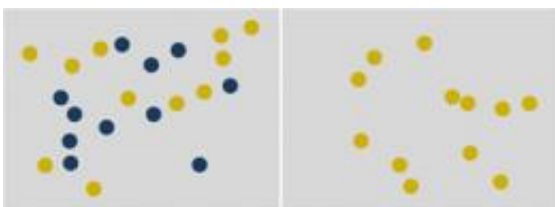


Poor 'gut sense' of numbers contributes to persistent math difficulties

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To measure children's ability to estimate and compare quantities, the researchers administered two series of tests. In the first, the children viewed groups of dots and were asked to say whether there were more blue or yellow dots. In the second, nine to 15 dots of one color appeared, and the children were asked to say how many dots they saw. Each screen was visible for only one fifth of a second, so the children wouldn't have time to count the dots.

A new study published today in the journal *Child Development* (e-publication ahead of print) finds that having a poor "gut sense" of numbers can lead to a mathematical learning disability and difficulty in achieving basic math proficiency. This inaccurate number sense is just one cause of math learning disabilities, according to the research led by Dr. Michele Mazzocco of the Kennedy Krieger Institute.

Approximately 6 to 14 percent of school-age children have persistent difficulty with mathematics, despite adequate learning opportunities and age-appropriate achievement in other school subjects. These [learning difficulties](#) can have lifelong consequences when it comes to job success

and financial decision-making. Heightened interest in the nature and origins of these learning difficulties has led to studies to define mathematical learning disability (MLD), identify its underlying core deficits, and differentiate children with MLD from their mathematically successful counterparts.

The new Kennedy Krieger study showed that children with a confirmed [math learning disability](#) have a markedly inaccurate number sense compared to their peers. But Dr. Mazzocco said students without a MLD who were below average in achievement performed on the number sense tasks as well as those considered average. For them, number sense doesn't seem to be the trouble.

"Some children have a remarkably imprecise intuitive sense of numbers, and we believe these children have math [learning disability](#), at least in part, due to deficits in this intuitive type of number sense," said Dr. Mazzocco, Director of the [Math Skills](#) Development Project at Kennedy Krieger. "But other students who underperform in math do so despite having an intact number sense. This demonstrates the complexity of determining precisely what influences or interferes with a child's mathematical learning. Difficulty [learning](#) math may result from a weak number sense but it may also result from a wide range of other factors such as spatial reasoning or working memory. While we should not assume that all children who struggle with mathematics have a poor number sense, we should consider the possibility."

To gauge their sense of numbers, Dr. Mazzocco and colleagues tested 71 children who were previously enrolled in a 10-year longitudinal study of math achievement. The students, all in the ninth grade, completed two basic number sense tasks. In the number naming task, they were shown arrays of dots and asked to judge how many dots were present, without allowing enough time to actually count them. In the number discrimination task, the children were shown arrays of blue dots and

yellow dots and asked to determine whether the blue or yellow array had more dots, again, without time to count them.

The researchers then compared the performance of four groups of students, who over the 10-year study, consistently showed having either a MLD, below average, average or above average math achievement.

Students with MLD performed significantly worse than their peers on both of the number tasks. The study findings suggest that an innate ability to approximate numbers, an intact ability present in human infants and many other species, contributes to more sophisticated math abilities later in life, while a less accurate ability underlies MLD. Additionally, the findings reveal that a poor number sense is not the only potential source of math difficulties, reinforcing that a 'one size fits all' educational approach may not be the best for helping children who struggle with math.

"A key message for parents and teachers is that [children](#) vary in the precision of their intuitive sense of numbers. We might take for granted that every child perceives numbers with roughly comparable precision, but this assumption would be false. Some students may need more practice, or different kinds of practice, to develop this number sense," Dr. Mazzocco said. "At the same time, if a child is struggling with mathematics at school, we should not assume that the child's difficulty is tied to a poor [number sense](#); this is just one possibility."

Provided by Kennedy Krieger Institute

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