The symbolic monkey? Token-mediated economic choices in tufted capuchins

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From paintings and photographs to coins and credit cards, we are constantly surrounded by symbolic artefacts. The mental representation of symbols – objects that arbitrarily represent other objects – ultimately affords the development of language, and certainly played a decisive role in the evolution of our hominid ancestors. Can other animal species also comprehend and use symbols?

Some evidence suggests that apes, our closest relatives, can indeed use symbols in various contexts. However, little is known about the symbolic competence of phylogenetically more distant species.

A study published in this week's PLoS ONE presents evidence of symbolic reasoning in tufted capuchin monkeys, a South-American species that diverged from humans about 35 million years ago. In the experiment, five capuchins engaged in "economic choice" behavior. Each monkey chose between three different foods (conventionally referred to A, B and C), offered in variable amounts. Choices were made in two different contexts. In the "real" context, monkeys chose between the actual foods.

In the "symbolic" context, monkeys chose between "tokens" (intrinsically valueless objects such as poker chips) that represented the actual foods. After choosing one of the two token options, monkeys could exchange their token with the corresponding food. The researchers examined whether capuchins' preferences in both real and symbolic contexts satisfy transitivity -- a fundamental trait of rational decision-

making, according to which if A is preferred to B, and B is preferred to C, then A must be preferred to C.

Capuchins' choices did satisfy transitivity, both in the real context and in the symbolic context. Capuchins systematically preferred item A to B, item B to C, and item A to C both with tokens and with the actual foods. Hence, their preferences were qualitatively similar in both contexts.

Quantitatively, however, expressing choices in the symbolic context increased the value distance between the corresponding foods. For example, when choosing between actual foods, capuchins were indifferent between one Cheerio and two pieces of parmesan cheese, indicating that the value of one Cheerio is equal to two times the value of one piece of parmesan cheese. When choosing between tokens that represented the same foods, the relative value increased – for example, capuchins were indifferent between one Cheerio-token and four parmesan-tokens.

These results indicate that capuchin monkeys can indeed reason about symbols. However, as they do so, capuchins also experience the cognitive burden of symbolic representation, and in this respect they appear to behave similarly to young children. In sum, though capuchins may not achieve adult-human-like symbolic competence, this study demonstrates that animal species relatively distant from humans have undertaken the path of symbolic use and understanding.

Source: Public Library of Science