THE ROLE OF MUSCLE FATIGUE ON KNEE BIOMECHANICS DURING SINGLE LEG LANDINGS

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Introduction
The purpose of this research was to determine the role of the lower extremity muscle fatigue on the knee biomechanics and proprioceptive sensitivity during single leg landings.
Methods
The test protocol for the experimental group consisted of following phases: 1. testing of the knee joint muscle power (during which the myoelectric signals before fatigues were collected), 2. testing of the knee joint dynamic stability (execution of the tests with one-legged (landings) from the 40 cm high bench), 3. functional fatiguing of the lower extremity musculature (walking and running at the treadmill), 4. identical to phase 1, 5. identical to phase 2. The control group, contrary to the above stated, has maintained in the 3rd phase the daily level of the physical activity without fatiguing the musculature. The participants were completely healthy and with well developed motor abilities. Following kinematic variables were studied: valgus and varus angle, angle of the inner and outer rotation as well as the angle of the flexion and extension in the knee joint and ground reaction force (GRF). The original EMG signals m. vastus medialis, m. vastus lateralis, m. biceps femoris and m. gastrocnemius, have been measured during execution of the maximum static contraction lasting for 10 seconds, with the aid of an dynamo-metric bench, and used for assessment of the fatigue by spectral analysis. The test subject consisted of a control (n=15) and an experimental group (n=15).
Results
The drop in media frequency of the EMG signal power spectrum was noticed at majority of the measured muscles, but statistically significant difference between first and second measurement within the experimental group, only showed the muscles valstus medialis and vastus lateralis. Statistically significant drop in correlation coefficient of the kinematic parameters, within the experimental group after fatiguing, is particularly expressed in inner and outer rotation angle as well as valgus-varus movement of both legs, what points at a motor deficit i.e. decrease of the proprioceptive senses caused by musculature fatigue. The analysis of the GRF signal also shows statistically significant differences between groups at almost all components, excluding component in direction front – back.
Conclusion
This research showed a significant influence of the fatigue on the proprioceptive sensitivity and the motor control in knee joint. The implementation and benefit of this method could be in the prevention of the injuries in the rehabilitation phase, when the information of the athlete's ability for the increased strain is needed, and determining the proper moment for involvement into the training process or adequate kinesiological exercise programme respectively.

References
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Keywords: 3D Analysis, Fatigue, Knee