In the last decade, a new competition form, cross-country (XC) skiing sprint, has been developed. XC skiing sprint differs from normal distances because of shorter and repeated performances. Up to present, there is no data about muscle activation and only a little knowledge about physiological loading during XC skiing sprint competition. The aim of this study was to investigate loading during a simulated XC skiing sprint competition (SC) in free technique.

Sixteen male skiers performed SC on roller skies on an indoor tartan track. SC consisted of four 850 m heats separated by 20 min of recovery. Skiers were instructed to ski the first and the last 50 m of each heat at the maximal effort and mid part of the heat with the maximal race velocity. Heat times, heart rate (HR) and oxygen consumption (VO2) were measured during the heats. Peak lactate (LApeak), as the highest value during recovery, and lactate before (LApre) each heat were also measured. EMG and velocity was measured from the triceps brachii and vastus lateralis in the beginning (20-50 m) and at the end (820-850 m) of each heat. The EMG signals from individual muscles were summed to represent overall electrical activity of these muscles (sum-iEMG). Maximal skiing velocity (Vmax) and iEMG-activity (EMGmax) were measured before SC by performing a 30 m speed test.

Heat times of SC in heat 1 (H1), heat 2 (H2), heat 3 (H3) and heat 4 (H4) were 142.6 ± 5.0, 142.6 ± 5.1, 142.4 ± 5.5, 141.9 ± 5.3 s and VO2max were 64.4 ± 4.0, 65.7 ± 3.9, 65.7 ± 3.6, 65.9 ± 4.0 ml/kg/min, respectively. Mean HRmax was 180 ± 7 bpm with no change over the four heats. LApeak was 12.8 ± 2.4, 13.3 ± 3.0, 13.5 ± 2.8, 13.8 ± 2.7 mmol/l and LApre 1.6 ± 0.7, 5.3 ± 3.6, 5.9 ± 4.1, 6.2 ± 4.0 mmol/l. The above mentioned variables did not change between the four heats, except LApre which was higher in H2 (p<0.05), H3 and H4 (p<0.01) compared to H1. The final sprint (820-850m) velocities of H1, H2, H3 and H4 were 14 ± 5, 13 ± 5, 13 ± 3, 15 ± 5 % (all, p<0.001) lower than Vmax and sum-iEMG at the same measuring phases were 27 ± 13, 28 ± 15, 24 ± 10, 27 ± 14 % (all, p<0.001) lower than EMGmax. However, sum-iEMG in the beginning phases of each heat did not differ from that of the Vmax test.

The present metabolic findings are mainly in line with Stöggl et al. (2006). We observed significant decreases in muscle activation and velocities during the single heats which may partly indicate neural fatigue. These decreases in sport specific EMG are in line with Peltonen et al. (1997), showing the important role of the central nervous system in short duration endurance performance. In conclusion, each single heat induced neuromuscular fatigue but the recovery between the heats seems to be long enough for preventing accumulation of fatigue.

REFERENCES
Keywords: Physical Load, Cross Country Skiing, Sprint