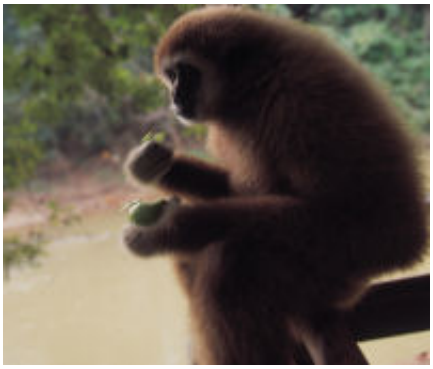
Gibbon feet provide model for early human walking

December 15 2008



Gibbons walk successfully on a flexible foot on the ground and in the trees.

Scientists at the University of Liverpool have found that early humans could have walked successfully on a 'flexible' flat foot, similar to modern day gibbons.

The arched 'rigid' foot of modern humans – thought to have appeared approximately 1.8 million years ago – is best adapted for upright walking, but scientists have found that early humans once had 'flexible' feet and could have walked on the ground some years earlier.

Scientists originally thought that a flexible foot could have been 'restrictive' for humans learning to walk upright as it lacked the necessary power to push off the ground. To understand the mechanisms of the flexible foot, scientists studied the movements of gibbons – small

apes living in the rainforest of South East Asia – which walk upright both on the ground and in the trees.

Dr Evie Vereecke, from the University's School of Biomedical Sciences, explains: "Gibbons have a flexible joint mid-way along the foot that supports them in walking and climbing. Human ancestors also had this joint for tree dwelling and ground walking, but modern humans have now lost its flexibility in favour of a 'rigid' foot.

"To understand how successful or 'restrictive' the flexible foot might have been for early humans we set up a high-speed camera at Belgium's Wild Animal Park to capture the gibbon's foot movements. We built a computer model to digitise the footage we collected so that we could analyse the mechanisms employed in the foot and compare it to how humans walk today.

"We found that gibbons hit the ground with their toes first, similar to the 'forefoot' strike of professional sprint runners, which stretches the tendons in the toes. We also found that instead of lifting the foot at the end of a stride, the gibbon raised its heel first, making an upward arch and stretching the tendons in the sole of the foot.

"These stretched tendons allow storage of elastic energy and once the toe leaves the ground the tendons in the foot recoil, releasing the stored energy and generating the necessary propulsion to push off the ground and walk upright quite successfully.

"The structure of the modern human foot is different to the gibbon, but the energy storage mechanism is similar. The human foot is spanned by an elastic band along its sole which is stretched when we put our weight on it and stores elastic energy ready for release when the foot leaves the ground."

The work - published in the *Journal of Experimental Biology* - shows that it is possible that human ancestors could have walked successfully with an upright-gait on a 'flexible' flat foot and may have similar energy storage mechanisms to modern humans.

Source: University of Liverpool