Muscle fatigue is a complex phenomenon that can be defined as an inability to maintain a desired level of force production, or as a reduction in the maximum force that a muscle can exert. Self-selected pacing strategy in a time trial is a consequence of a complex regulatory system, in which a central governor regulates voluntary activation and running intensity to ensure that no irreparable damage occurs to cellular function (St Clair Gibson and Noakes 2004, Noakes et al. 2005). Most studies have examined muscle fatigue by comparing the maximal performance before and after the exercise. Little is known about the development of fatigue during the endurance exercise. Therefore the aim of the present study was to compare the fatigue-induced changes in neuromuscular and stride characteristics in maximal short-term running at the end of the 5 km time trial to the neuromuscular alterations during the self-paced 5 km time trial. Eighteen well-trained male distance runners performed a maximal 20 m sprint test before and at the end of the 5 km running time trial. During the 20 m sprints and 5 km time trial the EMG of the five lower limb muscles and stride characteristics were measured. The sum of average EMG (AEMG) of all the muscles was calculated and used in the statistical analysis. In the 5 km time trial the decrease in the velocity from the beginning to the end of the trial was 9.9 ± 6.3 % (p < 0.001). The maximal 20 m velocity decreased 16.3 ± 5.2 % after the 5 km time trial (p < 0.001). However, the velocity in the end spurt of the 5 km time trial was 34.7 ± 11.7 % (p < 0.001) higher than the velocity before it. The decrease in velocity during the 5 km time trial did not correlate with the decrease in maximal 20 m velocity (r = 0.24). The fatigue in the 20 m sprint test was related to the maximal 20 m pre-test velocity (r = 0.58, p < 0.05), whereas the decrease in velocity during the 5 km time trial was inversely related to 5 km performance (r = -0.60, p < 0.05) and training volume (r = -0.58, p < 0.05). The AEMG of the pre-activation and total ground contact phase decreased in maximal 20 m sprinting as well as during the 5 km (p < 0.05). The changes in the AEMG during the pre-activation phase was inversely related to the changes in ground contact time (r = -0.80, p < 0.001) in the maximal 20 m sprint, suggesting that the alterations in central activation may play a role in muscle fatigue developed in the 5 km time trial. It was concluded that the muscle fatigue measured from the maximal 20 m sprinting differed from the fatigue measured during the 5 km time trial. The fatigue during the 5 km time trial depended on the pacing strategy. It may be postulated that the pacing strategy was related to the regulatory processes which aimed to ensure that a physiological reserve was maintained.

REFERENCES


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