RECOVERY OF POWER OUTPUT, SKELETAL MUSCLE
ANAEROBIC METABOLISM AND NEURAL ACTIVITY
FOLLOWING REPEATED SPRINTS
Mendez-Villanueva Alberto¹, Bishop David², Edge John³, Suriano Rob⁴, Hamer Peter⁴
(University of Alcala¹, Spain, University of Verona², Italy, Massey University³, New Zealand, The University of Western Australia⁴, Australia)

Introduction
The recovery of force production after a fatiguing bout of maximal work follows a time course that is partially dependent on the restoration of the homeostatic conditions within the working musculature. However, the factors that allow recovery of muscle function following recovery from previous fatiguing exercise are not well understood. The purpose of the present study was to examine the contraction capacity (i.e., power output) in relation to skeletal muscle anaerobic metabolism and net motor unit activity (i.e., EMG activity) following recovery from a previous repeated-sprint activity.

Methods
Eight healthy males performed 10, 6-s sprints on a cycle ergometer interspersed with 30 s of recovery. This was followed, after 6 min of passive recovery, by one, 6-s sprint (i.e., 11 x 6-s test). In one further trial (muscle biopsy condition) subjects performed only 10, 6-s sprints with 30 s of recovery (i.e., 10 x 6-s test). Mean power output (MPO) was calculated for each sprint. On the day of the 11 x 6-s cycle test, the EMG (i.e., RMS) activity from the vastus lateralis (VL) of the right leg was recorded. On the day of the 10 x 6-s cycle test, skeletal muscle anaerobic metabolism was evaluated from analysis of muscle biopsies from the VL obtained before (PRE), after (POST), and 6 min (POST6) after exercise.

Results
Over the first ten sprints, average MPO decreased by 27.2% (P < 0.001) from the maximal value. During sprint 11, following 6 min of passive rest, MPO values recovered significantly in relation to those achieved in sprint 10 (P < 0.001), but remained 11.7% (P < 0.005) lower than the values achieved during the first sprint. The value for RMS decreased over the ten sprints by 14.3% (P < 0.01). After the 6 min of rest between sprint 10 and sprint 11, RMS during sprint 11 did not show any recovery from sprint 10 and was 17.8% lower than the initial values recorded during the first sprint (P < 0.01). After the 6 min of rest between sprint 10 and sprint 11, RMS during sprint 11 did not show any recovery from sprint 10 and was 17.8% lower than the initial values recorded during the first sprint (P < 0.01). ATP decreased by 30.2% after sprint 10 (P < 0.0001). Following the 6 min recovery period, ATP was resynthesized to 92.8% of the resting value, being both values not significant different (P = 0.19). The PCr content of the muscle after sprint 10 was 46.9% of the resting value, and PCr was resynthesized to 82.2% of the resting value by 6 min into the recovery. Muscle pH decreased significantly by 0.22 pH units following the first 10 sprints and increased slightly (0.10 units) during the 6 min recovery.

Discussion
We found a concomitant incomplete resynthesis of anaerobic muscle metabolism (i.e., PCr) and a partial restoration of MPO, though muscle pH remained low throughout the recovery. In addition, following the recovery period a better single-sprint performance was accompanied by a lower motor-unit activity (i.e., lower RMS). Thus, our results suggest that the recovery of power output might be associated with both metabolic and neural adjustments.

Keywords: Electromyography, Anaerobic Power, Muscle Metabolism

12th Annual Congress of the ECSS, 11–14 July 2007, Jyväskylä, Finland