

Chimp, bonobo study sheds light on the social brain

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It's been a puzzle why our two closest living primate relatives, chimpanzees and bonobos, have widely different social traits, despite belonging to the same genus. Now, a comparative analysis of their brains shows neuroanatomical differences that may be responsible for these behaviors, from the aggression more typical of chimpanzees to the social tolerance of bonobos.

"What's remarkable is that the data appears to match what we know about the human brain and behavior," says Emory anthropologist James Rilling, who led the analysis. "The [neural circuitry](#) that mediates anxiety, empathy and the inhibition of aggression in humans is better developed in [bonobos](#) than in [chimpanzees](#)."

The journal of *Social Cognitive and Affective Neuroscience* published the results April 5, the most comprehensive comparative analysis to date of the neural systems of chimpanzees and bonobos.

"By contributing to our basic understanding of how brain anatomy relates to social behavior, this study may provide clues to the brain dysfunction underlying human social behavioral disorders like [psychopathy](#) and autism," Rilling says.

Chimpanzees and bonobos diverged from a [common ancestor](#) with humans about six million years ago, and from each other just one-to-two million years ago. Despite this relatively brief separation in evolutionary terms, the two species exhibit significant differences in [social behavior](#).

Compared with chimpanzees, bonobos are more anxious, less aggressive, more socially tolerant, more playful, more sexual and perhaps more empathic.

"Chimpanzees tend to resolve conflict by using aggression, while bonobos are more likely to use behavioral mechanisms like sex and play to diffuse tension," Rilling says. "The social behaviors of the two species mirror individual differences within the human population."

Rilling heads Emory's Laboratory for Darwinian Neuroscience, a leader in the use of non-invasive neuro-imaging technology to compare the neurobiology of humans and other primates. The lab draws on resources of Emory's Yerkes National Primate Research Center.

"In addition to exploring links between neuroanatomy and different social behaviors, we're mapping the underlying biology for how species evolve and differentiate," Rilling says.

A range of imaging and analytical techniques were used in the chimpanzee-bonobo study. Voxel-based morphometry compared the gray matter in standard structural scans of the brains. Diffusion tensor imaging (DTI) captured the white matter connections, to compare the fiber tracts that "wire" the brain.

The results showed that bonobos have more developed circuitry for key nodes within the limbic system, the so-called emotional part of the brain, including the amygdala, the hypothalamus and the anterior insula. The anterior insula and the amygdala are both implicated in human empathy.

"We also found that the pathway connecting the amygdala and the prefrontal cortex is larger in bonobos than chimpanzees," Rilling says. "When our amygdala senses that our actions are causing someone else distress, we may use that pathway to adjust our behavior in a prosocial

direction."

Chimpanzees have better developed visual system pathways, according to the analysis. Previous research has suggested that those pathways are important for tool use, a skill which chimpanzees appear better at than bonobos.

Provided by Emory University

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