AEROBIC CAPACITY AND RUNNING ECONOMY IN SPRINTERS, MIDDLE DISTANCE, LONG DISTANCE AND 400m RUNNERS

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Introduction
The energy demand for running at submaximal speed (running economy, RE) can be quantified by measuring the steady-state VO2, for a given running speed. The aim of this study was to examine the differences in aerobic capacity and running economy between runners competing in running events with different aerobic and anaerobic metabolic demands.

Methods
Forty-eight national level male runners: ten sprinters (S) (184.961617;4.8 cm, 76.661617;4.8 kg), personal best (PB) on 100m sprint = 10.8761617;0.41s; fifteen 400m (S4) (180.961617;4.2 cm, 73.061617;6.3 kg), PB on 400m = 49.561617;1.9s; ten middle distance (MD) (180.461617;5.7 cm, 68.661617;6.2 kg) and thirteen long distance (LD) (n=13; 179.161617;6.7 cm, 69.561617;7.0 kg ) runners participated in the study. As the steady-state, at low to moderate work rates, is attained in approximately 3 minutes, they performed an incremental treadmill test with 2 km/h speed increase every 4 minutes (1.5% grade) until volitional exhaustion. Metabolic and ventilatory parameters were collected at 8, 10 and 12 kmh-1 and at maximum exercise intensity, and the anaerobic ventilatory threshold (AnT, respiratory compensation point according to Wasserman) was calculated with the V-slope method. The analysis of variance was used to explore the relationship and determine differences in observed variables between the groups.

Results
With increasing length of track covered for a given running event, a progressive increase of aerobic capacity as well as increase of running economy was found. The groups differed significantly regarding both VO2max (55.4 ± 3.4; 59.6 ± 4.6; 64.4 ± 4.4 and 66.4 ± 4.7 ml/kgmin-1, p<0.01) and AnT (48.8 ± 2.4; 51.5 ± 3.9; 55.9 ±4.3 and 59.0 ± 4.8 ml/kgmin-1, p<0.01), for S, S4, MD and LD, respectively. Significant differences between groups were also found for running economy at velocities below AnT (C8, metabolic cost at 8 kmh-1 – 0.217 ± 0.02; 0.212 ± 0.03; 0.208 ±0.02 and 0.195 ± 0.01 ml/kgm-1, p<0.05; C10 – 0.215 ± 0.01; 0.210 ± 0.02; 0.203 ± 0.02 and 0.191 ± 0.02 ml/kgm-1, p<0.01; C12 – 0.211 ± 0.01; 0.208 ± 0.02; 0.198 ±0.01 and 0.188 ± 0.01 ml/kgm-1, p<0.01; for S, S4, MD and LD, respectively). The increase of running economy with increasing running speed was also significant, within each single group of runners (C8 > C10 > C12, p<0.05).

Conclusion
The present study demonstrates differences in physiological characteristics of national level runners specializing in different racing events. Significant differences between runners of various running disciplines were present in all the observed variables of aerobic capacity and running economy.

References

Keywords: Running, Endurance Performance, Economy