FIELD BASED TESTING PROTOCOLS TO MONITOR TRAINING ADAPTATIONS AND PERFORMANCE IN ELITE ROWERS

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ABSTRACT

Laboratory-based rowing tests are the established standard for assessing fitness traits among elite rowers, and for prescribing individualised exercise intensities for training. But because tests occur on a rowing ergometer, the specificity of laboratory testing has been questioned compared with the criterion of on-water rowing. This project validated equipment required to replicate a laboratory-based rowing test in the field and evaluated the feasibility of on-water tests. Ergometer and on-water test results were compared to assess the validity of ergometer-derived training prescriptions and to establish the effectiveness of on-water tests for monitoring longitudinal fitness changes and for predicting rowing performance.

Concept2 rowing ergometers (Morrisville, USA) have frequently been used for rowing tests. Although subtle design variations exist between the different models of Concept2 ergometer, there were no substantial differences between the results from incremental rowing tests using Model C and Model D ergometers. The Concept2 Model D was therefore accepted as the standard ergometer for subsequent laboratory tests. Typical error (TE) results from duplicate Concept2 Model D tests conducted 2-4 d apart showed that laboratory tests were highly reliable (TE: maximal power = 2.8%, peak oxygen consumption = 2.5%).

As oxygen consumption ($\dot{V}O_2$) is measured routinely during laboratory rowing tests, it is necessary to obtain similar measurements during any on-water protocol. The MetaMax 3B portable indirect calorimetry system (Cortex, Leipzig, Germany) was therefore validated against a first-principles, laboratory-based indirect calorimetry system (MOUSe, Australian Institute of Sport, Canberra, Australia). $\dot{V}O_2$ from the MetaMax was significantly higher during submaximal exercise (p=0.03), although results were within 0.16 L.min^{-1} (4.1%) across all exercise intensities. There was good agreement between duplicate MetaMax trials separated by ~2 d; mean $\dot{V}O_2$ was within 0.11 L.min^{-1} (2.5%) and TE was ≤2.3%.

The specificity of rowing testing was improved using an On-water incremental test that replicated a laboratory-based Ergometer protocol. However, the individual variation in physiological responses between-tests meant that training intensity recommendations from the Ergometer test were not always applicable to on-water

training. Furthermore, measurements from the On-water protocol displayed similar or lesser reliability (TE=1.9-19.2%) compared with the Ergometer test (TE=0.1-11.0%).

As an effective fitness test must also be sensitive to longitudinal changes, the responses to 6 wks training were compared between the Ergometer and On-water methods. The magnitude of On-water training effects were usually greater (small Cohen's effect size) compared with the Ergometer test (trivial effect), although On-water and Ergometer tests both indicated that training responses were negligible because virtually all changes were less than one of their respective TEs. Correlations between test results and rowing performance were largest when rowing mode was matched between conditions, but Ergometer results provided the highest correlations (Ergometer vs. 2000-m ergometer time-trial: R= -0.92 to -0.97 compared with On-water vs. On-water maximal power output: R=0.52 to 0.92).

Although On-water tests improved the specificity of on-water training prescriptions, these tests provided no obvious benefits for monitoring longitudinal fitness changes or performance compared with Ergometer tests. Given that On-water tests are also more time consuming and logistically challenging, their practical application is limited.

DECLARATION

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

Andrew J. Vogler

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