REDUCED MUSCLE FORCE FOLLOWING EXHAUSTIVE BALLISTIC CONTRACTIONS CAN MAINLY BE ATTRIBUTED TO CENTRAL FATIGUE

Leukel Christian¹, Taube Wolfgang, Gehring Dominic, Gollhofer Albert
(University of Freiburg ¹, Germany)

Introduction
A reduction in maximal voluntary muscle force or power can occur at the level of the muscle (peripheral fatigue) whereas central fatigue describes the failure of the nervous system to drive the motoneurons adequately (Gandevia 2001). During ballistic contractions, indirect measurements suggested that primarily central rather than peripheral fatigue caused a reduction in muscle force (Linnamo et al. 1998). The present study aimed to investigate fatigue-related changes after ballistic contractions with neurophysiological stimulation techniques. Thereby, Transcranial Magnetic Stimulation (TMS) as well as Peripheral Nerve Stimulation (PNS) were applied to distinguish between central and peripheral fatigue, respectively.

Methods
17 healthy subjects (age 26 ± 3 years) without any history of neurological and orthopaedic disorder participated in this study. Subjects performed sets of 20 ballistic isolated dorsiflexions until they could not afford 70% of their individual MVC. Before and after fatigue, Mmax and the corresponding resting motor twitch (PNS) as well as MEP recruitment curves were recorded in the right tibialis anterior muscle. Post measurement took place 2 minutes after subjects finished contractions.

Results
After fatigue, the slope of the MEP recruitment curves was significantly decreased (p = 0.01). However, TMS motor threshold was unchanged after fatigue (p = 0.74). Similarly, the electrically induced Mmax (p = 0.34) and the resting motor twitch (p = 0.99) were not altered following fatigue.

Discussion
The most important finding in this study was a decrement of the slope of the MEP recruitment curve with no changes in the TMS motor threshold. This indicates that the input-output properties of the motor system were reduced by fatigue. Since Mmax and resting motor twitch did not differ between measuring times, it can be concluded that central fatigue is mainly responsible for the reduction in muscle force.

References

Keywords: Neurophysiology, Fatigue