Study Sheds Light on Why Humans Walk on Two Legs

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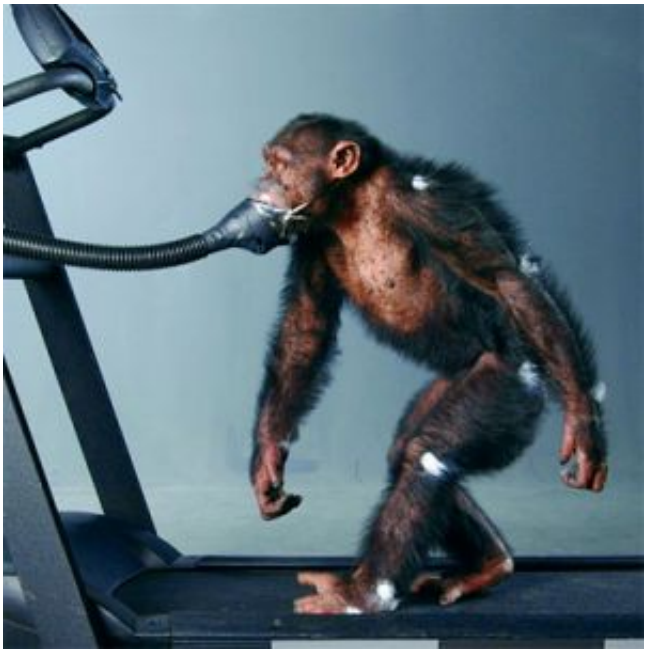

This trained chimp works out to help answer why humans walk on two legs. The face mask measures oxygen consumption. The paint spots on the chimp's joints aid in video-assisted biomechanical analysis. (Photo copyright Cary Wolinsky)

A team of anthropologists that studied chimpanzees trained to use treadmills has gathered new evidence suggesting that our earliest apelike ancestors started walking on two legs because it required less energy than getting around on all fours.

"When our earliest ancestors started walking on two legs, they took the

first steps toward becoming human," said lead researcher Michael Sockol of UC Davis. "Our findings help answer why."

The research appears this week in the online early edition of the *Proceedings of the National Academy of Sciences*. It will appear in the July 24 print edition.

"This is the first time anyone has succeeded in studying energetics and biomechanics in adult chimps," said Sockol, who worked for two years to find an animal trainer willing to coax adult chimps to walk on two legs and to "knucklewalk" on all fours on the sort of treadmill found in most gyms. The five chimps also wore face masks used to help the researchers measure oxygen consumption.

While the chimps worked out, the scientists collected metabolic, kinematic and kinetic data that allowed them to calculate which method of locomotion used less energy and why. The team gathered the same information for four adult humans walking on a treadmill.

The researchers found that human walking used about 75 percent less energy and burned 75 percent fewer calories than quadrupedal and bipedal walking in chimpanzees. They also found that for some but not all of the chimps, walking on two legs was no more costly than knucklewalking.

"We were prepared to find that all of the chimps used more energy walking on two legs -- but that finding wouldn't have been as interesting," Sockol said. "What we found was much more telling. For three chimps, bipedalism was more expensive, but for the other two chimps, this wasn't the case. One expended about the same energy walking on two legs as on four. The other used less energy walking upright."

These two chimps had different gaits and anatomy than their knucklewalking peers. And when the researchers examined the early hominid fossil record, they found evidence of these traits – skeletal characteristics of the hip and hind limb that allow for greater extension of the hind limb -- in some early bipeds.

Taken together, the findings provide support for the hypothesis that anatomical differences affecting gait existed among our earliest apelike ancestors, and that these differences provided the genetic variation natural selection could act on when changes in the environment gave bipeds an advantage over quadrupeds.

Fossil and molecular evidence suggests the earliest ancestors of the human family lived in forested areas in equatorial Africa in the late Miocene era some 8 to 10 million years ago, when changes in climate may have increased the distance between food patches. That would have forced early hominids to travel longer distances on the ground and favored those who could cover more ground using less energy.

"This isn't the complete answer," Sockol said. "But it's a good piece of a puzzle humans have always wondered about: How and why did we become human? And why do we alone walk on two legs?"

Sockol, a doctoral candidate in anthropology, has been pursuing his research for four years as part of his dissertation. He conducted the research at UC Davis and at a private animal refuge and training facility in Northern California with colleagues Herman Pontzer of Washington University in St. Louis and David Raichlen of the University of Arizona.

Source: UC Davis