How chimps, monkeys and humans compare on a level playing field

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(PhysOrg.com) -- A problem faced by scientists comparing the mental abilities of humans, chimpanzees, apes, and monkeys is that the humans are tested by their own species and understand the requirements of the tests, while the other primates are tested by a different species (humans) and have to work out what they are supposed to do. This uneven playing field can distort the results, and so researchers in the US have designed experiments that remove the advantages humans usually have.

Psychologist Sarah Brosnan of the Language Research Center at Georgia State University tested humans, chimps, and capuchin monkeys with a decision-making "assurance" game that ensured no participants had an advantage over the others. The game was a variation of an often-used game called "Stag Hunt," which has two participants who can choose to hunt either a hare or a stag. A hare can be killed by a single hunter for a small reward, but killing the more highly-rewarded stag needs both participants to choose the stag. The aim of the game is for the participants to work out how to get the greatest reward.

Most studies of this type are designed for humans and then adapted for the other primates, but Dr Brosnan reversed the process, designing the game for the monkeys and chimps and giving the humans no instructions other than telling them they would make decisions based on tokens, and would be paid in quarters or dollars each round. They also had to work out the game non-verbally, and the tokens did not have pictures of hares or stags, but were either blue or red.

The research team tested 24 chimpanzees, 52 humans (all students), and eight capuchin monkeys. All the subjects had previously participated in similar games with winnings paid in food or money. All subjects were tested in pairs of the same species and were seated next to each other. In most studies of this type the human pairs are selected via computers and do not sit next to each other.

The game began with each member of the pair handing over one of the two tokens to the researcher. Dr Brosnan then held up the tokens so each could see what their partner had chosen. She then gave participants a reward for a match, in the form of money for the humans, or fruit for the monkeys and chimps, with the greatest amount of money or fruit for a Stag-Stag match.

The capuchins generally had no strategy, with only one of the six pairs making Stag-Stag choices more often than expected by chance. The chimpanzees matched their partner more often, but chose Hare-Hare as often as Stag-Stag. The students matched Hare-Hare and Stag-Stag slightly more often than either of the other groups. A third of the human pairs selected Hare-Hare and then subsequently stuck with the low reward each round, suggesting they were resistant to risk, or thought they had beaten the game.

The results mirror the social complexity of the species, with human social life the most complicated, followed by chimps, which hunt in groups and have a complex social life. The capuchins are the least social of the species, and are the most evolutionary distant from humans. Dr Brosnan said the results provide preliminary evidence that human behavior in cooperative games could be part of an evolutionary continuum, and primates share the same foundations.

The results were different for the three species but not as different as the researchers had expected. For example, only five of the 26 student pairs

chose Stag-Stag, which was only a slightly higher rate than the chimps. When humans have the rules of the game explained to them and they are allowed to speak, they would normally demonstrate 100% cooperation. Their poor results of only 20% show humans are extremely reliant on language.

The paper was published this week in the *Proceedings of the National Academy of Sciences* (*PNAS*).

More information: Responses to the Assurance game in monkeys, apes, and humans using equivalent procedures, Sarah F. Brosnan et al., *PNAS*, Published online before print February 7, 2011, doi:10.1073/pnas.1016269108