11. Tips and tricks

Experiences in cycling

For many years physician and co-author of our book The Secret of Cycling (www.thesecretofcycling.com) Guido Vroemen advises cyclists and triathletes on training with power meters. Some of his tips and tricks are given below.

Pay attention to the options for data-analysis. These will increase your understanding of your workout and performance. Below we will help you to understand the options for data-analysis and the associated parameters .

The first time you run with a power meter, you'll notice quickly that the power data may vary significantly. This is not surprising, because the power meter responds directly to the accelerations in three dimensions (forward, lateral and vertical). A handy trick is to use the 3 or 10 seconds average power setting of your Garmin. Your watch then shows average values over 3 (or 10) seconds so that the variations are limited and the information is better visualized. After completing your run, you can see all the data on your PC or tablet. Several apps are available for this, including TrainingPeaks. They also have a "smoothing" feature that allows the data to be averaged which makes the graphs better visible. TrainingPeaks is one of the most popular apps, so we will use it as an example.

Because running power meters such as the Stryd are a recent development, you may experience some interface problems with older running watches. Depending on the brand and even watch model there are differences. Author Hans gets the power data in his Garmin 630 in the running mode on the cadence screen (which limits the power to 500 Watts because a cadence higher than 500 is unrealistic). Ron uses a Garmin 920XT and he has to switch this to the cycling mode to get his power data. This also means that TrainingPeaks shows the data as cycling results. This can be corrected manually by converting it in the app to running results. The standard cycling mode of the Garmin does not have a screen for pace. As a solution Ron can get the pace on his Garmin in cycling mode by using the special "Stryd pace" app which is available through the feature IQ Connect apps for Garmin. By zapping between cycling and running modes in the TrainingPeaks app on your PC or tablet sometimes more information can be obtained, for example, a pace:HR ratio instead of a power:HR ratio. For Strava this applies accordingly. Try it out!

The Stryd can also be used as a stand-alone device on your chest band. Then you have to synchronize the data after your workout and you do not see the real-time power data during your workout or race. A very useful service of TrainingPeaks is that your Threshold Power Value is calculated by this app from your race or workout. If this improves you can be notified by e-mail and you can optimize your zones with the new value. YouTube videos on the website of TrainingPeaks explain how to use this app.

Which parameters can be reported?

Average power (Watt, W):

This speaks for itself. This parameter equals all measured values divided by the total number of readings. The average power is calculated including the zeros readings.

Specific power (Watt/kg):

For your running performance, your specific power is most relevant. This is the power divided by your body weight. The higher your specific power is, the faster you will run. Previously we have shown that the maximum limit of the human power during 1 hour (Functional Treshold Power, FTP) is 6.4 Watt/kg for men and 5.7 Watt/kg for women.

Normalized Power NP (Watt):

There is often a misunderstanding about the difference between average power and normalized power. Some people think that normalized power is equal to the average power, but without the zeros. This is not the case. The normalized power represents the power that you would have needed to run at a constant speed. Variations in speed require more effort and therefore more power than maintaining a constant speed.

Variability index VI:

This is a parameter which is calculated by dividing the normalized power by the average power, so it indicates the variability of your workout. If you've run constant with few ups and downs than the VI will be 1.0.

Training Stress Score TSS:

Training Stress Score (TSS) is a parameter which includes both the intensity and duration in order to get a good picture of the total load of the workout or race. The calculation assumes that if you ran 1 hour at the intensity of your FTP, this corresponds to 100 TSS points. If you ran two hours with an intensity of 80% of the FTP you will get $(0.8)^2 * 2 * 100 = 128$ TSS points.

Intensity Factor IF:

This parameter says something about how intense a training or race has been compared to your FTP. The IF is calculated by dividing the normalized power by the FTP.

Work or energy consumed in kJ (Work):

By using a power meter, it is easy to calculate the energy you have used to run. Since the metabolic efficiency is about 25%, your body will have consumed about four times as much energy. Since 1 kCal equals 4.18 kJ, the energy consumption of your body in kCal roughly equals the kJ indicated by your power meter.

Peak Power:

This table shows what your best values were for various time intervals. By collecting all the power data the best values of all time or of the current workout can be assessed.

Efficiency Factor EF:

This parameter is calculated by dividing the normalized power by the average heart rate of the workout or race. By comparing this value with similar sessions, you can see whether you improved your aerobic efficiency. The value in itself is not very important. But an increase or a decrease means something. If the ratio rises this means that you have more power at the same heart rate, or the same power at a lower heart rate. In short, you got more efficient and better!

Power:HR and Pace:HR:

If the heart rate increases during aerobic endurance training while the intensity (power or pace) remains the same, the aerobic base is insufficiently developed. The same applies when the heart rate remains the same but the power output decreases. For assessing this ratio, the endurance training (or race) is divided into two parts. TrainingPeaks compares the ratio of the first half with that of the second half. With a decrease of more than 5%, improvement of the aerobic base is necessary and possible.

Velocity Ascended in Meters VAM:

This parameter provides in Watt/kg and in m/h gives an indication of the specific power and speed needed to cope with differences in altitude, such as hills.

Some examples

The figures below give an example of how results of workouts in Garmin Connect and TrainingPeaks are reported. The example is the Rotterdam Marathon that Ron ran on April 10, 2016. Of course Ron immediately calculated his running economy. His ECR-value (Energy Cost of Running in kJ/kg/km) was 1.071. Apparently Ron was less efficient than the 0.98 we always use as default in the model calculations in our book. That value he gets only on the track. Various of the above-mentioned parameters are shown in the figures. Interestingly, various apps calculate parameters such as TSS differently. The underlying algorithms are owned by the app providers and to underline this they even show the copy right symbol ©.

Ron was very pleased with his VI of 1.00. In Garmin Connect the IF value of Ron was 0.965 and in TrainingPeaks 1.08. The explanation is simple. The VI is the normalized power divided by FTP (the power that you can maintain for 1 hour). So for the marathon, the VI should be lower than 1. However, at the time of the marathon the FTP of Ron was not yet properly entered in TrainingPeaks (nor in Garmin Connect). For TSS the examples show values of 323 (Garmin Connect) and 401 (TrainingPeaks).

Figure: Running parameter summary from Ron's Rotterdam Marathon presented in Garmin Connect

Entire Workout

	Duration	Distance	TSS
	3:28:53	42.4 km	401.4

Work	3617 kJ	IF	1.08
NP	289 w	VI	1.00
Pa:Hr	5.77%	EF	130.38
El. Gain	75 m	Grade	--
El. Loss	75 m	VAM	22 m/h
VAM W/kg	0.11		

	MIN	AVG	MAX	
Power	168	289	354	W
Heart Rate	90	133	217	bpm
Cadence	159	166	194	rpm
Speed	4.54	12.2	17.8	kph
Pace	13:14	04:56	03:23	min/km
Elevation	-4	4	21	m

Figure: Running parameter summary from Ron's Rotterdam Marathon presented in TrainingPeaks.

We are curious to the reactions and experiences of the readers, we welcome you to share these at www.thesecretofrunning.com.

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