THE DIFFERENCE IN THE ANAEROBIC PROFILE OF ELITE AND SUB-ELITE 400 M SPRINTERS

Dominik Kolinger[1] • Petr Šťastný[1] • Pavlína Vostatková[1] • Ewelina Maculewicz[2] • Katarzyna Lorenz[2] • Anna Pisz[1]

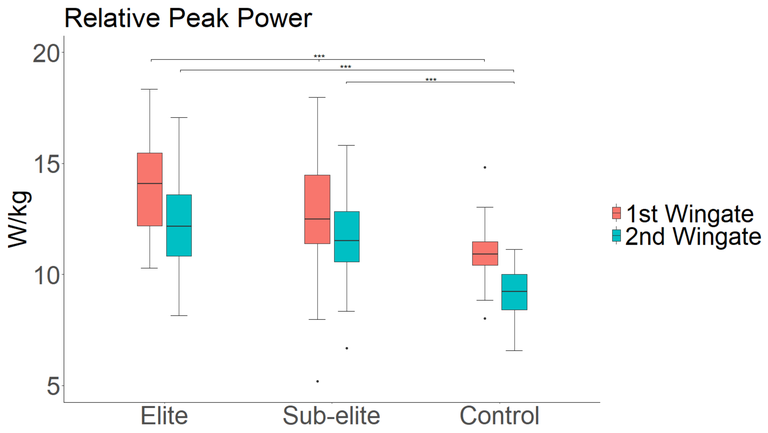
[1]Faculty of Physical Education and Sport, Charles University, Prague, Czech Republic; [2]AWF Warsaw, Poland

PURPOSE

Performance in the 400-meter sprint is largely determined by the capacity of the anaerobic system and the tolerance to lactate accumulation. Anaerobic performance consists of several parameters, such as peak power, power drop, and total work done. Each of these parameters represents a different training approach. Therefore, the aim of this study was to determine the critical anaerobic performance parameters of elite and sub-elite sprinters and to identify significantly different parameters between these groups and a control group in order to determine the optimal training direction.

METHODS

A total of 249 subjects participated in the cross-sectional study. 149 Czech and Polish male 400 m sprinters divided into two groups: Elite (n: 82, personal best (PB): 48.5 ± 1.02 s, age: 21.2 ± 4), Sub-elite (n: 67, PB: 51.4 ± 1.82 s, age: 19 ± 2.7) and a Control group of physically active men (n: 100, age: 20.5 ± 1.2). The measurement was carried out on a single occasion in the pre-season period. After a non-specific warm-up and a specific warm-up the participants performed two maximal Wingate tests of 30 seconds each with a load equal to 7.5 % of body weight. The tests were separated by a rest period of 3 minutes. Finger capillary blood samples were collected for blood lactate analysis before and during the exercise.



RESULTS

The relative peak power outputs of the Wingate 1 (W1) were significantly ($\rho < 0.05$) different between the Elite (E), Sub-elite (SE), and Control (C) group. The relative peak power outputs of the Wingate 2 (W2) did not differ significantly between E and SE, but did differ significantly between the two performance groups and C group. The decrease in peak power between W1 and W2 was significantly lower in SE (8.1±16%) compared to E (12.8±9.4%) and C (15.3±9.1%). Relative total work in W1 was significantly higher in E (0.294 ± 0.25 kJ/kg) compared to C (0.197 ± 0.023 kJ/kg), but did not show a significant difference from SE (0.247 ± 0.065 kJ/kg). The relative total work in W2 was significantly lower in C (0.159 ± 0.029 kJ/kg) compared to E (0.248 ± 0.203 kJ/kg) and SE (0.229 ± 0.036 kJ/kg). The blood lactate level during the rest period between W1 and W2 was significantly higher in E (13.6 ± 2.1 mmol/l) compared to SE (12.6 ± 2.7 mmol/l) and C (11.4 ± 2 mmol/l).

CONTACT

Mgr. Dominik Kolinger, do.kolinger@gmail.com

CONCLUSION

Peak power output appears to be the main determinant of performance that separates elite from sub-elite performance. Although elite runners perform at higher blood lactate concentrations, they show a more significant decline in maximal power output over time and no difference in total anaerobic capacity compared to sub-elite sprinters. Long sprint coaches should focus on maximum power training over speed endurance training. When selecting talent for the 400-meter sprint, preference should be given to individuals with high speed and strength potential.