Chimpanzee studies suggest speech perception not a uniquely human trait

October 31 2011

We all know that experience is a powerful teaching tool: practice remodels neural connections and leads to mastery. Now scientists suggest that it is early experience with language—and not special innate cognitive ability—that allows human beings to process and perceive speech while their closest evolutionary relatives, chimpanzees, do not.

Traditionally, the human brain has been thought to be uniquely adapted to perceive and process speech patterns, a trait widely regarded as an evolutionary phenomenon separating humans from other primates. However, a 25-year-old language-trained chimp named Panzee has recently demonstrated the ability to interpret highly distorted speech sounds in a similar manner to humans. These data provide evidence that the capacity for speech perception may have existed in a common ancestor. Under this theory, it is not that chimpanzees in the wild lack the perceptual apparatus to understand human language. Rather, they don't develop speech because they lack experience using their capacity for it. They need practice.

"I think our results just reinforce the fact that experience matters. Humans maybe do not perceive speech because they are human, but instead because of the tremendous amount of experience they have with it from birth", explains Lisa Heimbauer, a Ph.D. candidate and researcher at Georgia State University's Language Research Center. The team will present its findings Nov. 1 at the American Acoustical Society meeting in San Diego.

Heimbauer and her colleagues, Drs. Michael Owren and Michael Beran, also of Georgia State University, had an ideal subject in Panzee. Raised by humans since she was eight days old, Panzee was exposed to the English language early, as if she were a human baby. She is proficient in understanding more than 130 English words and also recognizes words in sine-wave form, a type of synthetic speech that reduces language to three whistle-like tones.

Understanding language even when highly distorted is a specialized capacity once attributed only to humans. However, like humans, Panzee processes words even when they are lacking many of the traditional cues present in normal speech. Now, similar to the 13 humans in the study, Panzee has also shown better recognition of these synthesized words when the first two sine-wave tones were present than when one of these was absent. This suggests that Panzee is relying upon the same information present in sine-wave speech that is used by humans for language recognition of words in this form.

This research may help scientists better understand the mechanisms used by young children to process and produce speech. “If nonhumans given a richer, early speech experience can show human-like speech perception, it suggests that speech impairments may not be related to problems in specialized circuits,” Heimbauer suggests. It’s an insight that could ultimately lead to a better understanding of why some children have hearing and language deficits.

Provided by American Institute of Physics