

Genetics and brain regions linked to sex differences in anxiety-related behavior in chimpanzees

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Genetics and specific brain regions are linked to sex differences in chimpanzees' scratching behavior, a common indicator of anxiety in

humans and other primates, according to a research study led by Georgia State University that shows chimpanzees can be models of human mental illness.

The researchers investigated genetic and neuroanatomical links to individual variation in scratching, a behavioral indicator of negative emotional states, such as stress, anxiety and frustration. They studied genes associated with vasopressin, a neuropeptide that has been strongly implicated in the development and evolution of complex social behavior in mammals. In particular, they examined different forms of the promoter region of the vasopressin V1a receptor gene (AVPR1A), known as DupA and DupB. The findings are published in a special issue of the journal *Psychophysiology* devoted to reshaping clinical science.

The project demonstrates how studies with chimpanzees can contribute to the National Institute of Mental Health's recently introduced Research Domain Criteria (RDoC), which aims to explain the neurobiological basis of mental illness. This study targets the RDoC Negative Valence Systems domain, one of five broad categories intended to provide a framework for psychopathology research.

"In combination with findings from human studies, work with chimpanzees can provide enormous insights into core biobehavioral processes relevant to psychological illness and health," said Robert Latzman, lead author of the study and assistant professor in the Department of Psychology at Georgia State.

In humans and other primates, self-directed displacement behaviors often take the form of self-grooming actions, such as head scratching or beard stroking, which indicate anxiety related to uncertainty, social tension or impending danger.

Researchers assessed scratching behaviors in 76 chimpanzees housed in

social groups at Yerkes National Primate Research Center. The sample included 45 chimpanzees with the DupB^{-/-} genotype and 31 chimpanzees with the DupB^{+/-} genotype. To elicit scratching in experimental conditions, the chimpanzees were shown a 30-minute video that included scenes and vocalizations of unfamiliar chimpanzees negotiating possession and sharing of watermelon. Scratching behavior was recorded in the subjects before and after watching the video, with a minimum of 12 hours in between. DNA samples were also taken, and each chimpanzee was genotyped for the AVPRIA Dup A/B region. In addition, [chimpanzees](#) completed magnetic resonance imaging (MRI) scans.

Analysis revealed that for males, DupB^{+/-} individuals showed significantly higher rates of scratching than DupB^{-/-} apes. In contrast for females, DupB^{+/-} individuals scratched significantly less than DupB^{-/-}. The study also found significant differences between DupB^{-/-} and DupB^{+/-} apes in 12 distinct brain regions, with the largest clusters within the frontal lobe.

"Some have speculated that vasopressin may exert stronger effects on male social behavior, and our findings seem to support this claim," Latzman said.

Significant [sex differences](#) were also found for rates of scratching and mean gray matter intensity values in certain areas of the brain. For males, increased scratching rates were associated with lower gray matter values. In contrast, increased scratching rates were associated with higher [gray matter](#) values in females.

More information: Robert D. Latzman et al. Displacement behaviors in chimpanzees (): A neurogenomics investigation of the RDoC Negative Valence Systems domain , *Psychophysiology* (2016). [DOI: 10.1111/psyp.12449](#)

Provided by Georgia State University

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