Brain differences between humans and chimpanzees linked to aging

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Chimpanzees, the closest living relatives to humans, do not experience a decrease in brain volume as they age like humans do, according to a study by George Washington University researcher Chet Sherwood and his colleagues. There are many similarities between the species, but this discovery reveals an important distinction, demonstrating how humans are unique from other animals. The study "Aging of the Cerebral Cortex Differs Between Humans and Chimpanzees" is the first study of its kind in this field and will be published in the *Proceedings of the National Academy of Sciences* on July 25, 2011.

“Although other animals experience some cognitive impairment and brain atrophy as they age, it appears that human aging is marked by more dramatic degeneration,” said Dr. Sherwood, associate professor of anthropology in GW’s Columbian College of Arts and Sciences.
The researchers used magnetic resonance imaging (MRI) to measure the volume of the whole brain and numerous specific internal structures using a sample of 99 chimpanzee brains ranging from 10-51 years of age. This data were compared to brain structure volumes measured in 87 humans ranging from 22-88 years of age.

Measurements of the neocortical gray and white matter, frontal lobe gray and white matter and the hippocampus were performed. In contrast to humans, who showed a decrease in the volume of all brain structures over the lifespan, chimpanzees did not display significant age-related changes. Furthermore, the effects of aging in humans were only evident after the maximum age of chimpanzees. As a result, the researchers

concluded that the brain shrinkage seen in human aging is evolutionarily novel and is the result of an extended lifespan.

The hippocampus, the area of the brain responsible for encoding new memories and maintaining spatial navigation, was of specific interest to the researchers, as this area is especially vulnerable to age-associated atrophy in humans. In addition, the hippocampus is the region of the brain most prominently affected by Alzheimer's disease (AD), an illness that is only seen in primarily older humans. AD is a form of dementia that is associated with a loss of brain function, impacting memory, thinking and behavior. AD is a result of neurodegeneration, which is the progressive loss of structure or function of neurons, including the death of neurons. The unique vulnerability seen in humans to develop AD may be in part due to the human tendency to show more pronounced brain atrophy than any other species, even in normal, healthy aging.
"What's really unusual for humans is the combination of an extremely long life and a large brain," said Dr. Sherwood. "While there are certainly benefits to both of these adaptations, it seems that more intense decline in brain volume in the elderly of our species is a cost."

Established in 1821 in the heart of the nation's capital, the George Washington University Columbian College of Arts and Sciences is the largest of GW's academic units. It encompasses the School of Media and Public Affairs, the Trachtenberg School of Public Policy and Public Administration and more than 40 departments and programs for undergraduate, graduate and professional studies. The Columbian College provides the foundation for GW's commitment to the liberal arts and a broad education for all students. An internationally recognized faculty and active partnerships with prestigious research institutions place Columbian College at the forefront in advancing policy, enhancing culture and transforming lives through research and discovery.

In the heart of the nation's capital with additional programs in Virginia,

the George Washington University was created by an Act of Congress in 1821. Today, GW is the largest institution of higher education in the District of Columbia. The university offers comprehensive programs of undergraduate and graduate liberal arts study, as well as degree programs in medicine, public health, law, engineering, education, business and international affairs. Each year, GW enrolls a diverse population of undergraduate, graduate and professional students from all 50 states, the District of Columbia and more than 130 countries.

More information: "Aging of the cerebral cortex differs between humans and chimpanzees," by Chet C. Sherwood et al.

Provided by George Washington University