

### 1P23 Effect of delayed onset muscle soreness on central and peripheral fatigue

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**Purpose:** The present study investigated the extent to which the time course of central and peripheral fatigue during sustained maximal voluntary contraction (MVC) was affected by delayed onset muscle soreness (DOMS) induced by repetitive eccentric exercise (ECC).

**Methods:** Subjects were seven healthy volunteers (age, 21-23 yrs.). The subjects sat in an experimental chair with the shoulder and elbow angles at 90 degrees, and performed MVC of elbow flexion for 60 sec just before (control), 2 days and 4 days after the ECC. To induce DOMS, the subjects performed ECC (about 30 deg/sec, range 90-180 deg.) of elbow flexion 30 times with maximal effort. DOMS was estimated by visual analog scale (VAS, 0 to 100 mm) during palpation of the upper arm. Electromyographic (EMG) activity was recorded from the Biceps Brachii (BB). Transcranial magnetic stimulation (TMS) was given during the MVC. The level of voluntary activation (VA), which was estimated by the increment of force after the TMS, the area of motor evoked potential (MEP), EMG silent period (SP), ratio of EMG amplitude and force (RMS/F) and elbow flexion torque were measured during off-line analysis.

**Results:** In some subjects, the VAS was lower than level 5 even 2 days after the ECC. To assess the effect of DOMS on central and peripheral fatigue, data obtained from subjects with a low VAS level was eliminated from further analyses in the present study. At the end of MVC for 60 sec, the maximal voluntary torque decreased to 62.1 % in the control and 55.9 % in subjects with DOMS. Initial VA did not significantly differ in the two groups, but it decreased to 94.7 % in the control and 89.6 % in subjects with DOMS at the end of the task. The decrease in MVC and VA were significantly greater with DOMS compared to the control values. In addition, there was a significant correlation between decreases in VA and the level of DOMS. In contrast, prolongation of SP and increase in MEP during MVC were not affected by DOMS. Furthermore, RMS/F, which is an indicator of peripheral fatigue, was significantly greater with DOMS.

**Discussion:** In the present study, it was found that the time course of central and peripheral fatigue during MVC for 60 sec was affected by DOMS. Central and peripheral fatigue was found to progress faster with DOMS than without DOMS. These findings suggest that DOMS induced by the ECC affect not only the peripheral fatigue process but also mechanisms underlying central fatigue. However, detailed neural mechanisms on how DOMS affect central fatigue remain to be solved.

**Key words:** delayed onset muscle soreness, central fatigue, peripheral fatigue, MVC, transcranial magnetic stimulation

### 1P24 Examination of the mechanomyogram characteristics by the difference in type of muscle activity

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**Purpose:** The purpose of this study was to examine mechanomyogram characteristics during isometric contractions and during concentric and eccentric isokinetic contractions.

**Methods:** Nine male subjects performed 5s isometric knee extension at 9 different leg flexion angles, from 10° to 90° and concentric and eccentric isokinetic knee extension at 3 angular velocities (30%/s, 60%/s and 90%/s) from 100° to 0° (concentric) and 0° to 100° (eccentric). The MMG was detected from vastus lateralis. Measurements included mean torque, workload, mean power frequency (MPF) and integral MMG (iMMG)

**Results:** Isometric mean torque increased with an increase in knee joint angle and was the greatest at 70°. The %iMMG showed same change as mean torque, but the MPF remained unchanged. In eccentric contractions, the %iMMG for 30%/s changed with the joint angle and was similar with the workload. However, the %iMMG increased with a rise in angular velocity and the MPF showed on variation at different joint angles and angular velocities. In concentric contractions, the %iMMG and MPF did not change. The %iMMG for eccentric contractions, like the workload for eccentric contractions, were higher than those for concentric contractions. When angular velocity increased, the dissociation of workload and %iMMG did happen in early phase of both concentric and eccentric contractions,

**Discussion:** The results of this study suggested that for both isometric and eccentric contractions, %iMMG was consistent with the changes of torque and workload. In isokinetic contractions, artifacts such as intracellular fluid and body movement may be mixed in the MMG in early phase of contraction with a rise in angular velocity.

**Keywords:** MMG, isometric contraction, isokinetic contraction, iMMG, MPF