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Without language, numbers make no sense

20:00 07 February 2011 by [Bob Holmes](#)For similar stories, visit the [The Human Brain](#) Topic Guide

People need language to fully understand numbers. This discovery – long suspected, and now backed by strong evidence – may shed light on the way children acquire their number sense.

Previous studies of Amazon tribes who lack words for numbers greater than three – or, [in the case of the Pirahã, for any numbers at all](#) – had shown that they struggle to understand precise quantities, when numbers are relatively large.

However, it wasn't clear whether this is because they lacked words for larger numbers, or because they came from a culture that viewed precise numbers as unimportant.

Now [Elizabet Spaepen](#), a psychologist at the University of Chicago, and her colleagues may have settled the question. The team studied profoundly deaf people from Nicaragua who had created their own sign language to communicate.

Wordless numbers

These "homesigners" live in a numerate culture, holding jobs and using money, yet lack any vocabulary for numbers. So the researchers reasoned that any difference in their numeracy must be down to language alone.

Spaepen's team tested their number sense by asking four homesigning adults to summarise picture stories in which numbers played an important part, for example a story featuring 10 sheep in a pen. Spanish-speaking Nicaraguans who weren't deaf and deaf people who used American Sign Language performed these tasks almost flawlessly.

In contrast, homesigners were only accurate at counting the smallest numbers. Beyond three or four they were often imprecise, for example holding out nine fingers to represent 10 sheep.

In a further task, homesigners were given a set of objects and asked to use tokens to create a second set containing the same number of tokens as objects. Again, their accuracy dropped significantly above sets of three objects.

"They're not wildly off," says Spaepen. "They can approximate quantities, but they don't have a way of getting to the exact number."

Count list

Spaepen's experiments did not reveal which component of language is crucial to developing an accurate number sense. However, she suspects that it is the "count list" – the familiar sequence of numbers that every speaking child learns early on.

Children learn this count list well before they actually understand that "four" refers to four objects rather than three or six, says [Michael Frank](#) at Stanford University in California.

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How many can you count? (Image: CJ Burton/Corbis)

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