World Academy of Science, Engineering and Technology
International Journal of Sport and Health Sciences
Vol:11, No:06, 2017

The Accuracy of an 8-Minute Running Field Test to Estimate Lactate Threshold

Authors : Timothy Quinn, Ronald Croce, Aliaksandr Leuchanka, Justin Walker

Abstract : Many endurance athletes train at or just below an intensity associated with their lactate threshold (LT) and often the heart rate (HR) that these athletes use for their LT are above their true LT-HR measured in a laboratory. Training above their true LT-HR may lead to overtraining and injury. Few athletes have the capability of measuring their LT in a laboratory and rely on perception to guide them, as accurate field tests to determine LT are limited. Therefore, the purpose of this study was to determine if an 8-minute field test could accurately define the HR associated with LT as measured in the laboratory. On Day 1, fifteen male runners (mean±SD; age, 27.8±4.1 years; height, 177.9±7.1 cm; body mass, 72.3±6.2 kg; body fat, 8.3±3.1%) performed a discontinuous treadmill LT/maximal oxygen consumption (LT/VO2max) test using a portable metabolic gas analyzer (Cosmed K4b2) and a lactate analyzer (Analox GL5). The LT (and associated HR) was determined using the 1/+1 method, where blood lactate increased by 1 mMol•L-1 over baseline followed by an additional 1 mMol•L-1 increase. Days 2 and 3 were randomized, and the athletes performed either an 8-minute run on the treadmill (TM) or on a 160-m indoor track (TR) in an effort to cover as much distance as possible while maintaining a high intensity throughout the entire 8 minutes. VO2, HR, ventilation (VE), and respiratory exchange ratio (RER) were measured using the Cosmed system, and rating of perceived exertion (RPE; 6-20 scale) was recorded every minute. All variables were averaged over the 8 minutes. The total distance covered over the 8 minutes was measured in both conditions. At the completion of the 8-minute runs, blood lactate was measured. Paired sample t-tests and pairwise Pearson correlations were computed to determine the relationship between variables measured in the field tests versus those obtained in the laboratory at LT. An alpha level of <0.05 was required for statistical significance. The HR (mean +SD) during the TM (167+9 bpm) and TR (172+9 bpm) tests were strongly correlated to the HR measured during the laboratory LT (169+11 bpm) test ($r=0.68$; $p<0.03$ and $r=0.88$; $p<0.001$, respectively). Blood lactate values during the TM and TR tests were not different from each other but were strongly correlated with the laboratory LT ($r=0.73$; $p<0.04$ and $r=0.66$; $p<0.05$, respectively). VE (L□min-1) was significantly greater during the TR (134.8+11.4 L□min-1) as compared to the TM (123.3+16.2 L□min-1) with moderately strong correlations to the laboratory threshold values ($r=0.38$; $p=0.27$ and $r=0.58$; $p=0.06$, respectively). VO2 was higher during TR (51.4 ml□kg-1□min-1) compared to TM (47.4 ml□kg-1□min-1) with correlations of 0.33 ($p=0.35$) and 0.48 ($p=0.13$), respectively to threshold values. Total distance run was significantly greater during the TR (2331.6+180.9 m) as compared to the TM (2177.0+232.6 m), but they were strongly correlated with each other ($r=0.82$; $p<0.002$). These results suggest that an 8-minute running field test can accurately predict the HR associated with the LT and may be a simple test that athletes and coaches could implement to aid in training techniques.

Keywords : blood lactate, heart rate, running, training
Conference Title : ICKESS 2017 : International Conference on Kinesiology, Exercise and Sport Sciences
Conference Location : London, United Kingdom
Conference Dates : June 28-29, 2017