Primate study offers clues to evolution of speech

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New research examining the brains and vocal repertoires of primates offers important insight into the evolution of human speech.

The vocal tract and larynx is similar in form and function amongst virtually all terrestrial mammals, including humans. However, relative to humans, non-human primates produce an extremely limited range of vocalisations.

Published in the journal *Frontiers in Neuroscience*, the new research investigates whether the reason primates are incapable of producing speech is because they lack the brain mechanisms needed to control and coordinate vocal production.

The study focused on two particular features of the brain: the cortical association areas that govern voluntary control over behaviour; and the brainstem nuclei that are involved in the neural control of muscles responsible for vocal production.

The academics, from Anglia Ruskin University and Stony Brook University, found a positive correlation between the relative size of cortical association areas and the size of the vocal repertoire of primates, which can range from just two call types in pottos to at least 38 different calls made by bonobos.

Lead author Dr. Jacob Dunn, Senior Lecturer in Zoology at Anglia Ruskin University, said: "This study shows, for the first time, a significant positive correlation between the vocal repertoire and the relative size of the parts of the brain responsible for voluntary control over behaviour.

"Cortical association areas are found within the neocortex and are key to the higher cognitive processing capacities considered to be the foundation for the complex forms of behaviour observed in primates. Interestingly, the overall size of the primate's brain was not linked to the vocal repertoire of that species, only the relative size of these specific areas.

"We also found a positive relationship between the relative volumes of the cortical association areas and the hypoglossal nucleus in apes, both of which are significantly bigger in these species. The hypoglossal nucleus is associated with the cranial nerve that controls the muscles of the tongue, thus suggesting increased voluntary control over the tongue in our closest relatives.

"By understanding the nature of the relationship between vocal complexity and brain architecture across non-human primates, we hope we are beginning to identify some of the key elements underlying the evolution of human speech."

More information: Jacob C. Dunn et al, Neural Correlates of Vocal Repertoire in Primates, *Frontiers in Neuroscience* (2018). DOI: 10.3389/fnins.2018.00534

Provided by Anglia Ruskin University