

## Behavioral studies show baboons and pigeons are capable of higher-level cognition

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Pigeon

It's safe to say that humans are smarter than animals, but a University of Iowa researcher is investigating the extent of that disparity in intelligence.

And, it may not be as great a gap as you suspect, according to UI psychologist Ed Wasserman, who presents his findings at the American Association for the Advancement of Science (AAAS) meeting today in Chicago.

One cognitive capacity that is vital to human intelligence is the ability to determine whether two or more items are the same or different - a skill the famous American psychologist William James called the very



"backbone" of our thinking. If you have two pennies in your left hand and a nickel and a dime in your right hand, then you can correctly report that the two coins in your left hand are the "same" and that the two coins in your right hand are "different." You can also make similar judgments with any collection of items.

Wasserman's research shows that baboons and pigeons can do that, too. A recent study by Wasserman and UI graduate student Dan Brooks found that both pigeons and people can learn same-different discriminations with visual stimuli that never repeat from trial to trial, thus proving that simple memorization cannot explain this cognitive feat.

In other studies, Wasserman and his colleagues at other research centers took the matter a step further, posing the question: Can animals learn the relations between relations? The answer appears to be "yes."

Wasserman and his associates discovered that both baboons and pigeons also understand the relations between relations - something that only humans were believed to appreciate. For example, the relation between A and A and the relation between B and B is the same: same equals same. So, too, is the relation between A and B and the relation between C and D: different equals different. But, the relation between A and A and the relation between C and D is different: same does not equal different.

Using joysticks and computerized visual images, Wasserman and colleagues Joel Fagot of the French CNRS (National Center for Scientific Research) and Mike Young of Southern Illinois University at Carbondale found that baboons also exhibit this level of cognition by solving the so-called relational matching-to-sample problem. Here, the baboons indicated which of two testing arrays of pictures involved the same relationship as the sample array that they had recently been shown. In a follow-up study, Wasserman and colleague Bob Cook of Tufts



University repeated the experiment with pigeons; the pigeons learned to peck a computerized touchscreen to accomplish the same feat as the baboons.

"The newsworthiness of our baboon experiment was to show that nonhuman primates are capable of higher-order relational learning. Understanding the relation between relations was previously believed to be a kind of cognition that sets humans apart from all other animals," Wasserman said. "The follow-up discovery - that pigeons too are capable of such higher-order relational learning - affirmed our suspicion that we've really established a finding of broad evolutionary significance."

Despite obvious anatomical differences, this behavioral evidence confirms Charles Darwin's proposal that "the difference in mind between man and the higher animals, great as it is, certainly is one of degree and not of kind."

The notion that there might only be a quantitative - not a qualitative - disparity between human and animal intelligence may make people uneasy, Wasserman said.

"What we're really trying to understand is the extent to which cognition is general throughout the animal kingdom. The evidence that we collect constantly surprises us, suggesting that we're not alone in many of these cognitive abilities," Wasserman said. "Why we would believe that humans alone have such capabilities is a peculiar and unfortunate arrogance. That's one reason why I enjoy studying animals; the smarter we discover them to be, the more humble we should be."

In addition to keeping human egos in check by proving we're not the only smart creatures on earth, this research may have practical applications, Wasserman said.



Some of the methods he uses to study baboons and pigeons can be deployed to study human cognition. Currently, Wasserman and colleague Leyre Castro in the UI Department of Psychology are collaborating with Amanda Owen of the UI Communication Sciences and Disorders Department to apply these animal-testing methods to studying the cognitive performance of children with language impairments.

"Because we must invent entirely nonverbal methods to study cognition in animals, these same methods may have particular promise for studying children with communicative disorders, like Specific Language Impairment and Autism," Wasserman said. "These methods may prove to have unique diagnostic and therapeutic significance."

Source: University of Iowa

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