Predicting the Expenditure of Anaerobic Work Capacity (AWCexp) based on Changes to the Torque-Velocity Curve

Karlee Edwards: Collaboration with Dr. Randolph Hutchison¹, Kelly Humes¹, Gibson Klapthor¹, Kristine Knowles¹, Gregory Mocko², & Ardalan Vahidi²

1 Department of Health Sciences, Furman University  Molnar Lab 2 Department of Mechanical Engineering, Clemson University

Background

- Some cancer risks can be reduced by physical activity, but assessment is often self-reported and imprecise.
- Must establish individuals’ objective, quantitative, and predictive measures for non-invasive means of activity levels.

Proposed Model

Cycling is an effective model for activity assessment and this study is to demonstrate how 3 tests can determine an individual’s Anaerobic Work Capacity (AWC), the threshold between heavy and severe exercise known as Critical Power (CP), and the correlation between AWC and changes to the torque-velocity curve (T-v).

Methods

- Subject: Male (n=10) and female (n=2) subjects, regularly trained cyclists or triathletes. Age (37.8 ± 11.6), Weight (72.7 ± 6.2)
- Exercise at increasing powers until exhaustion.
- Exercise for a set time of “all-out” power. CP6=last 30 second average, AWCexp=“area under the curve”
- 3 Separate T-v sprints, each at a different AWCexp-fatigue levels based on predicted 6-min exhaustive power (CP6).

Figure 1 represents the protocol used for the second day of testing. Literature has shown that an individual’s CP can be determined by a 3 min all-out sprint.

Figure 2 represents the novel protocol used for the third day of testing. We predicted that using an individual’s CP6 for a fatigue interval power, 100% AWC would be expended.

Subjects

- V02 ramps
- 3 Min All-out
- Sprint

Figure 3 represents the actual T-v curve. Each line is representative of the torque and velocity data for the corresponding sprint throughout the protocol.

Results

- Figure 3: Effects of AWCexp on T-v Curve
  - Fresh Sprint
  - Fatigue Sprint 1
  - Fatigue Sprint 2

- Figure 4: Effect of AWCexp on T/Tmax, V/Vmax, and Area under T-v curve

Conclusions

- Our protocols can individualize exercise prescription by determining the threshold between moderate and vigorous exercise.
- Potentially, at any moment in time, changes to the T-v curve during a 6-second sprint could determine a subject’s state of fatigue or remaining AWC.

References


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CONTACT: karleeeedwards92@gmail.com
- kellyannhumes@gmail.com
- kristineknowles@furman.edu
- kellyanhumes@gmail.com
- kelly.humes@furman.edu
- rhutchis@gmail.com
- kelleighumes@gmail.com
- kelleighumes@gmail.com

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