

Within-Day Reliability of Submaximal Running Economy Testing

GARRETT M. OEHLERT¹, ERIC J. JONES¹, & DUSTIN P. JOUBERT²

¹Human Performance Lab; Department of Kinesiology and Health Science; Stephen F. Austin State University; Nacogdoches, TX

²Endurance Performance Lab; Department of Kinesiology; St. Edward's University; Austin, TX

Category: Masters

Advisor / Mentor: Joubert, Dustin (djoubert1@stedwards.edu)

ABSTRACT

Running economy (RE), a measure of oxygen consumption associated with a given intensity, has been identified as a critical component of endurance performance. Acute, same-day interventions, such as alterations in footwear, have been shown to significantly impact RE. Quantifying the reliability of within-day RE measures would determine minimal detectable differences that could be expected when testing footwear and other acute interventions. **PURPOSE:** Assess the within-day reliability of RE testing on a calibrated metabolic measurement system. **METHODS:** Trained male distance runners (n=10) were recruited to perform 4 × 5-minute trials under constant conditions (set speed and in their own shoes) at their estimated marathon pace (14.64 ± 1.39 km h⁻¹; 5-minute rest period) during a single visit to the lab. Oxygen consumption (VO₂ in mL · kg⁻¹ · min⁻¹) and energy expenditure (EE in kcal · min⁻¹) data were collected on a metabolic cart (Parvo Medics TrueOne2400) during the final two minutes of each stage and averaged in duplicate across stages (A-B-B-A) to replicate the structure of common AFT testing. Both duplicate (A-B-B-A) and singular (A-B) measures were utilized for comparison. Within-subject standard deviations of metabolic measures between trials were divided by their means to determine coefficient of variation (CV) for each individual. Individual CV values were averaged across subjects to determine mean CV for each measure. **RESULTS:** In duplicate measures, mean CV in VO₂ was shown to be 0.57 ± 0.46% and ranged from 0.04 - 1.30% across subjects. In singular measures, mean CV in VO₂ was shown to be 0.50 ± 0.51% and ranged from 0.08 - 1.63% across subjects. In duplicate, mean CV in EE was shown to be 0.61 ± 0.44% and ranged from 0.08 - 1.35% across subjects. In singular measures, mean CV in EE was shown to be 0.55 ± 0.45% and ranged from 0.12 - 1.43% across subjects. A repeated measures ANOVA revealed no differences in either VO₂ (p = 0.662) or EE (p = 0.932) across trials. **CONCLUSIONS:** The small CV values in these results indicate that observed differences in VO₂ and EE values beyond ~0.6% while testing acute conditions, such as footwear selection, could be attributed to the condition rather than biological or mechanical variability. The metabolic system in the current study exhibited consistently low variability in VO₂, both in duplicate measures and singular measures, which seems to indicate that AFT testing with either method could elicit reliable results. However, in a less reliable metabolic cart, duplicate measures may serve to improve the reliability of the protocol.