

Study: Big brains allow dexterous hands

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Parents have to invest a lot of time and energy until their offspring are independent - like this Hanuman langur mother with her offspring. (Image: Karin Isler, ZOOM Erlebniswelt, Gelsenkirchen) Credit: Karin Isler, ZOOM Erlebniswelt, Gelsenkirchen

People are skilled with their hands, but take a long time to learn dexterous abilities. It takes babies generally around five months before they can purposely grip an object. Learning more complicated skills such as eating with fork and knife or tying shoelaces can take another five to six years. By that age, many other primate species already have offspring of their own. Why do we take so much longer than our closest relatives to learn fine motor skills?

Sandra Heldstab, an [evolutionary biologist](#) in the Department of Anthropology at the University of Zurich, and her colleagues Karin Isler, Caroline Schuppli and Carel van Schaik observed 36 primate species over a period of more than seven years to try to answer this question. She studied 128 [young animals](#) in 13 European zoos from birth until the age at which they had reached adult-level dexterity. What surprised her was that all species learned their respective manual skills in exactly the same order. "Our results show that the neural

development follows extremely rigid patterns—even in primate species that differ greatly in other respects," says Heldstab.

Large brain needed for dexterity

The researchers found, however, big differences in the specific fine motor skills of adults from different [primate species](#). Large-brained species such as macaques, gorillas or chimpanzees can solve much more [complex tasks](#) using their hands than primates with small brains such as lemurs or marmosets. "It is no coincidence that we humans are so good at using our hands and using tools, our large brains made it possible. A big [brain](#) equals great dexterity," says Heldstab.



Like these mantled guerezas, all primate species learn their respective manual skills in exactly the same order. (Image: Sandra Heldstab, Toni's Zoo, Rothenburg) Credit: Sandra Heldstab, Toni's Zoo, Rothenburg



Provided by University of Zurich

Great apes like these bonobos have big brains like humans and can therefore learn very skillful dexterity. (Image: Sandra Heldstab, Zoologisch-Botanischer Garten Wilhelma, Stuttgart) Credit: Sandra Heldstab, Zoologisch-Botanischer Garten Wilhelma, Stuttgart

Dexterity comes at a cost, however: In species with large brains like humans, it takes a long time for infants to learn even the simplest hand and finger movements. "It's not just because we are learning more complex skills than lemurs or callitrichids, for example. It's mainly because we do not begin learning these skills until much later," says Heldstab. The researchers think that the reason for this may be that the larger brains of humans are less well developed at birth.

In addition, learning takes time and is inefficient, and it is the parents who pay for this until their offspring are independent. "Our study shows once again that in the course of evolution, only mammals that live a long time and have enough time to learn were able to develop a large brain and complex [fine motor skills](#) including the ability to use tools. This makes it clear why so few species could follow our path and why humans could become the most technologically accomplished organism on this planet," concludes Sandra Heldstab.

More information: When ontogeny recapitulates phylogeny: Fixed neurodevelopmental sequence of manipulative skills among primates, *Science Advances* (2020). [DOI: 10.1126/sciadv.abb4685](https://doi.org/10.1126/sciadv.abb4685)

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