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# Possible roles of lower leg muscles involved in foot eversion during swing phases of gait

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The opossum *Didelphis marsupialis*, considered as a predecessor of primates including man, shows extreme inversion of hindfoot at late stance during quadrupedal walking (Narain et al., 2003). In inversion of the foot the sole turns inward, in eversion it turns outward. Repositioning of the opossum foot occurs in swing, eversion starting at toe-off (Narain et al., 2009). Tendons of extensor digitorum brevis and of peroneus muscles passing behind the fibular malleolus “pulley” may contribute to foot eversion in *Didelphis* (Lewis, 1966). A lower leg profundus muscle revealed by microdissection, may account for rotating the crus medially during swing (Narain et al., 2005). Functional analyses of this muscle in *Didelphis ursina* Shaw can be traced back more than two centuries. Lower leg repositioning by medial rotation presumed to be effectuated by this muscle in particular (Home, 1808) is strongly suggested, thanks to our analyses using HR-MRI imaging. Other tetrapods show profundus muscle activity mainly in stance (Schoenfuss et al., 2010). But the comparable popliteus muscle, also a lower leg medial rotator, is most active during free swing (Stensdotter et al., 2008). This muscle too may thus contribute to foot eversion which normally accompanies medial rotation of the lower leg. Various muscles might therefore be involved in guaranteeing foot eversion prior to touchdown.

With regard to eversion in bipedal primates like man, the strength of peroneus muscles may be trained to guarantee stable foot positioning at touchdown. Therefore, after approval by our medical-ethical committee, a group of nine youthful gymnasts without a medical history was trained by warm-up exercises four times weekly intended to reinforce peroneus muscles. After four weeks this group performed the single-leg standing balance on board longer than a control group exercising with non-specific warm-ups. Evertor muscles reinforcement might therefore be used to prevent so-called “inversion traumatism”.

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