Practice at “Guesstimating” Can Speed Up Math Ability

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A person’s math ability can range from simple arithmetic to calculus and abstract set theory. But there’s one math skill we all share: A primitive ability to estimate and compare quantities without counting, like when choosing a checkout line at the grocery store. Practicing this kind of estimating may actually improve our ability to do the kinds of symbolic math we learn in school, according to new research published in *Psychological Science*, a journal of the Association for Psychological Science.

Previous studies have suggested a connection between the approximate number system, involved in estimating, and mathematical ability. Psychological scientists Elizabeth Brannon and Joonkoo Park of Duke University devised a series of experiments to test this association.

The researchers enrolled 26 adult volunteers and had them complete 10 training sessions designed to hone their approximate number skills. On each of these training sessions, the participants practiced adding and subtracting large quantities of dots without counting them.

They were briefly shown two arrays of 9 to 36 dots on a computer screen and then asked whether a third set of dots was larger or smaller than the sum of the first two sets, or whether it matched the sum.

“It’s not about counting, it’s about rough estimates,” explains Park, a postdoctoral researcher at Duke.

As participants improved at the game, the automated sessions became more difficult by making the quantities they had to judge closer to each other.

Before the first training session and after the last one, their symbolic math ability was tested with a set of two- and three-digit addition and subtraction problems, sort of like a third-grader’s homework. They solved as many of these problems as they could in 10 minutes. Another group of control participants took the math tests without the approximate number training.

Those who had received the 10 training sessions on approximate arithmetic showed more improvement in their math test scores compared to the control group.

In a second set of experiments, participants were divided into three groups to isolate whether there had been some sort of placebo effect in the first experiment that made the approximate arithmetic group perform better. One group added and subtracted quantities as before, a second performed a repetitive and fast-paced rank-ordering with Arabic digits, and the third answered multiple choice questions that tapped their general knowledge (e.g., “which city is the capital of France?”)

Again, the people who were given the approximate arithmetic training showed significantly more improvement in the math test compared to either control group.

“We are conducting additional studies to try and figure out what’s driving the effect, and we are particularly excited about the possibility that games designed to hone approximate number sense in preschoolers might facilitate math learning,” Park said.

Park and Brannon can’t yet isolate the mechanism behind their effect, but the research does suggest that there is an important causal link between approximate number sense and symbolic math ability.

“We think this might be the seeds — the building blocks — of mathematical thinking,” Brannon said.

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