

How do ravens' thinking skills compare with apes'?

Authors:

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Abstract

Ravens behave in ways that suggest they are really smart. Most scientists studying animal intelligence focus on monkeys and apes like macaques and chimpanzees. One group of scientists made a set of puzzles that tested primates' physical and social thinking skills. We wanted to

Introduction

Have you ever wondered what animals think about? We were curious about bird brains and whether they are underrated. Ravens, crows, jays, and magpies are all members of a family of songbirds called corvids. Corvids lead interesting lives! Ravens form long-lasting friendships. Crows use tools. Jays make plans for the future. Magpies collect trinkets and give gifts. These behaviors show us that corvids are pretty smart!

Most scientists studying animal intelligence focus on non-human *primates.* One famous experiment compared the cognitive performance of chimpanzees, orangutans, and 2.5-year-old children. The researchers invented a set of 38 puzzles to test physical and social *cognitive skills.* They found that toddlers and chimpanzees have similar physical cognitive skills. But the children did better than both types of *great ape* on the social skills test! Another experiment showed that children develop cognitive skills at different ages than great apes. Comparisons like this help scientists understand how intelligence evolved and how it develops.

We wanted to know how ravens' physical and social cognitive skills compared to great apes. Other scientists noticed that ravens have complex social behavior. For instance, they form alliances and understand what another raven has seen. This suggests that ravens have great social cognitive skills. We suspected that ravens also have good physical cognitive skills. know more about ravens' intelligence, and we wanted to be able to compare ravens and great apes. So, we changed the set of puzzles to make sure they could be solved by a bird using a beak instead of fingers. We found that ravens did just as well as the apes on almost all of the puzzles!

Surprisingly, no one had made a raven-friendly version of the set of puzzles that were used with the great apes.

We wanted to answer three questions:

- How do ravens' physical cognitive skills compare to their social cognitive skills?
- How do ravens' cognitive skills develop as they grow from hatchlings to subadults?
- How does ravens' intelligence compare to great apes'?



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HOW DO RAVENS' THINKING SKILLS COMPARE WITH APES?



Methods

We chose four pairs of three-week-old raven siblings for the experiment. When the birds were old enough to fly, we took them to our outdoor *aviary*. Inside the aviary, we set up a small private area where we carried out the experiments. The birds could always choose to come to the experiment sessions and solve puzzles with us (and only one bird stopped participating in the study before the study was complete).

When one of the ravens came into the experiment compartment, one of us (a scientist and friend of the ravens) showed them a puzzle. If the raven solved the puzzle, they received a treat as a reward: for instance, dog treats or pork skins. These special treats (which they really like!) were only available at the experiment station.

Each puzzle tested a single aspect of either physical or social cognitive skills. We kept track of how likely the raven was to get the answer right with a random guess.

One physical cognitive skill that we tested is called causality (or understanding of cause and effect). (See Figure 1). We showed the ravens two cups. One of them held a treat, but the raven didn't know which one. We gave the bird different clues to solve this puzzle: for instance, sometimes we picked up the cup with a treat and shook it, so the raven could hear the rattle. Other times we picked up the cup without a treat and shook it. If the raven just guessed randomly, she had a 50-50 chance of guessing the right cup. But if she understood causality (that only a cup with a reward inside would make a rattle), she would choose the right cup on the first try.

We tested 9 kinds of physical cognitive skills and 6 kinds of social cognitive skills using similar tests. (See more examples in Table 1.)



Table 1: Some of the tests we used in our experiment.

TYPE OF TEST	WHAT WE TESTED FOR	HOW WE TESTED FOR IT
CAUSALITY	Understanding cause and effect	Shaking a cup: if it rattles, there is something in it
QUANTITIES	Being able to tell the difference between big and small numbers, understanding addition	Choosing the biggest pile of treats
SPACE	Keeping track of where things are	Knowing that a treat still exists when it is covered up by a cup and is moved somewhere else
COMMUNICATION	Learning from a person's signaling	Finding a treat when the scientist points at where it is hidden
THEORY OF MIND	Figuring out what another person or animal is feeling, hoping, or seeing	Seeing the scientist repeatedly stretch out their arm, and guessing that the scientist is trying to reach something





Results

We found that ravens did equally well on the tests of physical and social cognitive skills. The ravens were best at *quantitative* skills, such as determining which cup held the most treats. The ravens' scores were lowest on tests of spatial reasoning.

The ravens' scores did not noticeably change as they grew from 4 months old to 16 months old.

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Most of the ravens' scores were very similar to chimpanzees and orangutans. Spatial reasoning was the only category in which the ravens scored lower than apes.

Discussion

We expected our ravens to perform very well in the social cognitive tasks. But we were surprised to see that for the most part, the physical and social scores were about the same. This suggests to us that ravens have *generalized* intelligence rather than *specialized* intelligence.

Since the ravens' scores didn't change between the first test at 4 months old and the last test at 16 months old, it seems that their most important cognitive skills develop before the age of 4 months.

We were also surprised to find that ravens did poorly in the spatial reasoning section. Ravens are capable of acrobatic flying. They hide their food in *caches* and find their caches again. Those tasks take high spatial thinking skills. But it's important to remember that the same test can measure different things when you give it to a different species. Ravens' low scores on the spatial section of our test may say more about us humans designing the tests than about the ravens' abilities. Ravens' lives are competitive. Other ravens and other animals often try to steal from their caches.

Maybe the ravens thought we were trying to take the treat for ourselves!

Our experiment shows that the cognitive performance of ravens is very similar to great apes'. Since they have very different brains, this doesn't necessarily mean that their cognitive processes are similar, though: for instance, using different body parts (beaks or hands) uses different parts of the brain. Instead, it shows that ravens have a similar ability and motivation to solve the kind of puzzles that we showed them.

We think that future studies should come up with sets of puzzles for testing animal cognition that relate much more to the natural challenges of that species. We also think that it is important how the individuals grow up and if they trust and like to work with the human experimenters.

Conclusion

Do you ever play brain games? Can you think of any puzzles you could use to test your friend's or an animal's physical or social cognitive skills? Maybe you could even try one out on your younger sibling or a friend's pet – just remember to let them choose to participate in your experiment

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Glossary of Key Terms

Aviary – a large enclosed area or building for keeping birds in.

Cache – a hidden stash of food.

Cognitive skills or cognition – the ability to use senses, experiences, and thought to understand something, to learn something, or to plan something.

Corvid – the family of bird species including crows, ravens, jays, and magpies.

Generalized – applying to many things.

Great apes – the family of primate species including orangutans, chimpanzees, gorillas, and bonobos.

Primate – the family of mammals including monkeys, lemurs, apes, and humans.

Quantitative – related to measuring numbers.

Spatial – dealing with arrangements of objects in the world.

Specialized – applying to few things.

Subadult – stage in a bird's life just before adulthood; they don't yet have adult plumage (feathers).

	Check your understanding
1	What raven behaviors do we interpret as signs of intelligence?
	Why is it difficult to compare the intelligence of different animal species directly?
3	We learned that ravens developed their most important cognitive skills before the age of 4 months. Can you think of what human babies are able to do at that age?
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4	How would you test a bird's intelligence? Can you think of a puzzle that scientists could use in a study like this?
5	What other animals do you think might have high intelligence? What do those animals do that makes you think that they are smart?

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