

Golden Arches: Human Feet More Flexible Than We Thought

by Deborah Franklin

August 20, 2013 7:05 PM

<http://www.npr.org/blogs/health/2013/08/20/213882836/golden-arches-human-feet-more-flexible-than-we-thought>

The notion that sport shoes and inserts should keep the human arch stiffly supported is a decades-old assumption that could use some rethinking, according to a British gait analyst who has closely studied more than 25,000 footsteps of healthy people.

Robin Huw Crompton, a physical anthropologist at the University of Liverpool's Institute of Ageing and Chronic Disease, says his findings suggest the outer arch of the healthy human foot is actually much more flexible than previously thought.

"The idea before was that if this arch wasn't stiff, it probably required treatment," he tells Shots. "But based on what we found, I don't think that's true." The study was published Tuesday in the British journal *Proceedings of the Royal Society B*.

The familiar model of a human footstep starts with pressure at the heel that quickly runs along the outer edge of the sole of the foot and then spreads inward across the ball of the foot, pushing off with the toes. Everybody agrees, Crompton says, that the arch on the inner side of the foot flexes, thanks to ligaments and muscles that allow it to twist.

But we each also have a subtler arch on the pinky-toe side of the foot. And that outer, "lateral" arch, which runs from just below the little toe toward the heel, has been widely assumed to be much more rigid in humans than in nonhuman great apes.

To get a quantitative sense of how much human feet tend to flex in normal walking, Crompton and his research team asked 45 healthy male and female volunteers — most under 30 years old, and all with sound feet — to each spend five minutes walking barefoot at a comfortable pace along a special pressure-sensitive treadmill.

The treadmill's walkway was covered with thousands of tiny sensors that simultaneously sampled the precise pressures exerted across the entire foot many times a second, Crompton says.

The variation the scientists saw across these perfectly normal human footfalls "was astonishing," Crompton tells Shots, especially considering that the volunteers were walking at a steady speed, across an even, level surface.

It might not seem so surprising that different people tended to have different, characteristic footprints. But each person also showed a high degree of foot flexibility and a lot of variation among footsteps over time.

In fact, the varying patterns of foot pressure seen among the human volunteers looked a lot like the patterns seen in the footfalls of two bonobo chimps and an orangutan that the scientists had take the same test. As agile tree-climbers, these nonhuman great apes might have been expected to have much , Crompton says.

Among the humans, the outer arch seemed to flatten in about 7 percent of all the footsteps, which conventional assumptions would have suggested was bad — unstable. And most of the volunteers, Crompton says, had at least one step from each foot that, if judged under conventional evaluations in a foot clinic, would have flagged them as possible candidates for treatment for fallen arches.

There was nothing wrong with any of these feet, the scientist emphasizes. It's our definition of normal that needs to change.

"A sports shoe with a lot of arch support might not be such a great idea," he says. A bit of cushioning is fine. "But I'd look for a shoe that lets your toes wiggle and doesn't constrain foot motion. You want your foot to be able to move and flatten because that's what it's designed to do."