Hand gestures point towards the origins of language

August 20 2019, by Anthony King, Horizon Magazine

Comparing brain scans from different primates could help us understand the origins of language in humans. Credit: Susanne Jutzeler/Pixabay, licensed under Pixabay licence

Communication gestures used by humans and our primate relatives are providing clues about how our species' ability to use spoken language

evolved.

There are few one-offs in life on Earth—rarely can a single species boast a trait or ability that no other possesses. But human language is one such oddity. Our ability to use subtle combinations of sounds produced by our vocal cords to create words and sentences, which when combined with grammatical rules, convey complex ideas.

There were attempts in the 1950s to teach chimpanzees to 'speak' some words, but these completely failed. And with no other living relatives able to communicate as we do, it has made understanding the origins of language a knotty problem.

But Dr. Adrien Meguerditchian, a primatologist at the French National Centre for Scientific Research and Aix-Marseille University, believes that gestures could be a key landmark in the evolution of language—and these are something we do have in common with other primates.

Many primate species use gestures to communicate with others in their groups. Wild chimpanzees, for example, have been seen to use at least 66 different hand signals and movements to communicate with each other. Lifting a foot towards another chimp, for example, means 'climb on me," while stroking their mouth can mean 'give me the object." In the past, researchers have also successfully taught apes more than 100 words in sign language. A chimp named Nim was taught around 125 signs in a project at Columbia University, while the gorilla Koko in a Californian reserve learnt around 100 signs.

"The idea is to look at language, not just as speech, but seeing it as a constellation of many cognitive properties," said Dr. Meguerditchian. Most language properties involve asymmetric organisation of the human brain between the two hemispheres. Given that gestures in primates seems to involve several key properties that underpin spoken language,

Dr. Meguerditchian wants to see if primates undergo similar brain asymmetry when they gesture to each other.

"If you want to understand the origins of language, you need to understand not only animal cognition and communication but also its brain specialisation in comparison with humans and that is what we do in primate species," said Dr. Meguerditchian, who is leading the research under the GESTIMAGE project.

Baby brains

As both primates and humans can communicate through gestures, it provides a way of comparing how gestures are related to brain asymmetry for language and to unravel whether there are differences in how each species communicate.

Dr. Meguerditchian is studying both adult and baby baboons (*Papio anubis*) to see which gestures they learn and the parts of their brains that might be involved.

"When baboons invite someone to play, they will use their hands," he said. "Baboons are also able to point to food they want and use gaze, like children can."

In human babies, which learn to gesture at objects before they can speak, the left side of their brain seems to be engaged when they do so. Certain regions on the left side of our brain, such as Broca's area, are especially important when we speak. Named after French physician Paul Broca, who studied patients who had lost ability to speak, Broca's area is found in the frontal area of the brain of the dominant hemisphere (usually left).

Dr. Meguerditchian is using magnetic resonance imaging (MRI) to study baboon baby brains to see if they use a similar part of their brain when

they learn to gesture.

"The questions is, if language is mostly in the left hemisphere in humans, what about gesture in non-human primates?" he said. "If it is the same system, which was used by a common ancestor between us, gesture in baboons might also be related to this left hemisphere specialisation of the brain (in baboons)."

So far, early results from 27 brain scans of baby baboons suggest that his hypothesis is correct, and apes use similar asymmetric brain areas when they gesture as humans do when they gesture and speak.

By comparing these results in baboons with other primates, including humans, gorillas, chimps and monkeys, Dr. Meguerditchian hopes to unravel whether they too share a similar asymmetric system in the brain for communication. This might help discern where on our evolutionary tree gesture communication, and the brain structures needed for it, first arose and perhaps sowed the seeds for our spoken language.

But he is not alone in thinking that some of the earliest forms of language in our species may well have been gestural rather than vocal.

"But for some reason, speech won out evolutionarily," said Professor Wendy Sandler, a linguist at the University of Haifa, Israel. "We have not discovered any community of hearing people who happen to use sign language as their main mode of communication."

Prof. Sandler is exploring the relationship between physical communication and the composition of human language. She believes sign languages can provide some clues to the structure of human language and how language may have emerged in our ancestors.

Unlike all spoken languages, which are thousands of years old and

descended from other ancient languages, sign language can be born whenever a group of deaf people have an opportunity to meet and communicate.

"The visual aspect of language is much more important than linguists used to believe," added Prof. Sandler, who is leading a project called the Grammar of the Body (GRAMBY). Part of the work has involved studying the complexity of newly emerging sign languages and sign language in a number of different cultures.

Signing

"Different parts of the body convey different linguistic functions," she said. "The hands convey words, but the intonation, so the rise and fall of voice, is conveyed in sign language by facial expressions and different tilts of the head."

She and her colleagues also studied video footage of chimp displays at a Zambian wildlife orphanage to see if they use combinations of facial and gestural signals to convey complex meanings. Humans can knit together smaller elements of meaning according to known rules to form composites, which gives us the ability to communicate an infinite number of messages.

Prof. Sandler gives an example of this in the words 'train station," which we know is a station for trains because of the words and rules we know apply in English. We also easily understand that 'train station ticket office' is a kind of office, and so forth. She has also studied the expression of extreme emotion in athletes who have won and lost a competition.

Taking all her studies together, she has concluded that humans are 'compositional communicators."

"This means we can express complex messages by reorganising the same units according to their meanings and the rules of our language," Prof. Sandler said. This compositional complexity is critical in human communication.

Can chimps stack meaning like this to create a higher meaning? So far the answer is certainly negative in our nearest relatives. However, Prof. Sandler discovered that chimps can separate and recombine some gesture and facial expressions, which 'is a stepping stone to the compositionality of human language."

Scientists still do not know how or when language arose in our ancestors, a crucial mystery in unravelling our uniqueness. But a better understanding of how humans use gestures and our closest primate relatives communicate may reveal more about how and when we learned to speak.

Provided by Horizon: The EU Research & Innovation Magazine

Citation: Hand gestures point towards the origins of language (2019, August 20) retrieved 1 May 2024 from https://phys.org/news/2019-08-gestures-language.html