

Whose voice is that? Scientists discover 'voice' area in the brain of nonhuman primate

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For vocal animals, recognising species-specific vocalizations is important for survival and social interactions. In humans, a 'voice' region has been identified that is sensitive to human voices and vocalizations. As this region also strongly responds to speech, it is unclear whether it is tightly associated with linguistic processing and thus unique to humans.

Using functional magnetic-resonance imaging (fMRI) of macaque monkeys (Old World primates) researcher at the Max-Planck Institute for Biological Cybernetics discovered a high-level auditory region that prefers species-specific vocalizations over other vocalizations and sounds. This region not only showed sensitivity to the 'voice' of the species, but also to the vocal identity of individuals belonging to the same species.

These results establish functional relationships with the human-voice region and support the notion that for different primate species certain areas of the brain are adapted for recognizing communication signals from member of the same species.

The research group in the laboratory of Nikos Logothetis used a non-invasive imaging technique, which has become a standard tool for understanding human brain function, to image macaque monkeys, one of our distant primate relatives. In their study the authors describe the discovery of a monkey "voice" area, a part of the brain that appears to be important for an individual in recognising verbal communications from other members of their species.

The study shows that the voice area wasn't active to just any sound. Instead, this brain area preferred vocalizations from animals belonging to the

listener's species, preferring to process the vocal sounds that hold special meaning for "conspecific" individuals (i.e. belonging to the same species). Hence, this brain region plays a central role in the communication between members of a species, supporting their social interactions and contributing to the survival of the species.

In addition, the scientists also found that this voice area is sensitive to the identity of the individual that was vocalizing. Consequently, the scientists conclude that this area can support multiple verbal recognition abilities, such as helping the listener to recognize the acoustical signature or the 'voice of the species', as well as the voices of different individuals.

The discovery of a voice area in the monkey brain also opens a window into human verbal communication and brain function. Many people doubt that there is much to be learned from other animals about human verbal communication and language. Contrasting this, these findings provide direct parallels between how the brains of humans and non-human animals process communication signals. This study strongly argues that voice areas were evolutionarily conserved in primates, challenging the notion that higher-level verbal communication can only be achieved by the human brain.

"This discovery in monkeys and the link to the human work is exciting because the animals are now helping us to understand how this brain area recognizes voices in a way that we cannot in humans," says Dr. Petkov, who led the research study. The researchers believe that their discovery will provide pathways for understanding clinical conditions such as phonagnosia, where patients show deficits in voice recognition and verbal communication prohibiting them from recognizing

the voice of someone that they know.

Citation: Christopher I Petkov, Christoph Kayser, Thomas Steudel, Kevin Whittingstall, Mark Augath & Nikos K Logothetis, A voice region in the monkey brain, *Nature Neuroscience*, Published online: 10 February 2008 | doi:10.1038/nn2043

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