Patience reveals chimpanzee cognitive development

Cognitive Development in Chimpanzees

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What is it about children's development that allows them to participate in all forms of human culture, including language? Is there something special about the way the human brain develops that allows for the sophisticated cognitive world in which we thrive? One of our best opportunities to answer the big questions like these is to carefully compare the development of our own species with that of one of our two closest living relatives—the chimpanzee. With such comparisons, we can examine how human brain development and cognitive skills differ from those of the other great apes. In this spirit, the authors of this edited volume, together with their colleagues from the Kyoto University Primate Research Institute, report in 28 chapters the findings of their exhaustive research program examining the development of chimpanzee cognition.

This book is the first of its kind to cover such a broad range of topics concerning chimpanzee development, using a myriad of groundbreaking techniques to examine chimpanzees across a range of developmental periods and environments. From the uterus to the jungle, never before have we had the opportunity to learn so much about chimpanzee development in one place. Therefore, it is easy for me to declare that this book represents a landmark contribution to the study of the comparative development of humans and chimpanzees. It is a must read for students and experts interested in cognitive development, human evolution and the cognitive neurosciences.

The centerpiece of the book is five years of research tracking the development of three mother-reared chimpanzees as they grow inside of and then outside of their mothers' womb. To emphasize the scale of the accomplishment, it should be known that these studies have been 30 years in the making. The three infant chimpanzees were the offspring of three female chimpanzees that have participated in cognitive experiments for decades—one with each of the editors of the volume. Over the decades, these researchers have developed very special relationships with their research subjects, which have provided us with the unbelievable data that they now share. Because of their friendship with each of the

three chimpanzee mothers, the researchers were allowed to make daily measurements of each mother's offspring as they developed as fetuses, immediately after they were born, and as they developed through the first five years of life. Never before have chimpanzee mothers allowed members of our species to look so closely at how a normal mother-reared chimpanzee infant develops. How lucky we are to finally have such an opportunity.

The book begins with a skillfully written introduction to the behavior and development of chimpanzees that will be of interest to expert and beginner alike. This chapter helps to orient the reader by explaining the logic behind the book's organization, but most importantly it warns the reader of the complexities that are involved when studying our close relative. The book is then subdivided into five major sections: anatomy and behavior before and after birth, communication and the mother-infant relationship, imitation and the understanding of others, conceptual cognition and tool use and culture.

There is something for everyone in this volume, as it is full of chapters that have major implications for neuroscientists and will fuel future research for years to come. For example, imaging techniques reveal for the first time that the chimpanzee larynx drops during development in ways similar to that of our own species. What does this mean for the origins of the neuroanatomy responsible for producing spoken language? Another example is evidence that spindle neurons, which are only found in great apes, are fully developed before birth in chimpanzees. Do human spindle neurons then develop differently as they mature after birth? What does it mean for ape brain development that chimpanzee fetuses have long-term memory that allows them to retain an association conditioned *in utero* for as much as 8 months after birth? As if discoveries such as these were not enough, what then follows will grab the social cognitive neuroscientist in particular, with chapters investigating neonatal smiling and imitation days after birth, the development of face perception and gaze following in the first few weeks to months of life, the influence of mothers as infants overcome neophobia and learn how to use tools, the first experimental introduction of a new cultural tradition into a group of wild chimpanzees, and the careful documentation of the acquisition of tool technologies by the infants in this same group.

Perhaps the most lasting contribution of this work is its demonstration that the highest-impact research can also maintain the highest ethical standards. The authors show us that we can be at ease with the increasing compassion that we might feel for our close relatives as we learn more about them. It is the same unusual patience and respect that allowed these researchers both to enter into the world of the chimpanzee as never before and to report their systematic efforts to improve the lives of captive and wild chimpanzees. It then becomes clear that future opportunities to learn even more about the comparative development of our two species will only present themselves to those who can match the patience and respect of these authors; a full answer to what makes us human will require more superhuman efforts like those reported in this magnificent book.

COMPETING INTERESTS STATEMENT

The author declares no competing financial interests.

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