

# Acute effects of whole body vibration on quadriceps muscle voluntary and evoked torques

Jonas Saugy<sup>1</sup>, Nicola Maffiuletti<sup>2</sup>, Nicolas Place<sup>1</sup>

<sup>1</sup>Institute of Movement Sciences and Sport Medicine, University of Geneva, <sup>2</sup>Neuromuscular Research Laboratory, Schulthess Clinic

## INTRODUCTION

The use of whole body vibration (WBV) as a (re-)training modality for athletes and patients has considerably increased in recent years (Rittweger 2010). However, acute effects of WBV on neuromuscular function, and especially the influence of WBV on the extent of muscle fatigue during resistance exercise, remain to be clearly established. Therefore the purpose of the present study was to assess the acute effects of whole body vibration during repeated bouts of isometric half-squat exercise on quadriceps muscle voluntary and evoked force.

## METHODS

Nine subjects (8 men and 1 woman, age:  $32.3 \pm 4.9$  years) volunteered to participate to a randomized cross-over study. In both sessions (separated by 48 h), subjects had to maintain the half squat position with a barbell loaded to 50% of body mass on the shoulders ( $80^\circ$  of knee flexion,  $0^\circ$  = legs fully extended) for 1 min, repeated 5 times with 30 sec recovery between sets. In one session, the exercise was performed with 30 Hz, 4 mm-amplitude (WBV session), whereas no WBV was applied in the other session (CON session). The isometric maximal voluntary contraction torque (MVC) and the amplitude of the evoked response to electrical stimulation of the femoral nerve (paired stimuli at 100 Hz evoked after the MVC, i.e. potentiated peak doublet amplitude (Pd)) for the knee extensor muscles were measured before and immediately after the fatigue task.



Fig. 1. Placement of the electrodes for nerve and muscle stimulation

## RESULTS

Our results showed a significant ( $P < 0.01$ ) reduction in MVC for both sessions ( $-22.9 \pm 6.0\%$  vs.  $-24.9 \pm 6.0\%$  for WBV and CON sessions, respectively). In addition, Pd significantly ( $P < 0.01$ ) decreased by  $26.9 \pm 6.3\%$  for WBV and by  $22.7 \pm 5.6\%$  for CON. MVC and Pd losses were not different ( $P > 0.05$ ) between the two sessions.

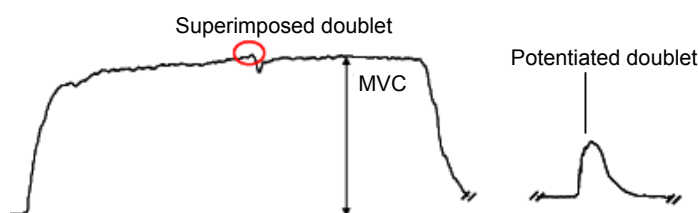
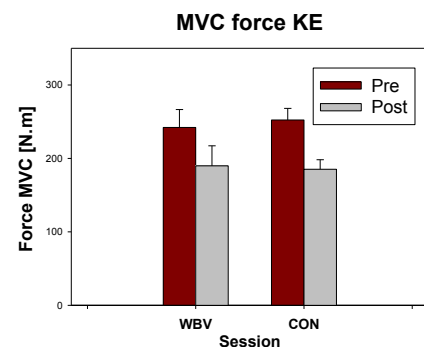


Fig. 2. Typical recording of a superimposed MVC followed by a potentiated doublet



## DISCUSSION

An impaired MVC force has already been observed after repeated bouts of 1-min WBV periods (de Ruiter et al. 2003). Here we show that (i) the decrease in the maximal force generating capacity, as measured with the MVC and (ii) the level of peripheral fatigue, as measured with the Pd, were not influenced by WBV. Thus WBV does not seem to be an effective stimulus to induce a greater level of muscle fatigue during a single bout of resistance training.

De Ruiter CJ, van der Linden RM, van der Zijden MJA, Hollander AP, de Haan A. Short-term effects of whole body vibration on maximal voluntary isometric knee extensor force and rate of force rise. *Eur J Appl Physiol* 2003; 88: 472-475

Rittweger J. Vibration as an exercise modality: how it may work, and what its potential might be. *Eur J Appl Physiol* 2010; 108: 877-904.

