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Citation	Pontzer, Herman, David A. Raichlen, Daniel E. Lieberman. 2006. Is arm swing active or passive during human walking and running? <i>Integrative and Comparative Biology</i> 46, S1: E112.
Published Version	doi:10.1093/icb/icl056
Accessed	February 17, 2015 4:39:15 PM EST
Citable Link	http://nrs.harvard.edu/urn-3:HUL.InstRepos:2797432
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Is arm swing active or passive during human walking and running?
Herman Pontzer, David A. Raichlen, Daniel E. Lieberman

Abstract:

Humans habitually swing their arms in phase with the contralateral leg during walking and running. This arm motion is generally thought to counteract the torque about the body's vertical axis (i.e. yaw moment) that is generated by the legs as they swing with each step. Thus it has been argued that the motion of the arms is a tuned, habitual, active response that is critical for maintaining stability during human locomotion, especially running. In this study, we investigated whether arm swing is in fact an active behavior, or is instead a passive response that follows solely as a consequence of our anatomical design. Human subjects walked and ran on a treadmill under different arm- and leg-weighting conditions, and without armswing, while kinematic and surface EMG data were recorded. A modeling study was also performed to determine the inherent effect of leg swing on arm movement in a human-like biped. Results of both studies suggest that arm swing is largely a passive response, and is not entirely an active, tuned behavior. Arm swing may therefore be an emergent property of human bipedalism, with the arms acting largely as passive damping mechanisms that decrease whole-body yawing.