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How Language Shapes Math

Members of a tiny tribe in the Amazon jungle that has no words for numbers beyond two can't conceptualize numbers any better than chimps or human infants do, a new study has found. The research attempts to cast light on a long-standing puzzle among linguists: whether concepts can exist without words to express them.



Tricky lineup. Tribesmen's number sense gets hazy beyond 2 or 3.

CREDIT: P. Gordon *et al.*

The Pirahã, a hunter-gatherer tribe of about 200 people, live in small villages on a tributary of the Amazon. They have one of the world's most phonemically limited languages, with just 10 consonants and vowels. A decade ago, Peter Gordon of Columbia University visited the Pirahã to conduct fieldwork with linguist Daniel Everett, now at the University of Manchester, U.K., and his wife Keren. Gordon gave a series of tests to the men (women and children were too shy to participate) to see how they dealt with concepts that have no representation in their language.

Even in the simplest task--asking them to duplicate a row of up to 10 batteries he placed on a table--he found that the Pirahã performance started to decay after two or three batteries. They also did very poorly in a task requiring them to copy lines on a piece of paper (see picture).

Perhaps the most striking result came from a test in which the men saw a piece of candy being put into a box with a picture of several fish on the lid. They were then shown the box with the candy and another box that had either one more or one fewer fish on its lid and asked to choose a box. Even though a correct guess meant a candy reward, subjects did no better than chance, the team reports in the 20 August online issue of *Science*. Although some linguists have hypothesized that humans have an innate number sense, Gordon contends that his results cast doubt on this theory.

Calling the study "fantastic," psychologist Lisa Feigenson of Johns Hopkins University in Baltimore, Maryland, says that because there is such a "drastic" difference in number sense between the Pirahã and most other human groups, it must be their language that limits their conceptual abilities. Everett, who lived with the tribe for 20 years, believes that the absence of both words and concepts for numbers "are the result of cultural constraints against quantification."

--CONSTANCE HOLDEN

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