Greipel, Boasson Hagen and Sagan charge for the line
Tim De Waele

MASTERCLASS
JAMES McARDLE

Power Play Pt 2

MASTERCLASS

After reading the first Train With Power article in the March-April issue, you'll know what power is, where it comes from, and what types of measurement devices are available. Take a deep breath and hold on tight…James McArdle once again dives headlong into the nitty gritty of getting the best results from your training with a power meter.

Functional Threshold Power

The first thing you need to know is your functional threshold power (FTP). You will need to perform the Functional Threshold Power Test, by working through the warm-up, main set, and cool-down, as layed out in the FTP Test table (above right). In power-based training, your FTP is a reference point; a number that is relevant only to you. You will come across other athletes with the same FTP but the chances are that their power to weight ratio will be different to yours;

FTP (Functional Threshold Power) Test				
	Time	Description	% of FTP	% of FTHR
Warm Up	20 min	Endurance Pace	65	70
	3 x 1 min (1 min Rec)	Fast Pedalling (100rpm)	N/A	N/A
	5 min	Easy Riding	65	‹70
Main Set	5 min	All-out Effort	Max	›106
	10 min	Easy Riding	65	‹70
	20 min	Time Trial	Max	99-105
Cool Down	10 min	Easy Riding	65	‹70

we'll get into that a bit later on. Your FTP is a number upon which you can base all your training zones; just as your maximum heart rate gives you zones to work with, so does your FTP.

To determine your FTP you'll need a power meter and you'll need to get on the bike and work. You can do an FTP test on the road but I strongly recommend using a trainer for a couple of reasons. One, you'll really struggle to find a road where you can actually exert yourself to the extreme point that will give you an accurate FTP. Two, it's just dangerous. You're trying to push yourself to your maximum and with that you will become fatigued and possibly want to vomit. When you get to this point you could possibly be swerving around trying to get your breath and feel your legs; the last thing you want to worry about is a car coming up from behind.

Points to remember:
• FTHR is functional threshold heart rate.
• Keep efforts at or below 65% FTP where indicated.

• When you do the 3 x 1 minute, ensure that you really do recover in between efforts. This means really light pedalling with very little effort.
• In the five-minute all-out effort of the Main Set, make sure you do give it everything. This is a blowout to ensure your heart rate and legs are up for the 20-minute time trial coming up.
• In the 20-minute time trial you want to make sure you ride it like a time trial. Start out pacing yourself for the first five minutes and build thereafter. The most important thing to do is finish those 20 minutes. Even if in that last minute you can't even turn a pedal, at least you know that you gave it everything you had.

Now what do you do? FTP is meant to be your functional threshold for 60 minutes of riding. But 60 minutes is a huge ask, so that's why a test like the one above was created. It allows you to achieve maximum exertion for a manageable time but we then need to adjust it to determine a value for 60

minutes. After downloading your data to your Garmin Connect or Training Peaks WKO+ account, get your best average power for that 20-minute time trial block. We then adjust the 20-minute power figure down by five per cent, which gives a realistic 60-minute reading. So we need to subtract five per cent of your 305 FTP as shown below:

305 x 0.05 = 15.25, then 305 – 15.25 = 290

This means your FTP is actually 290. So there you have it, your FTP around which everything else when training with power will revolve. Your goal is to challenge yourself over time to increase this number—and also to increase power output of three specific measures — your five-second, one minute and five minute power output figures.

Training Zones

Now you have your FTP, let's look at the zones to work in and how long should you train in each. The chart (above right), created by internationally recognised exercise physiologist Andrew Coggan, defines seven zones of activity and specifies power brackets, heart rates and time periods for training in each zone for optimum results.

Once you know your FTP and understand the optimum zones for training in the chart above, you need to know which zones you should use to maximise your potential. This is done through power profiling.
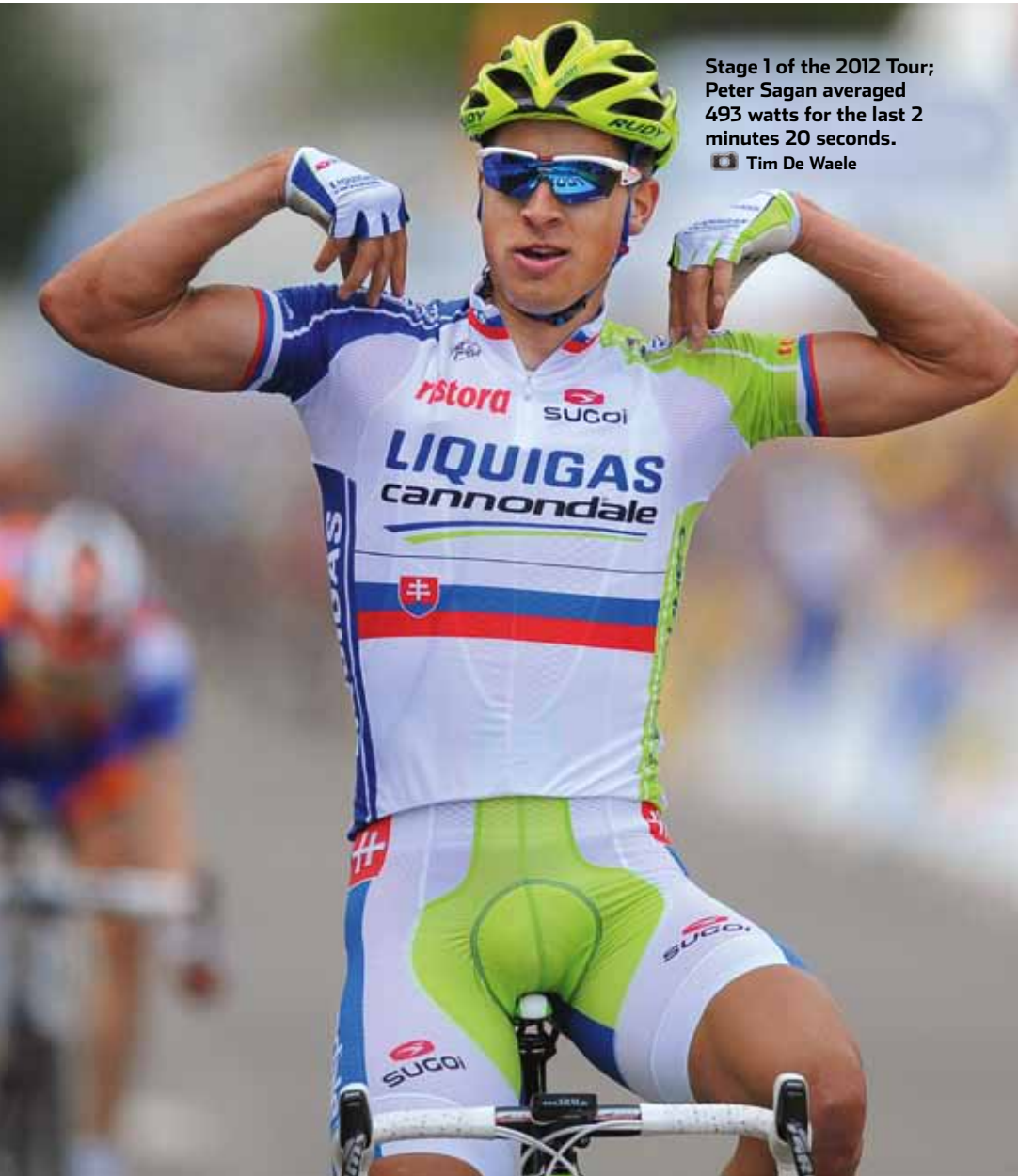
What's Power Profiling?

Power profiling is about finding out what you're capable of doing over a certain time period. Are you a sprinter or an endurance rider? Or would you be better as a time trialist? If you're a sprinter, are you better off attacking 100 metres from the finish or should you go from 500 metres out? Performing a power profile test will help you work out what, when and where you should be doing things.

If you're a rider who weighs 90kg and can put out 350 watts up a climb, you could have someone riding next to you who can only put out 218 watts, the difference being they weigh only 56kg. The extra mass on your body requires more power output to achieve the same velocity up a grade.

Again I strongly recommend doing this profiling session on a trainer and not on the road. Ensure you do have a good warm-up working in Zone 2-3.

Training Zones (Andrew Coggan)					
Zone	Description	% of FTP (watts)	% of FTHR (beats per minute)	Typical Duration	Typical Interval Effort
1	Active Recovery	‹55	‹68	30-90 min	N/A
2	Endurance	56-75	69-83	60-300 min	N/A
3	Tempo	76-90	84-94	60-180 min	N/A
4	Lactate Threshold	91-105	95-105	N/A	8-30 min
5	VO₂ max	106-120	›106	N/A	3-8 min
6	Anaerobic Capacity	121-150	N/A	N/A	30 sec-3 min
7	Neuromuscular Power	N/A	N/A	N/A	‹30 sec

Stage 1 of the 2012 Tour; Peter Sagan averaged 493 watts for the last 2 minutes 20 seconds.
Tim De Waele

Power Profile				
	Time	Description	% of FTP	% FTHR
Warm Up	˜45 min	Easy Riding	65	‹70
	3 x 1 min (1 min Rec)	Fast Pedalling 110rpm	80-90	80-90
Main Set	5 min (3-5 min Rec)	FTP Efforts	100	›106
	1 min (3-5 min Rec)	All-out Effort	›150	›106
	10 min	Easy Riding	70-80	›68
	5 min (10 min Rec)	Out of saddle, all-out effort from 30kph and Smash it for last 45sec	›115-120	›106
	1 min (5 min Rec)	Out of saddle, all-out effort from 30kph and then be seated to drive to the finish	›150	›106
	1 min (5 min Rec)	All-out Effort	›150	›106
	2 x 15 sec (2 Min Rec)	Out of the saddle, hard sprint from 25kph	Max	N/A
Cool Down	15 min	Easy Riding	60-70	›68

Points to remember:
• The Rec (Recovery) should be done at 60-70%.
• All-out Efforts really have to be that. Try and leave nothing in the tank on those.

Now you've done all the hard work, you can start to create your profile of what type of cyclist you are.

This is where we add some more power terminology, power to weight ratio. Earlier I mentioned that you could have the same FTP as someone but your power to weight ratio will be different and this is what we'll touch on now. We have your FTP, e.g. 290, now what we want to do is work out your power to weight ratio and to do that you need to do the following. Let's say you weigh 75kg; divide your 290 (FTP) by 75 (weight) = 3.86 watts per kilogram, we've just worked out your FTP power to weight ratio is 3.86 watts per kilo. Now download your data from the power profile test into Garmin Connect or Training Peaks WKO+ and then go through and pick out your best five second, one minute and five minute wattages.

Now you have the four main measurable numbers for power to weight. Below is a chart to plot your numbers against. Let me warn you about this chart; it can be very demoralising but you need to remember that it was created for world-class athletes who figure at the top of the chart – the rest of us appear progressively towards the bottom. So it's a guideline that will help to track your progress. Let's look at some examples:

All-rounder Profile			
5 Sec	1 Min	5 min	FTP
16.89	8.74	5.12	4.27
16.59	8.63	5.01	4.18
16.29	8.51	4.91	4.09
16.00	8.40	4.81	4.00

These numbers indicate an all-round rider because they're closely clustered on the chart and nearly horizontally across. If you really wanted to be more of a sprinter, climber or a pursuiter, just concentrate on training the relevant system, but always keep in mind that you still want to train all your other systems as well.

Cancellara's power…is it his quads or the way he holds his tongue?
Tim De Waele

Sprinter Profile			
5 Sec	1 Min	5 min	FTP
18.66	8.97	5.33	4.44
18.37	8.86	5.22	4.35
18.07	8.74	5.12	4.27
17.78	8.63	5.01	4.18
17.48	8.51	4.91	4.09
17.18	8.40	4.81	4.00
16.89	8.28	4.70	3.91
16.59	8.17	4.60	3.82
16.29	8.05	4.50	3.76
16.00	7.94	4.39	3.69

You can clearly see here the numbers start high on the left and fall off pretty quickly. This is a clear indicator that this cyclist is a sprinter and probably struggles on longer rides. Your strengths are based around your anaerobic system. As with all the other profiles you can work at changing these strengths and weaknesses.

Time Trialist, Climber, Steady State Rider Profile			
5 Sec	1 Min	5 min	FTP
18.66	8.97	5.33	4.44
18.37	8.86	5.22	4.35
18.07	8.74	5.12	4.27
17.78	8.63	5.01	4.18
17.48	8.51	4.91	4.09
17.18	8.40	4.81	4.00
16.89	8.28	4.70	3.91
16.59	8.17	4.60	3.82
16.29	8.05	4.50	3.76
16.00	7.94	4.39	3.69

The time trialist profile is basically opposite to a sprinter's profile and starts off low on the left hand side and climbs to the right. Look at the difference from the one minute to the five minute to the actual FTP. This shows a strong rider that has a great aerobic system but lacks the ability to really attack or sprint.

Pursuiter Profile			
5 Sec	1 Min	5 min	FTP
18.66	8.97	5.33	4.44
18.37	8.86	5.22	4.35
18.07	8.74	5.12	4.27
17.78	8.63	5.01	4.18
17.48	8.51	4.91	4.09
17.18	8.40	4.81	4.00
16.89	8.28	4.70	3.91
16.59	8.17	4.60	3.82
16.29	8.05	4.50	3.76
16.00	7.94	4.39	3.69

Now we're looking at an athlete that doesn't have the real sprinter ability off the mark; someone who can't attack with a huge amount of power. This is someone who can make a moderate attack and then climb into a higher power output for a sustained amount of time before their power drops off.

MASTERCLASS

To summarise power profiles:

If you're a sprinter and want to become more of an all-rounder you would need to work more on your endurance and tempo zones. If you're a climber or time trialist but struggle with that sprint at the end of the race, then you need to work on your anaerobic and neuromuscular system. All of these changes will take time and dedication but if you're truly happy with what your power profile is then you should embrace it and work hard with it to excel. Select races that suit your style and enjoy what your body and physiology can deliver. Base all your training around your strengths and then build your weakest systems up at the same time.

A note for master's riders: unfortunately your VO$_2$ max declines starting at around 30 years of age and goes down a little each year. In men it actually declines by 0.5ml/kg/min and in women it declines at a slower rate of 0.35 ml/kg/min.

Let's look at an athlete whose power profile indicates that they are more of a sprinter than anything else. What could this athlete do in their training sessions based around power and watts?

As mentioned earlier we would need to target zones 5-6-7 being VO$_2$ max, anaerobic and neuromuscular systems.

Below are some examples of sessions that will help a sprinter increase their power for attacking and sustained power. Just imagine if you can hold a sprint of 1,100 watts from 250 metres out when your competitors can only hold 1,100 watts for 225 metres. Straight away that's a win for you!

> " Even if in that last minute, you can't even turn a pedal, at least you know that you gave it everything you had. "

Level 5, VO$_2$ Max System Effort

VO$_2$ Max 3 & 2 Minute TT Efforts					
	Time	Description	Cadence	% of FTP	% of FTHR
Warm Up	10.0	Easy Riding	90-100	60	69-83
Main Set	10.0	5 min (5 min Rec) VO$_2$ Max	100+	106-115	›105
	30	6 x 3 min (3 min Rec) VO$_2$ Max	100+	120	›105
	10.0	Cruise	90-100	56-75	69-83
	24.0	4 x 2 min (4 min Rec) VO$_2$ Max TT	100+	135	›105
Cool Down	10.0	Easy Riding	90-100	60	69-83

Key points:
- Ensure you complete a proper warm up.
- The recovery periods need to be performed in your specific recovery zone.

Level 6, Anaerobic Capacity Effort

Anaerobic Capacity Hill Efforts					
	Time	Description	Cadence	% of FTP	% of FTHR
Warm Up	20.0	Easy Riding	90-100	56-75	69-83
Main Set	25.0	10 x 30 Sec (2 min Rec) Hill sprint repeats	60+	›120	›105
Cool Down	15.0	Easy Riding	90-100	56-75	69-83

Key points:
- The climb should be 30 seconds to two minutes long.
- Really attack the sprint/climb from the very start and smash yourself.
- Turn around and roll back to the bottom and have the full two-minute recovery between sets.

Level 7, Neuromuscular Power Effort

Neuromuscular Microburst Efforts					
	Time	Description	Cadence	% of FTP	% of FTHR
Warm Up	15.0	Easy riding	90-100	‹56	‹69
Main Set	45.0	3 x 10 min (5 minutes recovery) Continuous 15 seconds on, 5 seconds off microbursts			95-103
		15 Sec 'on' hard, smash it		150	N/A
		15 Sec 'off' recovery		50	N/A
Cool Down	10.0	Easy riding	90-100	56-75	69-83

Key points:
- The recovery periods need to be done in your recovery zone.
- The 15 seconds off should be done at a very light spin.
- Not all riders will be able to complete the workouts above. I've included a table below that shows when you actually should stop doing efforts. In the Level 6 session we have 10 x 30 second sprints—you may find you can't complete all ten. That's totally understandable. So use this listing as a rule of thumb of when to stop this interval training.

Intervals	Average Drop in Power
20 min	3-5 %
10 min	4-6 %
5 min	5-7 %
3 min	8-9 %
2 min	10-12 %
1 min	10-12 %
30 sec	12-15 %
15 sec	15-20 %

The average power decrease is based on the number of watts achieved in the third interval, e.g. you should rest when doing three minute intervals if your average power output drops 8-9 per cent below your third interval rating. Another good reason to have a power meter is that you could complete all ten intervals and have wasted the whole session because your body has been totally taxed wasting any gains you made in that session.

You've now learnt about functional threshold power, and more importantly what your own FTP is. You have also found out how to determine your power profile and know exactly where you sit in the cycling tree of power to weight ratios. And you've got some examples of how to improve your sprinting with some great intervals, so what else is there… but to get out and do it. ✍

MASTERCLASS