

Monkeys display basic numeracy

By Victoria Gill
Science and nature reporter, BBC News

Old World monkeys have better numerical skills than previously thought, researchers have discovered.

In a basic numeracy test, long-tailed macaques were able to work out which of two plates contained more raisins.

Strangely, they only excelled in this test if they were not allowed to eat the raisins they were shown.

The scientists report in the journal *Nature Communications* that the animals have the ability to understand the concept of relative quantities.

The team of researchers from the German Primate Center in Goettingen initially tested the macaques by showing them two plates containing different numbers of raisins. When the animals spontaneously pointed to one of the plates, they were fed the raisins.

But in this test, the monkeys often got it wrong - choosing the smaller amount.

Lead researcher Vanessa Schmitt said that this was because, rather than thinking about quantities, the animals were thinking about how much they wanted to eat the raisins.

"This impulsiveness impaired their judgement," Ms Schmitt told BBC News.

"But when we repeated the test, this time showing them two plates of inedible objects - pebbles - they did much better."

To find out if the monkeys really could judge quantities, the researchers tried another experiment.

"We wanted to know if they could simultaneously maintain two mental representations of the food items, first as choice, and second as food reward," said Ms Schmitt.

In this third slightly more confusing experiment, the monkeys were shown plates of raisins, but their reward for pointing to a plate was to be fed other raisins that were hidden underneath.

"They perform as well in this task as they do when choosing the pebbles," said Ms Schmitt.

"This seems to show that they see the raisins as signifiers - representations of the food rewards they're going to receive."

Youthful impulse

Ms Schmitt's co-researcher, Professor Julia Fischer, explained that very young children had the same difficulty in suppressing their impulses.

"There's a well-known experiment called the reverse reward paradigm," said Professor Fischer.

"You have two heaps of candies - one big, and one small. The child obviously points at the big heap - which is then given to another child, while the [first] child itself gets the small heap.

"Young children have trouble comprehending that they should point at the small heap to get the big one, but if you replace the candies with numerals or other symbols, they can do it."

Ms Schmitt says that previous studies of other primates, that have used food items to test their numeracy, may have been troubled by this effect, and therefore underestimated the animals' abilities.

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