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Is male reproduction in humans more egalitarian by mammalian standards?

A massive new study shows that human uniqueness can only be understood by first considering our mammalian ancestry.

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Representative photo. | Photo Credit: Jochen van Wylick/Unsplash

We have two contradictory expectations about human biology and behaviour. Given our primate and mammalian ancestry (1), we must be pretty similar to chimps, monkeys, and even rats. But given our big brains, superior intelligence, language, and above all, our ability to make culture and abide by it, we must be quite different. As is often the case, the truth is probably somewhere in between. But that's not good enough for anthropologists and evolutionary biologists. We want to know for sure and also exactly where in between.

'A spectacularly detailed study'

Our task is mind-bogglingly complex, given the staggering variation among the 500 primate and 6,500 mammal species and the equally daunting variability among the thousands of human tribes and cultures. To make any headway, we must pick one biological or behavioural trait at a time and study it in large numbers of mammalian species and many human cultures. This is by no means a job for a single scientist.

Indeed, a spectacularly detailed study about human uniqueness, or the lack thereof, in just one trait, has just been published (2) in the *Proceedings of the National Academy of Sciences*, USA, jointly by 105 authors from 70 institutions located in 15 countries (I was sorry to see India missing from this list), led by Cody T. Ross of the Max-Planck-Gesellschaft in Leipzig, Germany.

Dr. Ross and his colleagues focused on reproductive success, defined as the number of surviving offspring – arguably the most important trait in Darwinian terms. They did not use reproductive success averaged over societies, species, populations, or families. Instead, they used data on the reproductive success of 80,223 individuals drawn from 90 human societies and 49 free-ranging non-human mammal species. They were not interested in reproductive success *per se* but in the inequality in reproductive success among individuals.

More precisely, they were interested in the differences between males and females in the inequality in reproductive success. This needs some explanation.

What is sexual selection?

In addition to proposing the theory of natural selection, Charles Darwin also proposed the theory of sexual selection. He argued that individuals good at surviving might not necessarily be good at obtaining the highest quantity and quality of mates for reproduction. Sometimes, the best traits for obtaining mates may be detrimental to survival (think of the peacock), hence the need for a separate theory.

The most significant advance since Darwin in the theory of sexual selection is the idea that males and females pursue very different strategies to maximise their reproductive success. Males produce large quantities of inexpensive sperm and generally privilege quantity or quality, while females produce small numbers of expensive eggs and generally privilege quality over quantity. So the distribution of reproductive success among males is expected to be highly uneven: some males sire a large number of offspring while others very few or none at all. On the other hand, the distribution of reproductive success is expected to be somewhat more even among females.

Such theoretical expectations of differences in male and female mating strategies have often been much exaggerated and rightly criticised. Besides, there is a large body of literature – mostly ideas and opinions, with inadequate data – proclaiming that humans are unique in that the male-female differences in reproductive inequality are minimal, absent, or reversed. Hence the need for hard data, and that is what the new study provides.

How is inequality measured?

It turns out that inequality is as hard to measure as it is crucial to consider. Economists, for example, measure income or wealth inequality using the well-known Gini index. Insect sociobiologists like me have long been interested in measuring reproductive skew among female members of insect societies. There are dozens of statistical measures of skew whose popularity has changed with time, often calling into question the validity of previous research. Dr. Ross and colleagues have used their own newly minted, refined index, which they call M.

The point of this digression is to forewarn readers that M also may be superseded one day. Science, we must accept, is always a work in progress.

Are humans unique?

The central finding of Dr. Ross and co. is that humans show lower male reproductive skew and lower male-female differences in reproductive skew compared to non-human mammals and primates. However, humans are indeed embedded in the distribution of mammalian patterns of male reproductive skew as well as male-female differences in reproductive skew. To quote the authors:

> "… human populations are by no means radical outliers in the mammalian class, clustering in a small range in the bivariate distribution of mammalian skew values—near average for female skew and moderately below average for male skew".

They also find that human skew values fall in a relatively narrow range compared to the wide variation in other mammalian values.

An examination of the admittedly limited variation in skew between the 90 human societies permits the authors to explore the reasons for the relatively low skew values and low male-female differences among humans. Since the topic of human exceptionalism is so appealing, multiple explanations have previously been offered by the practitioners of a wide variety of disciplines long before any good data were available to confirm such exceptionalism, let alone measure its extent. Speculation is easy, data are hard!

What does the study mean for evolutionary biology?

A remarkable aspect of the effort of Dr. Ross and colleagues is the use of sophisticated mathematical modelling, grounded in sound evolutionary theory, to convert the many available verbal and qualitative predictions into 14 more rigorous, quantitative predictions and put them to the test.

The existence of male reproductive skew and male-female difference is explained by the theory of sexual selection described above. It is the lower values of both in humans that need a special explanation. The most important explanation, of course, is the more frequent occurrence of monogamy in humans, which reduces opportunities for some males to have a disproportionately large number of offspring.

But why is monogamy more common in humans?

This appears to be due to several uniquely human features. For example, human males need high levels of mutual cooperation to survive. A second reason is that human infants need more help from both parents and others, reminiscent of birds, where monogamy is far more common. An old saying, that it takes a whole village to raise a child, comes to mind. Finally, their cross-cultural comparisons emphasise the role of legal and social institutions that enforce monogamy in some human societies.

The results of this massive study are especially pleasing to the evolutionary biologist because they show that human uniqueness, or the lack thereof, can only be understood by first considering our mammalian ancestry and then adding those uniquely human features that fine-tune our biological traits to suit our environments.

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https://www.thehindu.com/sci-tech/science/human-reproductive-inequality-sexual-selection-pnas-study/article66950451.ece

1. Desikan, S. 2018. Bringing up a science. *The Hindu* https://www.thehindu.com/opinion/op-ed/bringing-up-a-science/article24692040.ece
2. Ross, C. T. *et al.* 2023. Reproductive inequality in humans and other mammals. *Proceedings of the National Academy of Sciences* **120,** e2220124120 https://doi.org/10.1073/pnas.2220124120