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2240 Board #253 June 1 2:00 PM - 3:30 PM

Allometric Scaling for Endurance Variables in Croatian Army

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(No relationships reported)

Body mass bias is widely spread among physical performance testing and may confound the results often leading to misinterpretation. Endurance testing is a part of physical performance testing in the army and is generally assessed by running distance time. Two such tests, 2-mile run (2MR) and 300 yards run (300YR), are used to assess soldiers' endurance. Also, incremental  $\text{VO}_2\text{max}$  treadmill test is used as a measure of aerobic capacity. If expressed as a relative value (ratio of  $\text{VO}_2\text{max}$  and body mass) or  $\text{RVO}_2\text{max}$  it is a good predictor of endurance or long distance running time. Considering that longer distances running time and  $\text{RVO}_2\text{max}$  are measures dependent of body mass, it is important to determine how to allow comparisons between subjects independent of their body mass. One practical solution is to determine body mass allometric exponent for distance running time.

**PURPOSE:** To determine experimental body mass allometric exponent (eAE) for endurance variables and if it corresponds to proposed theoretical body mass allometric exponent (tAE) which equals 0.33.

**METHODS:** 572 healthy male army recruits (mean age 29.4y) underwent endurance assessment comprised of a standard endurance testing battery in Croatian Army: 2-mile run (2MR), 300-yards run (300YR) and incremental  $\text{VO}_2\text{max}$  treadmill test. Their body mass (BM) was also measured. Relative maximal oxygen uptake ( $\text{RVO}_2\text{max}$ ) was taken as a measure of endurance since it is a better predictor of long distance running time. A regression technique was applied on the log-transformed data in order to determine the values of the allometric exponent for each particular test. One sample t-test was used to determine statistical differences between average eAE and tAE.

**RESULTS:** Regression analysis yielded BM allometric exponents for 2MR, eAE=0.33 (95%CI=0.23 - 0.43);  $\text{RVO}_2\text{max}$ , eAE=-0.47 (95%CI= -0.55 - (-0.38)); 300YR, eAE=0.22 (95%CI=0.15 - 0.28). Mean eAE =0.34 and compared with tAE=0.33 was not significantly different ( $p>0.05$ ) when tested by one sample t-test.

**CONCLUSION:** The results indicate that experimentally derived mean AE for endurance variables correspond to theoretical one and as such should be used for scaling endurance variables and comparing results of endurance tests recorded as running times. Supported by Grant of Ministry of Defence of the Republic of Croatia

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Self reported Performance Measures Of Males Are Predictive Of Overall Performance In The Crossfit Open

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(No relationships reported)

**PURPOSE:** To determine if measures of strength and skill, obtained from online athlete profiles, could distinguish overall performance in an international online fitness competition (OFC).

**METHODS:** The highest ranking male competitors ( $n = 1500$ ;  $27.18 \pm 8.4$  y;  $85.2 \pm 7.88$  kg;  $177.01 \pm 6.47$  cm) were split into quintile groups (Q1 - Q5). Subsequently, quintile comparisons were made using self-reported performances for a one-repetition maximum (1RM), squat (SQ), deadlift (DL), clean and jerk (CJ), snatch (SN), 400-m sprint, 5,000-m run, and benchmark workouts (Fran, Helen, Grace, Filthy 50, and Flight-gone-bad) via separate one-way analysis of variance.

**RESULTS:** Greater ( $p < 0.011$ ) performance scores were reported by Q1 for DL ( $232.4 \pm 20.5$  kg), SQ ( $201.6 \pm 19.1$  kg), CJ ( $148.9 \pm 12.1$  kg), SN ( $119.4 \pm 10.9$  kg) and Fran ( $2.3 \pm 0.2$  min) compared to all other quintiles. For Grace, Q1 ( $1.7 \pm 0.4$  min) reported faster ( $p < 0.001$ ) completion times than Q3 - Q5, while their performances in the 400-m sprint ( $59.3 \pm 5.9$  sec), Helen ( $7.6 \pm 0.6$  min) and Flight-gone-bad ( $430 \pm 70$  repetitions) were only better than Q3 ( $62.6 \pm 7.3$  sec,  $p = 0.022$ ), Q4 ( $7.9 \pm 0.7$  min,  $p = 0.007$ ) and Q5 ( $398 \pm 73$  repetitions,  $p = 0.010$ ) respectively. No specific quintile differences were observed in 5,000-m or Filthy-50 performance.

**CONCLUSION:** The data indicates that the most successful male athletes in this OFC possessed the greatest strength and power. Further, these athletes performed the best in a short-duration ( $< 3$  min) sports-specific workout (i.e., Fran) that emphasized these characteristics. Lower ranking athletes should focus on emphasizing strength and power development once sufficient anaerobic, aerobic, and sports-specific proficiency has been attained.

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2242 Board #255 June 1 2:00 PM - 3:30 PM

Increases in Maximum Oxygen Consumption and Lactate Threshold Predict Improvements in Race Performance during a Cross Country Season

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To our knowledge, the relationship between many physiological adaptations due to in-season training and their impact on racing performance remains unclear.

**PURPOSE:** To investigate multiple physiological variables that contribute to the greatest improvements in 6,000m cross country race performance.

**METHODS:** Nine female collegiate cross country athletes ( $1.8 \pm 0.1$  m,  $59.6 \pm 3.9$  kg) were evaluated twice during their competitive cross country season: pre-season (T1) and mid-season (T2). Subjects completed a graded exercise test to volitional fatigue on a motor driven treadmill. Oxygen consumption was measured by a Parvo TruOne 2400 Metabolic cart. Near-infrared spectroscopy (Portamon, Artinis Inc.) of the vastus lateralis was used to measure tissue saturation index (TSI) for each stage of the graded exercise test. In this study, the slope of the decline in TSI was determined and used to quantify the muscle oxygenation response. Blood lactate was analyzed at each workload by a handheld lactate analyzer (Nova Biomedical) to determine the inflection point of lactate accumulation. Efficiency was determined from work output and energy input during running. Changes in these variables along with standardized race performance times were analyzed.

**RESULTS:**  $\text{VO}_2\text{max}$  significantly increased ( $p < 0.05$ ) from T1 to T2 ( $51.6 \pm 3.2$  ml/kg/min to  $56.6 \pm 4.3$  ml/kg/min) indicating an average gain of  $4.9 \pm 3.9$  ml/kg/min or 9.7%. The slope of the TSI became more positive from T1 ( $-14.8 \times 10^{-3} + 6 \times 10^{-3}$ ) to T2 ( $-7.9 \times 10^{-3} + 7 \times 10^{-3}$ ), indicating less of a decline in muscle deoxygenation. The LT increased by one workload in four of the nine subjects. The subjects who experienced an increase in LT also experienced an increase in racing performance. Lastly, running efficiency did not significantly change between T1 and T2.

**CONCLUSIONS:** On average,  $\text{VO}_2\text{max}$ , LT, and muscle oxygenation improved from pre- to mid-season. The greatest gains in  $\text{VO}_2\text{max}$  and in LT from pre-season to mid-season correlated to the greatest improvements in racing performance. About 40% of the variance in race performance can be explained by the changes in  $\text{VO}_2\text{max}$  whereas improvements in LT explained 32% of the variance in racing performance. These data suggest that improvements in  $\text{VO}_2\text{max}$  are most important in predicting race performance in collegiate cross country runners.