Made available by Hasselt University Library in https://documentserver.uhasselt.be

Non-Sagittal Shank and Foot Movements in the Kinematic Articular Chain during the Swing Phase of Gait

Peer-reviewed author version

NARAIN, Faridi; VAN ZWIETEN, Koos Jaap; LAMUR, Kenneth S.; KOSTEN, Lauren; DE MUNTER, Stephanie; ZOUBOVA, Irina & SCHMIDT, Klaus (2013) Non-Sagittal Shank and Foot Movements in the Kinematic Articular Chain during the Swing Phase of Gait. In: FOLIA PRIMATOLOGICA, 84 (3-5), p. 305-305.

DOI: 10.1159/000354129
Handle: http://hdl.handle.net/1942/15812

Non-Sagittal Shank and Foot Movements in the Kinematic Articular Chain during the Swing Phase of Gait

Faridi H.M. Narain [a], *Koos Jaap van Zwieten* [a], *Kenneth S. Lamur* [b], *Lauren Kosten* [a], *Stephanie De Munter* [a], *Irina A. Zubova* [c], *Klaus P. Schmidt* [a]

[a]Anatomy, University of Hasselt, Hasselt, Belgium; [b]Anatomy, Anton de Kom University of Suriname, Paramaribo, Suriname; [c]Biomechanics and Valeology, St. Petersburg State Polytechnical University, St. Petersburg, Russia
E-Mail: koosjaap.vanzwieten@uhasselt.be

Key Words: Foot · Gait · Swing · Metatherians · Eutherians

Foot movements involved in the kinematic articular chain of the gait in metatherians (e.g., marsupials) may be analysed to unravel eutherian (e.g., primate) gait. We thus analysed videos (from the public domain) of a walking wombat, *Lasiorhinus krefftii*. From take-off, its foot's lateral side stays continuously lifted, causing everted foot positions during most of the swing phase, as also observed in the opossum, *Didelphis marsupialis*. Here the cardan-like ankle joint transmits shank axial rotation to foot-eversion or foot-inversion (Narain *et al.*, 2009). Only recently, have measurements from primates, viz. man, allowed extrapolating these data to bipedal gait. At the onset of swing, foot eversion clears the human foot from the ground (Legault-Moore *et al.*, 2012). Also recently, sophisticated technology captured foot eversion at the end of swing in the running cheetah *Acinonyx jubatus* (National Geographic video: Hubbard *et al.*, 2012). While doing so, this eutherian shows lower leg internal axial rotation with simultaneous heel-abduction, toe-extension and toe-abduction. The latter phenomenon might be universal, as was described in metatherians (van Zwieten *et al.*, 1991).

References

Narain, F. H. M., van Zwieten, K. J., Gervois, P., Lippens, P. L., Reyskens, A., Colla, P., Palmers, Y., Schmidt, K. P., Vandersteen, M., Biesmans, S., Robeyns, I., Op 't Eijnde, B., Zinkovsky, A. V., Varzin, S. A., Lamur, K. S. (2009) Human foot inversion prior to toe-off: an analysis by means of functional morphology, and comparative anatomical observation. Journal of Vibroengineering, 11 (3), 530-535.

Legault-Moore, D., Chester, V. L., de Vries, G. (2012) Multisegment foot kinematics during walking in younger and older adults. Journal of Clinical Medicine Research, 4 (4), 259-266.

Hubbard, K., Wilson, G. *et al.* (2012) Video: Filming the World's Fastest Runner. National Geographic, November Issue.

van Zwieten, K. J., Lippens, P. L., Honinckx, M. (1991) Gripping mechanism in *Didelphis* includes prehensive patterns. Belgian Journal of Zoology, 121, S1, 49-50.