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EMPIRICAL ARTICLE

CHILD DEVELOPMENT

Gender brilliance stereotype emerges early and predicts children's motivation in South Korea

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Abstract

Recent work suggests that the stereotype associating brilliance with men may underpin women's underrepresentation in prestigious careers, yet little is known about its development and consequences in non-Western contexts. The present research examined the onset of this stereotype and its relation to children's motivation in 5- to 7-year-old Korean children (N=272, 50% girls, tested 2021 to 2022). At age 7, children attributed brilliance to men when evaluating Asians and Whites, and girls became less interested in participating in intellectually challenging tasks than boys. Notably, this gender difference in interest was mediated by children's endorsement of the stereotype. The generalizable early emergence of the gender brilliance stereotype and its detrimental implications press the need to tackle gender imbalance in early childhood.

Despite the growing calls for gender parity in science, technology, engineering, and mathematics (STEM) in the era of Industry 4.0 (Fatourou et al., 2019; García Peñalvo et al., 2019), women remain underrepresented in certain sectors of higher education (OECD, 2021). Common stereotype against women's intellectual abilities—the *gender brilliance stereotype* (e.g., Bennett, 1996; Furnham et al., 2002; Gálvez et al., 2019; Storage et al., 2020)—has been suggested as one major factor that creates and perpetuates this gender imbalance (e.g., Bian et al., 2018; Leslie et al., 2015; Meyer et al., 2015). Given that men are more strongly associated with intellectual talents than women, women may be discouraged from pursuing STEM as well as other fields in which brilliance is believed to be the key to success (e.g., Computer Science, Economics, Philosophy, Physics; Bian et al., 2018; Ertl et al., 2017). Indeed, the more a field is believed to require sheer brilliance, the fewer women are represented in this field at the doctorate level, both in the STEM and non-STEM domains (Leslie et al., 2015; Meyer et al., 2015). To understand the developmental roots of this gender disparity, the present research addresses several important issues regarding the gender brilliance stereotype. Specifically, we investigated (1) its development in young children, and (2) its relation with children's motivation. In addition, we explored whether children consider the race of the stereotype targets when constructing the gender brilliance stereotype.

Prior research with U.S. children suggests that the gender brilliance stereotype is deeply rooted in early childhood and shapes children's motivation (Bian et al., 2017). In Bian et al. (2017), for a primary example, when 5- to 7-year-old U.S. children were presented with pictures of unfamiliar White men and women and asked to choose a "really, really smart" person, 6- and 7-year-old girls were less likely to select people of their own gender than were boys of the same age. Importantly, 6- and 7-year-old U.S. girls became less interested than boys in activities said to be for "really, really smart" children, while this gender difference disappeared when the same activities were described as for hardworking children. These findings suggest that the gender brilliance stereotype may adversely affect girls' motivation to engage in intellectually-challenging

Abbreviations: STEM, science, technology, engineering, and mathematics; WEIRD, Western, Educated, Industrialized, Rich, and Democratic.

activities as soon as it develops, providing useful insights into the early roots of women's underrepresentation in fields or careers thought to require brilliance.

However, research on the early-emerging gender brilliance stereotype to date has been conducted almost exclusively in the United States, one of the prime examples of the Western, Educated, Industrialized, Rich, and Democratic (WEIRD) societies (Henrich et al., 2010). Whether children from a different cultural context are exposed to and influenced by the gender brilliance stereotype remains an open question that is both theoretically and practically important. At the theoretical level, evidence from multiple cultures documenting the relation between the gender brilliance stereotype and girls' motivation highlights the crucial role of this stereotype in contributing to the gender imbalance in "brilliance-required" fields (Leslie et al., 2015; Meyer et al., 2015). At the practical level, identifying the developing point at which this gender stereotype and its consequences begin to surface provides important insights on when and how interventions should be implemented. Here, we tested young Korean children whose cultural context differs widely from that of the U.S. samples in which this stereotype has primarily been studied so far.

Several aspects of Korean culture make it a meaningful context to examine the cross-cultural continuity and variations of the gender brilliance stereotype in early development. On the one hand, there are reasons to expect that Korean children may be immune to the gender brilliance stereotype, given that Korean and U.S. cultures differ drastically in core values. While the U.S. culture is often characterized as an individualistic/independent culture emphasizing autonomy, independence, and self-reliance, Korean culture is characterized as a collectivistic/interdependent culture emphasizing harmony, interdependence, and social obligations (e.g., Triandis, 1989). These cultural differences are reflected in their respective members' social cognition, including gender stereotypes—for example, Korean adults view men as *less* independent than women, deviating from the westernized gender stereotypes of male independence (Cuddy et al., 2015). Considering independence and intelligence are often grouped together as competence-related traits (e.g., Abbott et al., 2016; Chamorro-Premuzic & Furnham, 2005; Cuddy et al., 2005), it is possible that the gender stereotype about brilliance is less prevalent in Korea compared to the United States.

On the other hand, there are several indications that Korean children may also be susceptible to the gender brilliance stereotype. First, Korea observes a higher gender disparity than the United States in multiple dimensions. According to the World Economic Forum's Gender Gap Index (2021) measuring overall gender equality across various domains (e.g., educational attainment, politics), Korea was ranked 103rd out of 156 countries, much lower than the ranking of the United States (30th). Mirroring this gender inequality, Korean adults are more likely than U.S. adults to endorse gender stereotypes against women in domains of politics (e.g., men make better political leaders), job opportunities (e.g., men have more rights to a job when jobs are scarce), and education (e.g., college education is more important for men) (UNDP, 2020).

Second, similar to the United States (National Science Foundation, 2021), women are underrepresented in the STEM domain in Korea. For example, less than 15% of doctoral degrees in the fields of Science and Engineering were awarded to female students in Korea (Statistics Korea [KOSTAT], Korean Statistical Information Service [KOSIS], 2020). This unequal distribution disadvantaging women seems to appear early: The average gender ratio (male: female) of students entering science high schools for the gifted (comparable to the STEM high schools in the United States) is 3.39:1 (KESS, 2021). In line with the statistics, 57% of Korean teachers who teach gifted classes in elementary and middle schools believed that boys are endowed with stronger abilities in mathematics and science than girls; Notably, 60% of the sample believed that the postulated differences were caused by inherent gender differences (Chae & Ryu, 2011).

Finally, it is commonly believed that men possess characteristics that are culturally valued, which may partially explain the male dominance in almost every culture (Cuddy et al., 2015; Pratto et al., 2000). From an evolutionary perspective, it is reasonable to assume that superb intelligence would be valued in all human societies (Cosmides & Tooby, 2002; Kanazawa, 2004). Thus, one could predict that the gender stereotype about intellectual abilities would also be formed in Korea where men hold relatively higher status than women (National Science Foundation, 2021; UNDP, 2020).

The only study so far that partly supported the generalizability of children's endorsement of the gender brilliance stereotype in non-Western contexts focused on 5- to 7-year-old Chinese children (Shu et al., 2022; see Okanda et al., 2022 for results with 4- to 7-year-old Japanese children with stick figure stimuli; also see Zhao et al., 2022 for results with older children from Singapore). Specifically, Shu et al. (2022) revealed that 6- and 7-year-old Chinese girls were less likely than boys to associate brilliance with their own gender when making judgments about White people's intelligence, replicating past research involving U.S. children (Bian et al., 2017). Given the novelty of the findings concerning the development of gender brilliance stereotype outside the United States, further evidence is needed to understand when and how this stereotype presents in other cultures.

More importantly, no previous work has examined whether boys and girls in non-Western contexts are

influenced by the gender brilliance stereotype, holding different levels of interest toward intellectually-challenging tasks. Korean culture emphasizes the role of effort in achieving success (Grant & Dweck, 2001), which could imply that brilliance is relatively less valued, and therefore the consequences of the gender brilliance stereotype may be less salient. Another factor that may moderate the consequences of this stereotype on children's motivation is how intelligence is conceptualized. While Westerners tend to endorse a more entity theory, viewing intelligence as unchangeable (Dweck, 2002), East Asians tend to endorse a more incremental theory, perceiving intelligence as malleable through effort (Heine et al., 2001; Norenzayan & Nisbett, 2000). If children believe that one can always grow to become more intelligent, the gender brilliance stereotype may not have a strong negative effect on girls' motivation. Yet, one study that manipulated adults' concepts of brilliance found that women were less interested in jobs requiring brilliance even when brilliance was portrayed as an acquirable trait (Bian et al., 2018). Thus, previous research does not license clear predictions about the detrimental implications of the gender brilliance stereotype in cultures valuing effort. We addressed this question by sampling children from Korea.

Another focus of the present research is to investigate whether children are sensitive to the race of the stereotype targets in forming the gender brilliance stereotype. Prior evidence regarding this question has been mixed. On the one hand, some studies suggest that children's gender brilliance stereotype varies depending on the target race (Jaxon et al., 2019; Shu et al., 2022). For instance, though 5- to 7-year-old United States and Chinese children linked men with brilliance rather than women when evaluating White targets, this association was reversed when evaluating Asians: Children associated high intelligence with Asian women rather than with Asian men (Shu et al., 2022). Similarly, 6-year-old U.S. children endorsed the gender brilliance stereotype favoring men when the targets were White, whereas 5- to 6-year-old U.S. children associated Black women with brilliance rather than Black men (Jaxon et al., 2019). On the other hand, some studies suggest that the gender brilliance stereotype applies similarly across different racial groups (Storage et al., 2020; Zhao et al., 2022). For example, using the Implicit Association Task, Zhao et al. (2022) found that Chinese Singaporean adults and 8- to 12-year-old children associated brilliance with both Asian men (vs. Asian women) and White men (vs. White women). Given the sparsity of the evidence as well as the variability in methods and testing ages, additional evidence is needed to further elucidate a complete picture on how children's gender brilliance stereotype intersects with targets' racial identity.

The present research

In the present research, we investigate the acquisition of the gender brilliance stereotype and how it relates to children's motivation in a non-Western context. In Experiment 1, we tested whether 5- to 7-year-old Korean children would attribute brilliance to men (vs. women) when judging Asians, who belong to the same racial group as participants themselves. Experiment 2 further examined the robustness of the gender brilliance stereotype, whereby we investigated whether Korean children would apply this stereotype to White people, whom they have limited contact with in daily life (e.g., the proportion of residents identified as White accounts for only around 0.4% in Korea, MOIS, 2020; MOJ, 2022). In Experiment 3, we assessed Korean children's motivation in intellectually-challenging activities and examined whether their acquisition of the gender brilliance stereotype predicted their motivation. The current work began as a relatively exploratory effort to investigate the cross-cultural consistency of the developmental trajectory and negative implications of the gender brilliance stereotype. However, all experiments followed similar methodological and analytical strategies as the previous research (Bian et al., 2017), and the work became increasingly confirmatory from Experiments 1 to 3.

EXPERIMENT 1

Experiment 1 investigated whether 5- to 7-year-old Korean children, who are raised in a racially homogenous culture with a majority of Asians (MOIS, 2020; MOJ, 2022), would associate brilliance with Asian men rather than Asian women. For exploratory purposes, we also assessed whether children held gendered ideas about school performance and its relation to children's endorsement of the gender brilliance stereotype. Since school achievements signal intelligence in principle, it is possible that children attend to gender differences in school grades to infer which gender is more intellectually talented.

Method

Power analysis

We performed an a priori power analysis (G*Power 3.1.9.4; Faul et al., 2009) for a linear regression model with three predictors, including participant gender, participant age group, and their interaction. Based on previous research with a similar experimental method (Bian et al., 2017; Jaxon et al., 2019; Shu et al., 2022), we assumed a medium effect size ($f^2 = .15$) with an alpha of .05 and obtained that at least 77 participants provide 80% power to detect significant predictors.

Nonetheless, we included 96 children to counterbalance all aspects in Experiments 1 and 2, following Bian et al. (2017).

Participants

Participants were 32 five-year-old (M_{age} = 5.50 years, SD = 0.24), 32 six-year-old (M_{age} = 6.48 years, SD = 0.26), and 32 seven-year-old (M_{age} = 7.53 years, SD = 0.28) Korean children. Half of them were boys, and half of them were girls. Twenty children were tested but excluded from the final sample because of inattentiveness (3), fussiness (1), activeness (1), parental interferences (1), or failure to pass the screener questions (14, see below). For this and the subsequent experiments, participants were recruited via advertisements in Korean online parenting communities, which are widely accessible to parents from various regional and economic backgrounds in Korea. We did not collect specific data on sample characteristics, thus further demographic details cannot be provided. Each participant's parent signed informed consent, and the protocols of this and subsequent experiments were approved by the Institutional Ethics Review Board at Sungshin Women's University.

Apparatus

In this experiment, children participated in either online (70) or in-person sessions (26), depending on the COVID-19 situation. The visual stimuli were created with Microsoft PowerPoint and used for both online and in-person experiments.

In-person experiment

Children participated in the experiment in a quiet room in the lab or at their institution. Children sat next to an experimenter and saw visual stimuli on a computer monitor. The experiment session was video-recorded.

Online experiment

An experimenter interacted with a child online. Using the Zoom platform, visual stimuli were presented using the "screen sharing" function. Prior to the study, parents were given instructions on how to set up their environments for the experiment, such as screen, recording, and sounds. Furthermore, parents were instructed to leave the room or sit behind their child silently to prevent any interference during the experiment.

Materials and procedures

Adapted from Bian et al. (2017), children first received a warm-up phase and a screener phase. Next, we presented children with two gender stereotype tasks to investigate their gendered beliefs about brilliance and niceness. We used niceness as a control trait because it is familiar to children of this age and not stereotypically associated with men more than women (e.g., Fiske et al., 2002). Children then received a grade task to investigate their perceptions of Asian children's academic achievements. The pictures used in all tasks were normed on a group of Korean adult participants (N = 31), showing no significant differences between the male and the female pictures in terms of attractiveness, emotion, and age.

Warm-up phase

An experimenter showed four numbers (1–4), one after another, and asked children to identify each number. This phase aimed to make children feel comfortable interacting with the experimenter and to ensure that they could use the numbers to mark choices. For instance, characters in the main tasks were number-coded (Figure S1), and children were asked to read the corresponding number to indicate their selections. Using numbers allowed us to conceal our purpose of examining children's gender-related beliefs. All participants were able to identify the four numbers.

Screener phase

We gauged children's understanding of the meaning of "smart" and "nice". For each trait, children received six questions. The "smart" and "nice" questions were presented in two separate blocks in a counterbalanced order.

In each question, children heard a description of an unknown child whose gender was unspecified. Among the six questions in each block, four questions provided descriptions that fit the definition of the trait (e.g., the child can always answer even the hardest question from the teacher) and two questions conveyed descriptions irrelevant to the trait (e.g., the child plays on a swing; for the full list, see Table S1). We included two irrelevant questions to rule out that children would provide a positive answer to any description. After hearing the description, children were asked whether the child possessed the relevant trait (e.g., "Is the child smart, not smart, or are you not sure?"). Children's answers were confirmed if they provided a correct answer ("smart/nice" to the four relevant questions, and "not sure" or "not smart/not nice" to the two irrelevant questions), and they were corrected otherwise. As in the previous study (Bian et al., 2017), children who scored lower than 4/6 for either trait were excluded from the final sample (n = 14; nine 5-year-olds, three 6-year-olds, and two 7-year-olds).

Gender stereotype tasks

After the screener phase, we presented children with two gender stereotype tasks (a gender-neutral story task and

a guessing task) to assess their tendency to attribute brilliance or niceness to their own gender. The order of the two tasks was counterbalanced.

The gender-neutral story task consisted of four stories, each of which described an unfamiliar person or child whose gender was unspecified. Two stories were about a "really, really smart person/child", and the other two were about a "really, really nice person/child". After hearing each story, children saw four pictures (two Asian males and two Asian females, interspersed) and chose one as being the person/child in the story. Half of the participants saw a male picture on the very left, and the other half saw a female picture on the very left.

The guessing task consisted of ten trials, organized into two blocks presenting children with pictures of either Asian adults (five trials) or children (five trials). The first trial of each block served as a practice trial in which children saw two individuals matched with their own gender. In the next four trials (the test trials), children saw pictures including one male and one female. Children were asked to guess which one of the two people/children is "really, really smart". Within each block, the order of the pictures was counterbalanced.

Across the two gender stereotype tasks, children received ten trials in total about brilliance and two trials about niceness. Note that, considering children's relatively short attention span, we chose to reduce the number of niceness trials to shorten the experiment. For each trial, children's responses were coded as 1 if they chose a person of their own gender, and 0 otherwise. Our main dependent measure was children's own-gender brilliance score, that is, the proportion of trials in which children selected individuals of their own gender as "really, really smart". We also calculated the proportion of trials in which children selected individuals of their own gender as "really, really nice" (own-gender niceness score).

Grade task

After the stereotype tasks, children received four questions to indicate their perceptions of Asian boys' and girls' academic achievements (Table S2). Responses were coded (same gender=1; other gender=0) and calculated similar to the previous tasks, and named as own-gender grade score.

After completing the sessions, children received a thorough debriefing and were thanked for their participation.

Analytic strategy

Our primary test of children's endorsement of the gender brilliance stereotype was the contrast between boys' and girls' own-gender brilliance stereotype scores. Prior findings suggest that 5- to 7-year-old children hold strong favoritism toward their own gender group such that they generally evaluate their own gender more positively (Dunham et al., 2011). However, if they have internalized the gender brilliance stereotype that favors men over women, girls should be less likely than boys to choose their own gender as brilliant. We conducted linear regression models on children's own-gender brilliance scores in R (Version 4.2.1, R Core Team, 2022), including participants' age group (5- vs. 6- vs. 7-year-olds), gender (boy vs. girl), and their interaction as factors. To break down interactions, we performed follow-up tests using *emmeans* packages. Past work suggested that children held similar gender brilliance stereotype toward adult and child targets (Bian et al., 2017), thus we collapsed the data across this factor in our primary analyses. However, we also performed additional analyses to explore if target age moderated our results. Any differences in children's responses to adult vs. child pictures were reported in the results section.

Additionally, we re-coded children's responses to indicate how often they chose males as being brilliant and compared their male selections against chance (.50). We reported deviations from chance across participants' gender so that boys' and girls' in-group bias can cancel each other out.

Finally, we conducted similar analyses on children's own-gender niceness scores to rule out alternative explanations, and on children's own-gender grade scores to investigate the relation between children's gender brilliance stereotype and their gendered beliefs about school achievements.

Results

Our preliminary analyses revealed no significant platform effects (online vs. in person) on any of the dependent measures (own-gender brilliance, niceness, and grade scores), all Fs(1, 92)<3.17, ps>.078; the data were, therefore, collapsed across the factor.

Gender stereotype about brilliance

We submitted children's own-gender brilliance scores to a linear regression model with participant gender, participant age group, and their interaction as factors. The analyses revealed a significant main effect of participant gender, B=.04, SE=.02, t=2.06, p=.042, and an interaction between participant gender and participant age, B=.05, SE=.02, t=2.12, p=.036 (Figure 1). Breaking down the interaction, the follow-up tests found that 5- to 6-year-old Korean boys and girls were equally likely to associate brilliance with their own gender: 5-year-olds (M_{boy}=0.59, SD_{boy}=0.23, M_{girl}=0.61, SD_{girl}=0.19, t=−0.37, p=.711); 6-year-olds (M_{boy}=0.67, SD_{boy}=0.20, M_{girl}=0.58, SD_{girl}=0.22, t=1.30, p=.197). In contrast, 7-year-old Korean girls were significantly *less* likely to associate their

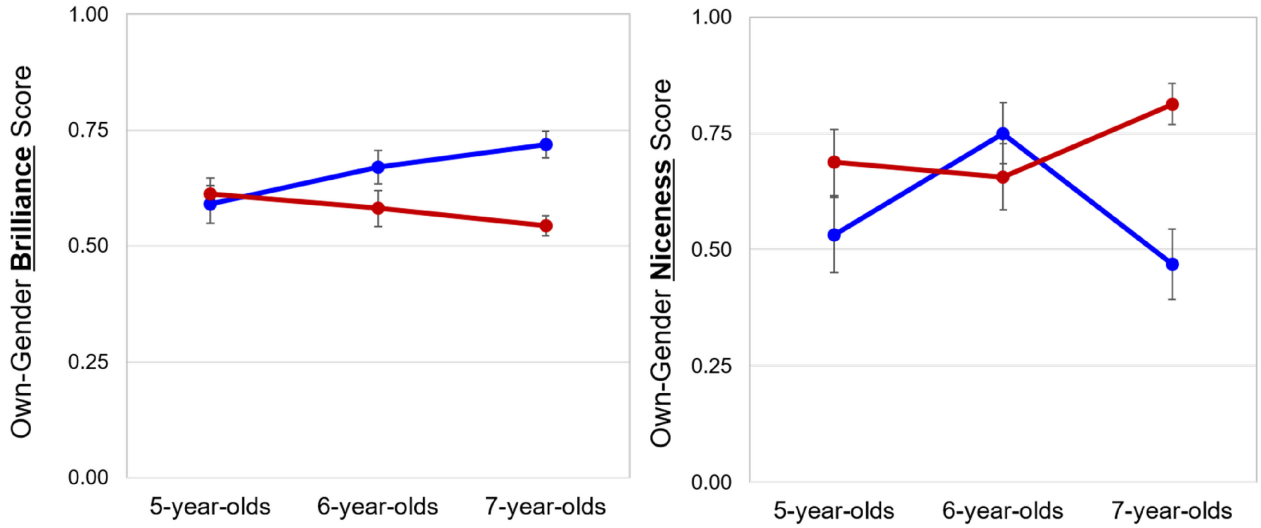

FIGURE 1 Boys' (blue) and girls' (red) own-gender brilliance scores (left) and own-gender niceness scores (right) in Experiment 1 by age group (5- vs. 6- vs. 7-year-olds). Error bars represent ±1 SE.

own gender with brilliance than boys, $M_{boy}=0.72$, $SD_{boy}=0.16$, $M_{girl}=0.54$, $SD_{girl}=0.12$, $t=2.60$, $p=.011$. An analysis using only the story or the guessing task revealed similar patterns (Table S3). An additional analysis using a linear mixed model including the age of target (adult vs. child) revealed no significant main effect or interactions involving target age, $ps>.136$, confirming previous findings that children hold similar gender stereotypes when judging adults and children (Alto & Mandalaywala, 2023; Bian et al., 2017).

We next coded the proportion of trials in which children chose males as "really, really smart". One-sample *t*-tests indicated that the choices of 5- and 6-year-olds did not differ from chance (5-year-olds: $M=0.49$, $SD=0.23$, $t(31)=-0.31$, $p=.762$; 6-year-olds: $M=0.54$, $SD=0.24$, $t(31)=1.01$, $p=.320$). However, 7-year-olds selected males significantly more often than expected by chance, $M=0.59$, $SD=0.19$, $t(31)=2.61$, $p=.014$. Overall, these results suggest that when judging Asians' intellectual abilities, Korean children begin to associate brilliance with males rather than with females at the age of 7.

Gender stereotype about niceness

A linear regression analysis found a marginal effect of participant gender, $B=-.07$, $SE=.04$, $t=-1.67$, $p=.098$, indicating that girls tended to choose their own gender as being nice than boys. Neither the main effect of participant age, $B=.02$, $SE=.05$, $t=0.32$, $p=.753$, nor the interaction between participant gender and participant age, $B=-.05$, $SE=.05$, $t=-0.95$, $p=.347$, reached significance. Despite the absence of this interaction, we conducted follow-up tests to further explore gender differences. The results showed that 5- to 6-year-old Korean boys and girls were equally likely to associate niceness with their own gender: 5-year-olds ($M_{boy}=0.53$, $SD_{boy}=0.46$, $M_{girl}=0.69$, $SD_{girl}=0.40$, $t=-1.13$, $p=.260$); 6-year-olds ($M_{boy}=0.75$, $SD_{boy}=0.37$; $M_{girl}=0.66$, $SD_{girl}=0.40$, $t=0.68$, $p=.499$). However, 7-year-old Korean girls were significantly more likely to associate their own gender with niceness than boys, $M_{boy}=0.47$, $SD_{boy}=0.43$, $M_{girl}=0.81$, $SD_{girl}=0.25$, $t=-2.49$, $p=.015$, a pattern different from children's gendered beliefs about brilliance.

One-sample *t*-tests on the average proportion of male selections indicated that 5- and 6-year-olds did not differ from chance (5-year-olds: $M=0.42$, $SD=0.44$, $t(31)=-1.00$, $p=.325$; 6-year-olds: $M=0.55$, $SD=0.43$, $t(31)=0.62$, $p=.540$). Seven-year-olds, however, selected males significantly less than chance, $M=0.33$, $SD=0.37$, $t(31)=-2.61$, $p=.014$, paralleling adults' stereotype associating women with warmth (e.g., Fiske et al., 2002). Importantly, these results rule out low-level alternative interpretations of the results regarding brilliance (i.e., children's general positivity bias favoring men over women).

Perceptions of school achievements

The analysis on children's own-gender grade scores revealed a significant interaction between participant gender and participant age, $B=.07$, $SE=.03$, $t=2.14$, $p=.035$. Neither the main effect of participant gender, $B=.00$, $SE=.03$, $t=0.10$, $p=.923$, nor participant age, $B=-.02$, $SE=.03$, $t=-0.71$, $p=.477$, was significant (Figure S2). The follow-up tests for each age group revealed no significant gender difference (5-year-olds: $M_{boy}=0.59$, $SD_{boy}=0.35$, $M_{girl}=0.73$, $SD_{girl}=0.30$, $t=-1.52$, $p=.132$; 6-year-olds: $M_{boy}=0.72$, $SD_{boy}=0.18$, $M_{girl}=0.72$, $SD_{girl}=0.24$, $t=0.17$, $p=.866$; 7-year-olds: $M_{boy}=0.69$, $SD_{boy}=0.25$, $M_{girl}=0.55$, $SD_{girl}=0.21$, $t=1.52$, $p=.132$). Five- to 7-year-old Korean boys and girls were equally likely to choose their own gender when making inferences about who achieves higher grades in school.

To explore the relation between children's achievement beliefs and their brilliance beliefs, we conducted a Pearson correlation analysis with children's own-gender grade scores and own-gender brilliance scores. There was a significant relationship between the two variables, $r = .52$, $p < .001$, suggesting that children's tendency to associate brilliance with their own gender was related to how much they believe their own gender outperforms in school. Note that this finding was different from Bian et al. (2017) showing a disconnect between the two sets of beliefs in U.S. children. We will return to this cross-cultural difference in the General Discussion.

Conclusion

Experiment 1 found that Korean children endorse the gender brilliance stereotype favoring Asian men over Asian women around age 7. Though Korean children demonstrated this stereotype slightly later than their U.S. counterparts (Bian et al., 2017; Jaxon et al., 2019), these results suggest that the beliefs associating brilliance with men may take root in early childhood across cultures.

EXPERIMENT 2

Experiment 2 investigated whether Korean children's gender brilliance stereotype intersects with targets' race. Past work on this topic presents a complex picture that requires more evidence. Here, we examined whether Korean children would apply the gender brilliance stereotype to White individuals. Regarding Korea is a racially homogenous country, with less than 5% of residents identified as foreign and about 0.4% as White (MOIS, 2020; MOJ, 2022), Korean children may be relatively unfamiliar with White people due to the limited direct interactions. Thus, assessing whether Korean children associate brilliance with White men (vs. White women) further speaks to the robustness and generalizability of the gender brilliance stereotype.

Method

Participants

Participants were a different group of 32 five-year-olds ($M_{age} = 5.53$ years, SD = 0.29), 32 six-year-olds ($M_{age} = 6.48$ years, SD = 0.31), and 32 seven-year-olds ($M_{age} = 7.46$ years, SD = 0.28). Half of them were boys and half of them were girls. Twenty children were tested but excluded from the analyses because they were inattentive (3), extremely talkative (2), or active (1), or because they failed the screener phase (14; nine 5-year-olds, three 6-year-olds; and two 7-year-olds). As Experiment 1, Experiment 2 was conducted either in person ($n = 36$) or online ($n = 60$).

Materials and procedures

The materials and tasks were identical to those of Experiment 1, except that children saw pictures of White individuals, previously normed and used in Bian et al. (2017).

Results

Preliminary analyses revealed no significant platform effects (online vs. in person) on any of the dependent

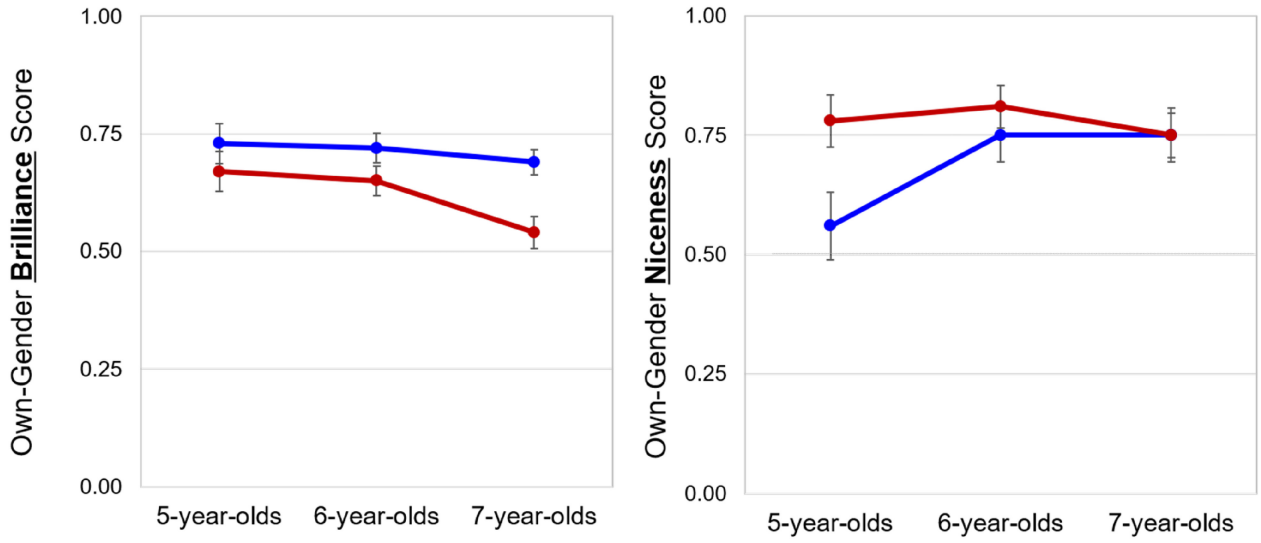

FIGURE 2 Boys' (blue) and girls' (red) own-gender brilliance scores (left) and own-gender niceness scores (right) in Experiment 2 by age group (5- vs. 6- vs. 7-year-olds). Error bars represent ±1 SE.

measures (own-gender brilliance, niceness, and grade scores), all $Fs(1, 92) < 0.36$, $ps > .549$; the data were, therefore, collapsed across the factor.

Gender stereotype about brilliance

As in Experiment 1, a linear regression analysis on children's own-gender brilliance scores revealed a main effect of participant gender, $B = .05$, SE = .02, $t = 2.26$, $p = .026$ (Figure 2), suggesting that Korean girls were significantly less likely than boys to associate brilliance with their own gender when making judgments about White people's intelligence. Neither the main effect of participant age group, $B = -.04$, SE = .02, $t = -1.70$, $p = .093$, nor the interaction between participant gender and participant age, $B = .02$, SE = .02, $t = 0.94$, $p = .348$, was significant. Although the interaction did not reach significance, we explored gender differences within each age group to better understand the developmental trajectory. At ages 5 and 6, Korean boys and girls were equally likely to choose White people of their own gender as being "really, really smart": 5-year-olds ($M_{boy} = 0.73$, $SD_{boy} = 0.24$, $M_{girl} = 0.67$, $SD_{girl} = 0.24$, $t = 0.80$, $p = .429$); 6-year-olds ($M_{boy} = 0.72$, $SD_{boy} = 0.18$, $M_{girl} = 0.65$, $SD_{girl} = 0.18$, $t = 0.97$, $p = .334$). However, at age 7, Korean girls were significantly less likely than boys to associate their own gender with brilliance, $M_{boy} = 0.69$, $SD_{boy} = 0.15$, $M_{girl} = 0.54$, $SD_{girl} = 0.19$, $t = 2.12$, $p = .037$. This pattern paralleled the developmental trend revealed in Experiment 1.

We next compared children's proportions of selecting White males as "really, really smart" against chance. We found that 5- and 6-year-old White male selections did not differ from chance (5-year-olds: $M = 0.53$, $SD = 0.31$, $t(31) = 0.51$, $p = .613$; 6-year-olds: $M = 0.53$, $SD = 0.26$, $t(31) = 0.76$, $p = .455$), whereas 7-year-old selected White men significantly more often than chance, $M = 0.58$, $SD = 0.20$, $t(31) = 2.09$, $p = .045$. These results indicated that 7-year-old Korean children began to associate brilliance with White men (vs. White women). An analysis focusing on each stereotype task separately revealed similar results (Table S4).

Interestingly, our additional analyses considering the age of the targets found a significant interaction between participant gender and target age, $B = .04$, SE = .02, $t = 2.84$, $p = .006$, suggesting that Korean children applied the gender brilliance stereotype differently to White adults versus White children. Specifically, girls were less likely to choose their own gender as being brilliant than boys when evaluating White adults, $M_{boy} = 0.74$, $SD_{boy} = 0.24$, $M_{girl} = 0.56$, $SD_{girl} = 0.26$, $t = 3.45$, $p < .001$, but this difference was not significant in their judgments of White children, $M_{boy} = 0.68$, $SD_{boy} = 0.25$, $M_{girl} = 0.68$, $SD_{girl} = 0.24$, $t = 0.08$, $p = .934$. Although Korean children have limited interactions with White people in general, one could speculate that Korean children are relatively more familiar with White adults than White children because of their exposure to the former group via books or media (e.g., Marvel movies). This increased familiarity may allow them to apply the gender brilliance stereotype to White adults, whereas they are slower to link the gender stereotypical traits to the less familiar racial and age groups. However, these intersectionality results are novel and should be interpreted with caution until replication.

Gender stereotype about niceness

The analysis on children's own-gender niceness scores revealed no significant effects of participant gender, $B = -.04$, SE = .03, $t = -1.31$, $p = .195$, participant age, $B = .03$, SE = .04, $t = 0.80$, $p = .426$, or their interaction, $B = .06$, SE = .04, $t = 1.60$, $p = .113$. In addition, the average proportion of children's male selections did not deviate from chance, 5-year-olds: $M = 0.39$, $SD = 0.40$, $t(31) = -1.56$, $p = .129$; 6-year-olds: $M = 0.47$, $SD = 0.40$, $t(31) = -0.44$, $p = .662$; 7-year-olds: $M = 0.52$, $SD = 0.37$, $t(31) = 0.24$, $p = .813$. Thus, Korean boys and girls were equally likely to associate niceness with their own gender when making judgments about White people.

Perceptions of school achievements

The analysis on children's own-gender grade scores revealed a significant interaction between participant gender and participant age, $B = .10$, SE = .03, $t = 2.85$, $p = .005$, but no main effects of participant gender, $B = .04$, SE = .03, $t = 1.49$, $p = .140$, or participant age, $B = -.04$, SE = .03, $t = -1.25$, $p = .213$ (Figure S2). At 5 and 6 years of age, boys and girls were equally likely to associate high academic performance with White children of their own gender: 5-year-olds ($M_{boy} = 0.64$, $SD_{boy} = 0.38$, $M_{girl} = 0.75$, $SD_{girl} = 0.22$, $t = -1.14$, $p = .256$), 6-year-olds ($M_{boy} = 0.81$, $SD_{boy} = 0.23$, $M_{girl} = 0.73$, $SD_{girl} = 0.23$, $t = 0.82$, $p = .417$). However, girls were less likely than boys to choose White children of their own gender as achieving better grades at the age of 7, $M_{boy} = 0.75$, $SD_{boy} = 0.20$; $M_{girl} = 0.47$, $SD_{girl} = 0.31$, $t = 2.94$, $p = .004$. A Pearson correlation analysis revealed a significant relation between children's own-gender brilliance scores and their own-gender grade scores, $r = .57$, $p < .001$. These results were largely consistent with those of Experiment 1: The more children perceived their own gender as excelling in school, the more likely they were to link brilliance with White individuals of their own gender.

Conclusion

Experiment 2 demonstrated that Korean children extended the gender brilliance stereotype to White people,

attributing brilliance to White men (vs. White women) from age 7. Given that White individuals make up only a small proportion of the Korean population (MOIS, 2020; MOJ, 2022), our results suggest that Korean children apply the gender brilliance stereotype to members of another racial group whom they have little interactions with. Together with Experiment 1, these findings indicate that Korean children exhibit strong gender brilliance stereotype favoring men over women.

EXPERIMENT 3

Experiment 3 set out to examine the potential impact of the gender brilliance stereotype on Korean children's motivation. In particular, we investigated whether children's endorsement of the gender brilliance stereotype would predict their motivation toward novel activities that are portrayed as requiring a high level of intelligence (vs. hard work). We introduced 6- to 7-year-old children to two novel games, one was said to be only for "really, really smart" children (the smart game), and the other was only for "really, really hardworking" children (the try-hard game), and measured children's interests toward each game. Based on Experiments 1 and 2, we predicted that 6-year-old boys' and girls' interests in either game would not differ, since their tendencies to associate brilliance with their own gender were not yet differentiated. In contrast, 7-year-old girls' interests toward the smart game, but not the try-hard game, would be lower than boys'.

Method

Power analysis

We conducted an a priori power analysis for a linear regression model with seven predictors, including participant gender, participant age group, game type, and all possible interactions. Our main prediction was a three-way interaction among gender, age group, and game type. In the one study reporting this interaction (Bian et al., 2017), the effect size was medium to large; thus, we assumed a medium effect size ($f^2 = .20$) with an alpha of .05. As a result, including 80 participants provides 80% power to examine significant predictors.

Participants

Participants were 40 six-year-olds ($M_{age} = 6.53$ years, SD = 0.31) and 40 seven-year-olds ($M_{age} = 7.45$ years, SD = 0.36). Half of them were boys and half of them were girls. Two children were tested but excluded from the final sample because of inattentiveness. As in previous experiments, Experiment 3 was conducted either in person ($n = 2$) or online ($n = 78$).

Materials and procedures

This experiment consisted of three parts: (1) *warm-up phase* (similar to Experiments 1 and 2), (2) *interest task* to measure children's interests in the two novel games, and (3) *gender stereotype task* to assess children's gender brilliance stereotype.

Interest task

In this task, children were introduced to two novel games (*modi* and *papu*) in a counterbalanced order. One game was said to be for "really, really smart" children (the smart game), and the other was said to be for children who "try really, really hard" (the try-hard game). Effort is regarded as essential to success in most careers and messages about its importance are available to young children, thus the try-hard game served as a neutral control condition to elicit children's baseline interest. In each game, children saw a picture of the game and heard about its rules and its key feature. We then asked, "Who can play this game well?" to check children's attention. If the child failed to answer correctly, we repeated the essential requirements of the game (e.g., "This game is only for *really, really smart children*.") and asked the same question again. All participants passed the attention check.

After hearing about each game, children were asked four questions to report their interests toward the game: (1) "Would you want to play the game or not?", (2) "Do you like the game or not?", (3) "Would playing the game make you happy or sad?", and (4) "If you can do something tomorrow, would you want to play this game or do something else?" (for the full scale, see Table S5). The order of the questions within each game was counterbalanced. Children's responses in each game were standardized and averaged to create an interest score.

Gender stereotype task

After completing the interest task, we presented children with the guessing task (two practice trials, eight test trials) from Experiment 1, assessing their gender brilliance stereotype. Again, we calculated the proportion of trials in which a child chose individuals of their own gender as "really, really smart" as children's own-gender brilliance score.

Analytic strategy

Children's interest scores were submitted to a mixed-effects linear regression model with game type (smart vs. try-hard), participant gender (boys vs. girls), participant age (6-year-olds vs. 7-year-olds), and all possible interactions as factors. The follow-up analyses compared boys' and girls' interests in each game separately for each age group. To examine children's gender brilliance stereotype, we conducted linear regression analyses including

participant gender, participant age, and their interaction as factors. Finally, we conducted a mediation analysis to investigate whether children's endorsement of the gender brilliance stereotype predicted their interest in the smart game (vs. the try-hard game).

Results

Interests

The mixed-effect linear regression model on children's interest scores revealed a significant three-way interaction among participant gender, participant age, and game type, Wald $\chi^2=2.67$, $p=.009$ (Figure 3). To discompose this interaction, we analyzed children's responses separately by game type.

Interests in the smart game

Children's interest scores for the smart game were submitted to a linear regression analysis with participant gender, participant age, and their interaction as factors. We found a significant main effect of participant age, $B=-.24$, SE$=.08$, $t=-2.93$, $p=.005$, indicating children's interests toward the smart game differed by their age group. Also, the effect of participant gender was marginally significant, $B=.16$, SE$=.08$, $t=1.93$, $p=.057$, which was qualified by an interaction with participant age, $B=.23$, SE$=.08$, $t=2.76$, $p=.007$. Consistent with our predictions, there was no gender difference in 6-year-old children's interests toward the smart game, $M_{boy}=0.17$, $SD_{boy}=0.74$, $M_{girl}=0.30$, $SD_{girl}=0.73$, $t=-0.59$, $p=.559$, while 7-year-old girls became less interested in this game than boys of the same age, $M_{boy}=0.14$, $SD_{boy}=0.58$, $M_{girl}=-0.62$, $SD_{girl}=0.84$, $t=3.32$, $p=.001$.

Interests in the try-hard game

A similar linear regression analysis revealed no significant effects of participant gender, $B=.05$, SE$=.09$, $t=0.53$, $p=.598$, participant age, $B=-.15$, SE$=.09$, $t=-1.61$, $p=.112$, or their interaction, $B=-.01$, SE$=.09$, $t=-0.16$, $p=.874$. Six- to 7-year-old Korean boys and girls were equally interested in the try-hard game (6-year-olds: $M_{boy}=0.21$, $SD_{boy}=0.80$, $M_{girl}=0.08$, $SD_{girl}=0.85$, $t=0.49$, $p=.628$; 7-year-olds: $M_{boy}=-0.12$, $SD_{boy}=0.91$; $M_{girl}=-0.19$, $SD_{girl}=0.74$, $t=0.26$, $p=.795$). These results ruled out a low-level alternative interpretation that 7-year-old girls' reduced interests toward the smart game simply reflected their tendency to shy away from novel activities.

Gender brilliance stereotype

We submitted children's own-gender brilliance scores to a linear regression model with participant gender, participant age, and their interaction as factors. We found a significant main effect of participant gender, $B=.05$, SE$=.02$, $t=2.20$, $p=.031$, suggesting that Korean girls were less likely to choose their own gender than boys when judging Asians' intelligence. Neither the main effect of participant age, $B=-.04$,

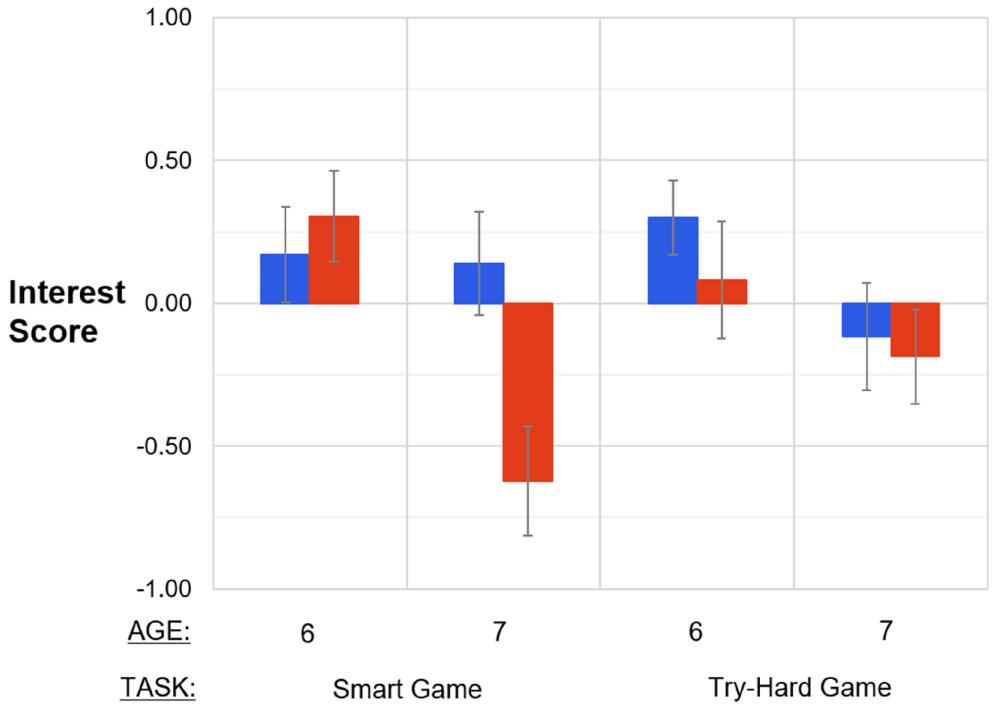

FIGURE 3 Boys' (blue) and girls' (red) interest scores (average of *z*-scored responses to four questions) in each novel game (smart game vs. try-hard game) in Experiment 3 by age group (6- vs. 7-year-olds). Error bars represent ±1 SE.

SE = .02, $t = -1.76$, $p = .083$, nor the interaction between participant gender and participant age was significant, $B = .02$, SE = .02, $t = 0.88$, $p = .383$. Follow-up tests revealed that girls were less likely to select their own gender as being really smart than boys at age 7, $M_{boy} = 0.64$, $SD_{boy} = 0.19$, $M_{girl} = 0.51$, $SD_{girl} = 0.19$, $t = 2.17$, $p = .033$, but not at age 6, $M_{boy} = 0.68$, $SD_{boy} = 0.21$, $M_{girl} = 0.63$, $SD_{girl} = 0.17$, $t = 0.93$, $p = .355$. The average proportion of male selections was also significantly above chance among 7-year-olds, $M = 0.57$, SD = 0.20, $t(39) = 2.03$, $p = .049$, but not among 6-year-olds, $M = 0.53$, SD = 0.24, $t(39) = 0.73$, $p = .471$. Together, these findings replicated the results of Experiment 1, suggesting that Korean children began to internalize the gender brilliance stereotype from the age of 7.

The relation between children's gender brilliance stereotype and their interests

To examine this relation, we conducted two sets of analyses. First, a Pearson correlation analysis revealed a significant relation between children's own-gender brilliance scores and their interests in the smart versus the try-hard game (a difference score), $r = .23$, $p = .041$. The more children associate brilliance with their own gender, the more interested they are in the smart game compared to the try-hard game.

Second, we submitted the 7-year-old data to a bootstrapped (5000 replications) product-of-coefficients mediation test by using PROCESS macro in SPSS 25 (Model 4; Hayes & Bigler, 2013). Children's own-gender brilliance score was entered as the mediator, with participant gender as the independent variable and children's interests in the smart versus the try-hard game as the dependent variable. Following Bian et al. (2017), we used the difference score of interest (the smart vs. the try-hard game) to control for children's baseline interests in the activity that was said to require dedication, while examining the mediating role of the gender brilliance stereotype in the relation between children's gender and their interests in the smart game. This also serves as a direct comparison between our sample and the U.S. children in Bian et al. (2017). The results showed a significant indirect effect, indirect effect = .31, 95% CI = [.12, .53] (Figure 4). Girls of age 7 were less likely than boys to associate brilliance with their own gender, which predicted girls' lower interests toward the smart game than boys (vs. the try-hard game). The mediation analysis using the 7-year-old children's interest scores in the smart game as the dependent variable revealed similar results (Figure S3).

Conclusion

As expected, at the age of 7, which is the age that Korean children began to assimilate the gender brilliance stereotype, Korean girls became less interested in the activity that was portrayed as for really smart children. Moreover, 7-year-olds' endorsement of the gender brilliance stereotype predicted their interests toward these activities: Because girls were less likely than boys to associate brilliance with their own gender, girls were less motivated to pursue intellectually-challenging activities. Experiment 3 provided the first evidence that children from non-WEIRD cultures attend to the gender brilliance stereotype in their activity choices.

GENERAL DISCUSSION

Across three experiments, our research provided three key findings speaking to the robustness of the development and possible pernicious impacts of the gender brilliance stereotype. First, Korean children around age 7 exhibited the gender brilliance stereotype favoring men over women when evaluating Asians, who belong to their own racial group. Second, Korean children extended their gender brilliance stereotype toward White people, whom children typically have limited direct interactions

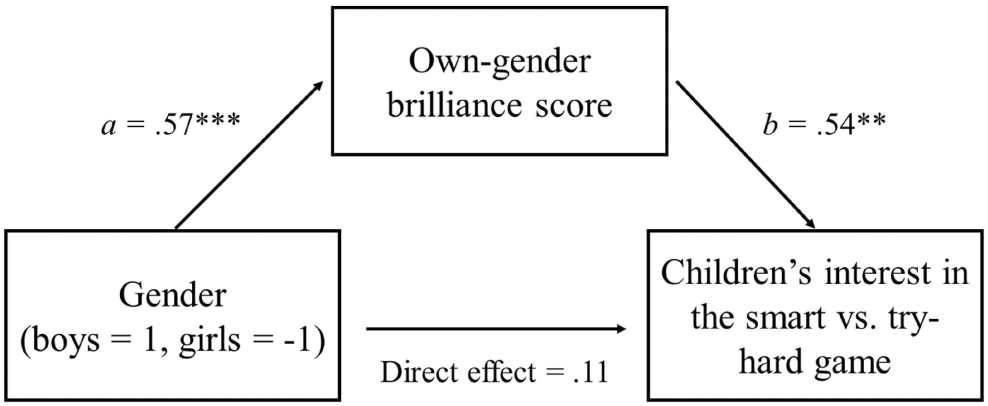

FIGURE 4 The gender difference in 7-year-olds' interest in the smart versus the try-hard game was mediated by their own-gender brilliance scores. Unstandardized coefficients are depicted. **$p < .01$, ***$p < .001$.

with. Third, children's endorsement of the gender brilliance stereotype predicted their motivation toward activities described as requiring high intellectual ability: Relative to boys, 7-year-old girls were less likely to attribute brilliance to their own gender, and they were also less interested in "brilliance-required" activities.

The present research contributes to the existing literature on children's gender brilliance stereotype in three aspects. First, our findings provide important evidence for the emergence of the gender brilliance stereotype in non-WEIRD cultures. Previous research revealed the gender brilliance stereotype begins to surface in U.S. children from age 6 (Bian et al., 2017) but left open the question of whether this stereotype extends beyond the U.S. context. Although the content of some gender stereotypes differs across cultures (Cuddy et al., 2015), our research indicates that Korean children begin to endorse the gender brilliance stereotype in early childhood, similar to their counterparts in the United States. These results suggest that the gender stereotype about intellectual abilities emerges around early elementary school years across distinct cultures.

Second, the present research supplies unique and crucial evidence suggesting that the possible impact of the gender brilliance stereotype on young girls' motivation is cross-culturally detrimental. *As soon as* the stereotype is acquired (around age 7), Korean girls became less interested in activities portrayed as for brilliant children than boys. Moreover, our mediation analyses provide initial evidence suggesting that girls' reduced interest toward the smart game was explained by their endorsement of the gender brilliance stereotype. Despite that collectivistic cultures often value effort over raw intelligence and emphasize hard work as the key to success (e.g., Heine et al., 2001; Heine & Hamamura, 2007), Korean children showed vulnerability to the gender brilliance stereotype just like U.S. children (Bian et al., 2017). This is consistent with the adult study showing that women are discouraged from pursuing brilliance-focused jobs than men even when brilliance is portrayed as an acquirable trait (Bian et al., 2018). Although Korean children tend to endorse a more incremental view of intelligence, perhaps the gender brilliance stereotype leads them to expect brilliance-focused activities to be more masculine and competitive (Meyer et al., 2015; Vial et al., 2022). Such perceived masculine cultures are likely to steer women and girls away. Overall, our results make meaningful contributions to our understanding of the pervasive gender disparity in almost every nation in the world (UNDP, 2020). Future work should identify the culturally specific mechanisms underlying the downstream consequences of the gender brilliance stereotype and systematically test whether children's theory of intelligence moderates these negative effects.

Lastly, our research adds to the sparse literature on whether children's gender brilliance stereotype intersects with their beliefs about other social dimensions: Race. Prior research on this topic has yielded mixed results. Some studies found that children extended gender brilliance stereotypes to White people, but not to Black or Asian people (Jaxon et al., 2019; Shu et al., 2022), whereas other studies did not find evidence for this intersectionality (Storage et al., 2020; Zhao et al., 2022). In particular, our findings seem inconsistent with Shu et al. (2022) that tested young Chinese children using similar methods, which may appear perplexing at first considering cultural similarities between Korea and China (e.g., interdependence, collectivism, Confucianism). However, the two cultures also differ in some cultural respects. For example, China is one of the fast-changing societies that may encourage its new generation to develop social characteristics that are more distant from traditional Confucian conservatism (i.e., diminish desires and be modest) than their Korean counterparts (Li, 2020; Zhang et al., 2005). In addition, Chinese society underwent active movements, known as "women hold up half of the sky" or "iron girls", advocating for women's participation in education and work (Lim, 2021; Wielink, 2019). These cultural messages may have led Chinese children to develop a more nuanced understanding of brilliance that is not exclusively linked to men. Yet, future work is needed to understand the building blocks underlying children's sensitivity to target race in their gender brilliance stereotype.

What are the sources of children's acquisition of the gender brilliance stereotype that appears across distinct cultures? Several factors have been suggested as potential contributors, such as parent's gendered expectations (Zhao et al., 2022), exposure to gender-stereotypical language (Charlesworth et al., 2021; Lewis & Lupyan, 2020), media (Xu et al., 2019), or statistical observations (Gálvez et al., 2019). Here, we suggest school experiences may also influence children's endorsement of the gender brilliance stereotype. We found that while U.S. children begin to assimilate the gender brilliance stereotype around the age of 6 (Bian et al., 2017), Korean children showed this endorsement a year later, at the age of 7. Intriguingly enough, this slight difference coincides with the age when elementary education begins in the two countries. That is, Korean children begin elementary school slightly later than U.S. children. Including the United States and Korea, in many cultures, children start academic learning (e.g., reading, mathematics) from elementary school (Lindt & Miller, 2017; MOE, 2015; Powell et al., 2012). Unlike in kindergartens where everyone is awarded a gold star, children in elementary school receive performance feedback that is more differentiated and could be used as cues indicating intelligence. These changes in classroom environments can serve as a platform exposing young children to cultural messages conveying the gender brilliance stereotype. For example, elementary

school teachers attribute boys' success in math to inborn ability, while attributing girls' performance to hard work (Chae & Ryu, 2011). Although our research was not designed to directly investigate the sources of the gender brilliance stereotype, we speculate that children's experiences in elementary school might be related to it.

To explore this possibility, as supplementary analyses, we re-grouped our children into two categories: kindergarteners versus elementary schoolers. Across the three experiments, there was a significant gender difference in elementary school girls' and boys' own-gender brilliance scores, $Fs > 5.24$, $ps < .027$, but not in kindergartners', $Fs < 1.83$, $ps > .182$ (Figure S4). The analysis on children's interest scores in the smart game also revealed a significant gender difference only in elementary schoolers, $F(1, 48) = 8.06$, $p = .007$, but not in kindergarteners: $F(1, 28) = 0.39$, $p = .536$ (Figure S5). Although informative, given the significant overlapping between grade level and age, these results should be interpreted with caution.

In addition, the present work suggested that Korean children's acquisition of the gender brilliance stereotype may be related to their beliefs about which gender excels at school. In particular, we found a significant relation between Korean children's gender brilliance stereotype and their perceptions of boys' and girls' school achievements. This finding contrasted with Bian et al. (2017), in which the two sets of beliefs were disconnected (U.S. children associate brilliance with boys around age 6, yet they believe girls have better school performance). It is possible that Korean children's gender brilliance stereotype is partly rooted in their observations or perceptions of who performs well in their class. However, it is worth noting that regular testing has been banned in Korean elementary schools since around 2010 (Lim et al., 2018), and in middle and high schools, girls actually outperform boys (MOE, 2022). Therefore, Korean children barely have an opportunity to observe that boys achieve higher grades than girls. Nonetheless, other factors embedded in children's school experiences, such as teachers' attitudes or biases (e.g., Beilock et al., 2010; Robinson-Cimpian et al., 2014), may shape children's beliefs about academic achievements and intelligence simultaneously. Another possibility, which is not necessarily mutually exclusive with this possibility, might be that Korean children are more likely than U.S. children to infer that "smart" children would receive top grades at school. Korean society is notorious for its fierce competition in education, strongly emphasizing the importance of academic achievements for life success (Statistics Korea (KOSTAT), 2019). It is possible that this cultural emphasis on competition reinforces children's link between their perceptions of intelligence and academic success. In future research, it would be worthwhile to study how children's gender brilliance stereotype is related to their school experiences across different cultures.

Our findings point to a number of promising future research directions. First, considering the novelty of the present research that shows the generalizability of the gender brilliance stereotype outside the United States (Shu et al., 2022; Zhao et al., 2022), further research testing children from various cultures is needed to examine the universality or culturally specific mechanisms of this gender stereotype. Second, children's gender brilliance stereotype may intersect with race in complex and context-sensitive ways. More studies are needed to examine how children in different cultures apply this stereotype to different racial categories under various contexts. Third, the negative implication of the gender brilliance stereotype on girls' motivation extends beyond the WEIRD cultures, calling for the urgent need for interventions to combat the gender brilliance stereotype as well as its consequences. Prior interventions have been focused on promoting females' engagement in STEM (e.g., Hite & Spott, 2022; Law et al., 2021; Rhodes et al., 2019; Shachnai et al., 2022). Yet, as noted earlier, women's underrepresentation goes beyond STEM and persists in some non-STEM disciplines thought as requiring brilliance (e.g., philosophy, economics). Future research should devise interventions targeting the domain-general stereotypes about intelligence to reduce gender disparities more broadly. Finally, our present work focuses on early-emerging associations between intellectual talents and gender groups, yet it would be important to depict the development of the associations between brilliance and different fields or careers. Investigating how, when, and why children come to perceive certain fields as requiring innate talents will help to provide a fuller picture of the developmental pathways to the gender imbalance in brilliance-required domains. This line of research will also provide useful insights for interventions to promote women's engagement.

In conclusion, the present research provides converging evidence showing that the development and consequences of the gender brilliance stereotype are cross-culturally consistent. By age 7, Korean children start associating brilliance with Asian men (vs. Asian women) and White men (vs. White women). Furthermore, this gender brilliance stereotype may have an immediate influence on girls' interests, discouraging them from pursuing activities said for brilliant children. These findings shed light on the developmental causes of the global phenomenon of women's underrepresentation in prestigious careers, and provide unique insight on when and how to reduce the gender gap from its roots.

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CONFLICT OF INTEREST STATEMENT

There are no conflicts of interest by any of the authors.

DATA AVAILABILITY STATEMENT

The data and code necessary to reproduce the analyses presented here are publicly available on the Open Science Framework: https://osf.io/z2akr/. The materials necessary to replicate the findings presented here are available from the first author. The analyses presented here were not pre-registered.

ETHICS STATEMENT

This study was approved by the institutional ethics review board at Sungshin Women's University.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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