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Do laboratory based tests give an accurate indication of potential race performances, taken from:

Jobson et al (2007) **The ecological validity of laboratory cycling: does body size explain the difference between laboratory and field based cycling performance.** Journal of Sports Sciences, 25(1): 3-9

Lab tests are a common tool for predicting fitness level and race performances, as a triathlete you only need access to a turbo trainer, treadmill and heart rate monitor and you can easily rig up your own tests. Completing tests on a regular basis allows you to monitor your own progress throughout the year and gives vital feedback for you and your coach.

In addition to monitoring progress, lab tests are used to predict race performances. If a group of triathletes each complete a time trial on the same turbo, theoretically the one who averages the highest power output should be the fastest cyclist in a road time trial. Jobson et al (2007) questioned whether this was actually the case and set out to determine if lab based tests were an accurate predictor of race performances in the field setting.

A total of 23 male cyclists completed a 25 mile time trial in the laboratory (on a kingcycle) and a 25 mile time trial on a recognized RTTC course, in addition, the body measurements of each rider were recorded.

Results

The first thing of note was that all participants rode slower on the road than they did on the kingcycle, despite an accurate calibration procedure before starting the lab testing. More significantly, the larger the participant the greater the difference between lab and road performance (larger people slowed more on the road).

Discussion

The results indicated that body mass was the main determinant of differences between road and lab performances. Body weight has long been recognised as a key indicator of road performance and the 'power to weight ratio' is often used as an indicator of performance. To calculate power to weight ratio, complete a ramp test on a turbo which gives power output and divide the end score (maximal aerobic power output) by body weight (Kg) to give watts per Kg. It needs to be highlighted that there are many different ramp test protocols and many different turbo trainers with power output displayed. The test and the turbo will determine results to a large extent and the same test and turbo must be used for future tests to ensure validity of results.

If we use 'power to weight ratio' to explain the differences encountered between the road and lab performances, the explanation would be something along the lines of: "the big guys scored higher power outputs on the kingcycle, but when they rode outdoors, they couldn't carry all that weight uphill, so the lighter guys performed relatively better". That would be a fair explanation had the test not taken place on a flat RTTC 25 mile course, surely on a flat course weight is not an issue, right?

The results indicated that weight was not an issue, but body surface area was the key factor, the calculation for BSA is $\sqrt{\text{Height(cm)} \times \text{Weight(Kg)} / 3600}$, and the answer is given as m^2 . Body size is relevant for both flat and hilly courses, on hilly courses gravity plays an important role and on flat courses smaller riders cut a smaller hole through the air due to less 'frontal resistance'. It is important to identify that 'body weight' affects uphill performance whilst 'body surface area' (body size) affects performances on flat courses. In addition to calculating the power to weight ratio (W/Kg), the power to surface area ratio (W/ m^2) should also be considered.

Implications

Don't presume that big and powerful riders will always outperform smaller riders on flat courses. Frontal resistance has a large effect upon performance and smaller riders benefit as a consequence. As you are likely to be going faster on flat courses, frontal resistance becomes even more of an issue. If you are a big rider, change your position to generate as little frontal resistance as possible. Ride in front of a mirror or video yourself from the front to get the best 'shape', consider an aero helmet and wear tight fitting clothing, small is fast.

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