The Development of Korean Children's Gender Stereotypes About Intellectual Brilliance

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A Master's Thesis
submitted to the
Graduate School of Sungshin University

in partial fulfillment of the requirements
for the degree of
Master of Psychology

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May, 2022

This is to certify that we have examined the

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Abstract

Recent research suggests that American children in early elementary school years associate intellectual ability with men rather than women (Bian et al., 2017). Consistent with this “brilliance = men” gender stereotype, American girls are less interested in games said to be for “really, really smart children” than boys from the age of 6. In three experiments, the present research examined whether children’s gender brilliance stereotype and the negative impact of this stereotype on children’s motivation is cross-culturally consensual. In the first two experiments, 5- to 7-year-old Korean children, apply the “brilliance = men” gender stereotype when making judgments of Asian (Experiment 1, *N* = 96) and White (Experiment 2, *N* = 96) people’s intelligence. Around the age of 7, Korean children were more likely to choose men as being smart than women, with both Asian and White targets. Experiment 3 (*N* = 80) presented 6- to 7-year-old Korean children with two novel games, one said to be for “children who are really, really smart” and the other for “children who try really, really hard.” At age 7, but not at age 6, girls’ interest in “smart” game was lower than boys’. Both boys and girls of all ages showed similar interest in the “hardworking” game. These results support the universality and generalizability of the gender stereotype about intellectual talents and the early existence of its negative impact on girls’ interests in intellectually challenging activities.

Keywords: "Brilliance = men" gender stereotype, generalizability, social cognitive development

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I. Introduction

Despite women's significant contributions in many fields, women are underrepresented in specific fields including those in science and technology. As a prime example, in the United States, women earned less than 21% of PhDs in computer science and physics and are in general earning fewer PhDs than men on average in STEM (science, technology, engineering, and mathematics) fields (NSF, 2021). Women's underrepresentation in STEM fields has been a strong focus of research and policymaking in recent years. However, a closer inspection of the data on women's involvement in various disciplines both in STEM and non-STEM revealed a more complex picture than previously thought. Although there are fewer women in STEM fields than in non-STEM fields overall, some fields within STEM, such as neuroscience and cell biology, have about equal proportions of men and women earning advanced degrees. Similarly, in non-STEM disciplines, while some fields (e.g., psychology) do not suffer from issues of representation, women in fields such as philosophy, economics, and music theory are earning fewer than 35% of degrees (NSF, 2016).

To explain the variability in the gender gap among different fields, Leslie and her colleagues (2015) proposed that women are underrepresented in fields where success is portrayed as depending on intellectual brilliance (e.g., a spark of genius), which women are perceived as less likely to possess than men (Bennett, 1996; Furnham, 2000; Furnham et al., 2002;

Storage et al., 2016). According to their Field-specific Ability Belief (FAB) hypothesis (Leslie et al., 2015), some disciplines are more likely than others to endorse the idea that high-level success depends on in-born intellectual talent rather than hard work or dedication. As such, the stereotypes against women's intellectual abilities may undermine women's willingness to participate in the fields that placed more value on intellectual brilliance than effort. Consistent with their account, Leslie et al. (2015) found that the more a field emphasized brilliance the lower women's representation was at the Ph.D. level in this field, both in STEM and non-STEM domains.

How does the gender stereotype develop? A growing body of literature has investigated the acquisition and the impact of the gender stereotypes of brilliance on children's development (Bian et al., 2017, 2018). Recent research suggested that American children in early elementary school years endorse the "brilliance = men" stereotype (Bian et al., 2017; Jaxon et al., 2019). To illustrate, in Bian et al. (2017), when shown pictures of unfamiliar men and women and asked who is "really, really smart", although 5-year-old boys and girls tended to choose individuals of their own gender, 6- to 7-year-old girls were less likely to associate brilliance with their own gender than boys at this age.

Children's gender stereotypes about brilliance immediately begin to constrain their motivation, leading girls to avoid the activities described as requiring brilliance. Consistent with the developmental trajectory in

children's gender-brilliance stereotype, 6- and 7-year-old American girls became less interested in novel games said to be for "really, really smart children" relative to boys, even though girls and boys at age 5 were equally interested in playing these games (Bian et al., 2017). In addition, children's own stereotypes directly predicted their interest in these novel activities. The more a child associated brilliance with the opposite gender, the less interested he or she was in playing our games for "really, really smart children." This evidence suggests an early link between stereotypes about brilliance and children's aspirations.

Though these findings paint a promising portrait of the developmental origins of gender stereotypes about intellectual talents, research to date has been conducted almost exclusively in the United States, one of the Western, Educated, Industrialized, Rich, and Democratic (WEIRD) societies whose people represent just 12% of the world's population (Henrich et al., 2010a, 2010b). Although studies conducted in the WEIRD populations are valuable in their own right, it may be problematic to use findings from WEIRD samples alone to draw conclusions about human development in general. Indeed, studies have demonstrated that individuals in the WEIRD and non-WEIRD cultures show different responses to psychological tasks related to social cognition; for example, in judging others' emotions by their facial expressions, individuals from collectivistic cultures are more likely to incorporate information from social context than individuals from individualistic cultures (e.g., Masuda et

al., 2008; Masuda & Nisbett, 2001, 2006; Nisbett & Masuda, 2003). Given that stereotypes are largely a cultural phenomenon shaped by socio-cultural input, it is imperative to include children from the other side of the world to examine the generalizability and variance of the developmental trajectory of the gender stereotype of intellectual brilliance. To our knowledge, only one study explored the development of the gender brilliance stereotypes in young children from non-WEIRD cultures (China) so far (Shu et al., 2022), and moreover, no study investigated the universality of the negative consequences of this gender stereotype on children's interests in intellectually challenging tasks.

The current experiments are one of the first attempts to examine the generalizability of the acquisition of the gender-brilliance stereotype and the negative impact of this stereotype on children's motivation. Adapting the methods of Bian et al. (2017), we examined whether Korean children associate intellectual brilliance more with men than women and whether this belief shapes Korean children's interest in activities requiring intellectual talent. We investigated (1) whether Korean children would apply the negative stereotype against women's intelligence when making judgments of Asian individuals (Experiment 1), (2) whether they would apply the stereotype even when making judgments of White individuals whom they have limited contact with in their everyday life (Experiment 2), and (3) whether the stereotype would affect Korean children's motivation, especially activities portrayed as requiring high levels of intellectual ability

(Experiment 3). Before describing this research, I will first review the theoretical frameworks and existing evidence relevant to the present research.

II. Theoretical background

Explanations for Women's Underrepresentation

Traditionally, two broad theoretical approaches have been proposed to address the problem of women's underrepresentation. According to the *biological account*, the underrepresentation of women is caused by biological factors (e.g., Baron-Cohen, 2002; Benbow & Lubinski, 1997; Dabbs et al., 1998; Hedges & Nowell, 1995). Specifically, researchers who adopt this approach assume that there are innate differences between men and women, for example, mathematical and spatial reasoning abilities and that these biological differences inevitably lead members of these two groups to choose different career paths. For instance, Baron-Cohen (2002) proposed that men tend to have "systemizing" brains, characterized by the ability to think abstractly and systematically. As such, men may be better equipped to learn about domains that benefit from thinking abstractly and systematically. It might be the case that having "systemizing" minds gives men an advantage when it comes to analyzing and making predictions about objects. In contrast, Baron-Cohen suggested that women tend to have "empathizing" minds, characterized by an innate capability for thinking about people's mental states and emotions and appropriately responding to those mental states and emotions. As such, women may be better at careers that value the ability to interact and deal with people.

A *sociocultural account* doubts the biological approach and rather believes women's underrepresentation to be caused by sociocultural factors

(e.g., Beilock et al., 2010; Bennett, 1996, 1997; Gunderson et al., 2012; Kirkcaldy et al., 2007; Stephens-Davidowitz, 2014; Storage et al., 2016). These researchers posit that innate differences between men and women (e.g., in ability) are either minimal or entirely nonexistent, and that any differences in career choices made later on in life are the result of socialization processes. In fact, there is no convincing evidence that the gender differences found in various tasks are biologically rooted and innate. For example, the evidence reported that gender differences in mathematical ability emerged only later on in life (Robinson & Lubienski, 2011) and were virtually absent in early childhood. Therefore, it is entirely plausible that the gender differences in math ability are not biologically based and rather are a product of socialization processes.

Among the myriads of sociocultural factors that could affect the gender differences in certain areas and eventually in career choices, proponents of the sociocultural account have focused on gender stereotypes as a crucial factor that contributes to women's underrepresentation. Gunderson et al. (2012), for example, reviewed a wealth of research which shows that both parents and teachers expect their male children and students to have greater ability in mathematics than their female counterparts. Additionally, the negative stereotype against girls influences school teachers' expectations of students' math performance (Robinson-Cimpian et al., 2014). Teachers believe girls need to put extra effort to achieve a level of math performance comparable to boys'—without

this extra effort, they believe that girls would fall behind. These biased perceptions are likely to affect children's perceptions of their own mathematics abilities and may eventually steer girls away from participating in STEM fields (e.g., Jacobs et al., 2005).

A Promising Sociocultural Account: The Field-specific Ability Beliefs (FAB) Hypothesis.

Although the existing evidence for the sociocultural account helps explain women's underrepresentation in STEM fields overall, researchers began to realize that there is great variability in women's representation within STEM and non-STEM domains (Cimpian & Leslie, 2017). Researchers began to wonder whether women's representation in a particular field might also be influenced by features *beyond* the distinction between STEM versus non-STEM.

As a promising account that could explain the variability in women's representations both in STEM and non-STEM fields, the Field-specific Ability Belief (FAB) hypothesis argues that fields vary in the extent to which they value various traits as necessary for success in the fields (Leslie et al., 2015). For example, practitioners in some fields emphasize effort as necessary for success, whereas practitioners of other fields believe largely that natural intellectual giftedness is required for success in their field. These "field-specific ability beliefs" shape the atmosphere and culture of a field, and communicate what is valued in that field. Importantly, such field-level beliefs can give rise to biases that may

result in an underrepresentation of women under certain circumstances. Specifically, the belief that certain fields require brilliance might lower women's representation in such fields because women are often stereotyped as lacking such abilities (e.g., Bennett, 1996, 1997; Kirkcaldy et al., 2007; Stephens-Davidowitz, 2014; Storage et al., 2016; Tiedemann, 2000; Upson & Friedman, 2012).

Initial evidence for the FAB hypothesis came from an American nationwide survey of over 1,800 academics from 30 (12 STEM and 18 non-STEM) fields (Leslie et al., 2015). In this survey, professors, postdoctoral researchers, and graduate students from a variety of fields were asked to indicate their beliefs about what is required for success in their respective fields (e.g., "Being a top scholar of [discipline] requires a special aptitude that just cannot be taught"). This simple measure was found to significantly predict the representation of women across the academic spectrum. That is, the more a field emphasized brilliance the lower women's representation was at the Ph.D. level in this field, both in STEM and non-STEM domains. Meyer, Cimpian, and Leslie (2015) provided additional evidence for the FAB Hypothesis by turning to the general population rather than professionals in academia. Results showed that lay people's beliefs about how much fields require "brilliance" and "genius" value significantly predicted the representation of women in those fields.

In sum, according to the FAB hypothesis, it is possible that (1) a field's belief that raw intellectual talent is necessary for success, combined

with (2) a cultural stereotype that women fail to possess this natural "gift" leads to the underrepresentation of women in that field (Bian et al., 2018; Leslie et al., 2015; Meyer et al., 2015; Storage et al., 2016; Vial et al., 2022).

A "Brilliance = Men" Stereotype

As discussed above, the FAB hypothesis posits that field-specific beliefs that fields require "brilliance" combine with a "brilliance = men" stereotype to reduce women's participation in those fields. Until recently, there is relatively little prior research on this broad stereotype about intellectual ability—a wealth of prior research on gender stereotypes has instead been focused on stereotypes about specific cognitive abilities such as mathematical or spatial reasoning abilities (e.g., Cvencek et al., 2011; Dabbs et al., 1998; Eccles et al., 1990; Spencer et al., 1999; Tomasetto et al., 2011).

A recent study using an implicit measure of bias directly tested the adults' gendered beliefs about intellectual abilities (Storage et al., 2020; Zhao et al., in press). In Storage et al. (2020), for example, in multiple IAT (Implicit Association Tests) experiments, adults from different regions of the U.S. sorted 4 kinds of stimuli, (1) stimuli related to the category male (e.g., pictures of White men), (2) stimuli related to the category female (pictures of White women), (3) words related to the trait brilliant (e.g., genius, brilliant, super-smart), and (4) words related to a comparison trait (e.g., creative, happy, funny). Participants' reaction times were

significantly faster in a stereotype-congruent block, in which stimuli related to male and brilliant were assigned the same response key, while stimuli related to female and the comparison trait were assigned a different response key (and sorted together) than in a stereotype-incongruent block, in which the pairings were reversed (male with a comparison trait and female with a brilliance). Moreover, adults' tendency to associate brilliance with men over women was correlated with several explicit measures of gender bias, such as their explicit endorsement of gender-brilliance, sexism, and political conservatism.

To summarize, researchers just recently began to investigate individuals' gendered beliefs about intellectual abilities and evidence indeed suggests that adults implicitly associate brilliance and genius with males more than with females.

Developmental Roots of the "Brilliance = Men" and Its Impact on Children's Interests

As described above, the FAB hypothesis provided a promising account of the current gender disparities across fields (Leslie et al., 2015), and recent investigations of this hypothesis that focused on adult participants provided convincing evidence supporting the hypothesis (Bian et al., 2018; Storage et al., 2020; Vial et al., 2022). Evidence from adult participants suggests that 1) professionals, as well as people outside the academia, share the notion of which fields require brilliance, and 2) adults associate brilliance or genius more with men than women. Given that

children identify typical characteristics of their gender from a young age, and are motivated to conform to the gender group (Martin et al., 2002; Martin & Rouble, 2004), an important question arises--When do young children start thinking that men are smarter than women (Bian et al., 2017; Jaxon et al., 2019)?

Bian, Leslie, and Cimpian (2017) first investigated the developmental origins of the gender stereotypes that associate intellectual abilities more with men than women. In the study, 5- to 7-year-old American children were asked questions that measured whether they associated being “really, really smart” with their own gender. For example, children heard a story from an experimenter about an unfamiliar individual whose gender was unspecified. One story was about a “really, really smart” person at the experimenter’s workplace who “comes up with answers much faster and better than anyone else”. The other one was about a “really, really nice” person at the experimenter’s workplace who “likes to help others with their problems and is friendly to everyone at the office”. After telling the story, the experimenter presented the children with two pictures of White women and two pictures of White men. In this and other tasks, 5-year-olds boys and girls were more likely to choose their own gender as a smart or a nice person; however, 6- and 7-year-old girls were significantly less likely than boys to choose their own gender as a smart person whereas this gender difference was reversed in their own-gender choice for the nice person. These results suggest that the negative

stereotype against women's intelligence emerges in early elementary school years.

Importantly, Bian et al. (2017) also found that the negative stereotypes against women's intelligence immediately begin to constrain boys' and girls' interests in intellectually challenging tasks from a young age. In a study, an experimenter presented 5- to 6-year-olds with two novel games with different descriptions, one (e.g., *zarky*) said to be for "children who are really, really smart" and the other (e.g., *impok*) for "children who try really, really hard." Next, the experimenter asked questions designed to measure children's interest in the game (e.g., "Would you want to play the *zarky*/*impok* game, or would you not want to play it?"). Consistent with their "brilliance = men" gender stereotype, 6-year-old, but not 5-year-old, American girls are less interested in games said to be for "smart children" than boys. Moreover, children's interest towards these activities was predicted by their beliefs about which gender is brilliant, suggesting the immediate impact of these stereotyped notions on children's interests. Consistent with these findings, children selected fewer girls than boys as teammates for an unfamiliar game when it was said to be for "really, really smart" children than when it was not (Bian et al., 2018).

The Need for Further Investigation of the Development of the "Brilliance = Men" Gender Stereotype in Different Cultures

Although informative, prior investigations of the development of the "brilliance = men" stereotype are limited in a critical way. That is, most of

the studies on this field to date have been conducted exclusively in the U.S., one of the prime examples of the Western, Educated, Industrialized, Rich, and Democratic (WEIRD) societies (Henrich et al. 2010a, 2010b). Therefore, it currently remains unclear whether the acquisition and the impact of the "brilliance = men" gender stereotype in early childhood observed by previous studies (Bian et al., 2017, 2018; Jaxon et al., 2019; Shu et al., 2022; Zhao et al., in press) reflects a universal perception in modern societies or rather stems from various experiences shared with individuals in the Western world.

The only exception so far is a recent investigation that examined 5- to 7-year-old Chinese children's gender-brilliance stereotypes about White and Asian people (Shu et al., 2022). The results indicated that children's gender stereotypes are sensitive to the target race and only partly supported the generalizability of children's "brilliance = men" stereotypes. When making judgments about White people's intellectual abilities, 6- and 7-year-old Chinese girls were less likely than Chinese boys to associate brilliance with their own gender, replicating past research involving U.S. children (Bian et al., 2017). However, when making judgments about Asians' intellectual abilities, 5- to 7-year-old girls were more likely than boys to attribute brilliance to their own. Shu et al. (2022) speculated that the Chinese children applied gender stereotypes more consistently to White than Asian people because they viewed White men who are members of the high-status racial group as more prototypical men than Asian men who

are members of relatively low-status racial groups. Given the novelty of the findings concerning the development of gender-brilliance stereotypes outside the U.S., further evidence is needed to understand when and how this stereotype presents in other cultures. In addition, we note that Shu and her colleagues only measured children's gender stereotypes; no previous work has examined whether boys and girls differ in interests in intellectually challenging tasks outside the U.S.

The present research examined the generalizability of the acquisition of the "brilliance = men" gender stereotype and its impact on children's interests. To do so, building on the prior work (e.g., Bian et al., 2017), the present research examined whether 5- to 7-year-old Korean children endorse the gender stereotypes associating intellectual brilliance with men, and also this negative stereotype impacts children's motivation, especially concerning activities portrayed as requiring high levels of intellectual ability.

It is important to test the generalizability of the gender stereotypes with Korean children because certain aspects of the cultural context of Korea (where only the 'W' part is different from U.S.) are distinct from the United States where most research on this topic has been conducted. First, compared to the U.S., Korea is a relatively more collectivistic culture that emphasizes interdependence and fulfilling social roles among its members (Hofstede, 1980; Markus & Kitayama, 1991; Schwartz, 1994; Triandis, 1989). Evidence from adults suggests that these cultural differences in independence-interdependence manifest in many domains of social cognition

including the gender stereotypes—while American adults rate men as less interdependent than women; Korean adults showed the opposite pattern, rating men as more interdependent than women, deviating from the "universal" gender stereotype of male independence (Cuddy et al., 2015). At least in Western culture, both independence and intelligence are viewed as competence-related traits (e.g., Abbott et al., 2016; Chamorro-Premuzic & Furnham, 2005; Cuddy et al., 2005; Heckhausen et al., 1989), therefore, it is possible that the gender stereotypes about intellectual brilliance might be less pronounced in Korea than in the U.S. Second, cross-cultural evidence suggested that compared to individuals from individualistic cultures, individuals from collectivist cultures are more likely to endorse the incremental theory that views some personal qualities (i.e., intelligence, morality) as changeable rather than the entity theory that views those as fixed (Herbig & Palumbo, 1996; Morris & Leung, 2010; Norenzayan & Nisbett, 2000) and focuses more on effort and dedication for success (Li, 2002; Salili & Hau, 1994). In this regard, it could be possible that intellectual brilliance is less culturally salient in Korea and thus that stereotypes about brilliance are less prominent.

In addition, the gender differences between boys' and girls' academic performances in some subjects that people value brilliance as necessary for success (e.g., Chestnut et al., 2018) are relatively small in Korea. Indeed, Korean girls performed better in those subjects than boys (KICE, 2012; Lee, 2012). For example, girls in the third grade of the

elementary school in Korea outperform boys (Lee, 2012). If children are sensitive to such cues, Korean children might be immune to the stereotyped notions associating intellectual abilities with boys.

However, despite the variations in dimensions of cultural differentiation, there are some reasons to suspect that Korean children may also acquire the gender stereotype linking brilliance with men. First, Korea has a higher gender disparity than the U.S. in multiple dimensions. According to the World Economic Forum's Gender Gap Index measuring overall gender inequality including economic opportunities, educational attainment, and political empowerment, Korea was ranked 103rd out of 156 countries, much below than the rank of the U.S. which is 30th (World Economic Forum, 2021). Mirroring the gender disparity, Korean adults are more likely than American adults to endorse gender stereotypes against women in domains of politics (e.g., Men make better political leaders), work (e.g., Men make better business executives, Men have more rights to a job when jobs are scarce), and education (e.g., University is more important for men than for women) (UNDP, 2020).

Second, just like the results in the U.S. (NSF, 2021), females are underrepresented in the STEM field overall in Korea. For example, women earned less than 15% of PhDs (KOSTAT, 2020) in the fields of Science and Engineering in Korea. Similarly, the average gender ratio of students entering science high schools for gifted (similar to the STEM high schools of the U.S.) across the nation is 3.39:1 (male: female) (KESS, 2021). In

line with the statistics, in one study, 57% of a sample of Korean teachers who teach gifted classes in elementary and middle schools reported that gender differences existed in high achieved students' learning ability in mathematics and science and most critically, 60% of the sample perceived that the differences were caused by inborn differences between girls and boys (Chae & Ryu, 2011).

Finally, although the contents of gender stereotypes differ across cultures, prior work suggested that given the universal dominance of males in almost every culture, there is a cross-cultural similarity that views men to possess more of the characteristics that are most culturally valued, *whatever* those characteristics are (Cuddy et al., 2015). From an evolutionary perspective, intelligence should be highly valued in all human societies (Byrne & Byrne, 1995; Cosmides & Tooby, 2002; Gallup, 2020; Kanazawa, 2004). Therefore, it is plausible that men in Korea as a relatively higher status group may tend to be viewed as possessing more intellectual abilities, which their society values.

Considering these reasons, it is also possible to predict that Korean children's endorsement of the "brilliance = men" stereotype may be the same as or even stronger than that of children in the U.S. In this case, the negative stereotype linking brilliance with men may also constrain Korean children's motivation towards the activities said to be for people of high intellectual ability.

Present Study

The main purpose of the present research is to test the generalizability (or the variability) of the developmental trajectory of the gender stereotypes about intellectual brilliance and their negative impact on children's interests in activities described as requiring brilliance. In Experiment 1, we tested whether Korean children endorse men as being brilliant rather than women when judging Asians, who belong to the same racial group as themselves. In Experiment 2, we further investigated whether Korean children, raised in a racially homogenous culture (e.g., Kim, 2015; the proportion of foreign residents accounts for only 4.2% in Korea, MOIS, 2020), would extend the gender stereotype about brilliance when making intelligence inferences about other races (e.g., White) whom they have limited contact with in their everyday life. In Experiment 3, we examined how this stereotype affects Korean children's motivation toward the novel activities portrayed as requiring high levels of intellectual ability. If Korean girls avoid the activities said to be for brilliant children than Korean boys, that would provide strong evidence that the negative impact of the gender-brilliance stereotype is cross-culturally robust.

III. Experiments

Experiment 1

In Experiment 1, we asked whether 5- to 7-year-old Korean children, who are raised in a racially and ethnically homogenous culture (Kim, 2015, MOIS, 2020) with a majority of Asians, would apply gender stereotypes about the brilliance when making judgments of Asian people's intelligence.

We adapted the tasks from Bian et al. (2017), which showed that American children in early elementary school years associate intellectual ability with White men rather than White women. Following Bian et al. (2017), we measured children's beliefs about niceness as a gender-neutral control trait, since "niceness" is quite a popular attribute among children in this age range and it was not predicted that it would generate "niceness = men" gender stereotype (e.g., Fiske et al., 2002). We also examined children's perceptions of academic achievement to see whether this has any potential relevance to children's gender-brilliance stereotype.

Method

Participants

Adapting Bian et al. (2017), participants were 32 5-year-olds (M_{age} = 5.50 years, *SD* = 0.24), 32 6-year-olds (M_{age} = 6.48 years, *SD* = 0.24) and 32 7-year-old (M_{age} = 7.54 years, *SD* = 0.28) Korean children. Half of them were boys and half of them were girls. Children were recruited from

Korea via advertisement on online parenting communities. Aside from the children reported above, 23 children were tested but excluded from the final sample because they did not meet the pass criteria (at least 4 correct answers out of 6) in a screener phase (n = 16, see below), because they were inattentive (n = 3), fussy (n = 1), or extremely active (n = 1), or because of parental interference (n = 2).

Each participant's parent signed informed consent, and the protocol was approved by the institutional ethics review board at Sungshin Womens' University.

Apparatus

For all experiments of the present thesis, children participated in either an online or an in-person experiment depending on the COVID-19 situation. Of 96 participants, 26 children participated in the experiment in person, and 70 children participated in the study online in Experiment 1.

Online experiment. An experimenter interacted with a child online. The experimenter presented visual stimuli to children through Zoom's "screen sharing," function, and all stimuli were made with Microsoft PowerPoint. All parents were given instructions on how to set up their screen (a proper size of monitor, single screen, zoom video setting, etc.), recording tool (centered webcam, etc.), sound (a computer volume), and environment (faces clearly visible, minimizing distractions, etc.). The experimenter recorded the shared screen during the session. To prevent any

interference during the experiment, parents were instructed to leave the room or sit behind their child and never to talk.

In-person experiment. This and the subsequent experiments in this thesis were conducted in-person when the pandemic situation allowed. In this case, children were tested individually in a quiet room in our lab or at their school by a single experimenter. Children sat next to the experimenter and saw visual stimuli displayed on a computer monitor. The same visual stimuli were used for the online and in-person experiments. The experimenter videotaped the experiment session.

Materials and Procedure

Adapting Bian et al. (2017), this experiment consisted of four parts: (1) *warm-up phase* to ensure children could differentiate the numbers used to mark choices in the main session, (2) *screener phase* to confirm whether children understand the main traits of "smart" and "nice" used in this experiments, (3) *gender stereotype tasks* to examine children's gendered beliefs about brilliance and niceness, and (4) *grade task* to investigate children's perceptions of Asian boys' and girls' school achievements. The pictures used in this experiment were normed on a separate group of adult participants (N = 31) such that there were no significant differences between the males and the females in terms of their attractiveness, emotion, and age. All pictures depicted Asian individuals.

Warm-up phase. In our online experiment, it was difficult to capture

children's pointing responses from the view of children's webcam. Therefore, all response options were number-coded and children were asked to read the number that corresponds to the option. For example, if there are four options of pictures, a number (1 to 4) were shown under or next to each picture. The experimenter then asked a child to choose one picture and read the number under or next to the picture. The warm-up phase was served to make children feel comfortable answering questions over video and to ensure that they could differentiate the numbers (1 to 4) used to mark choices in the main session. In this phase, the experimenter showed the children the screen with the numbers in the center and asked, "What number is this?". None of the participants failed to read out the numbers.

Screener phase. The experimenter first told the child they would talk about what "smart" and "nice" (a control trait) mean. Then, the experimenter said: "I'll tell you about some children I know and ask if you think they're smart (or nice)". Children were provided with 12 trials in this phase, half of them confirming their understanding of "smart", and half of them confirming their understanding of "nice". The "smart" and "nice" trials were presented as two separate blocks. The order of the blocks was counterbalanced.

In each trial, children first heard a description of an unknown child whose gender was unspecified and then were asked to determine if the described child has the target trait (smart or nice). For the "smart" screener questions, the experimenter asked children if they thought the child in the

description is “smart, not smart, or you don’t know?” by using a scale showing a thumbs up, a thumbs down, and a puzzled look (Figure 1). Children responded verbally by saying “smart,” “not smart,” or “I don’t know”. Four descriptions fit the definition of “smart” (e.g., this child can solve a very difficult puzzle), and the other two served as fillers (e.g., this child rides a swing). Similarly, for the “nice” screener questions, the experimenter asked children if they thought the described child was “nice, not nice, or you don’t know?” while using the same scale as in the smart trials. Again, four of the six descriptions fit the definition of “nice” (e.g., this child likes to help other people), and the other two served as fillers. The experimenter provided feedback on the children's responses, but the trial was not repeated after correction even if the child gave a wrong answer. The order of the trials in each block was counterbalanced. In line with the criterion used in the previous study (Bian et al., 2017), we excluded data from participants who scored no better than 4/6 for any of the two traits (n = 16).

"This child can solve a very difficult puzzle."

"Is this child smart? not smart? Or you don't know?"

Figure 1. Stimuli for the screener phase of the smart trials in Experiment 1.

Gender stereotype tasks. After the screener phase, the experimenter presented children with two gender stereotype tasks assessing their tendency to attribute brilliance or niceness to their own gender. The order of the two tasks was counterbalanced. In the story task, children received 4 trials. In each trial, the experimenter told a story about a special person. Two stories were about a "really, really smart person/child", and two stories were about a "really, really nice person/child." The task was separated into two blocks: one with stories about adult protagonists, and the other with stories about child protagonists. The order of the two blocks was counterbalanced. In each story, the gender of the protagonist was unspecified (e.g., "this person", "this child") (Table 1). After hearing the story, children were presented with pictures of four people (2 Asian males and 2 Asian females, interspersed) and asked to guess which one of the four people might be the person in the story (Figure 2). Half of the participants saw a male picture on the very left, and the other half saw a female picture on the very left. If children chose a person of their own gender, they received 1, and 0 otherwise.

Table 1. An English translation of the gender-neutral stories used to assess children's stereotypes in Experiment 1. All stories were presented in Korean language.

	Adult protagonist	**Child protagonist**
Smart	"There's a special person where I work, and the person is ***really, really smart***. This person knows how to do things quickly and comes up with the answer faster than anyone else. This person is ***really, really smart***."	"There was a special child in the kindergarten (elementary school) I went to, and this child was ***really, really smart***. This child learned everything really quickly and was able to answer the most difficult questions of the kindergarten teacher. This child was ***really, really smart***."

Nice	"There's a special person where I work, and the person is ***really, really nice***. This person likes to help others with difficulties and is kind to everyone in the office. This person is ***really, really nice***."	"There was a special child in the kindergarten (elementary school) I went to, and this child was ***really, really nice***. This child shared toys with everyone and took good care of the other children. This child was ***really, really nice***."

Figure 2. An example of adult stimuli of the story task in Experiment 1.

In the guessing task, children received 10 trials. On each trial, children were presented with a pair of individuals and asked to guess which one of the two people is "really, really smart." (Figure 3). This guessing task was separated into two blocks, one with pictures of Asian adults (5 trials), and the other with pictures of Asian children (5 trials). The order of the two blocks was counterbalanced. In the first trial of each block, the two individuals were of the same gender matching the participant's own gender. These filler trials served to conceal the purpose of the experiment. Within each block, the order of the test trials was counterbalanced. All participants saw a male on the left side of the screen in three trials and a female on the left side in one trial. If children chose

a person of their own gender, they were coded as 1, and 0 otherwise.

Across the two tasks, children received 10 questions in total to measure their gender stereotype for brilliance and 2 questions in total for niceness. The main dependent measure was children's own-gender stereotype scores, the proportion of questions in which a child chose the individual of their own gender as "really, really smart" (own-gender brilliance score) or "really, really nice" (own-gender niceness score).

Figure 3. An example of adult stimuli in the guessing task in Experiment 1.

Grade task. After the two stereotype tasks, children received the grade task. The purpose of this task was to measure children's perceptions of Asian boys' and girls' academic achievements. In this task, children received 4 trials. On each trial, children were presented with 4 pictures of unfamiliar Asian children (2 boys and 2 girls), and asked "Who do you think will get the highest score in school (or kindergarten) among these children?" and "Who do you think will be the best in your class?". Lastly, children were asked the same two questions again, except that this time the experimenter did not show any pictures, and children were required to

choose between two options (boys vs. girls). Responses of the total 4 trials were coded similarly to the previous stereotype tasks (same-gender = 1; other-gender = 0), and the total score was averaged (own-gender grade score).

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

Results and discussion

Our main goal of Experiment1 was to investigate whether Korean children endorse the "brilliance = men" gender stereotype toward Asian individuals. Preliminary analyses of the test data revealed the dependent measures (own-gender brilliance, niceness, and grade scores) were not significantly different depending on whether the experiment was conducted online or in person, all Fs(1, 92) < 1.45, ps > .532; the data were therefore collapsed across the factor.

Children's gender stereotypes about brilliance. We submitted children's own-gender brilliance scores to a linear regression model with children's gender (boy = 1, girl = -1), age group (5-year-olds = -1, 6-year-olds = 0, 7-year-olds = 1), and their interaction as factors. The analyses revealed a significant main effect of gender, $F(1, 92) = 4.68$, $p = .033$, and also an interaction between gender and age group, $F(1, 92) = 4.49$, $p = .038$ (Figure 4). The high scores are consistent with the overwhelming in-group positivity toward own gender in childhood (Dunham et al., 2011). To break down the interaction effect, we performed a simple

linear regression analysis with gender as an independent variable for each age group. The results suggest that children's gender stereotypes about brilliance change over the period from ages 5 to 7. Five- to 6-year-old Korean boys and girls were equally likely to associate brilliance with their own gender, 5-year-olds: $F(1, 30) = 0.11$, $p > .05$; 6-year-olds: $F(1, 30) = 1.75$, $p > .05$. In contrast, 7-year-old Korean girls were significantly *less* likely to associate their own gender with brilliance than boys, $F(1, 30) = 13.04$, $p < .000$.

As an additional analysis, we adapted a statistical plan of a previous study (Shu et al., 2022) that conducted the same experiment on Chinese children to explore further the difference between the responses of the younger group of children (5- and 6-years-olds) and 7-year-olds appears in other analyses. We counted how often children chose men as "really, really smart." One-sample *t*-tests against chance (.50) indicated that the choices of 5- and 6-year-olds did not differ from chance, 5-year-olds: $t(31) = -0.31$, $p = .762$; 6-year-olds: $t(31) = 1.14$, $p = .264$, whereas the choices of 7-year-olds selected men significantly often than would be expected by chance, $t(31) = 2.61$, $p = .014$. Although these results require careful interpretation because the boys' responses may be a natural result of their in-group bias, overall, these results suggest that when judging Asian individuals' intellectual abilities, Korean children start to associate males with brilliance rather than females at the age of 7.

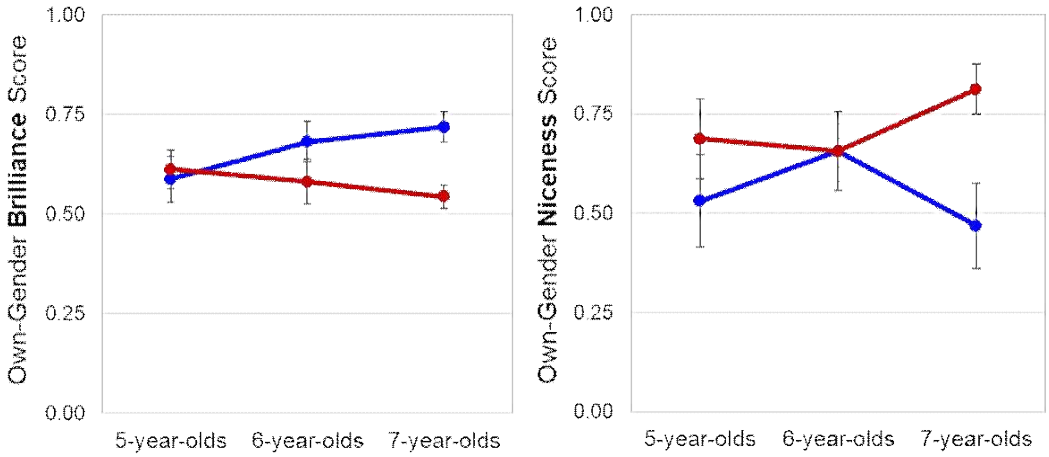

Figure 4. Boys' (blue) and girls' (red) own-gender brilliance scores (left) and own-gender niceness scores (right) in Experiment 1 by age group (5- vs. 6- vs. 7-year-olds). The error bars represent ± 1 SE.

Children's gender stereotypes about niceness. A linear regression analysis found the main effect of gender, $F(1, 92) = 4.25$, $p = .042$, indicating that girls were more likely than boys to choose their own gender as being nice. Neither the main effect of age group, $F(1, 92) = 0.10$, $p = .753$, nor the interaction between gender and age group, $F(1, 92) = 0.90$, $p = .346$, reached significance. Although there was no significant interaction between gender and age group, we conducted a series of simple regression analyses to further explore gender differences within each age group. 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: $F(1, 30) = 1.03$, $p = .318$; 6-year-olds: $F(1, 30) = 0.00$, $p = 1.000$. In contrast, 7-year-old Korean girls were significantly more likely to associate their own gender with niceness than boys, $F(1, 30) = 7.72$, $p = .009$ (Figure 4).

One-sample t-tests of the average proportion of male selections against the chance level (.50) indicated that 5- and 6-year-olds did not differ from chance, 5-year old: $t(31) = -1.00$, $p = .325$, 6-year-old: $t(31) = 0.00$, $p = 1.000$, whereas the choices of 7-year-olds selected men significantly less than would be expected by chance, $t(31) = -2.82$, $p = .008$.

The findings of the niceness condition suggest that Korean children start to associate niceness more with women than men around the age of 7. Moreover, these results rule out low-level alternative interpretations of the result in the brilliance condition (i.e., children simply have a general positivity bias favoring men over women).

Children's perception of school achievements. The analysis on children's own-gender grade scores revealed a significant interaction between gender and age group, $F(1, 92) = 4.49$, $p = .037$. The main effects of gender and age group were not significant, both $Fs(1, 92) < 0.04$, $ps > .482$. At 5 and 6 years of age, boys and girls were equally likely to associate high school performance to Asian children of their own gender, 5-year-olds: $F(1, 30) = 1.50$, $p = .230$, 6-year-olds: $F(1, 30) = 0.00$, $p = 1.000$. However, there was a tendency at the age of 7, $B = -0.14$, confidence interval = [-.31, .02], $F(1, 30) = 2.99$, $p = .094$, suggesting that 7-year-old Korean children tend to associate high school performance more with boys than girls.

We conducted a Pearson correlation analysis to see whether children's perceptions of school performance were related to their tendency of associating brilliance with their own gender. There was a significant correlation between the two variables, $r = .49$, $p < .001$, suggesting that the extent to which children associate brilliance with men is related to how much they believe their own gender outperforms in school.

Conclusion. Adapting Bian et al. (2017), Experiment 1 found that Korean children show the gender-brilliance stereotype that favors Asian men over women. These results indicate that the gender-brilliance stereotype in young children, previously investigated almost exclusively in the U.S. (Bian et al., 2017; Jaxon et al., 2019), is also present in other culture (Korea) that differs from the U.S. in relevant respects. Regarding the developmental timing of the emergence of the gender-brilliance stereotypes, Korean children showed the stereotype slightly later than American children do (Bian et al., 2017; Jaxon et al., 2019). We will come back to this issue in General Discussion.

Experiment 2

The main purpose of Experiment 2 was to further investigate the generalizability of children's gender stereotypes about intellectual talents. To do so, we investigated whether Korean children apply the gender stereotype about brilliance when making intelligence inferences about other races (e.g., White) with whom they have limited contact in their

everyday life. The conclusion that young children attribute brilliance to men is almost based on studies that tested children's stereotypical beliefs about the racial majority of their society, White people (Bian et al., 2017, 2018; Jaxon et al., 2019), with only one recent study suggested that Chinese children associate brilliance with White men and Asian women (Shu et al., 2022).

Here we set out to test whether Korean children, who are raised in a racially and ethnically homogenous culture (Kim, 2015, MOIS, 2020) with a majority of Asians, extend their gendered beliefs about intellectual talents (found in Experiment 1) even to other racial groups that they have little or no contact with. In Experiment 2, we assessed Korean children's inferences about the intellectual abilities of White men versus White women using the visual stimuli used in Bian et al. (2017). We further examined children's gendered attitudes about niceness (a gender-neutral control trait) and academic achievements to see if the findings of these traits would show a consistent pattern with Experiment 1.

Method

Participants

Participants were another 32 5-year-olds (M_{age} = 5.53 years, *SD* = 0.29), 32 6-year-olds (M_{age} = 6.49 years, *SD* = 0.30) and 32 7-year-olds (M_{age} = 7.46 years, *SD* = 0.28). Half of them were boys and half of them were girls.

All of the participants were recruited from Korea through online parenting communities. Aside from the children reported above, 20 children were tested but excluded from the analyses because they were inattentive (n = 3), extremely talkative (n = 2) or active (n = 1), or because they failed the screener phase (n = 14). As Experiment 1, Experiment 2 was conducted either in person (n = 36) or via online (n = 60).

Materials and Procedure

The materials and tasks were identical to those of Experiment 1, except that we used pictures of White individuals, previously normed and used in Bian et al. (2017) (Figure 5).

Figure 5. An example of White adult stimuli example for Experiment 2

Results and discussion

Experiment 2 aimed to examine whether Korean children extend their "brilliance = men" gender stereotype toward White people, which they showed toward Asian targets as in Experiment 1. The analytic strategy was the same as in Experiment 1. Preliminary analyses of the test data revealed the dependent measures (own-gender brilliance, niceness, and grade scores)

were not significantly different depending on whether the experiment was conducted online or in person, all *Fs*(1, 92) < 0.54, *ps* > .464; the data were therefore collapsed across the factor.

Children's perception of brilliance. As in Experiment 1, we submitted children's own-gender brilliance scores to linear regression analysis with children's gender (boy = 1, girl = -1), age group (5-year-olds = -1, 6-year-olds = 0, 7-year-olds = 1), and their interaction as factors. We found a significant main effect of gender, $F(1, 92) = 5.66$, $p = .019$, 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 (Figure 6). Neither the main effect of age group nor the Gender × Age group interaction were significant, both *F*s(1, 92) < 2.92, $p > .091$. Although there was no significant interaction between gender and age, based on the results of Experiment 1, we explored gender differences within each age group to better understand the developmental trajectory of the gender stereotypes. At age 5 and 6, Korean children did not differ choosing White people of their own gender as "really, really smart", 5-year-olds: $F(1, 30) = 0.43$, $p = .517$; 6-year-olds: $F(1, 30) = 1.73$, $p = .198$. However, 7-year-olds Korean girls were significantly less likely than boys to associate their own gender with brilliance, $F(1, 30) = 6.17$, $p = .019$.

In addition, following Experiment 1, we re-coded children's responses to reflect their proportions of selecting White males as "really,

really smart" and compared the average proportion against chance (.50). One-sample t-tests indicated that 5- to 6-year-olds did not differ from chance, 5-year-olds: $t(31) = 0.51$, $p = .613$; 6-year-olds: $t(31) = 0.89$, $p = .381$, whereas the choices of 7-year-olds selected men significantly often than would be expected by chance, $t(31) = 2.09$, $p = .045$. These results indicate that Korean 7-year-old children associated brilliance more strongly with White men than with White women.

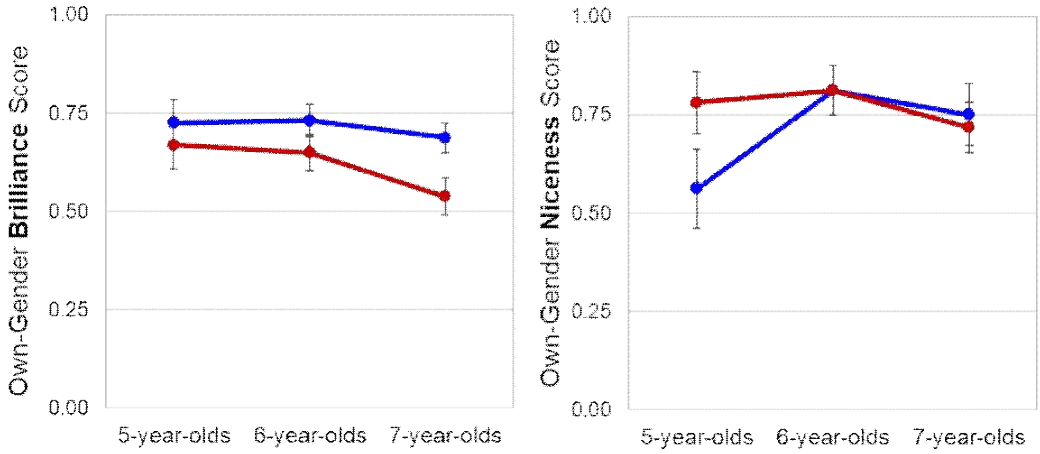

Figure 6. Boys' (blue) and girls' (red) own-gender brilliance scores (left) and own-gender niceness scores (right) in Experiment 2 by age group (5- vs. 6- vs. 7-year-olds). The error bars represent ± 1 SE.

Children's perception of niceness. The analysis on children's own-gender niceness scores no significant of children's gender, $F(1, 92) = 1.01$, $p = .319$, or age group, $F(1, 92) = 0.67$, $p = .415$, or their interaction, $F(1, 92) = 2.68$, $p = .105$ (Figure 6). In addition, one-sample t-tests of the average proportion of children's male selection revealed neither girls' nor boys' average proportion of Asian male selections deviated from chance (.50), 5-year-olds: $t(31) = -1.56$, $p = .129$;

6-year-olds: $t(31) = 0.22$, $p = .831$, 7-year-olds: $t(31) = -0.22$, $p = .831$. These results suggest that unlike in Experiment 1, Korean boys and girls were equally likely to associate niceness with their own gender group when making judgements of White people's niceness.

Children's perception of school achievements. The analysis on children's perceptions of school achievements revealed a significant interaction between gender and age group, $F(1, 92) = 8.19$, $p = .005$, but no main effect of gender or age group, $Fs(1, 92) < 2.52$, $ps > .116$. To further discompose the interaction, we performed a linear regression analysis within each age group with children's gender as an independent variable. At 5 and 6 years of age, boys and girls were equally likely to associate high school performance to White children of their own gender, 5-year-olds: $F(1, 30) = 1.00$, $p = .325$, 6-year-olds: $F(1, 30) = 1.39$, $p = .249$. In contrast, there was a significant effect of gender at the age of 7, $F(1, 30) = 9.00$, $p = .005$, suggesting that 7-year-old Korean children associate high school performance more with White boys than White girls. A Pearson correlation analysis revealed a significant correlation between Korean children's gender brilliance stereotype and their perceptions of school achievements, $r = .57$, $p < .001$, suggesting that Korean children's gender-brilliance stereotype was related to their perceptions of which gender performs well in school.

Conclusion. In Experiment 2, 5- to 7-year-old Korean children who were raised in racially homogenous environments (Kim, 2015, MOIS, 2020)

extended their "brilliance = men" gender stereotype when making inferences about the intelligence of members from the different racial group. Replicating the results of Experiment 1, Korean children around the age of 7 begin to attribute brilliance to White men (vs. White women).

The findings of Experiment 2 support the generalizability of children's gender-brilliance stereotype: Korean children associate brilliance both with Asian men and White men. In Korea, Asians are the majority of ethnic group and White individuals make up only a small minority of Korean population (e.g., estimated to account for about 0.4%, MOIS, 2020). Our results suggest that Korean children apply the gender-brilliance stereotype to members of another racial group that they typically have little or no direct interaction with in their everyday lives.

Experiment 3

Paralleling American children's acquisition of this gender stereotype, beginning at the age of 6, American girls start to shy away from novel activities said to be for children who are "really, really smart" (Bian et al., 2017). Moreover, children who held more negative stereotypes against their own gender's intelligence were less motivated to pursue these activities. These results support the key predictions of the FAB hypothesis (Leslie et al., 2015) that brilliance-focused messages should undermine girls' motivation and that children's endorsement of the "brilliance = men" gender stereotype should predict their motivation

towards activities portrayed as requiring brilliance.

In Experiment 3, we aimed to provide the first evidence supporting the key predictions of the FAB hypothesis (Leslie et al., 2015) in a non-WEIRD culture. By conducting mediation analysis, we investigated whether Korean children's "brilliance = men" gender stereotype influences their motivation toward novel activities that are portrayed as requiring a high level of intellectual ability (vs. requiring devotion as a control trait). Based on the previous study (Bian et al., 2017), "try-hard" was used as a control trait in Experiment 3. Also, various developmental psychology literature compares innate intelligence and dedication in performing specific tasks (Bian et al., 2017, 2018; Dweck et al., 2019; Leslie et al., 2015; Vial et al., 2022).

To do so, adapting the methods of Bian et al. (2017), we introduced 6- to 7-year-old children to two novel games, one was said to be for children who are "really, really smart" and the other for children who "try really, really hard", and measured the children's interest toward each game. Here, we chose to test 6- and 7-year-old children, based on the results of Experiments 1 and 2, which showed that Korean children begin to show the "brilliance = men" gender stereotype from the age of 7. In line with the findings of Experiments 1 and 2, we predicted that 6-year-old boys' and girls' interests in these games would not differ, since their ideas about brilliance are not yet differentiated. In contrast, 7-year-old girls' interest was predicted to be lower than boys'.

Method

Participants

Participants were 40 6-year-olds (M_{age} = 6.53 years, *SD* = 0.31) and 40 7-year-olds (M_{age} = 7.46 years, *SD* = 0.35). Half of them were boys and half of them were girls. Considering the statistical significance (p = .045) of the main results of the previous study (Bian et al., 2017) which conducted the exact same experiment on American children, the total number of participants in Experiment 3 was decided to target 40 children, slightly more than 32 for each age group of the previous study.

All of the participants were recruited from Korea through online parenting communities. Aside from the children reported above, 3 children were tested but excluded from the final sample because of being inattentive and extremely talkative (n = 2), and parental interference (n = 1). As in previous experiments, Experiment 3 was conducted either in person (n = 2) or via online (n = 78).

Materials and Procedure

Adapting Bian et al. (2017), this experiment consisted of three parts: (1) *warm-up phase* to ensure children could differentiate the numbers used to mark choices in the main session, (2) *motivation task* to measure children's interest in the two novel games, and (3) *gender stereotype task* to investigate children's gender stereotype about brilliance. Depending on the COVID-19 circumstance, this experiment was conducted online or in person.

Warm-up phase. As in Experiments 1 and 2, this phase aimed to make children feel comfortable answering questions that are presented on a computer screen and to ensure that they could differentiate the numbers (1 to 3) used to mark choices in the main session.

Motivation task. In this task, children were introduced to two novel games (*modi* and *papu*) in a counterbalanced order. Importantly, one of these two games was said to be for "really, really smart" children, and the other was said to be for children who "try really, really hard." For each game, the experimenter showed the children a picture of the game and briefly explained its rules (Table 2). The experimenter then asked the children "Who could play this game well?" to check manipulations. If the child did not provide the correct response, the experimenter did not make a correction to the child's answer, but instead repeated the essential attributes of the game (e.g., "This game is only for *really, really smart children*. Only *smart children* can play this game well") and then checked the manipulation once again.

Table 2. The introduction parts of the two novel games (These were presented to children in Korean language and which game (*modi*/*pupu*) was a smart or hardworking game was counterbalanced)

***modi* game (smart game)**	
"I will introduce this game that I sometimes played with other children. The name of this game is "modi," and it's very fun. [Introducing the game's rule] And there is a very important point in this game. Please listen carefully. Not everyone can play this game. This game is only for ***really, really smart children***. Only ***smart children*** can play this game well".	

***papu* game (hardworking game)**

"I will introduce this game that I sometimes played with other children. The name of this game is "papu," and it's very fun. [Introducing the game's rule] And there is a very important point in this game. Please listen carefully. Not everyone can play this game. This game is only for ***children who try really, really hard***. Only ***children who try hard***_can play this game well".

Next, the experimenter asked 4 questions to assess children's interest toward the game: (1) a motivation question (e.g., “Would you want to play the modi/papu game, or would you not want to play it?”), (2) a preference question (e.g., “Do you like the game or not?”), (3) a mood question (“Does playing the game make you happy or sad?”), (4) a future motivation (“If you can do something tomorrow, would you want to play this game or do something else?”). For the first three questions, the experimenter further asked children about the degrees of their interest (or non-interest) using a child version of the 3-point scale. While the future motivation question was given as a binary choice. This task was separated into two blocks: one block consisted of the description of the smart game and the following 4 questions, and the other included the description of the try-hard game with the following 4 questions. The order of the blocks and the questions within each block were counterbalanced.

Gender Stereotype Task. To test whether the gender differences in interest are related to children’s beliefs about brilliance, we measured these beliefs with the same guessing task in Experiment 1.

Results and discussion

Children's score on each question was first z-scored and then the four scores were averaged (children's interest score). We submitted children's interest scores to the linear mixed-effects regression model using the lme4 package in R, with children's gender (boy = 1, girl = -1, level-1 predictor), age group (6-year-olds = -1, 7-year-olds = 1, level-2 predictor), game type (smart vs. try-hard, within-subject, level-2 predictor), and the all possible interactions as factors. The analysis revealed a significant three-way interaction between children's gender, age group, and game type, Wald χ^2 = -2.64, p = .010. To discompose the interactions, we analyzed children's responses separately by the game type.

Children's interest in the smart game. Children's interest scores for the smart game were submitted to a linear regression analysis with children's gender, age group, and their interaction as factors. We found a significant main effect of age group, $F(1, 76) = 8.45$, p = .005, and also an two-way interaction between gender and age group, $F(1, 76) = 7.73$, p = .007. There was a tendency of the effect of children's gender, B = -.14, $F(1, 76) = 3.81$, p = .055. Overall, these results indicate that 6- to 7-year-old girls tend to be less likely to play the smart game than boys.

Follow-up testing of simple linear regression models at each age group with children's interest scores (dependent variable) and gender (independent variable) revealed the significant main effect of gender only at age 7. Specifically, while 6-year-old Korean boys and girls showed no

gender difference in the interest in playing the smart game, $F(1, 38) = 0.34$, $p = .565$, 7-year-old Korean girls were significantly less likely to participate in the novel activity that was said to be for "really, really smart" children than boys, $F(1, 38) = 11.40$, $p = .002$ (Figure 7).

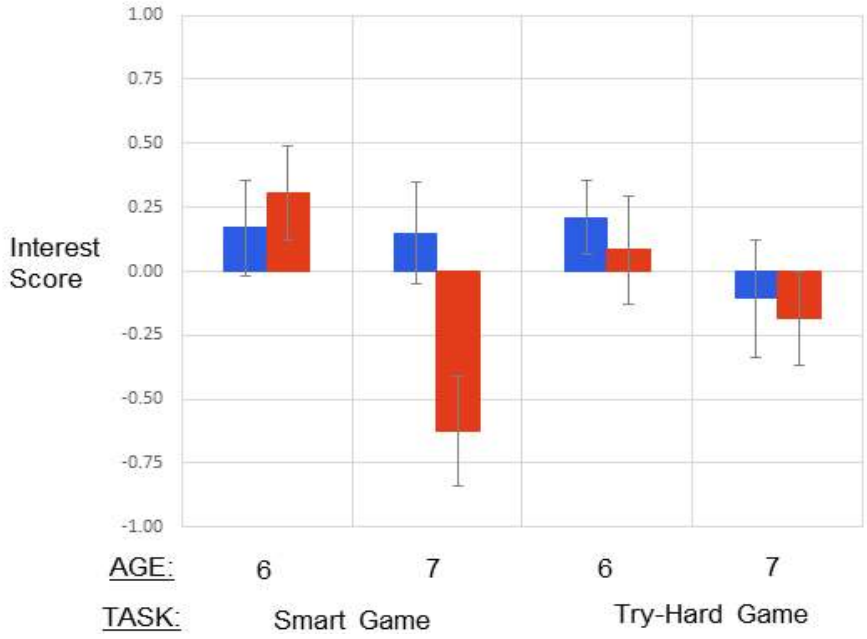

Figure 7. Boys' (blue) and girls' (red) interest scores (average of z-scored responses to 4 questions) in each novel game (smart game vs. try-hard game) in Experiment 3 by age group (6- vs. 7-year-olds). The error bars represent ± 1 SE.

Children's interest in the try-hard game. The linear regression analysis on children's try-hard game revealed no significant main effect of gender or age group, or interactions, $Fs(1, 76) < 2.49$, $ps > .119$. The results suggest that 6- to 7-year-old Korean boys and girls were equally interested in the novel game that was said to be for "try really, really hard children" (Figure 7). These results rule out a low-level alternative

interpretation of the results of the smart game above, for example, that girls are more likely than boys to shy away from any novel activities.

The relations between children's perception of brilliance and their interest in the smart game. We first analyzed the results of the guessing task of Experiment 3 to confirm we replicated the results of Experiment 1. First, we submitted children's responses to the stereotype task (same as the guessing task of Experiment 1) to a linear regression model with children's gender (boy = 1, girl = -1) and age group (6-year-olds = -1, 7-year-olds = 1), and their all possible interactions as factors. Replicating the results of Experiment 1, we found a significant main effect of gender, $F(1, 76) = 5.02$, $p = .028$, suggesting that Korean girls were less likely to choose their own gender rather than boys when they make inferences about Asian individuals' intelligence (Figure 8). Neither the main effect of age group, $F(1, 76) = 2.76$, $p = .101$, nor the interaction between gender and age group, $F(1, 76) = 0.88$, $p = .350$ were significant. Although Gender x Age group interaction was not significant, a simple linear regression at each age group revealed a significant main effect of gender only at the age of 7, $F(1, 38) = 4.94$, $p = .032$, but not at age 6, $F(1, 38) = 0.87$, $p = .358$. The average proportion of choosing men as brilliant was significantly above chance among 7-year-olds, $t(39) = 2.07$, $p = .045$, but not among 6-year-olds, $t(39) = 0.73$, $p = .471$ These results all together confirm that around the age of 7, Korean children begin to associate intellectual brilliance with men more than women.

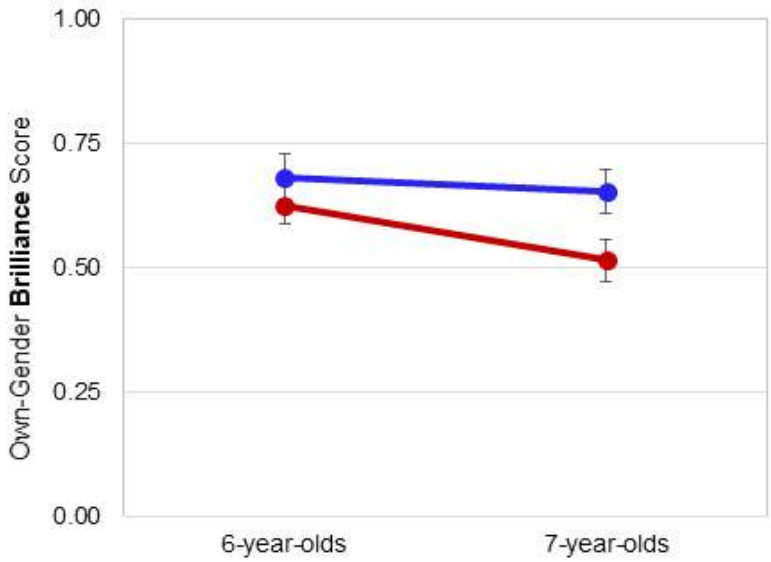

Figure 8. Boys' (blue) and girls' (red) own-gender brilliance scores in Experiment 3 by age group (6- vs. 7-year-olds). The error bars represent ± 1 SE.

In addition, we explored whether the gender differences in interest are related to children's beliefs about brilliance. A correlation analysis revealed a significant correlation between children's own-gender brilliance score (z-scored) and children's interest in the smart vs. the try-hard game, r = .53, p = .000. Next, we submitted the data to a bootstrapped (5,000 replications) product-of-coefficients mediation test by using PROCESS macro in SPSS 25 (Model 4; Hayes, 2013) with children's gender as the independent variable, their own-gender brilliance score (z-scored), as the mediator, and children's interest scores in the smart vs. the try-hard game as the dependent variable. The results showed a significant indirect effect of the mediator, indirect effect = -.14, 95%, confidence interval = [-.27, -.02] (Figure 9). These findings suggest that girls are less interested in

activities that require brilliance (as opposed to hard-working) than boys, and this gender effect is mediated by children's beliefs about their own's gender's brilliance.

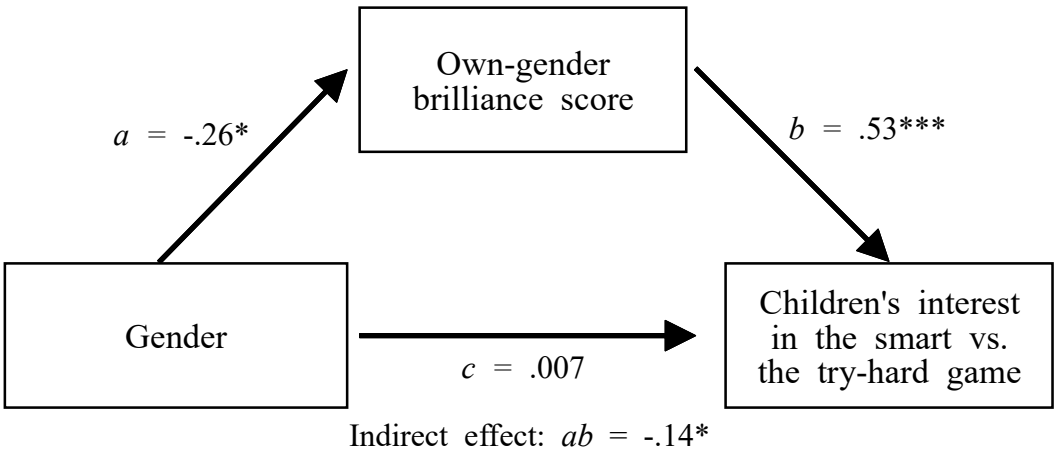

Figure 9. The difference between boys and girls in their interest in the smart vs. the try-hard game was mediated by their own-gender brilliance scores. Standardized coefficients are depicted. * $p < .05$, ** $p < .01$, *** $p < .001$

Conclusion. The results of Experiment 3 provide the first evidence that children from non-WEIRD cultures also show gender differences in their interest toward intellectually challenging activities. At the age of 7, Korean girls were significantly less interested in the activity that was said to be for smart children. Moreover, children's interest toward these activities was related with their perception of their own gender's intelligence: The more children hold negative stereotypes against their own gender's intelligence, the less were motivated to pursue intellectually-challenging activities.

IV. General Discussion

In three experiments, we examined the universality of children's gender-brilliance stereotype. Consistent with past research involving U.S. children (Bian et al., 2017; Jaxon et al., 2019), Korean children in early elementary school years endorse stereotype associating intellectual talents with men more than women. At the age of 7, Korean girls were less likely than boys to believe that members of their gender are "really, really smart." Moreover, Korean children apply the gender-brilliance stereotype across racial groups, Asian and White stereotype targets. This gender stereotype has an immediate impact on children's interests—7-year-old Korean girls begin to avoid activities said to be for children who are "really, really smart." These results thus support the generalizability of the development of gender-brilliance stereotype and its negative impact on children's motivation.

The Generalizability of Children's Gender-Brilliance Stereotype

Our results are one of the first findings supporting that children's acquisition of the gender stereotype is cross-culturally consensual. Although some gender stereotypes in adults are not universal but are moderated by cultural values (e.g., the "independent-men" stereotype in America, and "interdependent-men" in Korea; Cuddy et al., 2015), the gender stereotype about intellectual abilities emerge early across different cultures. The cultural generalizability of the development of gender-brilliance stereotype can be explained by that men as a group possesses higher status in

virtually every nation in the world (UNDP, 2020) and high-status groups are generally stereotyped as being competent (e.g., Fiske et al., 2002).

One major contribution of the present research is to identify that the impact of the gender-brilliance stereotype on children's motivation is universally detrimental. Consistent with the evidence from the U.S. (Bian et al., 2017), our 7-year-old Korean girls are less interested in activities said to be for children who are "really, really smart." than were boys of the same age. Despite the Confucian notion that values efforts and self-improving motivations (e.g., Heine et al., 2001), Korean children's motivation for intellectually challenging activities is also susceptible to the gender stereotype about brilliance. These findings are in line with the gender imbalance in STEM fields and prestigious careers in Korea (KOSTAT, 2020). Our findings provide strong evidence that the gender-brilliance stereotype begins to shape children's interests as soon as it is acquired and is expected to steer women away from certain domains and toward others one day.

In the present research, 7-year-old Korean children applied the gender-brilliance stereotype across racial groups, Asians and White. Given that Korea is a racially homogenous society (Kim, 2015; MOIS, 2020), these findings suggest that children can apply the gender-brilliance stereotype to members of other racial groups that they typically have little or no direct interaction with in their everyday lives. It is worthwhile to further examine the generalizability and variability of this gender-brilliance

stereotype across multiple racial and ethnic groups because children's gender-brilliance stereotypes seem to intersect with the racial or ethnic identity of the stereotype target. For example, Jaxon et al. (2019) measured 5- and 6-year-old American children's gender-brilliance stereotypes toward Black and White targets. When making judgments of White individuals' intelligence, 6-year-old American children exhibited a gender-brilliance stereotype favoring men over women. However, children's gender-brilliance stereotype was reversed when the stimuli depicted Black women and men, such that Black women were chosen more often than Black men as being "really, really smart." Shu et al. (2022) also reported that children from China and the U.S. showed a gender-brilliance stereotype favoring men when children evaluated White targets, but also the reverse, "brilliance = Asian women". Shu et al. interpreted their results that both Chinese and American children might have viewed Asian men as less prototypical men than White men. We speculate our Korean results did not find the intersectionality because Asians and White are both high-status groups in Korea. Although White individuals make up only a small minority of the Korean population (MOIS, 2020), they are associated with high social status in Korea in relation to Korean history (Ha, 2012; Kim, 2015). In future research, we will examine the evidence of the intersectionality in Korean children's gender-brilliance stereotype by testing their stereotypes toward racial or ethnic groups that occupy lower status in Korean society.

How do Children Attain the Gender-brilliance Stereotype?

A very important question for future research is where children's gender-brilliance stereotype comes from. One potential source of this stereotype in children's everyday experiences might come from their home environments. It is possible that parents transfer their stereotypes that associate brilliance with men. An article in the New York Times reported that American parents are about twice as likely to Google the question "Is my son a genius?" than the question "Is my daughter a genius?" (Stephens-Davidowitz, 2014). Such parents' gendered expectations can be either explicitly or implicitly expressed in daily interactions with their children. Indeed, using the IAT, a recent investigation found that the extent to which parents and their children aged 8 to 12 years associate brilliance and genius with men more than women are significantly related (Zhao et al., 2022). As a future direction, longitudinal research is needed to investigate the causal link between parents' gender stereotypes about brilliance and children's acquisition of the stereotype.

School can be another microsystem that could shape children's beliefs about the social world. Comparing the present findings with Bian et al. (2017), we found an interesting result regarding the developmental onset of the gender-brilliance stereotype. Our Korean children start to show this gender stereotype slightly later than American children -- while American children begin to show the gender-brilliance stereotype at around the age of 6 (Bian et al, 2017, 2018), our Korean children do so at around the age of 7. This slight difference in the onset of the gender-brilliance stereotype

coincided with the difference in the age when elementary education begins in the two countries. While most American children begin elementary school at the start of the school year (in August) in which they reach school age, 5 years old, most Korean children begin elementary school at the start of the school year (in March) in which they reach school age, 6 years old. In other words, Korean children begin elementary school slightly later than American children. Although our research was not designed to directly investigate the sources of the emergence of the gender-brilliance stereotype, we speculate that children's experiences in elementary school might be related with it.

To explore this possibility, in additional analyses, we re-grouped our children into two groups (kindergarteners vs. elementary-schoolers) depending on their current institutions. Across the three experiments, there was no significant gender difference in kindergartners' own-gender brilliance scores, Exp 1: $F(1, 50) = 0.53$, $p = .469$; Exp 2: $F(1, 59) = 2.22$, $p = .142$; Exp 3: $F(1, 28) = 0.39$, $p = .536$. In contrast, there was a significant gender difference in elementary girls' and boys' own-gender stereotype scores, Exp 1: $F(1, 42) = 7.20$, $p = .010$; Exp 2: $F(1, 33) = 6.45$, $p = .016$; Exp 3: $F(1, 48) = 5.49$, $p = .023$ (Figure 10). The analysis on children's interest scores in the smart game also revealed a significant gender difference only among the elementary schoolers, $F(1, 48) = 8.23$, $p = .006$, not among kindergarteners: $F(1, 28) = 0.29$, $p = .597$ (Figure 11). Although informative, given that the difference between the two groups can

be caused by their age, these results should be viewed with caution.

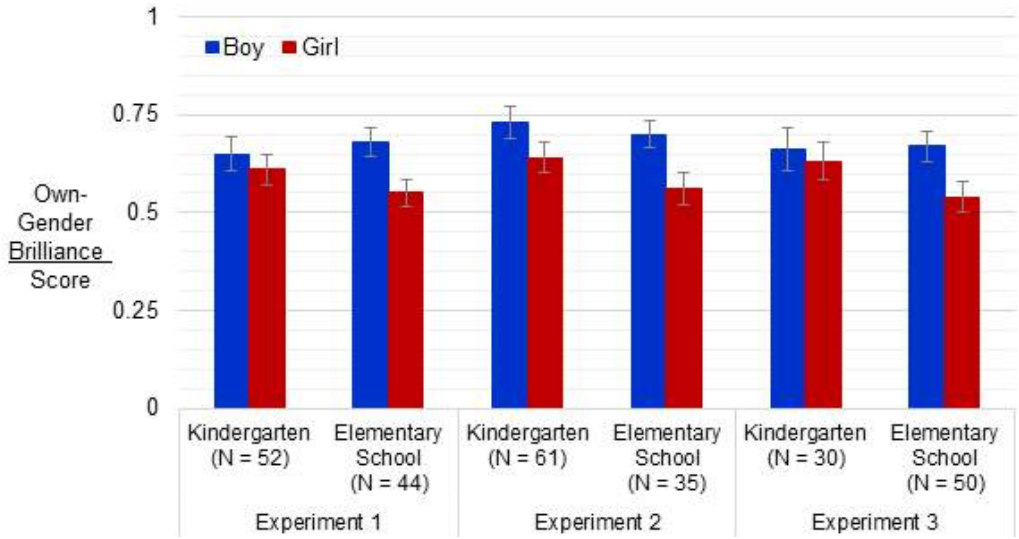

Figure 10. Children's own-gender brilliance scores in all three experiments by the institution they currently attending (Kindergarten vs. Elementary school). The error bars represent ± 1 SE.

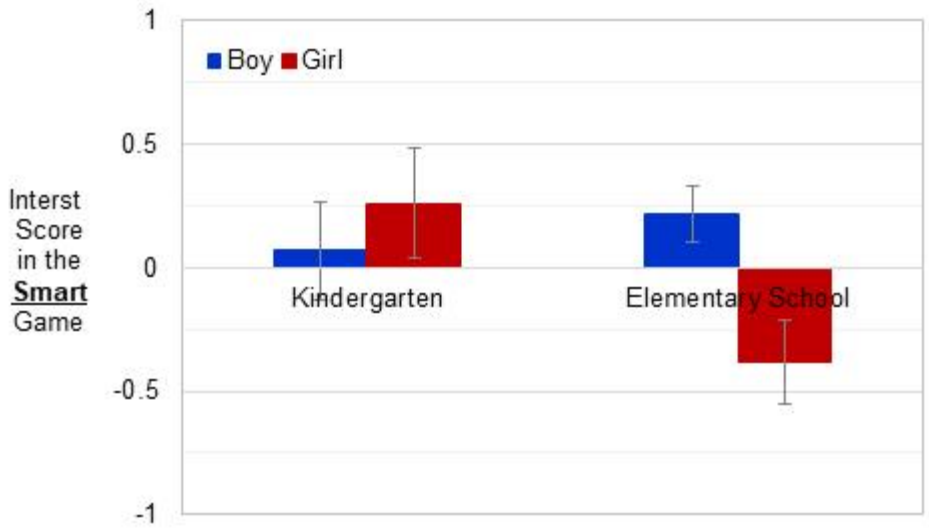

Figure 11. Children's smart game interest scores in Experiment 3 by the institution they currently attending (Kindergarten vs. Elementary school). The error bars represent ± 1 SE.

How could children's elementary school experiences be related with the development of gender-brilliance stereotype? Possibly, classroom environments and teachers' biases in elementary education could be implicated in the development of children's stereotypes and motivations. In many cultures, children start academic learning and get evaluated on achievements from elementary schools (Lindt & Miller, 2017; Powell et al., 2010, 2012; Rimm-Kaufman & Pianta, 2000). In the case of Korea, there are nationally standardized curriculums for early childhood education including kindergarten years and elementary school education. The national curriculum for early childhood education ("Nuri" curriculum) pursues a child-centered and play-based approach and focuses on holistic development and children's happiness (MOE and MOHW, 2019). As children enter elementary schools, they start to get formal literacy education (MOE, 2015) and learn various academic subjects such as Korean and mathematics. Unlike in kindergartens where everyone gets a gold star, children receive performance feedback (e.g., grades from algebra practices) presumably from the beginning of elementary school. With these changes in classroom environments, children might become more attuned to teachers' feedback.

In addition, teachers' beliefs about boys' and girls' abilities, particularly in academic subjects where people think brilliance or natural gift is necessary for success could encourage children's gender-brilliance stereotypes (Beilock et al., 2010; Robinson-Cimpian et al., 2014). For example, elementary school teachers tend to attribute their male students'

success in math to inborn ability, but attribute their female students' success in math to hard work (Chae & Ryu, 2011; Fennema et al., 1990). Similarly, with their female students, teachers attributed unexpected failure more to low ability and less to lack of effort than with boys (Tiedemann, 2000). In future research, it would be useful to study whether children's gender stereotypes about brilliance are affected by teachers' domain-specific ability beliefs and gendered beliefs about intellectual ability.

In conclusion, the present research shows that just like the evidence from the U.S. (Bian et al., 2017), Korean young children begin to show the gender-brilliance stereotype around the early elementary school years and it immediately causes detrimental impacts on children's motivation in intellectually challenging activities. Of course, the fact that this stereotype is observed in two countries does not mean that it is universal. However, given the substantial cultural differences between the U.S. and Korea, the present results provide valuable information for understanding the generalizability of the development of gender-brilliance stereotype and hence for shedding light on the causes of the global phenomenon of women's underrepresentation in prestigious careers. Future studies should explore what interventions can mitigate or combat the negative effects of this "brilliance = men" gender stereotype on children.

References

Abbott, L. J., Daugherty, B., Parker, S., & Peters, G. F. (2016). Internal audit quality and financial reporting quality: The joint importance of independence and competence. *Journal of Accounting Research, 54*(1), 3-40. https://doi.org/10.1111/1475-679X.12099

Baron-Cohen, S. (2002). The extreme male brain theory of autism. *Trends in Cognitive Sciences, 6*(6), 248-254. https://doi.org/10.1016/j.jesp.2017.11.006

Bian, L., Leslie, S. J., & Cimpian, A. (2017). Gender stereotypes about intellectual ability emerge early and influence children's interests. *Science*, *355*(6323), 389-391. https://doi.org/10.1126/science.aah6524

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

Beilock, S. L., Gunderson, E. A., Ramirez, G., & Levine, S. C. (2010). Female teachers' math anxiety affects girls' math achievement. *Proceedings of the National Academy of Sciences, 107*(5), 1860-1863. https://doi.org/10.1073/pnas.0910967107

Benbow, C. P., & Lubinski, D. (1997). Intellectually talented children: How can we best meet their needs. *Handbook of Gifted Education, 2*, 155-169. https://doi.org/10.1007/978-1-4020-6162-2_52

Bennett, M. (1996). Men's and women's self-estimates of intelligence. *Journal of Social Psychology, 136*(3), 411-412. https://doi.org/10.1080/00224545.1996.9714021

Bennett, M. (1997). Self-estimates of ability in men and women. *Journal of*

Social Psychology, 137(4), 540-541. https://doi.org/10.1080/00224549709595475

Byrne, R., & Byrne, R. W. (1995). The thinking ape: Evolutionary origins of intelligence. *Oxford University Press on Demand*. https://doi.org/10.1093/acprof:oso/9780198522652.001.0001

Chae, Y. J. & Ryu, J.Y. (2011). Study on gifted teachers' perceptions of gender differences in mathematics and science learning ability. *Journal of the Korean Association for Science Education, 31*(8), 1110-1120. https://doi.org/10.14697/jkase.2011.31.8.1110

Chamorro-Premuzic, T., & Furnham, A. (2005). Intellectual competence. *The Psychologist, 18*(6), 352-354. https://thepsychologist.bps.org.uk/volume-18/edition-6/intellectual-competence

Chestnut, E. K., Lei, R. F., Leslie, S. J., & Cimpian, A. (2018). The myth that only brilliant people are good at math and its implications for diversity. *Education Sciences, 8*(2), 65. https://doi.org/10.3390/educsci8020065

Cimpian, A., & Leslie, S. J. (2017). The brilliance trap. *Scientific American, 317*(3), 60-65. https://doi.org/10.1038/scientificamerican0917-60

Cosmides, L., & Tooby, J. (2002). Unraveling the enigma of human intelligence: Evolutionary psychology and the multimodular mind. *The Evolution of Intelligence*, 145-198. https://doi.org/10.4324/9781410605313-11

Cuddy, A. J., Norton, M. I., & Fiske, S. T. (2005). This old stereotype: The pervasiveness and persistence of the elderly stereotype. *Journal of Social Issues, 61*(2), 267-285. https://doi.org/10.1111/j.1540-4560.2005.00405.x

Cuddy, A. J., Wolf, E. B., Glick, P., Crotty, S., Chong, J., & Norton, M. I. (2015). Men as cultural ideals: Cultural values moderate gender stereotype

content. *Journal of Personality and Social Psychology*, *109*(4), 622. https://doi.org/10.1037/pspi0000027

Cvencek, D., Meltzoff, A. N., & Greenwald, A. G. (2011). Math–gender stereotypes in elementary school children. *Child Development, 82*(3), 766-779. https://doi.org/10.1111/j.1467-8624.2010.01529.x

Dabbs Jr, J. M., Chang, E. L., Strong, R. A., & Milun, R. (1998). Spatial ability, navigation strategy, and geographic knowledge among men and women. *Evolution and Human Behavior, 19*(2), 89-98. https://doi.org/10.1016/S1090-5138(97)00107-4

Dunham, Y., Baron, A. S., & Carey, S. (2011). Consequences of "minimal" group affiliations in children. *Child Development, 82*(3), 793-811. https://doi.org/10.1111/j.1467-8624.2011.01577.x

Dweck, C. S., & Yeager, D. S. (2019). Mindsets: A view from two eras. *Perspectives on Psychological Science, 14*(3), 481-496. https://doi.org/10.1177/1745691618804166

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

Fennema, E., Peterson, P. L., Carpenter, T. P., & Lubinski, C. A. (1990). Teachers' attributions and beliefs about girls, boys, and mathematics. *Educational Studies in Mathematics, 21*(1), 55-69. https://doi.org/10.1007/BF00311015

Fiske, S. T., Cuddy, A. J. C., Glick, P., & Xu, J. (2002). A model of (often mixed) stereotype content: Competence and warmth respectively follow from

perceived status and competition. *Journal of Personality and Social Psychology*, *82*(6), 878–902. https://doi.org/10.1037/0022-3514.82.6.878

Furnham, A. (2000). Parents' estimates of their own and their children's multiple intelligences. *British Journal of Developmental Psychology*, *18*(4), 583-594. https://doi.org/10.1348/026151000165869

Furnham, A., Reeves, E., & Budhani, S. (2002). Parents think their sons are brighter than their daughters: Sex differences in parental self-estimations and estimations of their children's multiple intelligences. *The Journal of Genetic Psychology*, *163*(1), 24-39. https://doi.org/10.1080/00221320209597966

Gallup Jr, G. G. (2020). To salvage human intelligence evolutionary psychologists may have to practice what they preach. *Evolutionary Behavioral Sciences, 14*(4), 329-331. https://doi.org/10.1037/ebs0000205

Gunderson, E. A., Ramirez, G., Levine, S. C., & Beilock, S. L. (2012). The role of parents and teachers in the development of gender-related math attitudes. *Sex Roles*, *66*(3), 153-166. https://doi.org/10.1007/s11199-011-9996-2

Ha, S. B. (2012). Yellow skin, white masks: A historical consideration of internalized racism and multiculturalism in South Korea. *Studies in Humanities, 33*, 525-556. https://doi.org/10.4324/9780203976586-10

Hayes, A. R., & Bigler, R. S. (2013). Gender-related values, perceptions of discrimination, and mentoring in STEM graduate training. *International Journal of Gender, Science and Technology, 5*(3), 254-280.

Heckhausen, J., Dixon, R. A., & Baltes, P. B. (1989). Gains and losses in development throughout adulthood as perceived by different adult age groups. *Developmental Psychology, 25*(1), 109-121.

https://doi.org/10.1037/0012-1649.25.1.109

Hedges, L. V., & Nowell, A. (1995). Sex differences in mental test scores, variability, and numbers of high-scoring individuals. *Science, 269*(5220), 41-45. https://doi.org/10.1126/science.7604277

Heine, S. J., & Hamamura, T. (2007). In search of East Asian self-enhancement. *Personality and Social Psychology Review, 11*(1), 4-27. https://doi.org/10.1177/1088868306294587

Heine, S. J., Kitayama, S., Lehman, D. R., Takata, T., Ide, E., Leung, C., & Matsumoto, H. (2001). Divergent consequences of success and failure in japan and north america: an investigation of self-improving motivations and malleable selves. *Journal of Personality and Social Psychology, 81*(4), 599-615. https://doi.org/10.1037/0022-3514.81.4.599

Henrich, J., Heine, S. J., & Norenzayan, A. (2010a). Most people are not WEIRD. *Nature, 466*(7302), 29-29. https://doi.org/10.1038/466029a

Henrich, J., Heine, S. J., & Norenzayan, A. (2010b). The weirdest people in the world?. *Behavioral and Brain Sciences, 33*(2-3), 61-83. https://doi.org/10.1017/S0140525X0999152X

Hofstede, G. (1980). Motivation, leadership, and organization: do American theories apply abroad?. *Organizational Dynamics, 9*(1), 42-63. https://doi.org/10.1016/0090-2616(80)90013-3

Jacobs, J. E., Davis-Kean, P., Bleeker, M., Eccles, J. S., & Malanchuk, O. (2005). I can, but I don't want to. The impact of parents, interests, and activities on gender differences in math. In A. Gallagher & J. Kaufman (Eds.), *Gender Difference in Mathematics*, 246-263. https://doi.org/10.1017/CBO9780511614446.01

Jaxon, J., Lei, R. F., Shachnai, R., Chestnut, E. K., & Cimpian, A. (2019). The acquisition of gender stereotypes about intellectual ability: Intersections with race. *Journal of Social Issues*, *75*(4), 1192-1215. https://doi.org/10.1111/josi.12352

Kanazawa, S. (2004). General intelligence as a domain-specific adaptation. *Psychological Review, 111*(2), 512-523. https://doi.org/10.1037/0033-295X.111.2.512

KESS (Korean Education Statistics Service). (2021). *2021 National Science High School Personnel. (in Korean)*. https://kess.kedi.re.kr/mobile/publ/publFile?survSeq=2021&menuSeq=3648&publSeq=59&menuCd=89651&menuId=0_12&itemCode=02

KICE (Korea Institute for Curriculum and Evaluation). (2012). *NAEA (National Assessment of Educational Achievement) 2012 Results and Implications.* https://scienceon.kisti.re.kr/srch/selectPORSrchReport.do?cn=TRKO201400003782

Kim, J. K. (2015). Yellow over black: History of race in Korea and the new study of race and empire. *Critical Sociology, 41*(2), 205-217. https://doi.org/10.1177/0896920513507787

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

Lee, S. (2012). Study on Difference in Elementary School Students' Mathematics Academic Achievement by Gender and Residential Area. *Education of Primary School Mathematics, 15*(3), 177–187. https://doi.org/10.7468/JKSMEC.2012.15.3.177

Leslie, S. J., Cimpian, A., Meyer, M., & Freeland, E. (2015). Expectations of brilliance underlie gender distributions across academic disciplines. *Science*, *347*(6219), 262-265. https://doi.org/10.1126/science.1261375

Li, J. (2002). A cultural model of learning: Chinese "heart and mind for wanting to learn". *Journal of Cross-Cultural Psychology, 33*(3), 248-269. https://doi.org/10.1177/0022022102033003003

Lim, W., Plucker, J. A., & Im, K. (2002). We are more alike than we think we are: Implicit theories of intelligence with a Korean sample. *Intelligence, 30*(2), 185-208. https://doi.org/10.1016/S0160-2896(01)00097-6

Lindt, S. F., & Miller, S. C. (2017). Movement and learning in elementary school. *Phi Delta Kappan, 98*(7), 34-37. https://doi.org/10.1177/0031721717702629

Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review*, *98*(2), 224-253. https://doi.org/10.1037/0033-295X.98.2.224

Martin, C. L., Ruble, D. N., & Szkrybalo, J. (2002). Cognitive theories of early gender development. *Psychological Bulletin*, *128*(6), 903-933. https://doi.org/10.1037/0033-2909.128.6.903

Martin, C. L., & Ruble, D. (2004). Children's search for gender cues: Cognitive perspectives on gender development. *Current Directions in Psychological Science*, *13*(2), 67-70. https://doi.org/10.1111/j.0963-7214.2004.00276.x

Masuda, T., Ellsworth, P. C., Mesquita, B., Leu, J., Tanida, S., & Van de Veerdonk, E. (2008). Placing the face in context: cultural differences in the perception of facial emotion. *Journal of Personality and Social Psychology, 94*(3), 365-381. https://doi.org/10.1037/0022-3514.94.3.365

Masuda, T., & Nisbett, R. E. (2001). Attending holistically versus analytically: comparing the context sensitivity of Japanese and Americans. *Journal of Personality and Social Psychology, 81*(5), 922-934. https://doi.org/10.1037/0022-3514.81.5.922

Masuda, T., & Nisbett, R. E. (2006). Culture and change blindness. *Cognitive Science, 30*(2), 381-399. https://doi.org/10.1207/s15516709cog0000_63

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

MOE and MOHW (Ministry of Education and Ministry of Health and Welfare). (2019). *Revised Nuri Curriculum Manual. Sejong: Ministry of Education*. *(in Korean)*. https://www.moe.go.kr/boardCnts/view.do?boardID=294&boardSeq=78061&lev=0&searchType=null&statusYN=W&page=1&s=moe&m=020402&opType=N

MOIS (The Ministry of the Interior and Safety). (2020). 2020 *Status of Foreign Residents in Local Governments (in Korean).* https://www.mois.go.kr/frt/bbs/type001/commonSelectBoardArticle.do;jsessionid=GrK7W-FqVupq+xriLgQUMwRY.node50?bbsId=BBSMSTR_000000000014&nttId=88648

Morris, M. W., & Leung, K. (2010). Creativity east and west: Perspectives and parallels. *Management and Organization Review, 6*(3), 313-327. https://doi.org /10.1111/j.1740-8784.2010.00193.x

National Science Foundation (2016). *Survey of Earned Doctorates*. http://www.nsf.gov/ statistics/srvydoctorates/

National Science Foundation (2021). *Survey of Earned Doctorates*.

https://www.nsf.gov/statistics/srvydoctorates/

Nisbett, R. (2004). *The geography of thought: How Asians and Westerners think differently... and why.* Simon and Schuster.

Nisbett, R. E., & Masuda, T. (2003). Culture and point of view. *Proceedings of the National Academy of Sciences, 100*(19), 11163-11170. https://doi.org/10.1073/pnas.1934527100

Norenzayan, A., & Nisbett, R. E. (2000). Culture and causal cognition. *Current Directions in Psychological Science, 9*(4), 132-135. https://doi.org/10.1111/1467-8721.00077

Norenzayan, A., Smith, E. E., Kim, B. J., & Nisbett, R. E. (2002). Cultural preferences for formal versus intuitive reasoning. *Cognitive Science, 26*(5), 653-684. https://doi.org/10.1207/s15516709cog2605_4

Powell, D. R., Son, S. H., File, N., & Froiland, J. M. (2012). Changes in parent involvement across the transition from public school prekindergarten to first grade and children's academic outcomes. *The Elementary School Journal, 113*(2), 276-300. https://doi.org/10.1086/667726

Powell, D. R., Son, S.-H., File, N., & San Juan, R. R. (2010). Parent-school relationships and children's academic and social outcomes in public school pre-kindergarten. *Journal of School Psychology, 48*(4), 269–292. https://doi.org/10.1016/j.jsp.2010.03.002

Rimm-Kaufman, S. E., & Pianta, R. C. (2000). An ecological perspective on the transition to kindergarten: A theoretical framework to guide empirical research. *Journal of Applied Developmental Psychology, 21*(5), 491–511. https://doi.org/10.1016/S0193-3973(00)00051-4

Robinson, J. P., & Lubienski, S. T. (2011). The development of gender

achievement gaps in mathematics and reading during elementary and middle school: Examining direct cognitive assessments and teacher ratings. *American Educational Research Journal, 48*(2), 268-302. https://doi.org/10.3102/0002831210372249

Robinson-Cimpian, J. P., Lubienski, S. T., Ganley, C. M., & Copur-Gencturk, Y. (2014). Teachers' perceptions of students' mathematics proficiency may exacerbate early gender gaps in achievement. *Developmental Psychology*, *50*(4), 1262-1281. https://doi.org/10.1037/a0035073

Salili, F., & Hau, K. T. (1994). The effect of teachers' evaluative feedback on Chinese students' perception of ability: A cultural and situational analysis. *Educational Studies, 20*(2), 223-236. https://doi.org/10.1080/0305569940200206

Schwartz, S. H. (1994). Beyond individualism/collectivism: New cultural dimensions of values. In U. Kim, H. C. Triandis, Ç. Kâğitçibaşi, S.-C. Choi, & G. Yoon (Eds.), *Individualism and collectivism: Theory, Method, and Applications*, 85-119. Sage Publications, Inc.

Shu, Y., Hu, Q., Xu, F., & Bian, L. (2022). Gender stereotypes are racialized: A cross-cultural investigation of gender stereotypes about intellectual talents. *Developmental Psychology*. Advance online publication. https://doi.org/10.1037/dev0001356

Spencer, S. J., Steele, C. M., & Quinn, D. M. (1999). Stereotype threat and women's math performance. *Journal of Experimental Social Psychology, 35*(1), 4-28. https://doi.org/10.1006/jesp.1998.1373

Statistics Korea (KOSTAT), Korean Statistical Information Service (KOSIS), (2020*). A survey of new Ph.D. recipients in Korea*.

https://www.krivet.re.kr/ku/da/kuBAAVw.jsp?gn=E1-E120210054

Statistics Korea (KOSTAT), Ministry of Gender Equality and Family (2020). *The life of women based on 2020 statistics*. http://kostat.go.kr/portal/korea/kor_nw/1/1/index.board?bmode=read&aSeq=384858

Stephens-Davidowitz, S. (2014). Google, tell me. Is my son a genius?. *The New York Times*, 19. https://www.nytimes.com/2014/01/19/opinion/sunday/google-tell-me-is-my-son-a-genius.html

Storage, D., Horne, Z., Cimpian, A., & Leslie, S. J. (2016). The frequency of "brilliant" and "genius" in teaching evaluations predicts the representation of women and African Americans across fields. *PloS One, 11*(3), e0150194 https://doi.org/10.1371/journal.pone.0150194

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

Tiedemann, J. (2000). Gender-related beliefs of teachers in elementary school mathematics. *Educational Studies in Mathematics*, *41*(2), 191-207. https://doi.org/10.1023/A:1003953801526

Tomasetto, C., Alparone, F. R., & Cadinu, M. (2011). Girls' math performance under stereotype threat: The moderating role of mothers' gender stereotypes. *Developmental Psychology, 47*(4), 943-949. https://doi.org/10.1037/a0024047

Triandis, H. C. (1989). The self and social behavior in differing cultural contexts. *Psychological Review, 96*(3), 506–520.

https://doi.org/10.1037/0033-295X.96.3.506

UNDP (United Nations Development Programme). (2020). *Gender Social Norms Index (GSNI)*. https://hdr.undp.org/en/gsni

Upson, S., & Friedman, L. F. (2012). Where are all the female geniuses? *Scientific American Mind*, *23*(5), 63-65. https://doi.org/10.1038/scientificamericanmind111263

Vial, A. C., Muradoglu, M., Newman, G., Cimpian, A., & Vial, A. C. (2022). An Emphasis on Brilliance Fosters Masculinity Contest Cultures. *Psychological Science*. *33*(4), 595-612. https://doi.org/10.1177/09567976211044133

World Economic Forum. (2021). *The Global Gender Gap Report 2021*. https://www.weforum.org/reports/global-gender-gap-report-2021

Zhao, S., Setoh, P., Storage, D., & Cimpian, A. (in press) The Acquisition of the Gender-Brilliance Stereotype: Age Trajectory, Relation to Parents' Stereotypes, and Intersections with Race/Ethnicity. *Child Development.*

Abstract in Korean

한국 아동들의 지적 탁월함에 대한 성 고정관념 발달

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선행 연구에 따르면, 초기 학령기 미국 아동들은 높은 지적 능력을 여성보다는 남성에게 연결시킨다(Bian et al., 2017). 이러한 "똑똑함 = 남성" 성 고정관념과 일관된 결과로, 만 6세 미국 여아들은 남아보다 "정말, 정말 똑똑한 아이들"을 위한 게임에 덜 하고자 하였다. 본 연구는 아동들의 지적 능력에 대한 성 고정관념과 아동들의 동기에 미치는 부정적인 영향의 일반화 가능성을 조사하고자 하였다. 실험 1(N = 96)과 실험 2(N = 96)에서는 만 5~7세 한국 아동들을 대상으로 아동들이 아시안(실험 1)과 백인(실험 2)의 지능에 대해 "똑똑함 = 남성" 성 고정관념을 보이는지 조사하였다. 그 결과, 만 7세 무렵의 한국 아동들은 아시안과 백인 모두에 대해 여성보다 남성을 더 똑똑하다고 응답하였다. 실험 3(N = 80)에서 연구자들은 만 6~7세 한국 아동들에게 "정말 정말 똑똑한 아이들"을 위한 게임과 "정말 정말 열심히 노력하는 아이들"을 위한 게임을 제시하고 각 게임에 대한 아동들의 동기를 조사하였다. 그 결과, 만 6세 한국 아동들은 각 게임을 하고자 하는 동기에 성별의 차이를 보이지 않은 반면, 만 7세 여아들은 "똑똑함" 게임에 대해서만 남아보다 덜 하고자 하였다. 본 연구의 결과는 지적 능력에 대한 성 고정관념

발달과 이러한 인식의 높은 지적 수준을 요구하는 활동에 대한 여아들의 동기에 미치는 부정적인 영향이 일반적인 현상일 수 있다는 가능성을 제시한다.

주요어: "똑똑함 = 남성" 성 고정관념, 일반화 가능성, 사회 인지 발달