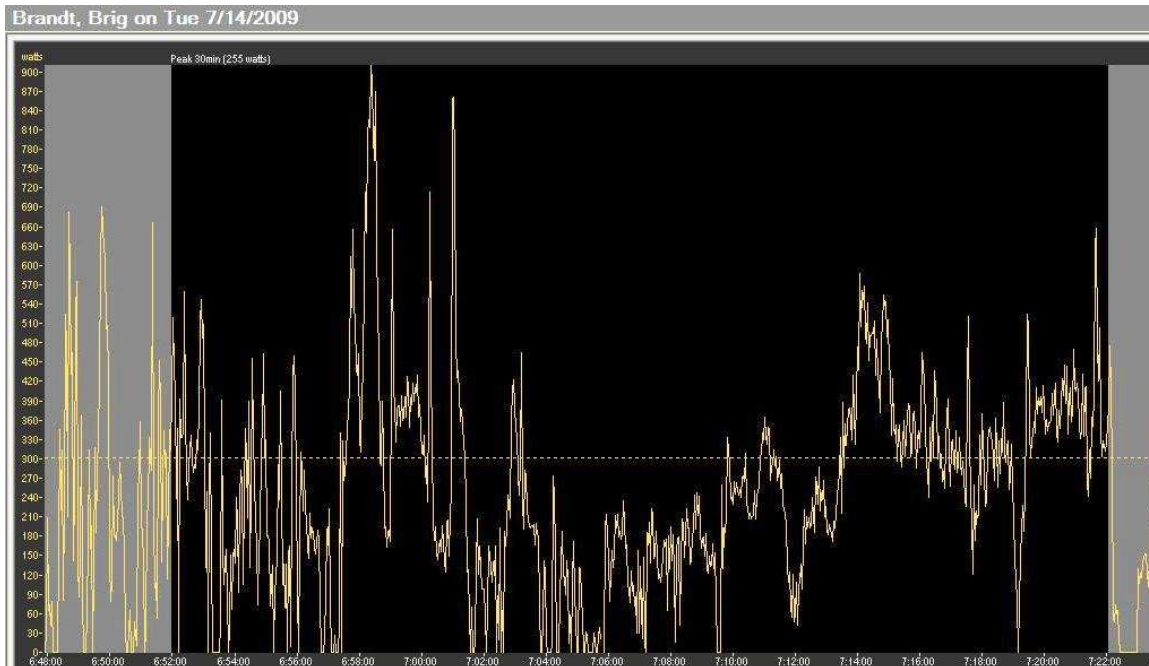


Power is not equal: Normalized Vs Average

We often here people talk about how much power a cyclist averaged up a climb, in a criterium, or in a time trial. Maybe we should be talking about normalized power, especially when referring to mass start events like criteriums and road races. What is normalized power, how does it differ from average power, and why is it so important?

Normalized power is a Training Peaks algorithm developed by Hunter Allen and Andrew Coggan to account for (and quantify) the high variability in cycling. Imagine a one hour ride where a cyclist rides 100% of the time at 250 watts. His average power would be (obviously) 250 watts. With a 300 watt threshold this is a manageable ride. Now imagine a ride where he alternates every 5 minutes between 100 and 400 watts for an hour. He would still average 250 watts, but it would be much harder (in fact, with a 300 watt threshold it would be impossible). Normalized power captures this idea, which is critical, because physiological stress is not linear—we can perform just below threshold power for a long time, but we can ride just above threshold for a very short time. If this was not true perhaps our fictitious rider would be able to complete the second workout.

Normalized power is very useful when we analyze ride data from races and group rides, because these workouts tend to have high variability in moment to moment power output. Here is a screen shot of from a competitive group ride. The blackened area represents the highest 30 minute power for the ride. The yellow line represents watts, and the dashed horizontal line is set at 300 watts for reference.



The average power for this thirty minute period was 255 watts. Just by looking at the reference line we can see a significant amount of time below 300 watts, and a decent amount of time at 0 watts, that is, coasting. So 255 average watts seems to make sense. But normalized power was 334 watts, which means this was a highly variable 30 minutes, and also much harder than a steady state ride at 255 watts would be.

So what use is there for normalized power? Firstly, it allows us to accurately quantify highly variable efforts, which is important because for the most part bike racing is highly variable sport. It also provides coaches with an idea of what our athletes could maintain in a steady state event, such as a time trial or long climb. If an athlete has a 60 minute normalized power of 295 watts (done during a hard group ride) and he has a 40K time trial approaching, he's capable of maintaining 295 watts for that 40K. **Even though he has not completed a full hour at maximal steady state power, we can provide a wattage guideline.** This is handy because most cyclists (except for a masochistic few) struggle with 60 minute max efforts. We prefer to suffer with others, not alone, and normalized power allows coaches to suggest a TT wattage without the athlete performing long solo efforts.

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