SPINAL REFLEX PLASTICITY DURING MAXIMAL DYNAMIC CONTRACTIONS FOLLOWING ECCENTRIC STRENGTH TRAINING.

Duclay Julien, Martin Alain, Robbe Alice, Pousson Michel (INSERM U887, France)

Introduction
During dynamic voluntary contraction, the H-reflex can be used as a tool to evaluate the modulation of the spinal loop (Duclay et al., 2005). Several investigations have indicated that reflexes evoked during the performance of the training exercise (Zehr, 2002) likely represent a more functional estimate of the training-induced adaptations at the spinal cord level. Because adaptations to training with maximal eccentric contractions results in a more action type specific response with greater neural adaptation than concentric exercise, it could be interesting to evaluate the plasticity of the spinal reflex modulations during dynamic actions following pure eccentric strength training. The aim of the present study was to use eccentric strength training of the plantar flexor muscles to investigate the plasticity of the spinal reflexes during maximal voluntary isometric, concentric and eccentric contractions.

Materials and methods
Eighteen healthy male subjects were divided into an eccentric strength training group (n=10) and a control group (n=8). The training program consisted of 18 sessions of pure eccentric exercise over a 7-week period. All subjects were tested at baseline (PRE session), after 9 training sessions (MID session) and after the last eccentric training session (POST session). Soleus (SOL) and medial gastrocnemius (MG) maximal H reflexes and M-waves were evoked at the same muscle length during passive isometric, shortening and lengthening actions (i.e., Hmax and Mmax, respectively) and during maximal voluntary isometric, concentric, and eccentric plantar flexion (MVC) (i.e., Hsup and Msup, respectively).

Results
After 18 training sessions, the MVC torque increased regardless of the contraction type. Hmax/Mmax ratios for both SOL and MG remained unchanged whatever the action type after training (P<0.05). The Hsup/Msup ratio was increased only during eccentric MVC for the SOL (P<0.01) and regardless of the contraction type for the MG (P<0.05). For the SOL, the eccentric SOL Hsup/Msup ratio was not different from the isometric and concentric Hsup/Msup ratios after 7 week of training. The MG Hsup/Msup ratios were not affected by the action type and were significantly higher during the MID and POST sessions than during the PRE session (P<0.05).

Discussion and conclusion
This study shows that the H-reflex obtained during dynamic contractions are modulated after eccentric training. Furthermore, for the first time, it was reported that the H reflex plasticity may be specific to the action type and the muscle studied. Changes in the regulation of the balance between excitation and inhibition affecting the motoneuron pool were suggested to explain this plasticity of the spinal reflex.