THEORETICAL MODEL VALIDATION OF MUSCLE FORCES DURING EXTREME MOVEMENTS

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INTRODUCTION: The validation of the involved muscular forces for a computer model of the human body, which allows simulation of internal forces in patients, was achieved by inverse-dynamic analysis.

METHODS: Beginning with an extreme vertical jump, joint moments were extracted from high-speed film data and eventually subdivided into muscular forces. The muscle groups responsible for movements were determined by electromyography.
A squat jump with both legs and maximum strength was filmed in the sagittal plane with a frequency of 200 Hz. Moments in the hip, knee and ankle joints were determined from the film data. Using surface electrodes of a Neuraxon Myosoft 2008 system and an amplifier system from Multichannel Systems, the muscle groups responsible for movements were electromyographically determined. The muscle insertions and muscle paths were extracted from MRI pictures of patients.

RESULTS: With this information joint moments can be subdivided into single muscle forces. Depending on the jump demands, the muscle groups responsible for movements can be divided and analyzed in six extensor groups.

CONCLUSION: Inverse-dynamic muscle force analysis is a basis which can be expanded for the validation of complex movements under extreme internal loads in patients.