

Math and me: Children who identify with math get higher scores

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How strongly children identify with math (their math "self-concept") can be used to predict how high they will score on a standardized test of math achievement, according to a new study by researchers at the University of Washington.

The study, published in the October 2015 issue of the journal *Learning and Instruction*, is the first to demonstrate a link between students' subconscious [math](#) self-concepts and their actual [math achievement](#) scores.

The study also measured the strength of students' stereotype that "math is for boys" and found that, for girls, the stronger this subconscious stereotype, the weaker the individual child's math self-concept.

"Our results show that [stereotypes](#) are related to how [children](#) think of themselves as math learners, which, in turn, is related to how well they do on an actual [math test](#)," said lead author Dario Cvencek, a research scientist at the UW's Institute for Learning & Brain Sciences (I-LABS).

With co-author Andrew Meltzoff, co-director of I-LABS, Cvencek examined math-gender stereotypes, math self-concepts and math scores in 300 children (an even mix of boys and girls) in grades 1, 3, and 5 in Singapore.

The researchers chose Singapore, because it—and other Asian countries including Japan and China—is consistently ranked as one of the top

nations in the world for math achievement among girls and boys.

The researchers focused on a high-achieving culture where there aren't gender differences in math ability, so that they could see which psychological factors have a role in student performance.

"We were fascinated to find that elementary-school children have subconscious thoughts about whether or not they are a math person," Meltzoff said. "They have an implicit identity of 'me is math' or 'me is not math.' This self-concept matters because it is correlated with actual behavior, such as math achievement."

At the beginning of the children's school year, the researchers led each child through an assortment of tasks measuring the students' beliefs about math-gender stereotypes ("math is for boys") and math-self concepts ("math is for me").

A Child Implicit Association Test (IAT) examined the children's subconscious beliefs. The IAT probes self-concepts, stereotypes and other attitudes that people may not know they have. Adult versions of IAT reveal hidden beliefs about gender, race, religion and other topics.

The researchers also used self-reported tasks to measure the children's explicit beliefs. These tasks involved the children looking at a series of drawings of boys and girls and then answering questions such as how much the characters in the drawings liked math.

Then, at the end of the school year, the students took a standardized math achievement test administered by their teachers.

Girls and boys performed well on the math test and had similar scores. But when the researchers factored in math-gender stereotype and math self-concept beliefs, they discovered that the children's implicit—but not

explicit—beliefs affected math scores.

In both genders, students with stronger implicit math self-concepts did better on the math test. Stronger implicit math-gender stereotypes correlated with stronger math self-concepts for boys, but weaker math self-concepts for girls.

"We've found that there are implicit psychological factors, such as students' beliefs about math, that can weaken students' identification with math and also impair their math performance," Cvencek said.

And since the factors are implicit and not detectable by self-report measures, this means they can affect student performance without [students](#) being aware of them.

Previously, Cvencek and Meltzoff found that as early as second grade children in the U.S. begin to express the cultural stereotype that "math is for boys, not for girls," which may discourage girls from pursuing math.

The researchers plan to use the findings to design ways to identify implicit math self-concepts as they emerge early in elementary school and create interventions to change beliefs that could be detrimental to math performance.

"We have high hopes for the usefulness of our tests," Cvencek said. "We think it could be useful for teachers and parents to know whether their young child identifies positively or negatively with math. If we can boost children's math self-concepts early in development, this may also help boost their actual math achievement and interest in the discipline. We plan to test this."

Provided by University of Washington

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