Like humans, chimps are born with immature forebrains

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In both chimpanzees and humans, portions of the brain that are critical for complex cognitive functions, including decision-making, self-awareness and creativity, are immature at birth. But there are important differences, too. Baby chimpanzees don't show the same dramatic increase in the volume of prefrontal white matter in the brain that human infants do.

Those are the conclusions of a study reported in the August 11th Current Biology, a Cell Press publication, that is the first to track the development of the chimpanzee brain over time and to make the comparison to humans.

"One of the most marked evolutionary changes underlying human-specific cognitive traits is a greatly enlarged prefrontal cortex," said Tetsuro Matsuzawa of Kyoto University in Japan. "It is also one of the latest-developing brain regions of the cerebrum."

That built-in developmental delay, now shown to be shared with chimps, may provide an extended period of plasticity, allowing both humans and our closest evolutionary cousins to develop complex social interactions, knowledge and skills that are shaped by life experiences, the researchers say.

"Both humans and chimpanzees need to render their neural network and brain function more susceptible to the influence of postnatal experience," Matsuzawa said.

For instance, he added, both chimps and humans enjoy close relationships between infants and adults, as indicated by smiles and mutual gazes. On the other hand, the greater prefrontal expansion in the human brain may contribute to the development of language, complex social interaction and other abilities that are unique to us.

Matsuzawa's team made their discoveries by studying magnetic resonance imaging (MRI) scans of three growing chimpanzees from the age of six months to six years, when chimps reach pre-puberty.

The findings suggest that a less mature and more protracted elaboration of neuronal connections in the prefrontal portion of the developing brain existed in the last common ancestor of chimpanzees and humans. That commonality is in contrast to what has been observed in studies of our more distant ancestors, the macaques.

Matsuzawa says his group is interested in exploring when over the course of evolutionary time this feature of brain development evolved. His team also hopes to explore the comparison between human and chimpanzee brains into young adulthood, noting that the chimpanzees they studied have entered late puberty at 11-years-old.

Provided by Cell Press