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HOW OLD ARE YOU IN CHIMPANZEE YEARS?

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YOUNG REVIEWERS:


ELI
AGE: 12


ERIC
AGE: 11


KAI
AGE: 10


LEAH
AGE: 9

GREAT APES

A group of animals that includes gorillas, orangutans, chimpanzees, and bonobos—animals known for their big brains, opposable thumbs, intelligence, tool use, and close relationship to humans.

It is fascinating to think about biology and behavior in humans and other animals. Chimpanzees are particularly interesting because they are humans' closest living relatives. In this article, we will tell you about how humans grow up and age compared to chimpanzees, and how to calculate your age in chimpanzee years. Humans and chimpanzees are roughly similar in age after birth, but humans take a bit longer to mature and age. Also, some humans live much longer than chimpanzees do. This means many of us live long enough to interact with our grandchildren and also struggle with aging-related problems, but this is less the case for chimpanzees.

CHIMPANZEES AND YOU: HOW ARE YOU RELATED?

Did you know that when you visit the zoo and see the **great apes**, you are visiting animals that are related to you? Humans and other great apes have a **common ancestor** that existed millions of years ago. A common ancestor is an individual that you and one of your relatives are descended from. For example, dinosaurs, which lived in the past, are ancestors to today's birds (Figure 1). These relationships are explained

by evolution, which tells us that all living things developed from other living things, over millions of years.

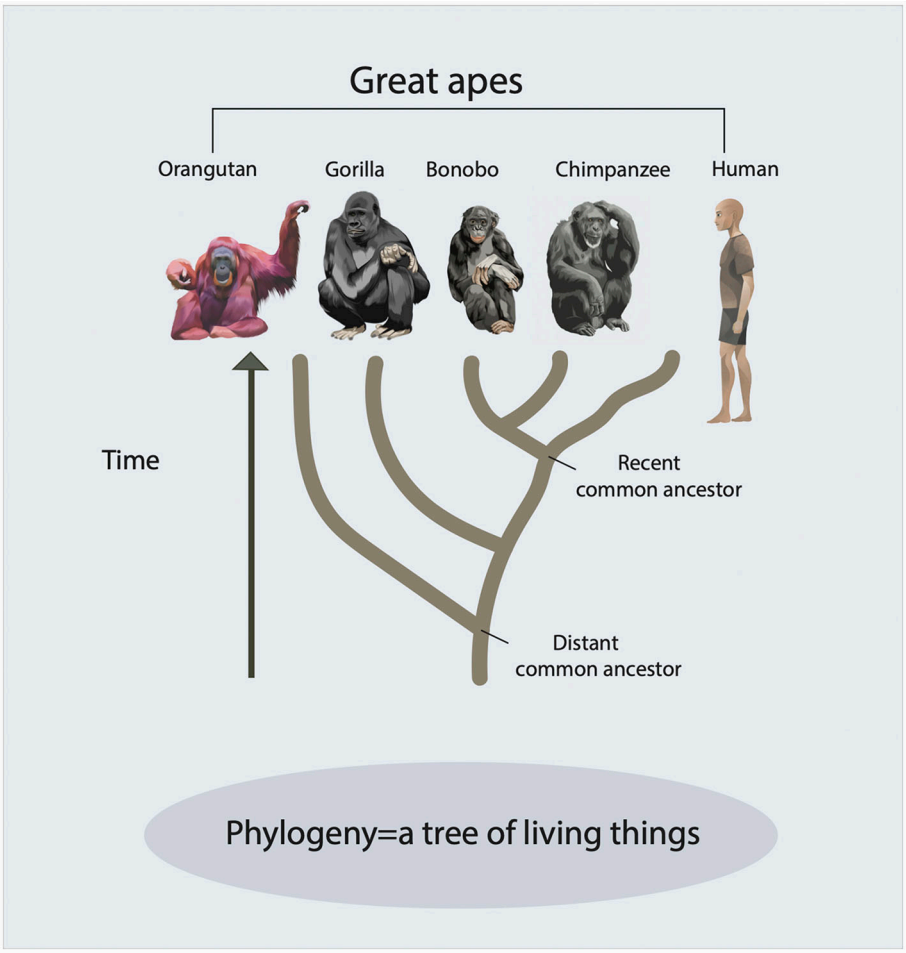

Figure 1

Humans, chimpanzees, gorillas, and orangutans are all considered great apes. Scientists group them together because all the great apes share similar traits, but each **species** also has its own unique traits. Two traits shared across great apes and humans are hands that can grasp things and brains that are large relative to body size. There are many more similar traits, too. Humans also *differ* from other great apes in that we walk on our feet, we possess language, and we are much less hairy, for sure! Another big difference between humans and other great apes is how long we live. The average human lifespan is about 70 years in the USA [1], while many chimpanzees in captivity do not live past 50 years [2]. What does that mean for how humans and other great apes mature and age? Comparing the pace of development and aging in humans and chimpanzees can reveal both how we are similar and how we differ from great apes. This work will help us to better understand how human biology and behavior are different compared with chimpanzees.

COMMON ANCESTOR

A relative like a great-great grandparent that animals or plants shared many years ago.

Figure 1

This "family tree" shows the evolution of the great apes, which include humans, chimpanzees, bonobos, gorillas, and orangutans. This tree shows how these species are related and how they evolved over millions of years. The tips of the branches represent species that are alive today. The bottom of the tree represents the common ancestors that gave rise to great apes. The branches split, which represents a common ancestor giving rise to different species. Branches that split toward their tips represent closely related species. The tree shows that humans are more closely related to chimpanzees than they are to orangutans.

SPECIES

A group of individuals that resemble each other and can make babies together. For example, cats are a different species than dogs because cats cannot make babies with dogs.

There are big differences in the speed of development across species. People often talk about how quickly dogs mature, because many of us grow up with dogs and we see them every day. We can appreciate how fast they grow and age compared with us (Figure 2). If you got a puppy when you were very young, you may have watched your dog develop gray hair and have difficulty moving around, while you were still a child. It is easy to see that animals like dogs develop and age at a different pace than humans do. But, until recently, we knew very little about how the pace of development and aging in humans compared with great apes [3]. Therefore, researchers collected a lot of information to compare the speed of development and aging across humans and chimpanzees, to find out how old humans are in chimpanzee years.

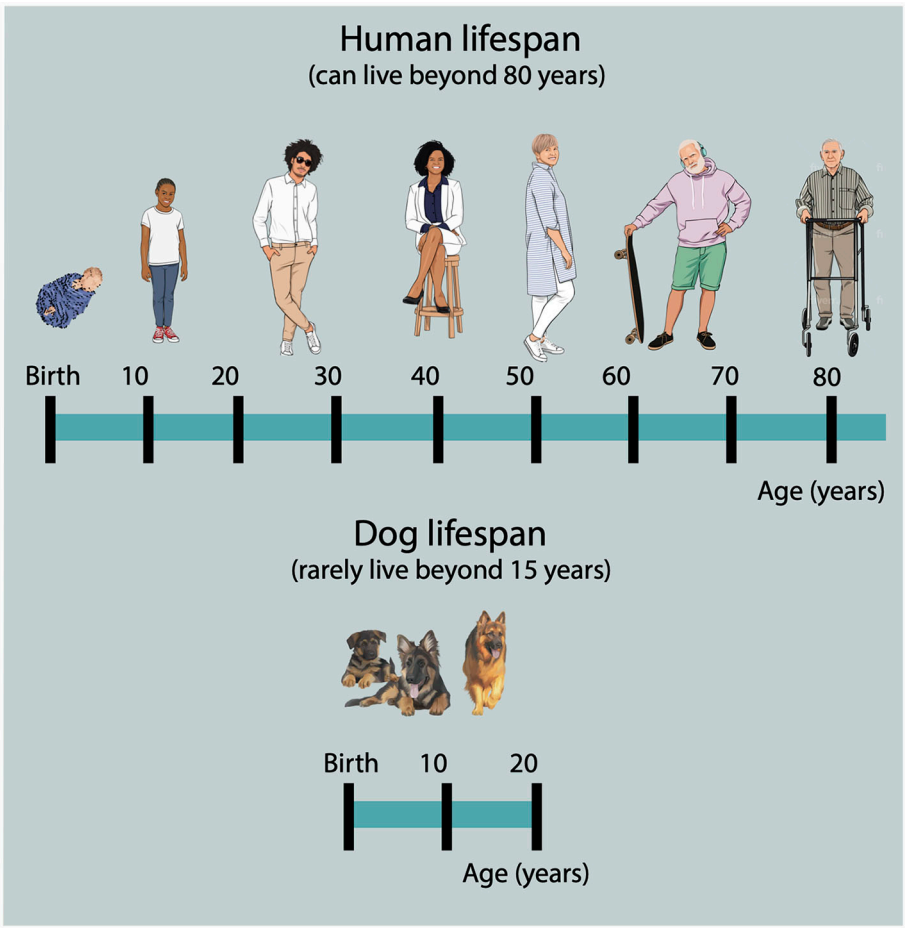

Figure 2

Species vary in the speed and development of aging. Humans can live beyond 80 years, but dogs rarely live beyond 15 years. A dog is grown up within a few years, but humans take around 20 years to become adults. In other words, humans take much longer to develop than dogs do. Humans also age over a longer time compared with dogs. Comparing our biology to that of our pets shows that the pace of development and aging vary a lot between species.

HOW OLD ARE YOU IN CHIMPANZEE YEARS?

There are many changes in the brain and behavior that are similar in both humans and chimpanzees as they age. Humans and chimpanzees both open their eyes, crawl, walk, and lose their baby teeth. The cells of both species contain proteins, DNA, and RNA that

change with age. Let us keep in mind that individuals within each species vary in terms of when age-related biological and behavioral changes occur. Nevertheless, scientists can gather information on the average age at which brain, body, and behavioral changes occur, to find out how old people are in chimpanzee years.

Collecting more than a hundred of these time points reveals how the speed of development and aging compares between humans and chimpanzees (Figure 3) [3]. Around birth, chimpanzees and humans are pretty similar in their maturity. That means that, when you were born, your age basically matched that of a chimpanzee that was also close to birth. A human that is about 12 years old matches a chimpanzee that is about 11 years of age. A human in their 50's matches a chimpanzee in its 40's. Overall, the speed of development and aging in humans is surprisingly similar to chimpanzees, although humans take slightly longer to mature and age than chimpanzees do. Another important observation is that chimpanzees rarely live past their 40's (which corresponds to humans in their 50's). Humans, in contrast, can live past their 80's. So, that is a phase of human life with no clear match in chimpanzees. Understanding how long humans and other species live, how quickly they develop, and how they age can teach us important things about human aging [2].

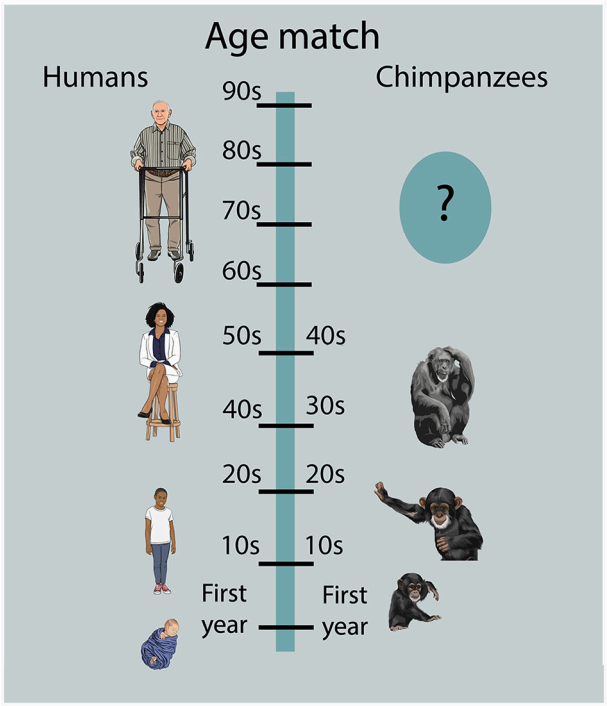

Figure 3

Figure 3

Humans and chimpanzees are pretty similar in maturity early in development. Humans and chimpanzees proceed through many biological and behavioral changes at similar ages, especially when they are young, but humans take a bit longer to grow up and age than chimpanzees do. Importantly, many humans live longer than most chimpanzees, so there is a time of human life with no clear match in chimpanzees [3].

DO CHIMPANZEES AGE LIKE KIDS DO?

As people get older, they can still do many of the things they enjoy, like their favorite hobbies and play with their grandchildren, but their

ALZHEIMER'S DISEASE

An incurable disease that impacts the brain and behavior, mostly in older people.

activity levels may decrease, and they are also more likely to get sick. Maybe one of your grandparents has experienced eye, heart, or lung problems; difficulty walking; or problems remembering things. You may know an elderly person with **Alzheimer's disease**, which causes people to forget many of the things that are important to them. People in the advanced stages of Alzheimer's may forget how to do simple things like cook an egg or button a shirt. Alzheimer's is a devastating disease that affects the ability of older people to care for themselves.

Chimpanzees have shorter lifespans than humans, so many of them miss out on both the fun *and* the devastating illnesses that humans may experience in old age. We do not quite know what most chimpanzees die of in the wild, but one study found that many chimpanzees die of heart disease in captivity [4]. The short lives of chimpanzees mean they have less opportunity to interact with their grandchildren. This may seem sad, but chimpanzees also have a different family structure than humans do, so the lack of grandparents does not affect their lifestyle. Chimpanzees *do* show signs of Alzheimer's disease [5], but few chimpanzees should experience it as severely as humans do. Our study suggests this happens because chimpanzees do not have as long of a lifespan as humans [5, 6].

Do you think that it is good that chimpanzees are less likely to experience age-related diseases? Is it cool that humans can live to such an advanced age? The next time that you visit the zoo, think about the differences and similarities between you and your primate relatives, and how amazing it is that humans can live for such a long time.

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CONFLICT OF INTEREST: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

YOUNG REVIEWERS

ELI, AGE: 12
Just your average nerd. I play a lot of video games and I like baseball. I have a sister and three crazy cats. My favorite subjects are dismissal and recess, but I do also like math and humanities.

ERIC, AGE: 11

Eric loves animals. He visited the zoo in every city he traveled to. He is very curious about animals and wants to know everything about them. He enjoys playing video games and tennis. He lives in the USA.

KAI, AGE: 10

Kai is a very athletic person. He loves sports such as hockey, baseball, and swimming. He is very energetic and active. During his free time, he likes to make origami and read. He is always enthusiastic at school and willing to learn. He has always dreamed about playing in the NHL. His favorite food is ramen. He lives in the USA.

LEAH, AGE: 9

I am a nerd who likes to read, likes to write, and likes to have fun. I do archery and horseback riding but not many sports. I have a brother and three kittens, I like school and my favorite school subjects are composition, science, Latin, and literature.

AUTHORS

CHRISTINE J. CHARVET

Dr. Christine Charvet received her PhD in biology from the University of California, Irvine. Christine went on for postdoctoral training in neuroimaging at Harvard Medical School and statistical genetics at Cornell University. Her team at Auburn University leverages big data in genetics and neuroimaging to find corresponding ages across species. They have developed an online resource (https://translatingtime.org) to enable researchers to find corresponding ages across lab animals (e.g., mice) and humans. This work serves to translate findings gained in one animal to further our understanding of human biology and health. *charvetcj@gmail.com

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Rania Mohamedelhassan is a Ph.D. student in biomedical sciences at Auburn University's College of Veterinary Medicine. Rania is enthusiastic about the study of neurodegenerative diseases and aging. She realized that this was her passion while pursuing her degree in Medicine. In the Charvet lab, she is interested in identifying corresponding ages across the lifespan of different species. Translating neurodevelopmental timelines and aging processes aligns perfectly with Rania's research interests and future goals.

MADISON BRYANT

Madison Bryant is a senior at Auburn University pursuing a double major in Biomedical Science and Neuroscience, with a minor in Business. She began working as an undergraduate researcher in Dr. Charvet's lab in early 2022. She will be performing her final year of research on a University Undergraduate Research Fellowship to further the lab's progress on the Translating Time tool. Some of her topics of interest include developmental neuroscience and neurodegenerative disorders. Madison plans to pursue a master's degree in business administration after graduating from Auburn University.

TONI LEE

Toni Lee began working in Dr. Charvet's lab in her freshman year of undergraduate study at Auburn University. She is currently pursuing her bachelor's degree in Anthropology with a minor in Public Health. She has a passion for learning about health culture, medicine, and projects like "Translating Time", which find corresponding ages across species. Toni is working in the lab and on her degree to satisfy her curiosity on subject matters and widen her field of knowledge. Toni plans to continue her education with a Masters in Cultural Anthropology.