

Study documents importance of language to learning math

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Using numbers in ordinary conversation helps young children learn the meaning of numbers. Credit: David Barner/UC San Diego.

Talk to your toddler. And use numbers when you talk. Doing so may give a child a better head start in math than teaching her to memorize 1-2-3 counting routines.

That's the takeaway of an international study published this week in the

online early edition of the *Proceedings of the National Academy of Sciences*.

Led by David Barner, associate professor of psychology and linguistics in the Division of Social Sciences at the University of California, San Diego, the study examined how well children ages 2 to 4 understand [number](#) concepts.

It has been known since the 1970s that learning to count is different than comprehending what numbers really mean, said Barner, director of the Language and Development Lab at UC San Diego. A youngster who can recite numerals in the correct order, to 10 or even 20, will not necessarily be able to correctly answer "How many?" when presented with a small pile of five or even fewer.

It has also been known for a long time that "later mathematical achievements are affected by the very earliest experiences, but it has been difficult to point to what exactly it is about these early experiences that matters," Barner said.

So Barner and colleagues – from University College London, King Saud University, University of Nova Gorica and MIT – looked into the possible role of language. The researchers found a natural experiment among speakers of Slovenian in the capital Ljubljana and speakers of the Saudi dialect of Arabic. In both cases, in addition to singular and plural forms for words, the languages also make a finer grammatical distinction for sets of two. They have a "dual marker," or a piece of grammar that is similar to a plural, but that speakers use when talking about quantities of exactly two.

Children who speak these dual-marking languages seem to grasp the concept of "two" much earlier than their English-speaking counterparts, Barner said, even when the children have received little to no training on

counting. In fact, they are faster to begin learning number words than children learning any other language reported so far, including Russian, Japanese and Mandarin Chinese, despite the fact that some of those studied had much more experience with counting routines.

"Our study provides the strongest evidence to date that the language a child speaks affects the rate at which they learn number words, and also that hearing number words in naturalistic speech – not just in counting routines and procedures – is a critical part of number word learning," Barner said.

Interestingly, the early advantage conferred by language seems to disappear when looking at numbers over two and as the children grow. Where there are drastic differences among 2-year-olds who are "two-knowers," by age 4 the English speakers in San Diego have actually surpassed their counterparts in Riyadh and Ljubljana, and more of them understand "three" and higher.

"Language provides really rich cues to number meaning," Barner said, "but [language](#) only gets you so far." After that, you do need to teach the routines.

"We know that early learning about number is a critical foundation to later mathematics performance in the classroom," Barner said, "so it can only be beneficial to also expose kids to speech that contains informative cues to number concepts."

In the simplest terms: It is important to teach [children](#) to memorize their 1, 2, 3s along with their A, B, Cs. And singing songs like "One, Two, Buckle My Shoe" can't hurt. But it's at least as important to put numbers into natural speech and say to your 12- to 24-month-old "There are two buttons," when pointing to a pair.

More information: Grammatical morphology as a source of early number word meanings,

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