

## Learning to count not as easy as 1, 2, 3: Working with larger numbers matters

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Preschool children seem to grasp the true concept of counting only if they are taught to understand the number value of groups of objects greater than three, research at the University of Chicago shows.

"We think that seeing that there are three objects doesn't have to involve counting. It's only when children go beyond three that counting is necessary to determine how many objects there are," said Elizabeth Gunderson, a UChicago [graduate student](#) in psychology.

Gunderson and Susan Levine, the Stella M. Rowley Professor in Psychology, Comparative Human Development and the Committee on Education at the University, study how children develop an understanding of the connection between number words and their actual numerical value. That connection is known as the cardinal principle, which states that the size of a set of objects is determined by the last number reached when counting the set.

Learning to recite number words in order is not the same as understanding the cardinal principle, they point out. Research has shown that children who enter kindergarten with a good understanding of the cardinal principle do better in mathematics.

Gunderson is lead author of a paper, "Some Types of Parent Number Talk Count More than Others: Relations between Parents' Input and Children's Cardinal-Number Knowledge," published in the current issue of the journal *Developmental Science*. Levine, a leading national expert

on the early acquisition of mathematics, is co-author.

Levine's work has shown that exposure to language related to numbers improves mathematics [comprehension](#); the latest paper goes a step further. It shows that children who are exposed to number words from four through 10, in addition to the number words from one through three, acquire an understanding of the cardinal principle before children who have little exposure to these higher number words.

To perform the study, team members made five home visits and videotaped interactions between 44 [youngsters](#) and their parents. The sessions lasted for 90 minutes and were made at four-month intervals, when the youngsters were between the ages of 14 to 30 months. They coded each instance in which parents talked about numbers with their children.

When the children were nearly 4 years old, they were assessed on their understanding of the cardinal principle. The results were then compared to the records of their conversations about numbers with their parents.

Children whose parents talked about sets of four to 10 objects that the child could see were more likely to understand the cardinal principle, the research showed. Using smaller numbers in conversations and referring to objects the [children](#) couldn't see (such as "I'll be there in two minutes.") was not predictive of children's understanding of the cardinal principle. "The results have important policy implications, showing that specific aspects of parents' engagement in numerically relevant behaviors in the home seem to have an impact on children's early mathematical development," the authors point out.

Parents frequently do not realize the impact they can have on their children's understanding of mathematics and believe that a child's school is primarily responsible for the development of mathematical skills,

research shows. Parents also frequently overestimate their children's understanding of mathematics.

Further studies could lead to suggestions of how [parents](#) and early childhood educators can best boost early mathematics learning, the authors point out.

Provided by University of Chicago

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