3D-Kinematics of Vertical Climbing in Hominoids

Summary / Zusammenfassung

In the anthropological literature the origin of bipedalism and its development have been a main focus of research. Today, the vertical climbing-hypothesis is the most generally accepted view, which suggests that vertical climbing is the biomechanical link between brachiation and bipedalism and is the critical positional behaviour preadaptive for hominid bipedality. The vertical climbing-hypothesis is confirmed only by a few two-dimensional kinematic studies, which some twenty years ago have suggested a connection between human bipedalism and vertical climbing in apes.

The focus of this study is to compare three-dimensional kinematics of vertical climbing in different species of hominoid primates (gorillas, bonobos, orang-utans and gibbons). The climbing sequences are recorded simultaneously by four digital video cameras. Angular displacement patterns of the major limb joints, cycle duration, the relative duration of the support phase or duty factor, stride length and speed, the type of limb support and gait patterns were all analysed, as well as the vertical inclination of the trunk relative to the substrate and the distance of the body centre of gravity from the substrate. For this, segment inertial properties have been derived from cadavers by segmentation.

Analyses show substantial differences in footfall patterns and kinematics of vertical climbing between the studied species, and allow to call into question qualitative descriptions of vertical climbing in the literature. As climbing is a very complex locomotion, considerable intra- and interindividual variation exists. Nevertheless, the similarities between individuals of different age/sex classes of one species are pronounced.

Publications / Publikationen


Keywords / Suchbegriffe

Primates, Hominoidea, Locomotion, Climbing, Kinematics

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