

For clues to healthy brain aging, look to the Bolivian Amazon

March 21 2023, by Nina Raffio



The Tsimané have some of the lowest rates of heart and brain disease in the world. Credit: Tsimane Health and Life History Project Team

Some of the lowest rates of heart and brain disease ever reported by science are found among Indigenous communities inhabiting the tropical

forests of lowland Bolivia. New USC research on two of these societies, the Tsimané and Mosetén, suggests that there are optimal levels of food consumption and exercise that maximize healthy brain aging and reduce the risk of disease.

The study appears on Monday, March 20 in *Proceedings of the National Academy of Sciences*.

Thanks to industrialization, humans now enjoy greater access to food, less physical toil and better access to [health care](#) than ever before. However, we've grown accustomed to eating more and exercising less. Obesity and [sedentary lifestyles](#) are associated with smaller [brain](#) volumes and faster cognitive decline.

To better understand the tipping point where abundance and ease begin to undermine [health](#), the researchers enrolled 1,165 Tsimané and Mosetén adults, aged 40-94 years, and provided transportation for participants from their remote villages to the closest hospital with CT scanning equipment.

The team used CT scans to measure brain volume by age. They also measured participants' body mass index, blood pressure, total cholesterol and other markers of energy and overall health.

Researchers found that the Tsimané and Mosetén experience less brain atrophy and improved cardiovascular health compared to industrialized populations in the U.S. and Europe. Rates of age-related brain atrophy, or brain shrinking, are correlated with risks of degenerative diseases like dementia and Alzheimer's.

"The lives of our pre-industrial ancestors were punctured by limited food availability," said Andrei Irimia, an assistant professor of gerontology, [biomedical engineering](#), quantitative/[computational biology](#) and

neuroscience at the USC Leonard Davis School of Gerontology and co-corresponding author of the study. "Humans historically spent a lot of time exercising out of necessity to find food, and their brain aging profiles reflected this lifestyle."

The Mosetén: A bridge between pre- and post-industrialized societies

The findings also illustrated key differences between the two Indigenous societies. The Mosetén are a "sister" population to the Tsimané in that they share similar languages, ancestral history and a subsistence lifestyle. However, the Mosetén have more exposure to [modern technology](#), medicine, infrastructure and education.

"The Mosetén serve as an important intermediary population that allows us to compare a wide spectrum of lifestyle and health care factors. This is more advantageous than a straight comparison between the Tsimané and the industrialized world," Irimia said.

Irimia said that, along this continuum, the Mosetén showed better health than modern populations in Europe and North America—but not as good as that of the Tsimané.

Among the Tsimané, surprisingly, BMI and somewhat higher levels of "bad cholesterol" were associated with bigger brain volumes for age. This, however, may be due to individuals being more muscular, on average, than individuals in industrialized countries who have comparable BMIs.

Still, both the Tsimané and Mosetén come closer to the "sweet spot," or balance between daily exertion and food abundance, that the authors think may be key to healthy brain aging.

The future of preventative medicine relies on an understanding of humans' evolutionary past

The study's authors explained that people living in societies with abundant food and little requirement for [physical activity](#) face a conflict between what they consciously know is best for their health and the cravings, or drives, that come from our evolutionary past.

"During our evolutionary past, more food and less calories spent in getting it resulted in improved health, well-being and ultimately higher reproductive success or Darwinian fitness," notes Hillard Kaplan, a professor of health economics and anthropology at Chapman University who has studied the Tsimané for nearly two decades. "This evolutionary history selected for psychological and physiological traits that made us desirous of extra food and less physical work, and with industrialization, those traits lead us to overshoot the mark."

According to Irimia, the best place to be in terms of brain health and risk for disease is the "[sweet spot](#)" where the brain is being provided with neither too little nor too much [food](#) and nutrients, and where you have a vigorous amount of exercise.

"This ideal set of conditions for disease prevention prompts us to consider whether our industrialized lifestyles increase our risk of disease," he said.

More information: Hillard Kaplan et al, Brain volume, energy balance, and cardiovascular health in two nonindustrial South American populations, *Proceedings of the National Academy of Sciences* (2023).
[DOI: 10.1073/pnas.2205448120](https://doi.org/10.1073/pnas.2205448120)

Provided by University of Southern California

Citation: For clues to healthy brain aging, look to the Bolivian Amazon (2023, March 21)
retrieved 23 April 2024 from

<https://medicalxpress.com/news/2023-03-clues-healthy-brain-aging-bolivian.html>

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