens

U.S. Chess Federation. (2016). *US Chess Membership Survey*. https://new.uschess.org/sites/default/files/wp-thumbnails/2016/11/2016MemberFeedbackSurvey-charts_only.pdf

Vollstädt-Klein, S., Grimm, O., Kirsch, P., & Bilalić, M. (2010). Personality of elite male and female chess players and its relation to chess skill. *Learning and Individual Differences*, *20*(5), 517–521. https://doi.org/10.1016/j.lindif.2010.04.005

Voyer, D., Voyer, S. D., & Saint-Aubin, J. (2017). Sex differences in visual-spatial working memory: A meta-analysis. *Psychonomic Bulletin & Review*, *24*(2), 307–334. https://doi.org/10.3758/s13423-016-1085-

Waters, A. J., Gobet, F., & Leyden, G. (2002). Visuospatial abilities of chess players. *British Journal of Psychology*, *93*(4), 557–565. https://doi.org/10.1348/000712602761381402

Zhao, S., Setoh, P., Storage, D., & Cimpian, A. (2022). The acquisition of the gender-brilliance stereotype: Age trajectory, relation to parents' stereotypes, and intersections with race/ethnicity. *Child Development*, *93*(5), e581–e597. https://doi.org/10.1111/cdev.13809.

Received January 30, 2023
Revision received June 25, 2023
Accepted June 29, 2023 ■