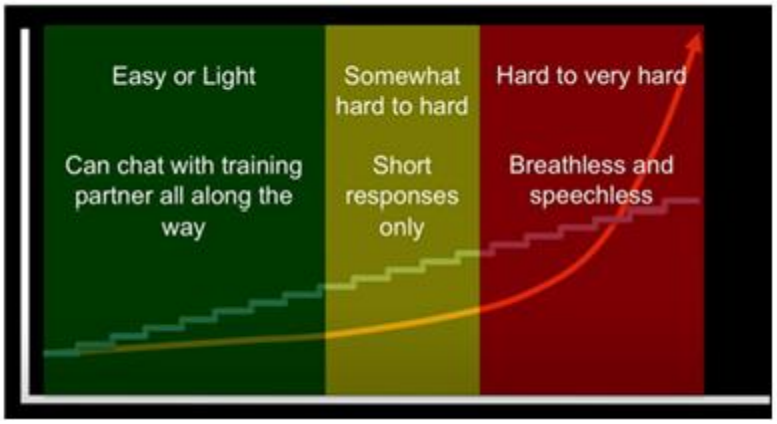
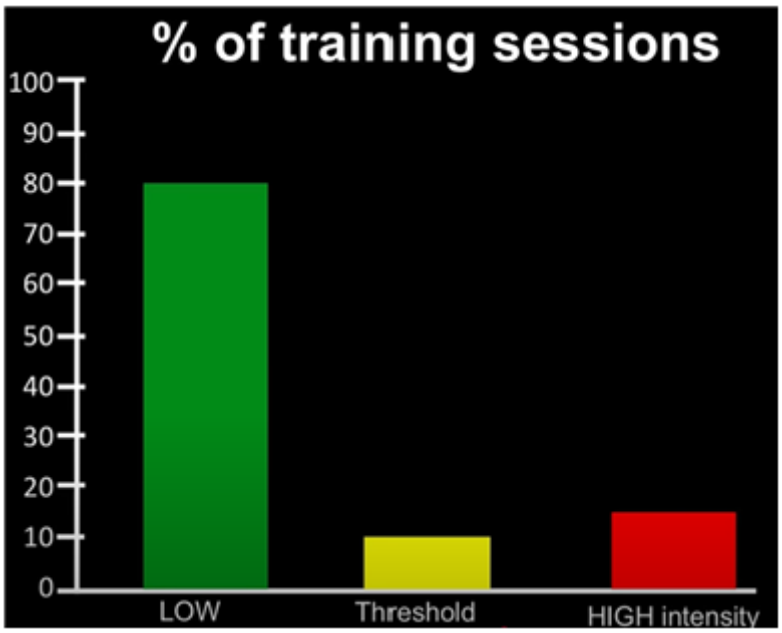
'No pain no gain' is no longer the way forward, according to Dr Stephen Seiler, the well-known exercise physiologist and expert on endurance training, who is particularly known for his work on polarized training and the 80/20 principle. We will be following these principles in our hill climb training plans.

Dr Seiler reinforces the importance of zone 2 training as part of a balanced training program. He attempts to quantify endurance training by accurately measuring the two fundamental variables of every endurance training workout, intensity and duration. Duration is easy to measure, whereas intensity is more challenging, and can be looked at from two perspectives, external and internal. External intensity or workload is the pace or power which is produced e.g. 200watts on a bicycle. However, that same external intensity can produce very different internal physiological responses in an athlete or when compared across different athletes, depending upon the physical capacity at the time. Fortunately, these physiological responses can be measured based on the external workload, in the laboratory. When carrying out these measurements across increasing intensities, three distinguishable intensity zones emerge, which Dr Seiler refers to as green, yellow and red.



Empirically we should all understand the graph above. When we increase the intensity of exercise, we move from being able to chat with our cycling chums, to being able to share a few words between more frequent breaths, to the point where we can hardly gasp "can we knock it back a bit". In essence, there are 2 reasonably well-defined borders between 3 different physiological states as the intensity of our exercise increases.

From studying many elite athletes across the world, the following basic intensity distribution emerges



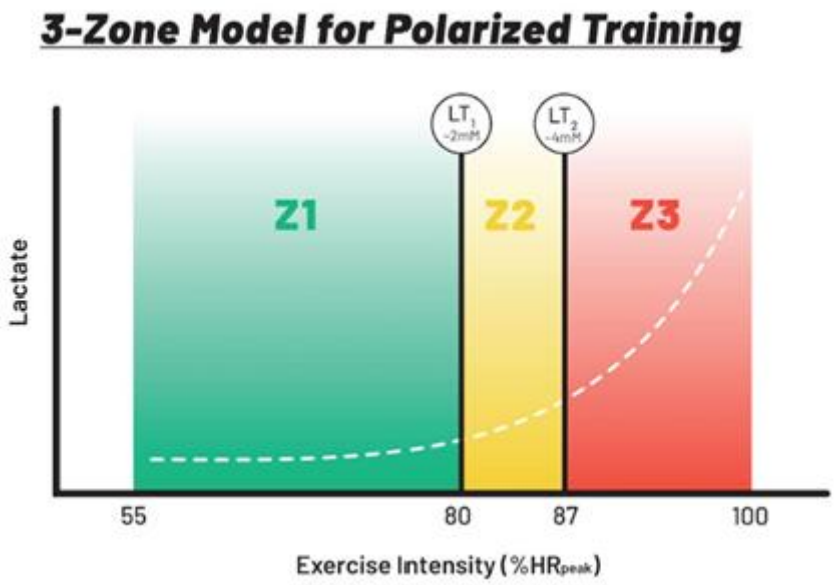
… where low is easy intensity, Threshold is 'somewhat hard to hard' and High Intensity is 'hard to very hard'.

For those very observant readers, it would appear that the aggregate of the three sessions is > 100% (Ooops!), luckily only just.

The preponderance of low intensity training is clear. In fact, on average, about 8 of every 10 training sessions are performed in the athlete's green zone. Note that very little time is spent in the yellow zone. The hundreds of hours spent training in the green zone can build the foundation for those red zone performances which can win races. The training strategy is not entirely pain free of course, as high intensity sessions are very hard! If there is a criticism of a 'normal' cyclist, like your or me, they spend too much time in the yellow zone, where there is little gain for substantial pain. Without a disciplined approach, green zone rides or sessions tend to drift into the yellow zone rides, and planned high intensity rides or sessions tend to drift back into the yellow zone.

A study of professional cyclists over four years gave an average power output of 191 watts and an average heart rate of 65% of max heart rate. The reason athletes don't train in the yellow and red zones every day is that their bodies are unable to sustain that intensity; on most days they train in the green zone. Dr Seiler describes this way of training as polarized, with the 80 of 80/20 referring to 80% of time spent in the green zone. The key reason this method of training works, is that it is sustainable. Research has shown that repeated high levels of stress within a training regime can lead to burn out or overtraining, with a consequent drop in performance. Fortunately, these polarized methods used by elite athletes scale down for normal people with training ambitions but limited time. So, slow down on most days and train harder on those few high intensity days, and reap the rewards!

The green, yellow and red zones of course, become the 3-zone model!



The thresholds in the 3-zone model are LT1 and LT2.

LT1 is the first lactate threshold where lactate levels in the blood become significantly elevated over resting levels and there is a shift in power production from fat burning to sugar burning. At a similar point in the curve, there is an increase in the athlete's breathing rate, hence why being able to just about hold a conversation puts you at the top end of z1.

LT2 is the second lactate threshold and is the point at which lactate production equals lactate clearance, often referred to as MLSS or the maximal lactate steady state. Training above LT2 is anaerobic. Above LT2, conversation is not possible due to breathlessness.

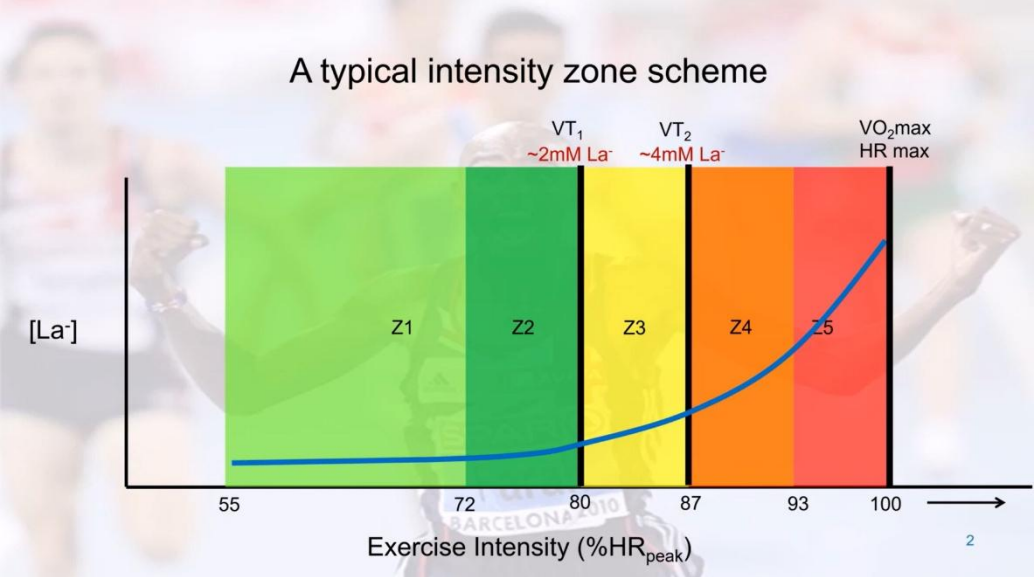
The 3-zone model can then morph into the 5-zone model below to give better granularity:

Z1 (3z model) -> Z1 & Z2 (5z model)

Z2 (3z model) -> Z3 (5z model)

Z3 (3z model) -> Z4 & Z5 (5z model).

Check this out from Dr Seiler, some thoughts on endurance training intensity zone -> Training Intensity Zones: general rules and importance of individual testing.



When we talk about Zone 2 training, we are talking about Zone 2 in the 5-zone model above! Essentially zone 2 is just below LT1 (and VT1 or ventilatory threshold 1) which is why the ability to just be able to hold a conversation can be used to identify it.

The 7-zone model adds a couple of anaerobic zones to the model, anaerobic capacity and neuromuscular power. See the table below for a description of each zone.

If you don't have a power meter of heart rate monitor, this table may help you understand which zone you're training in.

Table 1: Training Zones

Level	% FTP	%THR	%MHR	RPE	How it feels/talk test
Level 1: Active Recovery	<55%	<68%	50-60%	2-3	Very easy. A brisk walk or very easy pedalling. You can easily hold a conversation.
Level 2: Endurance	55-75%	69-83%	60-70%	4-6	Easy to moderate. You can ride all day here. You can hold a conversation, but you can't sing a song.

Level 3: Tempo	76-87%	84-94%	70-80%	7	Moderate to comfortably hard. You can speak sentences but may need breaks.
Level 3.5: Sweet Spot	88-94%	84-94%		7.5	Comfortably hard. You speak short a short sentence but may need breaks.
Level 4: Threshold	95%-105%	95-105%	80-90%	8	Hard. Your breathing is heavy. You can say a couple of words at a time, but you need a good reason to.
Level 5: VO2Max	106-120%	>105%	90-100%	9	Uncomfortably Hard. In the talk test, most words you say sounds like @#$%.
Level 6: Anaerobic Capacity	>120%	N/A	N/A	10	All-Out. In the talk test, you don't have any energy to spare on words.
Level 7: Neuromuscular Power	>150%	N/A	N/A	!!	Even more all-out. In the talk test, you don't have time to talk.

From <https://www.spicychickpea.com/resources/cycling-training-zones> with the addition of an MHR column.

Note: THR (Threshold Heart Rate) represents the maximal sustainable heart rate for steady-rate efforts lasting 30-75 minutes.

MHR: The maximum heart rate (MHR) is the highest number of times your heart can beat in a minute during physical activity.

From <https://support.wahoofitness.com/hc/en-us/articles/13814361243922-What-is-THR-Threshold-Heart-Rate>

Using the table above with my data - ftp of 220 watts, THR of 168 & MHR of 180 bpm gives the following for zone 2:

Power range: 121 watts to 165 watts, Heart rate range (THR): 116 bpm to 139 bpm, Heart rate range (MHR): 108 bpm to 126 bpm.

From my perspective as a cyclist: The THR numbers feel a bit on the low side, I can hold a conversation at c.150 bpm, whereas the MHR numbers are even lower, so you might need to investigate your own numbers. The upper end of the power range is probably a bit higher for me, I think it's around 180 watts. It's quite easy to check; get on the trainer, warm up and then hold your

zone 2 top end watts for 20 minutes and check your heart rate and see if you can still hold a conversation (this shouldn't be too easy). The figures do vary by individual and for each individual depending on factors like heat, hydration and how fatigued you are.

I strongly recommend looking at the following ->

How "normal people" can train like the worlds best endurance athletes | Stephen Seiler | TEDxArendal - YouTube which is where most of the above information was gleaned from.

For more information on training zones, check this out for the 7 zone model -> Polarised Cycling Training: A Detailed Guide — High North Performance or try this for the 5 zone model -> https://vo2master.com/blog/training-zones
More information about zones, ftp and V02 max -> https://www.bikeradar.com/advice/fitness-and-training/training-zones

There are many other articles on training and training zones - have fun!

20 week or 12 week Training Plans

So, we've done the heavy lifting on training zones. It should come as no surprise that our training plans are broadly based on the ideas of polarized training as outlined above. Both the 20 week and 12-week Individual Training Plans are designed to get you to the start line of your first Hill Climb in September. The 20-week plan is full on and requires at least 5 training sessions per week, whereas the 12-week plan has a more relaxed attitude towards training. The plans should be used as a basis for what you do but can be varied as you see fit. If you are short of time, cut down the number of rides per week or reduce their duration, if you fancy a bit more, go for it but don't overtrain! If you're short of time stick with 1 or 2 days of hill work/high intensity training per week. In general though, do not have more than 2 days of hill work/high intensity work per week, as that may lead to overtraining.

A good primer on zone 2 training from GCN, including some words from Iñigo San Millán, who also coached Tadej -> Why Riding Slower Makes You Faster: The Secrets Of Zone 2 Training - Bing video

The following is also very interesting about zone 2 training -> Long, low intensity endurance sessions: When is Low too low? When is Long too long?

A key takeaway with zone 2 training is the importance of staying within the power/hr ranges for zone 2 rides to ensure you get the associated benefits. This is because **zone 2** is the "**fat-burning** endurance" zone that helps you build an aerobic base and improve your body's ability to use fat for fuel - Zone 2 Cycling – Train Slow to Go Incredible Fast in 2025. Whilst training in zone 2, you should be able to hold a conversation with a bit of difficulty OR you should be able to breathe through your nose. If you go too quickly and move out of zone 2, your body will switch energy systems to burn

more carbohydrates; if this happens and you reduce your power/hr back to zone 2 levels, it takes about 30 minutes for your body to switch back to fat burning thus reducing the effectiveness of your ride. It does take a bit (a LOT) of discipline to do it correctly!

Zone 2 isn't the only story for this training of course. The 80/20 principle also caters for 20% of high intensity training, to get you ready for race type efforts. The discussions below about improving your FTP and VO_2 max will reference a number of appropriate high intensity sessions which also appear in the training plans. For an initial deep dive on High Intensity training -> Interval training: HIIT workouts for cyclists | BikeRadar

As ever, please consult your health professional/doctor before embarking on these training plans to ensure you're able to cope with the stresses on your body.

FTP, Max HR and VO_2 max

There are references in the plans to FTP, Threshold HR and Max HR. FTP is Functional Threshold Power, the highest average power a rider can sustain for an hour. HR is heart rate, or pulse rate, the number of times your heart beats per minute, and Max HR is the maximum heart rate your body can achieve during very hard physical activity. THR (Threshold Heart Rate) represents the maximal sustainable heart rate for steady-rate efforts lasting 30-75 minutes. If you possess a Garmin cycle computer, it will generally give you an estimate of your FTP. If you have a home trainer and use programs like Zwift, TrainerRoad, MyWhoosh, or one of the many other training programs, you can likely test your FTP with a ramp test. DC Rainmaker does some interesting reviews of indoor trainers and indoor trainer apps- > https://www.dcrainmaker.com/

Good primer on FTP -> What is FTP in cycling? Here's how to test and improve it | Cycling Weekly

Want to know your max heart rate? -> How to Test For Your Cycling MAX Heart Rate - Cycling-Inform Cycle Coaching

THR -> https://help.trainingpeaks.com/hc/en-us/articles/204071934-How-to-Calculate-Threshold-Power-Heart-Rate-or-Pace

Great set 3 of training sessions from Tristantakevideo with John Wakefield (worked with Tadej Pogacar - nuff said) -> How To Improve Your FTP: 3 Training Sessions from a WorldTour Cycling Coach

As you get closer to 'race day', a key aspect is to improve your VO_2 max.

VO_2 max is the **maximum amount of oxygen your body can absorb and use during exercise**. It measures your aerobic fitness levels and is a common tool to understand your fitness level. If you're looking to improve your aerobic fitness, you might consider maximizing your VO_2 max. If your VO_2 max improves, then you're able to use more oxygen, develop more power and go faster!

Another great video from Tristantakevideo with John Wakefield (love the way they have a good old laugh about training - if you done some of the sessions you'll know why) -> 6 Training Sessions to TRANSFORM your Vo2 MAX the training plans include similar training sessions to these!

Hill Repeats

Hill repeats are a great way of improving your climbing abilities. If you can do the hill repeats on the hill used in a hill climb event you've entered – even better; you'll get a much better understanding of the climb and your optimum pacing.

A great introduction to hill repeats from roadcyclingacademy -> Increase Your Strength & Power on the Bike (with Hill Repeats) - these sessions are included in the two training plans.

Hill Repeats - follow these steps to get the best out of hill repeats.

The goal of these hill repeats is to work zones 5 (aerobic), 6 & 7 (both anaerobic) - so be prepared to go deep! The benefits will be to increase VO_2 max, increase muscular strength and increase your ability to tolerate lactate (aka lactic acid). During the sessions, be prepared to use a bigger gear (at a lower cadence) than you might normally do to really work your leg muscles. If you get any knee pain when you lower the cadence, revert to the previous higher cadence. Only reduce the cadence when your body is adequately conditioned.

For all sessions, warm up for a good 20 minutes before the session and cool down for 20 minutes after the session; try and find a quiet area for the repeats without too much traffic. An option is to use your indoor trainer.

The training plans suggest a progression between the different sessions below, feel free to change it based on your progress within the hill climb repeats. After each ascent, just roll down the hill to commence the next ascent/repeat.

Session 1

Find a local hill with a gradient of 6 - 8% for an effort of about 1 minute.

New to hill repeats -> start in upper zone 3 or zone 4 (90 - 105% of ftp see Table 1 above) targeting a cadence of 70 to 80 rpm and do 6 repeats - get a feel for the repeats, when comfortable with this and stronger, move onto the more experienced session below:

More experienced -> work in zone 5 (106 - 120% of ftp see Table 1 above) with a cadence of 60 to 70 rpm, start with 8 repeats and build up to 15 (adding (say) a couple of repeats every week). Only use the lower cadences when you've really conditioned yourself.

When you're comfortable with session 1, move onto session 2 below.

Session 2

Now you're really into hill repeats, find a steeper (and possibly shorter) climb ...say 9% + the effort will still be about 1 minute.

Aim to use a cadence of 60 - 70 rpm and do (say) 9 repeats - staying within zone 5 (106 - 120% of ftp see Table 1 above)

On every 3rd repeat get out of the saddle for the whole repeat and work in zones 5 and 6 (106 - 150% of ftp see Table 1 above, use power to define zones as heart rate may be too slow to respond).

When you're comfortable with session 2, move onto session 3 below.

Session 3

Great work, now for the tough stuff. Find a hill for an effort of c.2 minutes with some really steep sections (or on an indoor trainer).

Aim to use a cadence of 55 - 65 rpm, staying within zones 5 and 6 (106 - 150% of ftp see Table 1 above). Concentrate on good form, using pressure throughout the whole pedal stroke. Start with 6 repeats, increase by 1 each week to 9 if your training plan permits.

If the hill has a flatter part, increase the cadence to keep your speed

Every 3rd repeat go as hard as you can (zone 7 150%+ ftp) for the last 50m of the climb (in or out of the saddle).

So, I hope that all helps. Time to get busy!

Have fun.