Psychological Science Explores the Minds of Dogs

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Dogs are one of the most common household pets in the world, so it's curious that we know relatively little about their cognitive abilities when we know so much about the abilities of other animals, from primates to cetaceans. Over the last couple decades, researchers have been aiming to bridge this gap in scientific knowledge, investigating how our canine companions behave and what they know and why.

A special issue of *Current Directions in Psychological Science* is dedicated to exploring all that psychological scientists have learned about dog behavior and cognition in recent years.

"Although Pavlov's classic work on conditioning was conducted with dogs, since then most research with animals has been done primarily with rats, pigeons, and primates (including humans)," notes special issue editor and APS Fellow Thomas R. Zentall of the University of Kentucky in an introduction to the special issue. "The reason for this shift in experimental subjects can be attributed to a number of factors, including the issue of keeping them housed in cages, and although dogs are generally quite available as companion animals, researchers have been reluctant to have to deal with the large range in breed characteristics, experience, and age."

"In the past 20 years, however, researchers have recognized that those sources of variability may not be

as great as once imagined, and a wealth of research on the cognitive abilities of dogs has appeared in the literature," Zentall explains.

The special issue offers an overview of the literature, highlighting the kinds of questions scientists have been trying to answer in an effort to understand the mental and social capacities of dogs, he adds.

The collection of articles underscores the unique relationship that dogs have with humans. Accumulated research shows, for example, that dogs are highly attentive to humans' communicative cues — including pointing and eye gaze — and they are able to comprehend and respond to human spoken words. Studies also indicate that dogs can recognize individual humans based on their face and can discriminate between different expressions of emotion, at least to some degree.

But existing research also provides little evidence that dogs have a meaningful understanding of humans' motivations and mental states, or the ability to reflect on their own mental states. Although studies suggest that dogs can solve complex visual tasks and store multisensory representations, dogs appear to have limited spatial memory and numerical discrimination. And data indicate that dogs' sense of object permanence is roughly equivalent to that of a 1- to 2-year-old child.

"There can be little argument that dogs are remarkable beings: Their ability to inveigle a larger, stronger, and surely more intelligent species to support their welfare is itself striking enough," writes APS Fellow Clive D. L. Wynne of Arizona State University in his article about dog cognition. But just because dogs are incredibly skilled when it comes to social interactions with humans doesn't necessarily mean that they have more advanced cognitive abilities than other animals do, he adds.

As many contributors to the special issue note, research on dogs' particular capacities and abilities is still in its infancy. Existing studies tend to be small and underpowered, making it difficult to examine individual variability and complex behaviors. Furthermore, integration across multiple levels of analysis — including behavior, neurobiology, and genetics — tends to be rare. But momentum in the field seems to be building.

"Although dogs had not been considered worthy of research for their own sake for many years, the situation has changed dramatically in the past decade," write Gregory S. Berns and Peter F. Cook, both of Emory University. "There is now a veritable renaissance in canine behavioral research."

The fact that dogs are so socially adept means that they can be trained to participate in studies that employ a variety of investigative approaches, including relatively new technologies like noninvasive neuroimaging techniques. This opens up avenues for exploration that are not available to researchers who study most other animals.

As research methods improve and collaborative partnerships develop, the field stands to gain deeper insight into the mechanisms and processes that underlie dogs' behavior. These insights may, in turn, elucidate important aspects of human behavior.

"Bringing these scientific practices to bear on canine cognition will have huge advantages," researchers Rosalind Arden (London School of Economics and Politics, United Kingdom), Miles K. Bensky (University of Illinois at Urbana–Champaign), and Mark J. Adams (University of Edinburgh, Scotland)

write in their review of 105 years' worth of canine research. "We have an immense amount to learn from these captivating animals. Let's go to the dogs."