

Preschoolers' grasp of numbers predicts math performance in school years

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A new study published today in the journal *PLoS ONE* reports that the precision with which preschoolers estimate quantities, prior to any formal education in mathematics, predicts their mathematics ability in elementary school, according to research from the Kennedy Krieger Institute.

Humans have an [intuitive sense](#) of number that allows them, for example, to readily identify which of two containers has more objects without counting. This ability is present at birth, and gradually improves throughout childhood. Although it's easier to compare quantities if the amounts differ greatly (such as 30 versus 15 objects), greater precision is needed when comparing items that are much closer in number. When this ability is measured during the school age years, it correlates with mathematics achievement. However, it has been unclear until now whether this intuitive ability actually serves as a foundation for school-age math abilities.

Results of the new study show that children's ability to make numerical estimates in preschool predicted their performance on mathematical tests taken in elementary school, more than two years later. The relationship appeared to be specific to math ability, because preschool number skills did not predict other abilities, such as expressive vocabulary or the ability to quickly name objects like letters or numbers.

"Children vary widely in both their numerical and non-numerical [cognitive abilities](#) at all ages," said Dr. Michele Mazzocco, Director of

the [Math Skills](#) Development Project at Kennedy Krieger Institute and lead author of the study. "Based on earlier data showing a relationship between intuitive number skills and formal mathematics, we were interested to learn whether numerical skills measured prior to schooling predict the level of mathematics skills children demonstrate years later, in a formal educational setting."

Mazzocco, along with researchers Lisa Feigenson and Justin Halberda of Johns Hopkins University, examined the performance of 17 children (7 girls, 10 boys) who had taken part in an earlier study of numerical abilities as preschoolers. At ages three and four, the children had been asked to judge which of two sets of objects, such as blue or red crayons, had more items. In this new study, researchers measured the same children's [math abilities](#) more than two years later using a standardized mathematics assessment that involved a wide range of skills like counting, reading and writing numbers, and simple arithmetic.

"It was striking to find evidence that basic number abilities at such a young age may play a role in formal math achievement," said Mazzocco. "But additional studies are needed to determine whether these skills are malleable at an early age, how they contribute to math achievement and if they are related to other known influences on [math](#) performance."

Provided by Kennedy Krieger Institute

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