



This is an adaptation of an article written by James Spragg for www.roadcyclinguk.com

1. What are training zones?

We've all heard people referring to which 'zones' they are riding in – but what does this actually mean, where do training zones come from and how can you use them effectively?

Training zones refer to the intensity at which you are riding at. Riding at different intensities brings about different physiological adaptations and, therefore, the idea behind having specific training zones is you can control and measure how hard you are riding, thus giving you the ability to target specific improvements in your form.

There are different models with regards to the number of training zones – more on this later – but the basis of all training zones is what we refer to as threshold. There are actually two different thresholds: aerobic and anaerobic threshold.

Aerobic threshold is the maximum intensity at which you can ride without blood lactate levels increasing. This is the level at which the mitochondria in your muscles are working at capacity in terms of how much lactic acid they can process.

Anaerobic threshold is what people commonly refer to as their 'threshold'. This is your functional threshold power (FTP) for those of you using a power meter, or the maximum heart rate you can sustain for one hour.

At this point the amount of lactate in the blood is elevated but still under control. Ride any harder and the amount of lactic acid will increase exponentially, you will be riding in the red and the effort will become unsustainable. A perfect example of your anaerobic threshold is the pace you can ride a 25-mile time trial.

Using these two thresholds gives us a basic structure of three zones: zone one (below aerobic threshold), zone two (between aerobic and anaerobic threshold) and zone three (above anaerobic threshold).

So why do many training zone models refer to more than three zones?

2. Why are there often more than three zones?

We've discussed the basic structure of three zones but there are many different models for the number of zones. All, however, are based on the aerobic and anaerobic thresholds. So why the need for more zones, I hear you ask?

Coaches tend to like a lot of zones as this gives us a more detailed way to describe sessions to the riders we coach. I, for example, like to use Andy Coggan's five zones for heart rate and seven zones for power.

Having more zones means you can more precisely hone in on a specific intensity and, therefore, target more precisely a certain aspect of fitness. What is important to remember, however, is no matter how many zones you use, they

represent a certain range on a spectrum of intensity. Just as when looking at a rainbow it's very easy to identify the colour blue but very difficult to pick the exact point at which blue turns into indigo. To refer back to cycling, it's easy to select the intensity required to work on a rider's base fitness (zone two in Coggan's model) but riding at the top of zone two and the very bottom of zone three will bring about very similar physiological adaptations despite being different zones.

For whichever model you decide to use, the most important thing is that you understand what each zone is targeting and you stick to the zones when out training. Doing this – especially for riders with limited time on the bike – will allow you to maximise the time you have to train and will cut down on the amount of junk training that you do.

But how can you calculate your training zones?

3. How do I calculate my zones?

To calculate your individual training zones you need to know one of the following things: your functional threshold power, your heart rate at anaerobic threshold, or your maximum heart rate.

Your maximum heart rate is the easiest of these to calculate. The old adage of 220 minus your age is more likely to be incorrect than correct so it's time to get on the bike and go hard.

First off, you will need a heart rate monitor and a good warm up. Ride for ten minutes at a steady pace and then ride progressively harder and harder for another ten minutes, before spinning the legs out for ten minutes before you start the test.

Now pick a section of road (minimum of five minutes long – a hill is best) and start off at an intensity you think you can just about hold until the end. Every minute accelerate and ride a little bit harder until you are right at your limit, then try and sprint for as long as your legs will allow. Record your maximum heart rate.

To calculate your functional threshold power or your heart rate at anaerobic threshold you need to ride for a little longer. Again, a good warm up is important and then you need a section of uninterrupted road twenty minutes long. Set off at a pace you feel you can just sustain for 20 minutes (this is probably slightly easier than you think) and aim to hold this intensity for the first 17 or 18 minutes, then for the final 2-3 mins give it everything you have until the end. You need to record your average power and average heart rate for the 20 minutes. To calculate your FTP take the power and multiply it by 0.95. Do the same for your average heart rate to calculate your threshold heart rate.

There are many training zone models but if you are working with maximum heart rate then I would recommend Sally Edwards' zones. Otherwise, I would recommend Andy Coggan's zones if you are using threshold heart rate/power. These models will give you five or seven to work with respectively – let's take a closer look at each zone and how to you use them to make the most of your training.

Zone	Name	% FTP Power	% Threshold HR	% Max HR
One	Active recovery	<55%	<68 [^]	50-60%
Two	Endurance	55-75%	68-83%	60-70%
Three	Tempo	76-90%	84-94%	70-80%
Four	Threshold	91-105%	95-105%	80-90%
Five	VO2	106-120%	>106%	90-100%
Six	Anaerobic	121-150%	n/a	n/a
Seven	Neuromuscular power	>150%	n/a	n/a

4. When do I use which zone?

As mentioned earlier, each zone has a specific purpose and your body will have a specific physiological reaction to training in a particular zone.

Zone one – active recovery

(<55% FTP power / <68% threshold HR / 50-60% max HR (MHR)

Training at this intensity means you can stay active without becoming fatigued. After training hard your body will often go in to shut down mode to try and recover as quickly as possible. This, however, leaves you feeling sluggish.

Training in zone one will allow you to keep your legs turning over without adding to your levels of fatigue.

When to ride in zone one

Perfect for when you need to recover from a hard session but don't want to feel sluggish the next day.

Zone two – endurance

(55-75% FTP power / 68-83% threshold HR / 60-70% MHR)

I recently covered base training and all the riding described in that article would take place in zone two. Riding in zone two teaches your body to burn fat as a fuel source and encourages your body to produce more mitochondria. The very top of zone two is your aerobic threshold. Therefore in zone two your blood lactate shouldn't be elevated.

When to ride in zone two

To work on your base fitness. Sessions in zone two can typically last up to six or seven hours for pro cyclists but you don't need to ride for that long to feel the benefit.

Zone three – tempo

(76-90% FTP / 84-94% threshold HR / 70-80% MHR)

This zone works on your ability to hold a consistent high pace. When in zone three you will be riding in when riding hard but comfortably. Most people really enjoy zone three training as they feel they are riding quickly without riding too hard. Training in zone three has a lot of the advantages of zone two, however it's a lot more tiring. Therefore, the number of sessions that can be completed in a row, or the length of each individual session, needs to be limited. The

biggest reason for riding in zone three is that it stimulates your body to increase the amount of glycogen it can store (in zone three glycogen usage is starting to overtake fat usage as the primary fuel source).

When to ride in zone three

Often periods of zone three are included in a predominately zone two ride. This way a rider can earn the benefits of zone three training without the accompanied fatigue. One to three hours is the rough period of time you should be able to sustain in zone three.

Zone four – threshold

(91-105% FTP / 95-105% threshold HR / 80-90% MHR)

Zone four works on your anaerobic threshold. Therefore, the zone starts just below a rider's anaerobic threshold and stretches to just above. This allows a rider to push up their anaerobic threshold using longer intervals and pull up their threshold by training using shorter intervals. Training in zone four produces a great deal of lactic acid and therefore zone four actually gives the greatest stimulus to increase the number of mitochondria in the muscles.

When to ride in zone four

Training in zone four is very fatiguing and therefore can only be done for limited periods. More often than not zone four training is done in intervals with a period of recovery between efforts. You should be able to maintain zone four for between ten minutes and one hour.

Zone five – VO2

(106-120% FTP / >106% threshold HR / 90-100% MHR)

This is the intensity you can hold for three to eight minutes. Training in zone five is very fatiguing and these are typically leg-burning efforts. In shorter efforts your heart rate may not have time to respond to the effort and your maximum heart rate may actually be after you've reached the top of a climb. This is the limit to which heart rate zones are usable as after this efforts will either be too short for heart rate to respond to, or you will simply reach your maximum heart rate. Training in this zone works on your cardiac output – how much and how quickly your heart can pump blood to where it is needed in the muscles.

When to ride in zone five

This is typically the zone you will be riding at when going as hard as you can up a small climb. A good example of this is the effort needed to climb the Koppenberg in the Tour of Flanders sportive.

Zone six – anaerobic

Power only (121-150% FTP)

This is the zone you can hold for up to three minutes – for example, a max effort going as hard as possible. As mentioned, heart rate isn't a very good measure for this type of effort as it won't have time to respond to the effort or you will be riding at your maximum heart rate.

When to ride in zone six

Attacking a group of fellow cyclists is a good example of this type of effort.

Zone seven – neuromuscular power

Power only (150%+ FTP)

Training in this zone works on your sprint power! This zone also causes the most muscle size increase (hypertrophy), therefore if you want bigger, more powerful legs then zone seven is for you.

That's given you an overview of how you can use each zone to inform your training, but you can also use your zones to keep you from overtraining.

5. How can using zones keep me from overtraining?

Using zones when training gives you a good way to monitor how tired you are, particularly if you train with power.

Chances are that you have a few rides that you do on a regular basis. So, for example, if you go out and do intervals one week and can maintain zone four from the bottom to the top of your favourite climb, but then go out the next week and can only maintain zone three, then the chances are that you are too tired to perform at your best.

A good rule of thumb when you're training is that if you can't reach the zone you are aiming for then you won't get out of the session what you are aiming to. So if you can only sustain zone four instead of zone five for your normal three minute climb, then it's time to build some recovery into your training plan.

Heart rate is a little more difficult. As you become tired during the season your maximum heart rate will drop slightly. This is a normal process and nothing to worry about. It is, however, something to keep in the back of your mind. After a break over the winter your sustainable heart rate will be actually be higher than when you are in top shape over the summer.

It's also important when using power or heart rate that you test yourself regularly to ensure that your training zones are up to date. If you only test yourself at the start of the year then your zones will be out later on in the summer and your training won't be as effective. Try and test yourself every six weeks or whenever riding a certain power feels easier than normal.

6. Time in the zone is key - it's not all about the average

A lot of people will chase an average heart rate or average power during a ride. However, averages don't tell the whole story.

What is far more important is the amount of time spent in a particular zone. For example, let's take a session designed to work on lactate threshold. A typical session may include a warm up, 3x10 minutes in zone four with ten minutes recovery between efforts, and then a cool down.

The periods of recovery are very important as they mean that you can hit and maintain zone four in the threshold efforts. Doing the recovery blocks in zone one instead of zone two means that when it's time to start riding hard again you're much fresher and can still put out the numbers you need to. By riding easier in the recovery blocks you will

actually get home with a lower average heart rate and average power, however, the quality of the session is likely to be higher as you will be hitting the correct intensity in the efforts. Don't be tempted to hit the biggest numbers you can.

A good plan is to go out on each ride knowing exactly which zones you want to ride in. The same can be applied to events. If you know you can sustain 160 beats per minute for one hour then that is the heart rate you will need to ride at up a mountain pass in the Etape du Tour. Riding at 170 beats per minute for the first five kilometres will inevitably mean that at some point you are going to have to slow right down to avoid blowing up. Use your training zones to your advantage in both training and racing.

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