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Editorial

Noise or Progress: A Call for Understanding Cycling Training Terminology

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In recent years, the number of scientific publications related to sports performance, and in particular cycling performance, has increased exponentially. Several authors want to make their contribution to scientific advances. However, it should be questioned whether all these contributions really represent progress. In many cases, their contribution is simply a different way of referring to the same concept. For example, nowadays it seems that referring to aerobic and anaerobic metabolism is a classic terminology of the past, with the terms oxidative and glycolytic being more appropriate. Without going into the details, the underlying concept is similar. Rather than putting one label or the other, the important point should be to understand, in each case, the predominant way in which energy is obtained. However, on the other hand, it is still common to use concepts that have been known to be erroneous for years. A clear example is the role of lactate: among many other functions, it is an essential metabolite in energy production and in the reduction of acidosis (Robergs, 2011). Despite this, it is still common to observe many professionals mistakenly claiming that its accumulation in the body is the cause of metabolic acidosis.

In cycling, and particularly since the appearance of power meters, several metrics have been developed for the monitoring and control of training. This has led to the existence of different terms to refer to the same concept. Worst of all is that, sometimes, some coaches –or pseudo-coaches– tend to generate noise and confusion by using a large number of metrics, without being aware –or intentionally so– that, in some cases, the terms used refer to the same concept. Therefore, table 1 shows metrics whose underlying concept is the same or similar, related to those used by two of the most widely used software in cycling: Golden Cheetah and Training Peaks/WKO5.

Table 1. Equivalences of some metrics used in Training Peaks/WKO and Golden Cheetah.

Training Peaks/WKO5	Golden Cheetah
Functional Threshold Power (FTP)	Critical Power (CP)
Functional Reserve Capacity (FRC)	W'
Normalized Power (NP)	IsoPower / xPower
Intensity Factor (IF)	BikeIntensity / Relative intensity
Training Stress Score® (TSS)	BikeScore / BikeStress
Acute Training Load (ATL)	Short Term Stress (STS)
Chronic Training Load (CTL)	Long Term Stress (LTS)
Training Stress Balance (TSB)	Stress Balance (SB)

Of all these metrics, we will briefly describe similarities and differences of four of them. Specifically, reference will be made to 1) Functional Threshold Power (FTP) vs Critical Power (CP); 2) Functional Reserve Capacity (FRC) vs W'; 3) Normalized Power (NP) vs xPower; and 4) Training Stress Score® vs BikeScore.

Functional Threshold Power and Critical Power

Both FTP and CP are metrics that aim to provide a sustainable intensity over time without fatigue. That is, FTP and CP relate to the transition between a steady-state and non-steady-state oxidative metabolism (Barranco-Gil et al., 2020), or between the heavy and severe domains (Poole, Burnley, Vanhatalo, Rossiter, & Jones, 2016). In other words, they should estimate the maximal lactate steady state (MLSS) intensity (Borszcz, Tramontin, & Costa, 2019). However, FTP and CP give different values (Karsten et al., 2021). This is because they are obtained from different tests –see Jones, Burnley, Black, Poole, & Vanhatalo (2019) for CP and Allen & Coggan (2012) for FTP–. Hence, differences with respect to the MLSS intensity are sometimes reported (Galán-Rioja, González-Mohíno, Poole, & González-Ravé, 2020; Jones et al., 2019; Lillo-Beviá et al., 2022). In our opinion, rather than arguing about whether CP or FTP, the important question is to know how their values are obtained and to be consistent in their assessment. Both tests are simpler and more practical alternatives to the traditional method of determining MLSS.

Functional Reserve Capacity and W'

When working above FTP or CP, much of the energy comes from anaerobic –or phosphagen and glycolytic– metabolism. The energy that can be obtained by this route is limited, which is why the concept of anaerobic energy reserve or anaerobic work capacity is proposed. This existing concept is what has been coined as W' or FRC. That is, the amount of work that can be done above CP or FTP, respectively. The two terms are therefore equivalent. Their differences lie exclusively in the measurement of CP or FTP.

Normalized Power and xPower

The NP proposed by Coggan and the xPower proposed by Skiba are virtually identical 4-step mathematical algorithms that aim to estimate the average power that could have been maintained constant for the physiological cost incurred. The only difference between both algorithms lies in the first step: Coggan proposes a 30-second moving average, and Skiba modifies it performing a 25-second exponentially weighted moving average, considering that it better represents the physiological delay of the organism –see Clarke & Skiba (2013) for xPower algorithm and Allen & Coggan (2012) for NP algorithm–.

Training Stress Score® and BikeScore

BikeScore and TSS are two quantification indexes whose formula is identical, except that the former uses xPower and CP, and the latter NP and FTP in its calculations (see equations 1 and 2 for BikeScore and TSS, respectively). In both cases, an effort of 1 hour at CP or FTP would give a value of 100 points.

$$BikeScore = \left(\frac{xPower}{CP}\right)^2 x \frac{t(s)}{3600} x100$$

Equation 1

$$TSS = \left(\frac{NP}{FTP}\right)^2 x \frac{t(s)}{3600} x100$$

Equation 2

In essence, rather than using a large number of metrics, the important question is to know what they mean, as many of them are equivalent or very similar. Another matter is that there is some hidden interest in using a lot of terms in order to generate noise and confuse athletes. Perhaps, some coaches prefer to look like "sophisticated" scientist rather than being better understood by athletes, at the time some brands or authors create new terms for old and well defined concepts.

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