

Measures of training stress in cyclists do not usefully predict maximum mean power in competitions

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Abstract

Background: Many competitive cyclists use mobile ergometers to monitor power output during training and competition rides. A training-impulse model is then often used to combine a training-stress score from each ride into measures of "fitness" and "fatigue", the difference in which is interpreted as a measure of "freshness" that might predict competitive performance.

Purpose: To determine the effect of fitness, fatigue and freshness the day before cycling competitions on physiological indicators of performance in the competitions.

Methods: Twenty male and four female competitive cyclists (29 ± 9 y, 71 ± 7 kg, mean \pm SD) provided recordings of their SRM or Quarq mobile ergometers for training rides, 55 time trials (16-40 km), and 447 mass-start road races over a 6- to 8-month period. TrainingPeaks software (version WKO+ 3) was used to synthesize fitness, fatigue and freshness scores on the day before each competition and to extract maximal mean power (MMP) for four durations (5 s, 60 s, 5 min, 20 min) from the competition ride. The within-cyclist relationship between each measure of training and each measure of performance was investigated by producing scatterplots of the deviations from each rider's mean training and mean performance measure for time trials and road races in single-day and multi-day competitions. Mixed modeling was used to quantify the relationship as the linear effect of a change of two within-cyclist standard deviations of the measure of training, assuming a smallest important change in performance of 1%.

Results: Individual typical variation in maximum mean power from competition to competition ranged from $\pm 7.1\%$ (5-min MMP) to $\pm 14\%$ (5-s MMP). Scatterplots were generally consistent with a random relationship between the indicators of performance in competitions and the measures of training the previous day, and all effects of training measures on performance measures were unclear.

Discussion: The uncertainty in the relationships between the measures of training and the measures of performance is due to the extremely poor reliability of the measures of maximum mean power. Contextual information about each competition ride might improve the reliability by helping to filter out or otherwise account for poorer performances. Alternatively other measures of performance from competitions are needed to determine whether fitness, fatigue and freshness usefully predict competition performance.

Conclusions: Maximum mean power in competitions is too unreliable to determine whether the measures of fitness, fatigue and freshness provided by mobile ergometers and TrainingPeaks software reflect readiness for competitions.

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