

## **Abstract**

**Title: Myodynamics of the support phase during different take-off tasks in human locomotion**

### **Objectives:**

Six types of take-off movement were analyzed in terms of support limb kinematics, take-off dynamics and muscle activation, in order to identify differences in motor control.

### **Methods:**

14 male athletes ( $22.6 \pm 4.4$  years;  $182.4 \pm 5.3$  cm;  $74.7 \pm 6.2$  kg) took part in laboratory experiment. Each athlete performed six different take-off movements (running, acceleration – first and second step, long jump take-off, high jump take-off and take-off to the hurdle). System Qualisys was used to analyze kinematics of the support limb. Dynamic of the support phase was measured with Kistler 9281 EA force-plate. ME6000 apparatus was used to measure the muscle activation. Results were processed and statistically evaluated in Matlab (MathWorks, Inc) environment. Pair ANOVA, T-test and Friedmann test were performed to identify differences between take-off movements. regression analysis was introduced to find the relationship between parameters.

### **Results:**

Significant differences in take-off dynamics are realized with not so significant differences in kinematic and electromyographic parameters. high jump and long jump take-offs acted most specifically in comparison with other types of take-offs. Two typically preactivation muscles were identified (tibialis anterior and biceps femoris). Other muscle's activation depended on the type of take-off. Cocontraction was specific for each type of jump.

### **Keywords**

track & field, kinematics, dynamics, biomechanics, kinesiology, preactivation, cocontraction, take-off, running, acceleration, long jump, high jump, hurdle, optimization