Research Article

STEREOTYPE SUSCEPTIBILITY IN CHILDREN:
Effects of Identity Activation on Quantitative Performance

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Abstract—A growing body of research indicates that the activation of negative stereotypes can impede cognitive performance in adults, whereas positive stereotypes can facilitate cognitive performance. In two studies, we examined the effects of positive and negative stereotypes on the cognitive performance of children in three age groups: lower elementary school, upper elementary school, and middle school. Very young children in the lower elementary grades (kindergarten-grade 2) and older children in the middle school grades (grades 6–8) showed shifts in performance associated with the activation of positive and negative stereotypes: these shifts were consistent with patterns previously reported for adults. The subtle activation of negative stereotypes significantly impeded performance, whereas the subtle activation of positive stereotypes significantly facilitated performance. Markedly different effects were found for children in the upper elementary grades (grades 3–5). These results suggest that the development of stereotype susceptibility is a critical domain for understanding the connection between stereotypes and individual behavior.

Although gender and ethnic differences in mathematics performance have declined considerably over time, they have not disappeared. For instance, high school males still outperform females in math word problem solving (Hyde, Fennema, & Lamon, 1990). Further, girls are less likely than boys to take advanced courses in mathematics and science and to go into careers in these fields (American Association of University Women, 1999). Similarly, Caucasians outperform black and Hispanic students on standardized achievement tests (Williams & Ceci, 1997), and Asian-American students outperform other ethnic groups on quantitative tests (Sue & Okazaki, 1990).

A number of explanations have been offered to account for these gender and ethnic discrepancies. For example, the discrepancies have been attributed to parent and teacher expectations (e.g., Eccles & Jacobs, 1987; Eccles, Jacobs, & Harold, 1990; Jacob & Eccles, 1992; D. Yee & Eccles, 1988), differences in attitude and attributional styles (e.g., Catambis, 1994), family structure (e.g., Kao, 1995), motivation (Dweck, 1986), culture and history (Ogbu, 1997; Sue &Okazaki, 1990), values (Graham, Taylor, & Hudley, 1998), and genetics (Benbow & Stanley, 1987). Recent social psychological research on young adults suggests another powerful factor that might account for some gender and ethnic differences in the academic performance of children. Specifically, children’s academic performance might be susceptible to prevailing sociocultural stereotypes associated with their gender and ethnicity.

Research on adults has found that the implicit activation of sociocultural stereotypes can have a significant impact on academic performance (Steele, 1997; Steele & Aronson, 1995). Thus, work on stereotype threat has found that the activation of negative stereotypes regarding individuals’ group memberships can substantially impede performance (Aronson, Quinn, & Spencer, 1998; Croizet & Claire, 1998; Spencer, Steele, & Quinn, 1999; Steele, 1997). Moreover, the activation of stereotypes not only can hurt performance, but also can boost performance (Shih, Pittinsky, & Ambady, 1999). In accordance with common sociocultural stereotypes that Asians have superior quantitative skills compared with other ethnic groups (Steen, 1987) and that women have inferior quantitative skills compared with men (Hedges & Nowell, 1995), in a previous study we (Shih et al., 1999) found that Asian-American women performed better on a mathematics test when their ethnic identity was activated, but worse when their gender identity was activated, compared with a control group who had neither identity activated.

Although it seems clear that adults are susceptible to both positive and negative stereotypes regarding their social-identity groups, no research, to our knowledge, has examined age differences in stereotype susceptibility. Examining such age differences will enable researchers to better understand the connection between stereotype activation and behavior observed in adults, as well as to frame and time interventions around stereotypes and their effects on academic performance. We therefore sought to examine whether children’s academic performance is susceptible to stereotypes in the same ways as has been found for adult samples. Is there a certain age at which children first become susceptible to sociocultural stereotypes?

DEVELOPMENT OF SOCIAL IDENTITY AND STEREOTYPE AWARENESS

The developmental literature on the process of social identification and acquisition of stereotypes suggests potential stages at which self-relevant stereotypes might affect children.

Preschool Through Grade 2

Children become aware of gender and ethnic categories at a very young age. For example, children are able to discriminate accurately between males and females by 2 years of age (Huston, 1987) and are able to identify people of different ethnicities between 3 and 5 years of age (Aboud, 1988; Hirschfeld, 1996). Some cross-cultural evidence suggests that as early as the first grade, children believe that boys are better than girls in mathematics (Lummis & Stevenson, 1990), and first graders also express the belief that mathematics performance is more relevant to boys than girls’ self-concepts (Entwistle, Alexander, Pallas, & Cardigan, 1987). Adults view stereotypes as generalizations about a social group and do not necessarily believe these stereotypes to be true, but young children are less flexible in their understanding of stereotypes (Bussey & Bandura, 1999; Golombok & Fivush, 1994). Further, evidence about whether very young children can identify their own race is equivocal (Aboud, 1988; Morland & Hwang, 1981).

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Stereotype Susceptibility in Children

Upper Elementary School (Grades 3–5)

During upper elementary school, when children are between the ages of 8 and 10, they begin to incorporate abstract concepts, such as the concept of masculinity and femininity, into their representations (Eisenberg, Martin, & Fabes, 1996; Martin, Wood, & Little, 1990). In contrast to younger children, most children over age 7 are able to incorporate individualizing information into their social judgments (Martin, 1990). By the end of second grade, when children are around the ages of 6 to 8, their ability to identify their own race becomes quite accurate (Aboud, 1988).

Middle School (Grades 6–8)

By the time children are 10 years old, the content of their gender stereotypes begins to resemble the content of the stereotypes held by adults (Rubie & Martin, 1998). Children’s gender identity also undergoes significant transformations as they approach adolescence. It is also around this age that gender differences in mathematics achievement begin to emerge (Hyde, Fennema, & Lamon, 1990).

THE PRESENT RESEARCH: STEREOTYPE SUSCEPTIBILITY AND ACADEMIC PERFORMANCE

Thus, although young children recognize social categories and older children possess knowledge about social stereotypes, very little is known about how self-relevant sociocultural stereotypes affect children’s behavior. It is unclear, for example, at what age stereotypes begin to influence the behavior of children and whether explicit endorsement of stereotypes is necessary for them to affect behavior. Information regarding when and how the activation of stereotypes affects performance could influence not only the type but also the timing of interventions that can be made to enhance performance. In this article, we report two studies that tested the hypothesis that stereotype susceptibility should emerge around upper elementary and middle school, when abstraction and ability to identify one’s own race emerge.

The first study examined the impact of subtly activating identities associated with positive or negative stereotypes on the quantitative performance of Asian-American girls. The second study established the generalizability of the findings with a sample of Asian-American boys.

STUDY 1: ASIAN-AMERICAN GIRLS

The first study was designed to replicate earlier work indicating that Asian-American women performed better on a mathematics test when their Asian identity was subtly activated and worse when their female identity was subtly activated compared with Asian-American women who had no particular identity activated (Shih et al., 1999). We examined age differences in stereotype susceptibility with a sample of Asian-American girls. Based on the developmental research, we hypothesized that stereotype susceptibility would emerge during middle school, so that in this age group the activation of gender identity would inhibit quantitative performance and the activation of ethnic identity would facilitate quantitative performance.

Method

Participants

Eighty-one Asian-American girls from the Greater Boston Area participated in the study. Participants were recruited from advertise-ments in local Chinese, Korean, and Japanese newspapers, and from a summer program at Chinatown. Participants’ grade enrollments ranged from kindergarten to grade 8. Most of the participants (71%) were born in the United States. Participants received a certificate, a small gift (candy and an embossed pencil), and monetary remuneration in exchange for their participation.

Design and manipulation

Participants were randomly assigned to one of three conditions: Asian identity activated, female identity activated, and no identity activated (control). Each participant, depending on her grade, completed one of two age-appropriate manipulation tasks.

Participants from kindergarten through grade 2 colored one of three randomly selected pictures. In the ethnic-identity condition, participants were asked to color a picture depicting two Asian children eating with chopsticks out of rice bowls. In the gender-identity condition, participants were asked to color a picture of a girl holding a doll. In the control condition, participants were asked to color a landscape scene. In order to keep the experimenter blind to the condition, participants were asked not to show the picture to the experimenter.

Participants in grades 3 through 8 filled out one of three randomly selected questionnaires. In the ethnic-identity condition, participants were asked to answer questions related to ethnicity: (a) whether they had any non-Caucasian (nonwhite) classmates; (b) whether most of their friends were white, black, or Asian; (c) what their favorite subject in school was; (d) whether they spoke a foreign language at home; (e) whether their parents spoke another language; and (f) whether their grandparents lived with them. In the female-identity condition, participants were asked to answer questions related to gender: (a) whether boys or girls were better at sports, (b) whether most of their friends were boys or girls, (c) whether any of their friends were dating, (d) whether there was sex education at their school, (e) whether they thought that boys and girls were treated differently at most schools, (f) how many sisters they had and how many brothers they had, and (g) whether they more resembled their father or their mother. In the control condition, participants were asked to answer neutral questions: (a) whether they liked the outdoors, (b) what their favorite season was, (c) whether they liked spending more time inside or outside, (d) whether they liked animals, (e) what their favorite animal was, and (f) what their least favorite animal was.

Manipulation check

The two different methods of identity activation (coloring pictures vs. answering questions) were not associated with any performance differences across conditions, F(2, 65) = 1.63, n.s. Thus, one method did not seem to activate identity more strongly than the other.

Procedure

Each participant and her parents were greeted by a female Asian-American experimenter when they arrived. The parents were shown to a waiting area and asked to fill out a demographic questionnaire. The participant was led to a separate room and asked to complete the appropriate manipulation task. After the participant had completed the manipulation task, she was given a math test consisting of questions taken from a standardized math test, the Iowa Test of Basic Skills, appropriate to her particular grade. After 15 min, the participant was stopped.
and given two implicit stereotype-awareness tasks. (The order of the tasks was counterbalanced across participants.) For the gender-stereotype-awareness task, she was told: “There were many good students in my high school, but one of my classmates stood out from the rest. This student got As in every subject, but was especially good at math. This student could figure out problems that even the teachers couldn’t solve. One time, the student entered a state math contest and got a perfect score!” The participant was then asked to repeat the story, and the experimenter noted whether she used the pronoun “he” or “she.”

For the ethnicity-stereotype-awareness task, the participant was shown a picture of an Asian and a Caucasian girl and was told: “Sarah is 6 years old and is already very good at math. Which of these girls do you think she probably is?” The participant’s choice was then recorded.

Each participant was also given an explicit stereotype-awareness task in which she was asked, “Are boys better at math, girls better at math, or are they the same?” and “Are Asians better at math, white people better at math, or are they the same?” The order in which the questions were asked was counterbalanced. After responses to this task were recorded, the participant was thanked and dismissed.

Results and Discussion

For the analyses, the girls were divided into three grade groups: lower elementary (grades K–2, ages 5–7, n = 20), upper elementary (grades 3–5, ages 8–10, n = 29), and middle school (grades 6–8, ages 11–13, n = 28). Four participants were dropped from the analyses because of missing data. We chose these age groups to correspond to different stages of gender and ethnic identity discussed in the developmental literature.

Test performance

The main dependent variable was performance on the mathematics test. As in previous research, performance was measured by accuracy, or the number of questions answered correctly divided by the number of questions the participant attempted to answer (Shih et al., 1999; Steele & Aronson, 1995). A 3 (condition) × 3 (grade level) analysis of variance (ANOVA) revealed a main effect for condition, F(2, 68) = 5.08, p < .01; girls whose ethnic identity was activated (M = .84) performed significantly better than the control group (M = .81) or those whose gender identity was activated (M = .81).

There was no main effect for grade level, but there was a significant condition-by-grade-level effect, F(4, 68) = 4.77, p < .005, indicating that participants’ susceptibility to self-relevant stereotypes changed as they grew older (see Fig. 1). Focused contrast analyses revealed that the performance of the oldest participants (i.e., participants in middle school) was highest when their Asian identity was made salient (M = .92), lowest when their gender identity was made salient (M = .77), and intermediate when no identity was made salient (M = .84), t(25) = 2.59, p < .01, one-tailed. Surprisingly, the youngest participants (i.e., lower elementary school) also showed the same trend, scoring higher when their Asian identity was activated (M = .93) and lower when their female identity was activated (M = .66) compared with the control condition (M = .83), t(17) = 3.97, p < .005, one-tailed. Participants in upper elementary school, however, showed the reverse trend. They scored higher on the math test when their female identity was activated (M = .92) than when their Asian identity was activated (M = .84) or when no particular identity was activated (M = .81). A post hoc contrast revealed that this effect was significant, t(26) = 1.78, p < .05. There were no significant differences in the number of questions attempted across conditions.

Fig. 1. Performance of Asian-American girls on the math test. Accuracy is graphed separately for the three grade groups and the three identity-activation conditions.

Thus, both the oldest (i.e., middle school) and the youngest (i.e., lower elementary school) participants showed susceptibility to the stereotypes in the direction predicted. In contrast, girls in upper elementary school performed best when their gender identity was activated. Perhaps it is at this age that children realize that their ethnic identity makes them different from their peers. Further, at this age children are reported to be most chauvinistic, with both sexes claiming superiority at a variety of tasks (Kaminski & Sheridan, 1984; Powlishta, 1995; Sheridan & Short, 1984; M. Yee & Brown, 1994). But clearly these reversed effects do not seem to hold for very long, and by middle school, these girls, much like young-adult Asian-American women, performed better when their Asian identity was activated and more poorly when their gender identity was activated, compared with a neutral condition.

Stereotype awareness

On the implicit measure of ethnic stereotype awareness, girls of all three age groups tended to identify the Asian child, rather than the Caucasian child, as being good at mathematics (69%, 77%, and 75% for grades K–2, 3–5, and 6–8, respectively, p < .01 for each age group). On the implicit measure of gender stereotype awareness, the youngest and oldest groups were slightly, but not significantly, more likely to assume the outstanding math student was a boy than a girl (53% and 57%, respectively), but the third through fifth graders were slightly more likely to identify the student as a girl rather than a boy (54%). This is interesting because the girls in this group who implicitly endorsed girls as being better at mathematics than boys also performed better when their gender identity was activated compared with the other two conditions.

No significant differences were found on the measures of explicit stereotype awareness. When asked whether boys or girls were better at math or if they were all the same, the majority of children (75%), regardless of their age, responded that boys and girls were the same. There were also no significant differences in opinions about whether Asians were better at math, Caucasians were better at math, or the two groups were the same. Thus, as in previous research on adult samples, implicit stereotypes affected behavior even when the stereotypes were
Stereotype Susceptibility in Children

not explicitly endorsed (Bargh, Chen, & Burrows, 1996; Shih, Richardson, Ambady, & Pittinsky, 2000).

**STUDY 2: ASIAN-AMERICAN BOYS**

In order to further investigate the trends found in the previous study, particularly the reversal in the upper elementary age group, we conducted a second study to examine the influence of stereotype activation on the academic performance of Asian-American boys. Because both Asians and males are stereotyped to have superior quantitative skills, we hypothesized that Asian-American boys would perform better on a quantitative task both when their ethnic identity was activated and when their gender identity was activated, compared with a neutral condition. Thus, we predicted that boys in the youngest and oldest groups would show a different pattern than girls in their susceptibility to ethnic- and gender-identity primes.

Our prediction for the performance of the upper elementary, or middle, group of boys was based on the results of Study 1. We predicted that the boys in this group, like the upper elementary girls, would demonstrate facilitated performance when their gender identity was activated and impeded performance when their Asian identity was activated.

**Method**

**Participants**

Seventy Asian-American boys from the Greater Boston Area participated in the study (79% were born in the United States). Participants were recruited and rewarded in the same way as in the previous study.

**Design and manipulation**

The design, manipulations, and procedure were the same as in the previous study, except that in the gender-identity condition, boys in kindergarten through grade 2 were asked to color a picture of a Caucasian boy playing basketball. Again, the two different methods of identity activation were not associated with significant performance differences across conditions.

**Results**

**Test performance**

As before, the participants were divided into three grade groups: lower elementary (grades K–2, ages 5–7, n = 21), upper elementary (grades 3–5, ages 8–10, n = 21), and middle school (grades 6–8, ages 11–13, n = 25). Three participants were dropped from the analyses because of missing data. A 3 (condition) × 3 (grade level) ANOVA revealed no main effect for condition. There was a significant condition-by-grade-level effect, F(4, 58) = 4.57, p < .005, indicating age differences in participants’ susceptibility to stereotypes (see Fig. 2). Focused contrast analyses indicated that, as predicted, participants in the youngest group performed better when their Asian identity was activated (M = .85) and when their male identity was activated (M = .81) compared with when no identity was activated (M = .73), t(18) = 2.30, p < .02. Older boys in middle school displayed a similar pattern, performing better in the Asian-identity condition (M = .93) and gender-identity condition (M = .87) compared with the no-identity condition (M = .84), t(22) = 1.54, p < .07. Participants in upper elementary school scored higher on the math test when their male identity was activated (M = .92) than when their Asian identity was activated (M = .76). The performance of the control group was in the middle (M = .86), t(18) = 2.72, p = .01. There were no significant differences in the number of questions attempted across conditions.

Thus, once again, we found that the oldest and youngest participants both showed the predicted pattern of stereotype susceptibility. Moreover, upper elementary boys showed the same pattern as upper elementary girls. Thus, at this stage, both boys’ and girls’ performance seems to be facilitated by gender-identity activation and impeded by ethnic-identity activation.

**Stereotype awareness**

On the implicit measures of stereotype awareness, all three groups of boys tended to identify the Asian child, rather than the Caucasian child, as being good at mathematics (85%, 68%, and 73% for the three age groups, respectively, p < .01 for each group), and to assume that the outstanding math student was a boy, rather than a girl (85%, 78%, and 85% for grades K–2, 3–5, and 6–8, respectively, p < .01 for each group). When asked explicitly whether boys or girls were better at math or if they were all the same, most participants (79%) responded that boys and girls were the same. The majority indicated that Asians and Caucasians are equally good at math.

**GENERAL DISCUSSION**

These results clearly indicate that both positive and negative self-relevant stereotypes are insidious and can affect the performance of even very young children. Unexpectedly, even children as young as 5 years old are susceptible to the activation of identities associated with positive and negative stereotypes regarding quantitative performance. Thus, Asian-American girls in lower elementary school (5–7 years old) performed significantly worse than a control group when their gender identity was activated and performed significantly better than a control group when their ethnic identity was activated. Asian-Amери-
can boys in lower elementary school, in accordance with stereotypes regarding both their gender and their ethnic superiority in the quantitative domain, performed significantly better than a control group when either their gender or their ethnic identity was activated. Exactly the same pattern was revealed for Asian-American girls and boys in middle school (ages 11–13). Thus, the effects of threat associated with negative stereotypes in the domain of quantitative performance (Aronson et al., 1998; Spencer et al., 1999; Steele, 1997) occur in quite young children, but the protective effects of subtly activated positive stereotypes also occur at the same age.

The pattern of results for children in upper elementary school (8–10 years old) was quite different. Both boys' and girls' quantitative performance improved when their gender identity was activated compared with when their ethnic identity was activated or when no identity was activated. Although unexpected, these results can be explained by two findings from the developmental literature. First, at this stage children are extremely chauvinistic about their gender identity and feel that their own sex is superior to the other (Kaminski & Sheridan, 1984; Powlishta, 1995; M. Yee & Brown, 1994). For example, in one study, 8- to 10-year-olds rated same-sex targets more positively than other-sex targets (Powlishta, 1995). Thus, superior performance associated with gender-identity activation might be associated with this chauvinism. Second, because this is the stage at which self-race identification becomes accurate (Aboud, 1988), perhaps children want to distance themselves from their minority ethnic identity, trying to fit in with the majority.

Older girls (11–13 years of age), however, showed declines in performance when their gender identity was activated, whereas older boys showed improvements in performance in this condition. This trend is consistent with the literature indicating that between the ages of 11 and 14, girls and boys both stereotype mathematics as a male domain, a trend that becomes even more pronounced in high school (Hyde, Fennema, Ryan, Forst, & Hopp, 1990), as reflected in the higher scores of boys on standardized tests such as the Scholastic Assessment Test (American Association of University Women, 1999).

Both younger and older girls and boys, however, showed performance boosts when an alternative identity associated with positive stereotypes in the quantitative domain was activated. Thus, possessing an alternative identity associated with positive stereotypes might buffer girls from the negative stereotypes associated with their gender. This finding has important implications for the types of interventions that might be designed to make girls less vulnerable to negative gender stereotypes in the domains of mathematics and science, and for the timing at which interventions should be introduced.

A number of different mechanisms could be posited for these results, including mechanisms thought to mediate stereotype threat (Steele, 1997), as well as those proposed to mediate gender discrepancies in performance. For example, the expectancy-value models of Eccles and her colleagues suggest that activated self–stereotypes might trigger different mediating processes, such as achievement-related beliefs, gender-role beliefs, self-perceptions, and task perceptions, that interact to affect intellectual performance (Eccles [Parsons], Adler, & Meece, 1984).

On the whole, these results are disconcerting and suggest that socialization and exposure to sociocultural stereotypes begin to exert their influence at very early ages. But they also suggest that performance is malleable and sensitive to situational and psychological cues. Some strategies to improve performance of children in various domains might be to provide them with alternative positive stereotypes and positive role models that can be harnessed in appropriate situations (Bussey & Bandura, 1999). Further research to identify the mechanisms associated with this phenomenon, as well as interventions designed to prevent the negative consequences of stereotype susceptibility at early ages, is critical.

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Stereotype Susceptibility in Children


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