NUEROMUSCULAR FATIGUE OF ATHLETES, ENGAGED IN ENDURANCE AND EXPLOSIVE CONTRACTION TYPE SPORTS

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Numerous animal studies reported about the relationship between innervation frequency and the muscle fibre properties (for review see Pette and Staron 1997; Gundersen 1998). However, there is little information in the literature about the relationship between electromyographical parameters and different muscle types in athletes. Kupa et al. (1995) and Gerdle et al. (1997) reported close links between the median / mean power frequency (MPF) of the EMG-signal and muscle morphology. The aim of this study was to compare the EMG pattern during muscular contraction in four different groups of athletes.

EMG and force measurements were taken from three heads of the M. quadriceps femoris of 12 volleyball players (VG), 12 sprinters (SG), 12 marathon runners (MG), and 12 control subjects (CG, not specifically trained physical education students) in isometric contractions from 10% of the maximum voluntary contraction (MVC) to 90% MVC. All subjects performed at each force level 10 trials (5 seconds of contraction) with a rest of 5 seconds in between until the required force could not be achieved any more.

- The number of contractions of the sprint group (SG) was significantly reduced in comparison to the remaining three groups.
- The marathon group (MG) and the control group (CG) were significantly different to SG and to each other.
- The averaged mean power frequency (MPF) from the three heads of the quadriiceps did not show significant differences between the groups. But for the vastus lateralis EMG, measured with the 2-channel electrode assembly, differences were found, especially between MG and CG and MG and SG (Table 1).

- The MPF-values at 10 to 40% MVC within the sprint group (p<0.01) as well as over all subjects (p<0.05) were inversely correlated to the sprint time.
- An inverse correlation (p<0.05) existed also between the number of achieved contractions and the sprint time over all subjects.

The results indicate a strong relationship between the ability to sustain fatigue and the MPF because MG and VG had the highest number of contractions as well as the lowest MPF-values. These results fit well into the concept that low innervation frequencies transform muscle fibre properties towards slower contraction characteristics.

REFERENCES