Predicting a Power-Duration Curve in Elite Endurance Track Cyclists.

Keywords

Power-duration, performance modelling, track cycling.

Introduction

A power-duration curve provides coaches and athletes with a snapshot of the workload achievable for any given duration at a single point in time which can then be used to inform training and race strategy depending on the demands of the event. Being able to accurately predict the power-duration curve is important to ensure it can be used to accurately predict performance. Various protocols can be used to predict the power duration curve however previously they have only been shown to accurately predict the power-duration curve within the severe exercise domain (Anaerobic Power Reserve, APR model) (Sanders et al, 2017), or moderate exercise domain (Critical power and W Prime models) (). This research aims to determine whether a multi-trial protocol can be used to accurately predict the power duration curve up to the length of 45 minutes (a typical track endurance race duration) specifically in elite track cyclists. Furthermore, it seeks to explore which trials can be used to most accurately predict the curve with the least amount of trials so that coaches and athletes can use the protocol without impacting heavily on their training schedule.

Methods

A total of 18 (9 male, 9 female) elite track cyclists (defined as having competed for a National Cycling Federation at a major international competition within the last 2 years) aged 22±4 years completed 6 maximal time trials of differing durations (6 seconds(s), 30s, 60s, 360s, 720s, 1200s) over 2 days (3 on each) on a static cycle ergometer (Wattbike, Nottingham UK). Each trial was completed seated and from a static start using the participants same individual riding positions. Participants were asked to refrain from strenuous activity for 24 hours before the trials and had 30 minutes of off the bike recovery between the 3 trials on each day and 24 hours of recovery between the two testing days to ensure they could perform their best in each trial.

The average power output was recorded for each of the 6 trials completed and plotted on a power duration curve (Figure 1) and extended exponentially to cover durations of 1s to 45 minutes (roughly the longest duration of an endurance track cycling race) which was taken as the gold standard. Individual data points were then systematically taken out of the power duration curve to determine whether an accurate prediction could still be achieved with less trials (Figure 2).

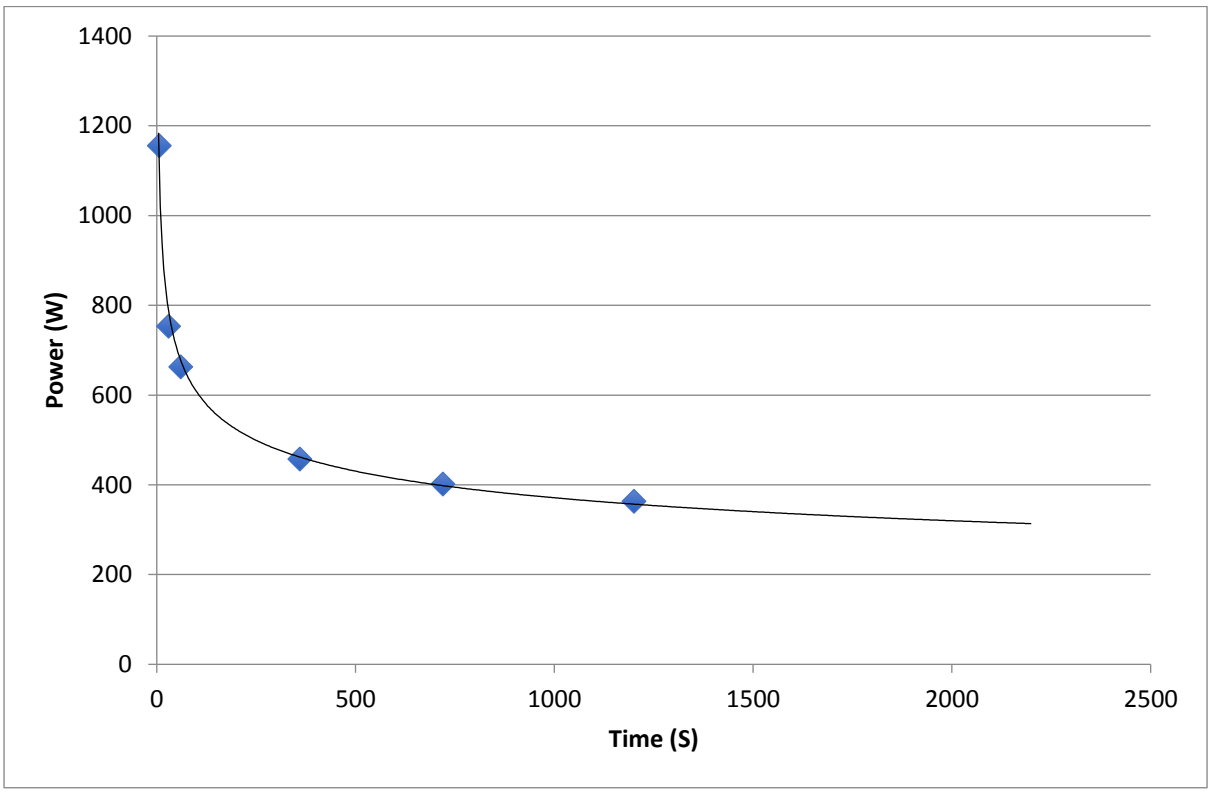

Figure 1. Power-duration curve predicted using 6 maximal time trials over a 2-day period.

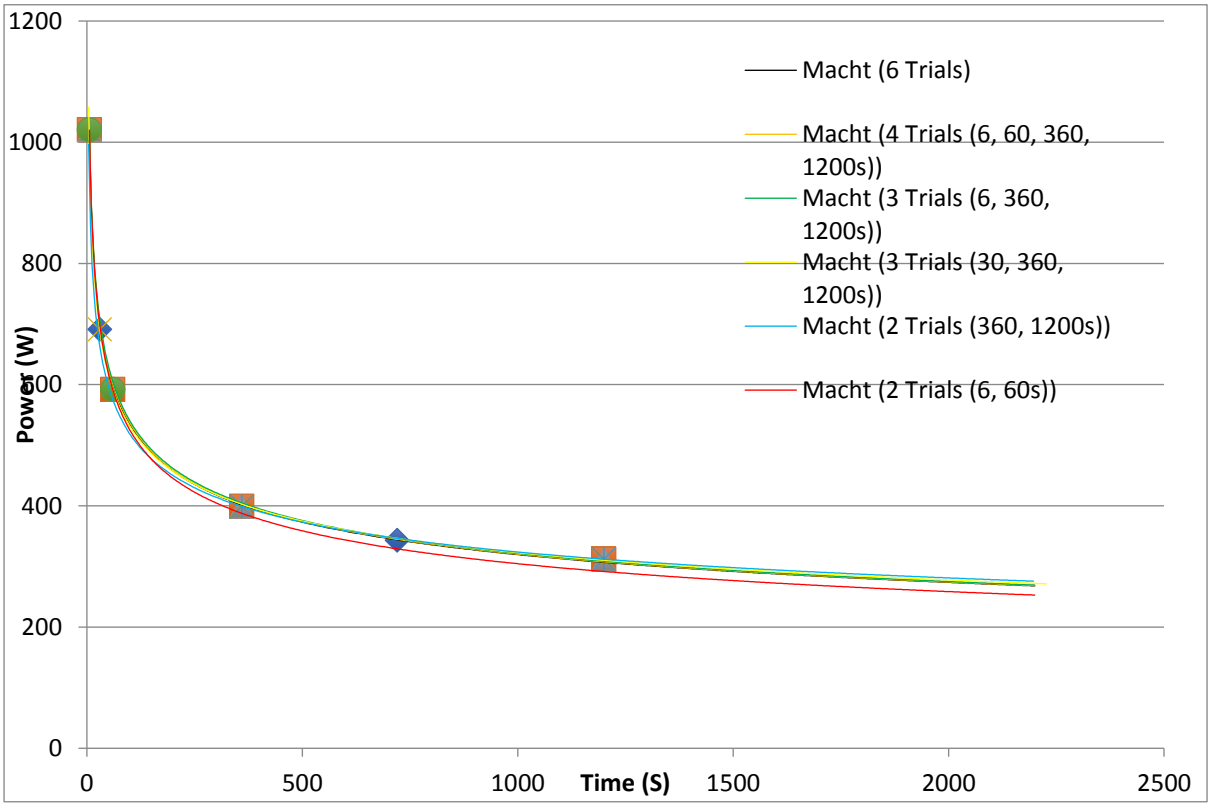

Figure 2. Power-duration curves predicted from the same data set using 2,3,4 and 6 data points.

Results

To be updated 01/04/2018

Conclusion

To be updated 01/04/2018