

## Understanding dogs' neural responses in a food-giving paradigm

Commentary on [Cook et al.](#) on *Dog Jealousy*

**Zachary A. Silver & Laurie R. Santos**

Department of Psychology  
Yale University

**Abstract:** In their target article, Cook et al. provide exciting new insights into dogs' neural responses when they watch their caregivers giving food to a fake dog or placing it into a bucket. The use of fMRI in awake and unrestrained dogs is tremendously valuable for understanding canine emotionality. We worry, however, that it is too soon to conclude that the reported pattern of amygdala activation corresponds to a specific emotion. Further testing will be essential to determine whether this amygdala activation is indeed an expression of jealousy.

[Zachary A. Silver](#) is a first-year graduate student at Yale University where he investigates components of social decision making and social learning in nonhuman animals. Prior to beginning his work at Yale, Zachary graduated from Illinois Wesleyan University with a B.A in Psychology and Music.



[Laurie R. Santos](#) is director of the Comparative Cognition Laboratory and the Canine Cognition Center at Yale. She received her A.B. in Psychology and Biology from Harvard University in 1997 and her Ph.D. in Psychology from Harvard in 2003. She is an Associate Professor in the Department of Psychology. [Website](#)



Using a novel noninvasive brain imaging paradigm, Cook et al. (2018) demonstrate that domestic dogs with more aggressive temperaments show increased amygdala activation when watching their caregiver give food to a fake nonspecific compared to when the caregiver places food into a bucket. One exciting feature of this new paper is its use of fMRI in awake unrestrained dogs. This technique has the potential to provide exciting new insight into areas of canine cognition that are otherwise difficult or impossible to examine empirically. The use of this type of technique will undoubtedly have a tremendous impact on our ability to understand emotion in nonhuman animals. In the present commentary, however, we focus on what the target article tells us about human-like jealousy in dogs today, as we feel the current results introduce almost as many new questions as they provide answers.

Our first question is whether the results provide evidence of human-like jealousy per se in dogs. As the authors note, jealousy in our own species involves a highly complex set of emotions. Before concluding that the observed pattern of amygdala activation in aggressive dogs is indicative of jealousy, we must rule out alternative explanations. For example, could the observed

increase in amygdala activity indicate not jealousy but some other phenomenon? It is to be expected that aggressive dogs demonstrate increased amygdala activation when attending to a variety of stimuli that are more socially complex than the bucket control. Under this view, more aggressive dogs show additional amygdala activation not because of the social implications of their caregiver giving food to another dog but simply because this condition involves more complex social stimuli.

Similarly, this pattern of amygdala activation could correspond to fear of the fake dog rather than jealousy. Aggressive dogs may view conspecifics as competitors for resources; under this view, the observed pattern of amygdala activation would indicate not jealousy but a competitive instinct to seek out resources. We were surprised that the authors expected to observe jealousy only in dogs with aggressive temperaments. Humans of all temperaments experience jealousy. It is thus possible that this emotion occurs in dogs with various temperaments.

Overall, we worry that it's too soon to conclude that the reported pattern of amygdala activation corresponds to a specific emotion. Further testing will be essential to determine whether this is indeed an expression of jealousy. To isolate the source of this amygdala activation, future research could investigate whether the pattern of amygdala activation would generalize to other social contexts, and whether the identity of the human performing the action (e.g., a close social partner like a guardian vs. a stranger) affects amygdala activation. Future research should also try to determine whether social resources are important in this effect — as one would expect for the emotion of jealousy — or whether aggressive dogs simply show brain activation indicative of aggression when watching a conspecific in the absence of social resources.

One of the virtues of the fMRI method is the objective nature of the data, free of any subjective human coding errors or biases. To preserve this objectivity, it is important to temper conclusions so as to avoid inadvertent anthropomorphic biases. A holistic investigation of the social and emotional factors involved in jealousy using both neuroimaging and behavioral measures would probably enable us to draw more effective conclusions about the components of jealousy in domestic dogs.

## References

Cook, P., Prichard, A., Spivak, M., and Berns, G. S. (2018) [Jealousy in dogs? Evidence from brain imaging](#). *Animal Sentience* 22(1)

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LE PROBLÈME DES  
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THE OTHER  
MINDS PROBLEM

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***The Other Minds  
Problem: Animal  
Sentience and Cognition***

**Overview.** Since Descartes, philosophers know there is no way to know for sure what — or whether — others feel (not even if they tell you). Science, however, is not about certainty but about probability and evidence. The 7.5 billion individual members of the human species can tell us what they are feeling. But there are 9 million other species on the planet (20 quintillion individuals), from elephants to jellyfish, with which humans share biological and cognitive ancestry, but not one other species can speak: Which of them can feel — and what do they feel? Their human spokespersons — the comparative psychologists, ethologists, evolutionists, and cognitive neurobiologists who are the world's leading experts in "mind-reading" other species — will provide a sweeping panorama of what it feels like to be an elephant, ape, whale, cow, pig, dog, chicken, bat, fish, lizard, lobster, snail: This growing body of facts about nonhuman sentience has profound implications not only for our understanding of human cognition, but for our treatment of other sentient species

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