Did talking about these early tools help our ancestors make them better?

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Human language may have evolved to help our ancestors make tools

By Michael Balter | Jan. 13, 2015 , 11:00 AM

If there's one thing that distinguishes humans from other animals, it's our ability to use language. But when and why did this trait evolve? A new study concludes that the art of conversation may have arisen early in human evolution, because it made it easier for our ancestors to teach each other how to make stone tools —a skill that was crucial for the spectacular success of our lineage.

Researchers have **long debated when humans starting talking to each other**. Estimates range wildly, from as late as 50,000 years ago to as early as the beginning of the human genus more than 2 million years ago. But words leave no traces in the archaeological record. So researchers have used **proxy indicators** for

symbolic abilities, such as early art or sophisticated toolmaking skills. Yet these indirect approaches have failed to resolve arguments about language origins.

Now, a team led by Thomas Morgan, a psychologist at the University of California, Berkeley, has attacked the problem in a very different way. Rather than considering toolmaking as a proxy for language ability, he and his colleagues explored the way that language may help modern humans learn to make such tools. The researchers recruited 184 students from the University of St. Andrews in the United Kingdom, where some members of the team were based, and organized them into five groups. The first person in each group was taught by archaeologists how to make artifacts called Oldowan tools, which include fairly simple stone flakes that were manufactured by early humans beginning about 2.5 million years ago. This technology, named after the famous Olduvai Gorge in Tanzania where archaeologists Louis and Mary Leakey discovered the implements in the 1930s, consists of hitting a stone "core" with a stone "hammer" in such a way that a flake sharp enough to butcher an animal is struck off. Producing a useful flake requires hitting the core at just the right place and angle.

The students in each of the five groups learned to produce Oldowan flakes in different ways. Subjects in the first group were presented with a core, hammer, and some examples of finished flakes and told to just get on with it by themselves. In the next group, a second student learned how to make the tools by simply watching the first subject and trying to duplicate what he or she did with no interaction at all between them; in the third group, subjects actively showed each other what they were doing but without gesturing; in the fourth group, gesturing and pointing were allowed but no talking; and in the fifth group, the "teacher" was permitted to talk to the "learner" and say whatever was necessary.

In each group, the learner became the teacher in the next round. In this fashion, the research team created five different "chains of transmission" of Oldowan toolmakers, which produced a total of more than 6000 flakes. The results of the experiment, reported online today in *Nature Communications*, were striking. As might be expected, subjects sitting alone and attempting to "reverse engineer" Oldowan flakes simply by looking at cores, hammers, and examples of the flakes had only limited success. But performance improved very little among students who just watched others make the tools. **Only the groups in which gestural or verbal teaching was allowed performed significantly above the reverse engineering baseline on several indicators of toolmaking skill**, such as the total number of flakes produced that were long enough and sharp enough to be viable and the proportion of hits that resulted in a viable flake. For example, gestural teaching doubled and verbal teaching quadrupled the likelihood that a single strike would result in a viable flake, the team found.

The researchers conclude that the successful spread of even the earliest known toolmaking technology, more than 2 million years ago, would have required the capacity for teaching, and probably also the beginnings of spoken language—what the researchers call protolanguage. (Many researchers think that gestural communication was the prelude to spoken language, which might explain its effectiveness in

these experiments.) “The ability to rapidly share the skill to make Oldowan tools would have brought fitness benefits” to early humans, Morgan says, such as greater efficiency in butchering animals; and then Darwinian natural selection would have acted to gradually improve primitive language abilities, eventually leading from protolanguage to the full-blown, semantically complex languages we speak today.

“This is an exciting paper,” says Thomas Suddendorf, a psychologist at the University of Queensland, St. Lucia, in Australia, because it “nicely demonstrates the transmission power of teaching and symbols … in a context that was critical in human evolution.” And Dietrich Stout, an archaeologist at Emory University in Atlanta, comments that “a major strength of the paper is that it adopts an experimental approach to questions that have otherwise largely been addressed through intuition or common sense.”

Although Suddendorf finds the team’s interpretations “sensible” and “plausible,” he cautions that the experimental results cannot be considered direct proof for the theory behind them. For one thing, Suddendorf says, the subjects “already have language and have grown up with language,” and so it would be expected that they would learn more effectively when they could talk to each other, which may not have been true for our earliest ancestors.

Ceri Shipton, an archaeologist at the University of Cambridge in the United Kingdom, agrees. “This article perhaps overreaches in its interpretations,” he says, because the subjects have grown up with language but “they have not grown up with stone tools” as early humans did. Another weakness of the study, Stout adds, is that the subjects were given only 5 minutes to learn the toolmaking techniques, and then no more than 25 minutes to produce Oldowan flakes. Had they been given more time, Stout suggests, the additional practice might have erased “any detectable difference in the transmission conditions.”

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