*Research Article*

Psychological Science
2022, Vol. 33(2) 276–284

DOI: 10.1177/09567976211034806
www.psychologicalscience.org/PS

# Queen's Gambit Declined: The Gender-Equality Paradox in Chess Participation Across 160 Countries

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## Abstract

The *gender-equality paradox* refers to the puzzling finding that societies with more gender equality demonstrate larger gender differences across a range of phenomena, most notably in the proportion of women who pursue degrees in science, technology, engineering, and math. The present investigation demonstrates across two different measures of gender equality that this paradox extends to chess participation ($N$ = 803,485 across 160 countries; age range: 3–100 years), specifically that women participate more often in countries with less gender equality. Previous explanations for the paradox fail to account for this finding. Instead, consistent with the notion that gender equality reflects a generational shift, mediation analyses suggest that the gender-equality paradox in chess is driven by the greater participation of younger players in countries with less gender equality. A curvilinear effect of gender equality on the participation of female players was also found, demonstrating that gender differences in chess participation are largest at the highest and lowest ends of the gender-equality spectrum.

## Keywords

gender equality, cross-cultural differences, gender differences, chess, open materials

Received 2/9/21; Revision accepted 6/14/21

Are differences between men and women smaller in cultures with more political and economic gender equality? This question lies at the heart of whether differences between men and women reflect innate biological differences or culturally constructed roles (Buss, 1989; Eagly & Wood, 1999; Wood & Eagly, 2012). If gender differences are innate, they can be expected to appear across cultures, even if their magnitude might vary on the basis of exposure to stressors (Geary, 2021). Meanwhile, if gender roles are culturally constructed, gender differences can be expected to be smaller or even reversed in societies with greater political and economic gender equality.

Surprisingly, many large-scale studies in diverse domains have revealed a gender-equality paradox: Gender differences are actually larger in more gender-equal countries. By *gender equality*, I refer to the reduction or elimination of the ideology that men are primary and women are subordinate, which may be expressed in the belief that education is more important for boys than for girls or that men should have more access to jobs and leadership positions than women (Breda et al., 2020; Inglehart & Norris, 2003). The gender-equality paradox thus refers to the myriad findings that societies with lower levels of such an ideology display larger gender differences in various domains. Such findings have been found in a range of domains using both objective measures, such as in pursuit of fields of study and occupations (Breda et al., 2020; Miller et al., 2014; Stoet & Geary, 2018), and subjective measures, such as those assessing basic human values (Schwartz & Rubel-Lifschitz, 2009), personal preferences (Falk & Hermle, 2018), personality traits (Costa et al., 2001; Schmitt et al., 2008), rates of depression (Hopcroft & Bradley, 2007), and moral judgments (Atari et al., 2020). Various theoretical accounts have been proposed to explain

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these findings. In the present investigation, I sought to extend this debate both empirically and theoretically by demonstrating the existence of a gender-equality paradox in a domain that the gender-equality literature has not previously focused on—chess participation—and testing for a novel mechanism underlying these findings.

Chess is an intellectual pursuit in which mastery is unrelated to established gender differences in biological traits, such as height and physical strength. Nevertheless, it is dominated by men across different skill levels; approximately 90% of players are men, and this percentage is even greater among the top players (Chabris & Glickman, 2006; Stafford, 2018). In comparison, men comprise 75% of graduates in inorganic science, technology, engineering, and mathematics (STEM) fields (excluding life sciences; Stoet & Geary, 2018). Thus, among pursuits not related to gender difference due directly to biological traits, chess is one of the most gender-biased pursuits that can be studied.

Finding a gender-equality paradox in chess participation can inform the debate around the gender-equality paradox for several reasons. First, many studies demonstrating the gender-equality paradox have used subjective ratings (Atari et al., 2020; Costa et al., 2001; Falk & Hermle, 2018; Hopcroft & Bradley, 2007; Schwartz & Rubel-Lifschitz, 2009), in which participants rate themselves relative to an undefined reference group. Societies with lower levels of gender equality also restrict interactions between men and women, potentially leading to different reference groups in different societies. This may lead to an experimental artifact unique to such subjective ratings (Guimond et al., 2007; Wood & Eagly, 2012) because of shifting standards of comparison (Biernat, 2003). In contrast, chess participation is an objective measure not susceptible to such alternative accounts. Second, studies demonstrating a gender-equality paradox using objective measures have focused almost exclusively on representation in fields of study and occupations, such as in STEM (Breda et al., 2020; Miller et al., 2014; Stoet & Geary, 2018). Because chess is pursued largely as a hobby, a demonstration of the gender-equality paradox in chess participation would reveal that this paradox extends to leisure activities. Finally, chess participation is particularly well-suited to test the generational-shift account of the gender-equality paradox.

## The Generational-Shift Account

Theories of cultural change posit that socioeconomic development leads to greater support for egalitarian values, including gender equality, and this change occurs more rapidly in younger generations than in older generations (Greenfield, 2016; Inglehart & Norris, 2003). For instance, one set of studies found that in a cultural context undergoing significant socioeconomic development, egalitarian gender roles were endorsed more strongly by adolescents relative to their mothers or grandmothers (Abu Aleon et al., 2019; Weinstock et al., 2015). The importance of accounting for generational shifts in gender differences has also been demonstrated in voting behavior in Britain, where older women vote with the Conservative party more than older men, but younger women vote with the Labour party more than younger men (Norris, 1996). Thus, the presence and active participation of a younger generation may play a critical role in reducing gender differences that have existed historically. Countries highest in gender equality may not necessarily be the ones most suited to undergo rapid cultural change in reducing gender differences. Instead, when a society obtains a level of socioeconomic development sufficient to diversify people's motives beyond mere subsistence, societies with a suite of sociodemographic factors that increase the relative proportion of younger people may be most well-suited to reduce gender disparities. Such factors might include higher birth rates and lower life expectancy (decreasing the representation of older people). Thus, a gender-equality paradox might be, at least in some instances, an epiphenomenon driven by the smaller relative representation of a younger generation in more gender-equal societies.

### Statement of Relevance

The existence of gender disparities is a cause for concern among educators and policymakers. Particularly vexing is the finding that gender differences are frequently larger in countries with greater political and economic gender equality—a set of findings referred to as the *gender-equality paradox*. This investigation demonstrates that such a paradox exists in a domain of competitive intellectual pursuit—chess participation. Furthermore, it yields insights for the gender-equality paradox more broadly. First, the paradox can be curvilinear: The representation of female players is lowest at both low and high levels of gender equality. Second, a generational shift may underlie the paradox: It is driven by the greater participation of younger people in countries with less gender equality. Consequently, at least in chess, the lower participation of female players appears to be an epiphenomenon of gender equality.

The generational-shift account rests on an assumption that differentiates it from other accounts of the gender-equality paradox. Specifically, this account assumes a baseline of historically low participation of women in fields dominated by men. From this baseline, participation of women is expected to increase across the globe, reflecting the rising tide of support for gender equality (Inglehart & Norris, 2003), but the rate of such a change might be greater in countries with lower gender equality, whose players come from younger age cohorts. Meanwhile, other accounts of the gender-equality paradox assume the opposite pattern, in which the gender-equality paradox in fields dominated by men emerges because the representation of women *declines* in countries with higher gender equality. For instance, according to the motivational account of the gender-equality paradox, people in societies with greater political and economic gender equality seek to maintain gender differentiation by creating and enforcing gender stereotypes in other domains (Breda et al., 2020; Charles & Bradley, 2002, 2009; Vishkin et al., 2021), leading to a decline in the representation of women in fields dominated by men. Similarly, according to the account that innate differences exist between men and women, societies with greater gender equality and the concomitant increase in economic development are more able to allow men and women to express their innate preferences (e.g., Geary & Stoet, 2020; Su & Rounds, 2015), leading to a decline in the representation of women in fields dominated by men. A critical test of the viability of these alternative accounts in explaining the gender-equality paradox in chess, then, is whether the representation of female chess players has increased or decreased over time or over age cohorts. Existing findings suggest that the proportion of female players has increased with time (Smerdon et al., 2020), yet it is unclear whether this is the case in countries across the world.

Chess participation is a particularly well-suited context for testing these alternative accounts. Active chess players span a large range of ages across several generations. For instance, at one end of the age spectrum, Sergey Karjakin learned to play chess at the age of 4 years and achieved the title of Grandmaster at the age of 12. At the other end, Grandmaster Mark Taimonov continued playing chess until his death at the age of 90. In addition, the worldwide popularity enjoyed by chess enables the testing of these mechanisms in a sample of countries that is larger than is typical for studies on the gender-equality paradox.

## The Present Investigation

I evaluated two questions pertaining to the gender-equality paradox in chess participation. First, I examined whether the gender-equality paradox in chess exists by testing whether two established country-level measures of gender equality predict the proportion of female chess players in each country. Next, I evaluated whether this can be explained by the generational-shift account by testing (a) whether the representation of female players increases or decreases in younger age cohorts and (b) whether the mean country-level age of chess players mediates the link between gender equality and the proportion of female players. Supplemental material and analysis code are available on OSF (https://osf.io/a8fqb/).

## Method

### *Chess participation*

Data on chess participation were accessed on December 16, 2020, from the website of the Fédération Internationale des Échecs (FIDE), or the World Chess Federation (https://ratings.fide.com/download.phtml). FIDE receives reports on games and tournaments played in national chess federations and international competitions and compiles a list of players on the basis of this information. The full list contains information about active and inactive players who are unrated or who are rated with a standard rating (slow time controls), a rapid rating (moderate time controls), or a blitz rating (fast time controls). The total number of active players was 803,485 (15.7% female players) originating from 160 countries with scores for gender equality (proportion of female players per country: $M = .162$, $SD = .076$). Ten participants were removed for having improbable birthdays—prior to 1920 or after 2017 (age: $M = 28.83$ years, $SD = 19.29$, range = 3–100). Including them did not alter results. In addition, England, Scotland, and Wales are treated separately in the chess participation data, but both measures of gender equality include a score only for the United Kingdom. Consequently, all three were combined for the analyses. Master-level chess players, those with a rating of 2,200 or higher (De Felice, 2018), comprised 1.2% of the sample, revealing that the vast majority of participants were not professional players.

### *Gender-equality measures*

I used two different measures of country-level gender equality frequently cited in the literature. The Global Gender Gap Index (GGGI) is published annually by the World Economic Forum (2019). The GGGI assesses the extent to which women fall behind men on 14 indicators in the areas of health, education, economy, and politics. The most recent data available, from 2020, were used. Scores were available for 145 countries, of which 142 had data on chess participation ($M = .70$,

*SD* = .06), and ranged from .494 (Yemen) to .877 (Iceland). Higher scores indicate greater gender equality.

The Gender Inequality Index (GII) is published annually by the United Nations Development Programme (2020). The GII is a composite index reflecting inequality in three domains: reproductive health, empowerment, and the labor market. The most recent data available, from 2019, were used. Scores were available for 162 countries, of which 157 had data on chess participation (*M* = .34, *SD* = .19), and ranged from .025 (Switzerland) to .795 (Yemen). Higher scores indicate greater gender inequality.

The measures were correlated, $r(137) = -.52$. To establish the robustness of the findings, I analyzed results using each measure separately.

## Results

For each country, I calculated the number of female chess players relative to the total number of players. The scores ranged from .00 in countries with no female chess players to .40 in countries whose chess players are 40% female. The number of chess players per country varied widely, ranging from three players (Chad) to 76,105 players (India). Consequently, I weighted the countries by the total number of chess players in each country. To test for the gender-equality paradox in chess, I regressed the GGGI and GII on the proportion of female chess players in each country. Greater gender equality, as assessed by the GGGI, predicted a lower proportion of female chess players, $\beta = -0.29$, $t(140) = -4.40$, $p < .001$, 95% confidence interval (CI) = [−0.42, −0.16]. Lesser gender equality, as assessed by the GII, predicted a higher proportion of female chess players, $\beta = 0.35$, $t(155) = 5.11$, $p < .001$, 95% CI = [0.22, 0.49]. These findings reveal a gender-equality paradox in chess; the representation of female chess players is smaller in countries with greater gender equality.

Given that the number of chess players in each country differed greatly, such that the country with the largest number of chess players had more than four orders of magnitude more chess players than the country with the smallest number of chess players, weighting countries by the number of chess players may skew results. However, the data from countries with few chess players are necessarily less reliable—for instance, the only country with no female chess players was also the country with the fewest players. To address this, I reran the analyses without weights and selected two arbitrary cutoffs for the number of players per country: countries with at least 100 players (removing 16 countries out of 160; $n = 802{,}913$) and countries with at least 1,000 players (removing a further 53 countries; $n = 778{,}809$). Among countries with at least 100 players, the GGGI still predicted a lower proportion of female chess players, $\beta = -0.17$, $t(132) = -1.99$, $p = .049$, 95% CI = [−0.34, −0.00], and the GII still predicted a higher proportion of female chess players, $\beta = 0.31$, $t(139) = 3.77$, $p < .001$, 95% CI = [0.15, 0.47]. Among countries with at least 1,000 players, the GGGI still predicted a lower proportion of female chess players, $\beta = -0.26$, $t(85) = -2.47$, $p = .016$, 95% CI = [−0.47, −0.05], and the GII still predicted a higher proportion of female chess players, $\beta = 0.29$, $t(89) = 2.85$, $p = .006$, 95% CI = [0.09, 0.49].

Figure 1 illustrates the latter findings for both the GGGI (Fig. 1a) and GII (Fig. 1b). A close look at Figure 1 suggests that in addition to the main finding, there is a nonlinear association between gender equality and national differences in the representation of female players. Specifically, countries with the lowest representation of female players appear at both ends of the spectrum of gender equality. To investigate this, I reran the previous analyses and added a term for the quadratic effect of gender equality predicting the proportion of female players ($y = a + b_1 * x + b_2 * x^2$). In all tests, the quadratic effects were significant (Table 1), indicating that the proportion of female players was lowest in countries high in gender equality and in countries low in gender equality. An implementation of the two-lines test recommended by Simonsohn (2018) confirmed the existence of an inverted-U-shaped regression function with a sign change (see the supplemental material at https://osf.io/5aymu/). Critically, the linear relation between gender equality and the proportion of female chess players remained significant in five of the six analyses. Thus, both a linear effect and a quadratic effect of gender equality predict the proportion of female chess players across countries. Overall, these results confirm the existence of a gender-equality paradox in chess, although they add nuance in revealing that the countries with the greatest proportional representation of women are those with moderate, rather than low, gender equality.

## Testing the Generational-Shift Account

To test the generational-shift account, I first examined whether the proportion of female players increased by age cohort in each of the 91 countries with at least 1,000 players. The proportion of female players was significantly greater among players born in later years in 89 out of 91 countries, indicating a shift toward greater representation of women in chess across the globe (see Table A2 at https://osf.io/5aymu/). This reveals that the generational-shift account is a viable explanation for the gender-equality paradox in chess, whereas the motivational or innate-differences accounts of the gender-equality paradox are not. If the generational-shift

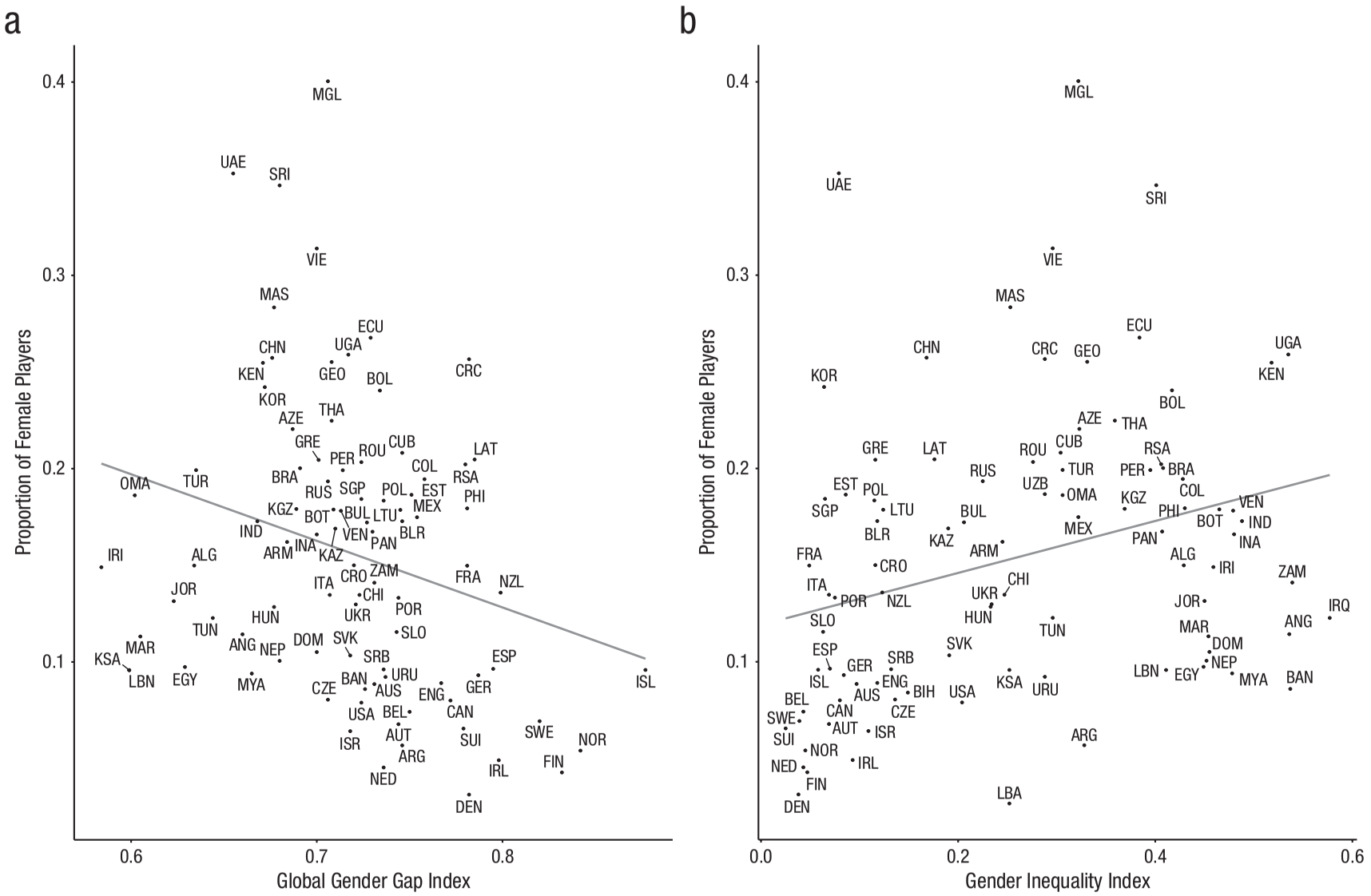


**Fig. 1.** Relation between gender equality and the proportion of female chess players in 91 countries with at least 1,000 chess players each. Results are shown separately with gender equality measured by (a) the Global Gender Gap Index and (b) the Gender Inequality Index. The solid lines show the best-fitting linear regressions. ALG = Algeria; ANG = Angola; ARG = Argentina; ARM = Armenia; AUS = Australia; AUT = Austria; AZE = Azerbaijan; BAN = Bangladesh; BLR = Belarus; BEL = Belgium; BOL = Bolivia; BIH = Bosnia & Herzegovina; BOT = Botswana; BRA = Brazil; BUL = Bulgaria; CAN = Canada; CHI = Chile; CHN = China; COL = Colombia; CRC = Costa Rica; CRO = Croatia; CUB = Cuba; CZE = Czech Republic; DEN = Denmark; DOM = Dominican Republic; ECU = Ecuador; EGY = Egypt; EST = Estonia; FIN = Finland; FRA = France; GEO = Georgia; GER = Germany; GRE = Greece; HUN = Hungary; ISL = Iceland; IND = India; INA = Indonesia; IRI = Iran; IRQ = Iraq; IRL = Ireland; ISR = Israel; ITA = Italy; JOR = Jordan; KAZ = Kazakhstan; KEN = Kenya; KGZ = Kyrgyzstan; LAT = Latvia; LBN = Lebanon; LBA = Libya; LTU = Lithuania; MAS = Malaysia; MEX = Mexico; MGL = Mongolia; MAR = Morocco; MYA = Myanmar; NEP = Nepal; NED = Netherlands; NZL = New Zealand; NOR = Norway; OMA = Oman; PAN = Panama; PER = Peru; PHI = Philippines; POL = Poland; POR = Portugal; ROU = Romania; RUS = Russia; KSA = Saudi Arabia; SRB = Serbia; SGP = Singapore; SVK = Slovakia; SLO = Slovenia; RSA = South Africa; KOR = South Korea; ESP = Spain; SRI = Sri Lanka; SWE = Sweden; SUI = Switzerland; THA = Thailand; TUN = Tunisia; TUR = Turkey; UGA = Uganda; ENG = United Kingdom; UKR = Ukraine; UAE = United Arab Emirates; USA = United States of America; URU = Uruguay; UZB = Uzbekistan; VEN = Venezuela; VIE = Vietnam; ZAM = Zambia.

**Table 1.** Proportion of Female Chess Players Predicted by Linear Gender Equality as a Single Predictor and by Linear Plus Quadratic Gender Equality as Simultaneous Predictors

| | Global Gender Gap Index (GGGI) | | | | | Gender Inequality Index (GII) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Predictor | β | *df* | *t* | *p* | 95% CI | β | *df* | *t* | *p* | 95% CI |
| Weighted (GGGI: $N = 142$; GII: $N = 157$) | | | | | | | | | | |
| Single predictor | | | | | | | | | | |
| Only linear | −0.29 | 140 | −4.40 | < .001 | [−0.42, −0.16] | 0.35 | 155 | 5.11 | < .001 | [0.22, 0.49] |
| Simultaneous predictors | | | | | | | | | | |
| Linear | −0.29 | 139 | −4.65 | < .001 | [−0.41, −0.17] | 0.02 | 154 | 0.27 | .79 | [−0.16, 0.21] |
| Quadratic | −0.32 | 139 | −4.17 | < .001 | [−0.48, −0.17] | −0.46 | 154 | −4.91 | < .001 | [−0.65, −0.28] |
| > 100 players per country (GGGI: $N = 134$; GII: $N = 141$) | | | | | | | | | | |
| Single predictor | | | | | | | | | | |
| Only linear | −0.17 | 132 | −1.99 | .049 | [−0.34, −0.00] | 0.31 | 139 | 3.77 | < .001 | [0.15, 0.47] |
| Simultaneous predictors | | | | | | | | | | |
| Linear | −0.22 | 131 | −2.61 | .010 | [−0.39, −0.05] | 0.34 | 138 | 4.35 | < .001 | [0.19, 0.50] |
| Quadratic | −0.25 | 131 | −2.95 | .004 | [−0.42, −0.08] | −0.28 | 138 | −3.59 | < .001 | [−0.44, −0.13] |
| > 1,000 players per country (GGGI: $N = 87$; GII: $N = 91$) | | | | | | | | | | |
| Single predictor | | | | | | | | | | |
| Only linear | −0.26 | 85 | −2.47 | .016 | [−0.47, −0.05] | 0.29 | 89 | 2.85 | .006 | [0.09, 0.49] |
| Simultaneous predictors | | | | | | | | | | |
| Linear | −0.27 | 84 | −2.67 | .009 | [−0.47, −0.07] | 0.35 | 88 | 3.59 | < .001 | [0.16, 0.55] |
| Quadratic | −0.28 | 84 | −2.77 | .007 | [−0.48, −0.08] | −0.32 | 88 | −3.21 | .002 | [−0.51, −0.12] |

Note: CI = confidence interval.

account is correct, then the previous findings should be accounted for by the relatively smaller representation of younger people in more gender-equal societies. Therefore, I conducted a set of mediation analyses to test whether the linear and quadratic effects of gender equality on participation of women in chess are mediated by the mean age of chess players in each country ($M = 29.48$, $SD = 7.36$). I conducted separate mediation analyses when weighting the countries by the number of players, selecting countries with at least 100 players and at least 1,000 players, for the GGGI and GII. I conducted each mediation analysis with both linear gender equality and quadratic gender equality as simultaneous predictors and then tested for the indirect effect of each predictor separately.

Mean age mediated the association between the linear effect of gender equality and the proportion of female chess players in five of the six analyses. Furthermore, mean age mediated the association between the quadratic effect of gender equality and the proportion of female chess players in all six analyses. Figure 2 presents the mediation analyses among countries with at least 100 players (for additional mediation analyses, see https://osf.io/5aymu/). For gender equality as represented by the GGGI, the linear effect of gender equality was fully mediated by mean age (indirect effect = −0.20, 95% CI = [−0.33, −0.09]), as was the quadratic effect of gender equality (indirect effect = −0.19, 95% CI = [−0.31, −0.07]). For gender equality as represented by the GII, the linear effect of gender equality was fully mediated by mean age (indirect effect = 0.29, 95% CI = [0.17, 0.40]), as was the quadratic effect of gender equality (indirect effect = −0.28, 95% CI = [−0.41, −0.17]). Thus, both the linear and quadratic effects of gender equality on chess participation of women were mediated by the mean age of chess players in each country.

## Discussion

The present investigation revealed a gender-equality paradox in chess participation; specifically, the proportion of female chess players is smaller in countries with greater gender equality. This finding was obtained across different measures of gender equality and different methods of accounting for variation in the number of players in different countries. A demonstration of the gender-equality paradox in chess is significant because it cannot be explained by artifacts that subjective ratings are prone to (Guimond et al., 2007; Wood & Eagly, 2012). An unexpected nonlinear association

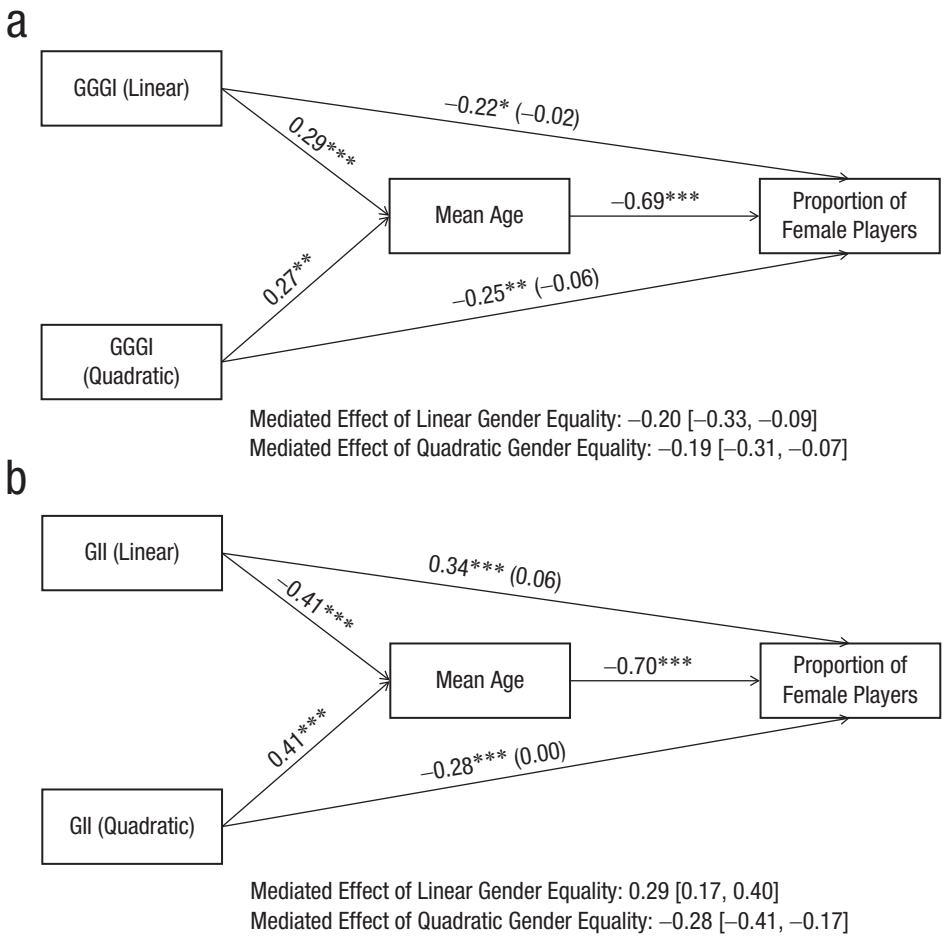


**Fig. 2.** Mediation models showing the effect of mean age on the association between gender equality and the representation of female chess players. Results are shown separately with gender equality measured by (a) the Global Gender Gap Index (GGGI) and (b) the Gender Inequality Index (GII). Values shown are standardized coefficients (95% confidence intervals are given in brackets). Path values after controlling for mediation are given in parentheses. Asterisks indicate significant paths (*$p < .05$, **$p < .01$, ***$p < .001$). $N > 100$.

also emerged: The proportion of female chess players was largest in countries with moderate gender equality. This, to my knowledge, is the first example of a U-shaped association in the literature on the gender-equality paradox. The present investigation may have been particularly well-suited to detect such an association because it included a larger number of countries than is typical for studies assessing the gender-equality paradox.

Results were not consistent with previous accounts for the gender-equality paradox, including the accounts that larger gender differences emerge in more gender-equal societies so that gender distinctiveness can be maintained (Charles & Bradley, 2002, 2009) or as an expression of innate differences between men and women (Geary & Stoet, 2020; Su & Rounds, 2015) because the trend across age cohorts in almost all countries reflected an increase in the proportion of female chess players. Instead, the present investigation tested the generational-shift account, a novel mechanism not previously explored in the literature on the gender-equality paradox. In line with the generational-shift account, results showed that both the linear and nonlinear associations between gender equality and participation of women in chess were mediated by the mean age of chess players in each country. This reveals that countries higher in gender equality, as well as countries at the lower or higher ends of gender equality, have older chess players, and older cohorts of players have a smaller proportion of female players. Such a finding suggests that as younger generations become more active in the chess community, they bring with them egalitarian values that break down stereotypes and stigmas about the participation of women in chess. A remaining puzzle is why country-level gender equality is

associated with the mean age of players. Possible explanations include demographic trends such as lower birth rates and higher life expectancies that lead to higher mean ages in more gender-equal countries. In addition, the quadratic effect of gender equality, from the point at which lower gender equality predicts a smaller representation of female players and higher mean age, might be due to patriarchal institutions in conservative cultures, which restrict young and unmarried women from participating in leisure activities outside the home. Such institutions could have the effect of increasing the mean age of players as well as decreasing the representation of female players in younger age cohorts. Future research can examine the precise mechanisms linking gender equality and participation in leisure activities such as chess.

Inglehart and Norris (2003) elucidated the development and trajectory of "a rising tide of support for gender equality in over seventy societies around the world" (p. 10). A tide of gender equality may be rising indeed, but on which beaches? It is conceivable that the rate of change in gender equality is not equivalent across countries. In which countries, then, might greater rates of gender parity be achieved? The present findings reveal that countries with more active younger generations have more equal representation of female players. This reveals that, at least in some domains, generational shift is a mechanism of the gender-equality paradox that was not previously accounted for in the literature. Such a mechanism cannot account for instances of the gender-equality paradox that emerge among participants from the same age cohort (e.g., Schmitt et al., 2008; Stoet & Geary, 2018) or where the representation of women in fields dominated by men might decline over time in countries with higher gender equality. Thus, generational shift is a mechanism that is not mutually exclusive with the other mechanisms suggested in the literature. Building on the notion of psychology as a historical science (Muthukrishna et al., 2021), future research can capitalize on historical data to test for the generational-shift account in novel data sets.

## Transparency

*Action Editor:* Kate Ratliff
*Editor:* Patricia J. Bauer
*Author Contributions*

A. Vishkin is the sole author of this article and is responsible for its content.

*Declaration of Conflicting Interests*

The author(s) declared that there were no conflicts of interest with respect to the authorship or the publication of this article.

*Funding*

This research was supported by Israel Science Foundation Grant No. 119/20.

*Open Practices*

Data were accessed on December 16, 2020, from the website of the Fédération Internationale des Échecs (FIDE), or the World Chess Federation (https://ratings.fide.com/download.phtml). Analysis code for this study has been made publicly available via OSF and can be accessed at https://osf.io/a8fqb/. The design and analysis plans for the study were not preregistered. This article has received the badge for Open Materials. More information about the Open Practices badges can be found at http://www.psychologicalscience.org/publications/badges.

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## Acknowledgments

The author thanks Maya Tamir, Galit Agmon, and Yochanan Bigman for their helpful feedback on an earlier version of this article.

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