Simulative analysis of joint loading during leg press exercise for control applications

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Abstract

Leg extension is a multi-articular movement allowing flexibility of muscular activation and control. Therefore, joint loadings during leg press exercise can only be estimated using the whole reaction force vector together with the leg posture. A dynamic model of the musculoskeletal system as well as experimental data from a diagonal leg press are used to investigate external knee joint loadings and the influence of different orientations of the foot plate. Varying orientation in sagittal plane affects ankle, knee and hip loadings by changing the leg posture and the direction of the resulting force vector. Different orientations in frontal plane move the center of pressure of the force vector across the foot and thus change knee adduction and abduction moments. The results in this paper indicate, that high forces, which are required for an effective training, can be controlled using the foot orientation as manipulated variable. There by, unphysiological loadings and training-induced damage can be avoided.