Chimps have a head for numbers

Chimpanzees may have better numerical memory than humans, according to a recent report by Sana Inoue and Tetsuro Matsuzawa of the Primate Research Institute at Kyoto University, Japan (*Curr. Biol.* **17**, R1004–R1005; 2007). Their results challenge the widely held belief that humans have superior cognitive function across the board compared with nonhuman primates.

Their study included three mother-offspring chimpanzee pairs. One of the mothers (named Ai) had been previously trained to use numerals to label real-life objects; the other chimps had no prior exposure to tasks involving numerals. In the first test, the numerals 1 through 9 were displayed on a touch screen in various positions, and the objective was to touch each numeral in order. Chimps received a peanut upon completing each test successfully. They were then given a new version of the test in which only five numerals were included, with the same objective. All the chimps learned to complete both tasks successfully.

Inoue and Matsuzawa then introduced a masking test. This was similar to the first task, except that once the subject touched the first numeral, all remaining numerals were replaced by white squares. The chimp was thus required to remember the locations of the remaining numerals in order to touch them all in numerical sequence. All the chimps also mastered this task. The researchers note that the probability of completing the test successfully by chance is very low (1/24 with four numerals, 1/120 with five and 1/362,880 with nine). The young chimps performed better on this task than did their mothers or the human test subjects.

Graham Yuile

The final test (limited-hold memory) built on the masking test by introducing a defined 'hold' interval in which the numerals were visible before being replaced by squares. Three different hold intervals were tested using two chimps (Ai, the best-performing mother, and Ayumu, her son and the best-performing offspring) and nine university students. Among the humans, accuracy decreased with shorter hold times. Ai's performance similarly decreased with shorter hold intervals, and her accuracy was overall lower than theirs. Ayumu's accuracy was consistent regardless of hold interval, however, and he completed the trials more quickly and accurately than did the human subjects.

The chimp's ability may be similar to photographic memory, the retention of a detailed image of a complex pattern. This ability is not uncommon among human children but seems to fade with age, perhaps in exchange for the development of language recognition.

Monica Harrington

IN REPRODUCTION, FEMALES QUIETLY CALL THE SHOTS

In the race to fertilize, sperm can't make it on their own. New research shows that females play an important part in enabling sperm to survive and that they may even be involved in selecting compatible sperm and weeding out the 'bad seed'.

An international scientific team led by Alireza Fazeli of the University of Sheffield (UK) examined protein production in the oviducts of sows, in the presence of either oocytes or spermatozoa. Once a sow entered estrus, the researchers carried out a laparoscopic procedure that ensured that one of the sow's oviducts would remain free of gametes and that either oocytes or sperm (in sows that were artificially inseminated) could enter the second oviduct (*J. Proteome Res*. doi:10.1021/pr070349m, published online 16 November 2007). When the team analyzed oviductal fluid and epithelial cells, they found that presence of spermatozoa or oocytes in an oviduct caused marked changes in protein production, compared with the second, non-gamete-stimulated oviduct in the same sow. Most of the proteins were altered only by the presence of sperm; one protein was affected only by oocytes; and a few could be altered by either. Because the changes were observed within a single sow, investigators could conclude that the effects occurred in response to the presence of gametes and were not a result of hormonal influence, which was previously assumed to be the sole reproductive regulatory mechanism in females.

The presence of a gamete recognition system that controls the oviductal environment may begin to explain certain biological phenomena that are as yet poorly understood. One such phenomenon is the sperm's ability to survive in the female reproductive tract during estrus, even though oviductal immunity is heightened during this period, making the tract more hostile to foreign cells. Another reproductive phenomenon is postcopulatory female selection, in which a female is inseminated by several males and 'favors' sperm from males with a compatible genotype, regardless of their phenotype. The team's findings could help elucidate the molecular mechanisms underlying this effect.

This study could have profound implications for studies related to *in vitro* fertilization and cloning. According to Fazeli, the highly regulated conditions in the female reproductive tract are rarely taken into account in these types of research. This may mean that scientists are missing out on important components when attempting to duplicate a natural environment for the fertilization and development of an embryo.

Karen Marron