

TRAINING

Periodization --By Joe Friel

If you want to make it simple, the basics of training come down to three steps:

Step 1: Early in the season, gradually increase the weekly volume of training with medium and easy rides while including strength work.

Step 2: Once a solid base of aerobic fitness and strength is established, include a few high-effort workouts weekly, gradually making them more race-like.

Step 3: Significantly reduce the weekly volume starting a few weeks before an important race while keeping intensity race-like. Pretty simple, huh? Even Elmer Fudd could understand it. But perhaps you're the scientific type. If so, read on. We'll take a look at the system Albert Einstein would have preferred had he been a mountain biker.

Theory

You've probably heard of periodization. That's just another way of saying "time management." It is a strategy for arranging the pieces of the training puzzle into a pattern that systematically brings fitness to a peak at just the right points in the race season while making the optimal use of your limited time. The heart of periodization is the annual training plan. Usually, the season is broken down into seven-day "microcycles" on an annual training plan, but other combinations, such as 10-day "weeks," are possible. When I develop an annual training plan for an athlete, I typically divide the season into five periods known as "mesocycles."

General Preparation Period

This mesocycle usually lasts 12 to 24 weeks. For some, especially novices, this could be the entire season. Most athletes call this the "base" period. There are four outcomes that are desired at the end of this period. They are, in their order of importance at this stage of training: 1) excellent aerobic endurance, 2) exceptional muscular strength, 3) refined pedaling and bike-handling skills, and 4) improved muscular endurance. The methods to bring about these changes include long endurance rides at a low intensity, weight-room training that eventually gives way to big gear and then hill work, pedaling and handling drills, and long intervals done just below the lactate threshold.

Specific Preparation Period

I call this the "build" period and usually schedule it to last six to eight weeks. The name "specific preparation" comes from training that is specific to the event for which you're training. Intervals of all kinds, fast group rides, anaerobic hill repeats, and off-road time trials are typical in the specific preparation period. But they don't have to be. The idea is to do workouts that simulate what you expect the race conditions to be like.

Pre-Competition Period

Most of us call this the "peak" or "taper" period. It's the last few weeks, usually one to four, that immediately precede the major races of the year. By the week of the race the miles or hours ridden are only a fraction of what is typical. During this period it is important to do a race-effort workout every 72 to 96 hours. It should be shorter than the goal race, but just as fast. The workouts between are short and easy to encourage full recovery.

Competition Period

This is the period you've been aiming for - the week of an A-priority race. There should only be two or three competition periods in a season. Since you peak and taper for each of these, more than that will prevent you from maintaining your fitness. It may be necessary to return to an abbreviated base period following a competition period to regain some of that lost fitness.

Transition Period

It's time to rest. Immediately after each competition period take a mini-vacation from training. This may be two days in May, or four weeks in October. The farther you go into the season, the longer the transitions should be.

The Correct Mix of Training Intensities

Whilst 'cruising along' as described above is key to providing that essential broad base for your fitness programme, you'll not make the performance improvements you're probably looking for without introducing some work-outs at a higher speed. Whilst these rides will be 'in the red' as I'd call it (that is slowly building up lactate), you must of course restrain your rate of working so that you manage to keep going for the full time of the workout.

A very basic weekly programme for an amateur enthusiast might look something like this:

Day 1	90 min high speed cruise
Day 2	90 min high speed cruise + 20 min in the red
Day 3	2 to 3 hours nice and easy ('recovery ride or run')
Day 4	rest day
Day 5	60 min in the red (maybe a race)
Day 6	2 to 3 hours nice and easy (another 'recovery ride or run')
Day 7	second rest day

Adjust this programme around what you're actually trying to achieve, but keep to the basic idea of mixing the two intensities of work-out.

The leisure runner or rider should do less than the above, say one hour instead of 90 minutes - with the first 30 minutes gently warming in, and the last 30 minutes pushing harder bit by bit - but not 'in the red' (OK - maybe just a bit 'in the red' towards the end). The leisure person must take care about any exercise 'in the red', as this might not be good for him or her. If you are new to training I must emphasise the essential need to take it easy!! We have already mentioned the need for a medical check-up at least once per year, and we do not apologise for repeating this again.

For the amateur athlete, you can get a long way with something like the above programme, but once you want to get serious you must take professional advice about the precise programme you should follow

Note that your actual programme will depend on the time of year too. Your out of season training will be much easier (physically anyway) than your in-season training.

As a rough guide, keep completely out of 'the red' for a good three months of the out of season period of each year.

Also note that if you race, you have to fit your rest and your training sessions around the races. It would not be unusual to find that there are periods of just racing and resting, with some recovery runs/rides. Remember that doing too much is counter-productive, and may even be dangerous for your health - even for a top athlete. The serious athlete needs a good coach who understands his or her particular needs. 'The devil is in the detail' as they say.

We hope this has been a useful introduction to the basic concepts - as we see them - that should underlie training

Short, interval sessions to improve fitness

By Ric Stern*

The end of the season approaches, and maybe you need to boost your fitness level? That'd be good, wouldn't it? Fear not, here is an excellent performance booster that can help all riders improve, be it roadies, time trialists wanting a new PB, or just to help you ride further, faster. Outlined is a training session to help you improve.

One of the core sessions that I have my riders do is a simple, short, moderately intense, interval session. The session works equally well for the professional's that I train, through to 5th category riders. The absolute intensity is different, but the principle remains the same.

What's involved?

The session is slightly different depending on whether you have a power meter (e.g., SRM cranks, Power-Tap hub, Computrainer, etc.) or a HRM, and revolves around results from either a (recent) 10-mile TT (~ 20 - 30 minute TT), or a maximal aerobic power test (see below).

Depending on what you're trying to target the session can be completed indoors on a trainer, outside on flat roads, or up a steady climb.

The session should be completed on your main race bike. If you mainly do TT's then complete the session on that bike, using your aero-bars. If you're a roadie then use your race bike. However, there's no need to use your race wheels/tires. The session can easily be modified for MTBers, and trackies, etc.

Having previously selected the modality of the intervals (e.g., indoors, outdoors, etc.), start the session with a good warm up, around 20 minutes, gradually upping the intensity, as if you were warming up for a race.

Power

If you have a power meter, such as the Power-Tap hub, bring the power up to 105% of 10-mile TT power output (e.g., if you average 300 W for a '10', then target power is 315 W). Ensure that cadence is moderately high, 95 - 105 rpm, and hold this target effort for 4 minutes. Typically, most people report that the first minute feels 'easy', the second 'moderate', and the final minute 'very hard'. At the completion of the first 4 minutes, switch to an easy gear on your small chainring, and spin at 80 - 100 rpm for 1 - 5 minutes, to ensure full recovery.

The recovery period is dependent upon your fitness, and ability to recover. Try to ensure that each recovery period is the same duration. In subsequent sessions, you could lower the recovery time as your fitness improves.

Depending on your fitness the interval can be repeated two - seven times. Elite riders may be able to complete eight of these intervals, with a short (1 minute) recovery period between each one, whilst experienced master athletes may be able to complete four to six with a 4 minute recovery period.

Heart Rate

The principle of the intervals is the same with a HR monitor, i.e., just above 10-mile TT pace. However, as HR lags behind power output, it may take 60 - 90 seconds for HR to come up to slightly above race HR level. Depending on the training methodology that you adhere to the likely HR zone for these intervals is going to be around Zone 5b (US), or the upper half of Level 3 (UK). The time for these intervals starts when you accelerate to the desired range, NOT when your HR gets to (e.g.) Zone 5b. You'll likely find that HR will get to the 'correct' zone at a faster rate on each subsequent interval, and may peak at higher levels.

Your perceived effort during the intervals should be just above that felt during a 10-mile TT, breathing will be hard, and rapid, and talking should be impossible! Out on the road, you should find that speed during the interval is ~ 0.5 mph faster than during the average of a 10-mile TT. However, this will be highly dependent upon the environmental, and topographical conditions being the same as during a race.

How many, how often?

The number of intervals that you complete is going to be dependent upon your current fitness levels. Fourth, or fifth category riders may want to start with three intervals, and at least 5 minutes recovery between intervals. Elite riders will be able to complete more, and with a shorter recovery period.

The frequency of the session is once a week for less experienced riders. Professionals, or elite riders may increase the frequency to two to three times per week.

Recovery from this type of session can take 24 - 48 hours. Therefore, you may need to programme a relatively easy day after the interval session, this maybe an hour at a very moderate pace. Each week you should endeavour to increase the number of intervals that you can achieve by one, so that over a three-week period you may go from (e.g.) 4 to 6. At the end of a three-week period most people programme in a rest/recovery week. When you start up again with these intervals they may need to be carried out at a slightly higher level (as you will have improved). Also, as your fitness increases the recovery period may also come down. Good luck with these intervals, and enjoy your new fitness level.

Maximal Aerobic Power Test

For the riders who I test, I use a 15 - 25 watts per minute ramp rate depending on gender, and fitness level; women 15 wpm, elite males 20 wpm, non-elite males 25 wpm. Starting power is dependent on fitness, but a 3rd category rider may start at ~ 150W. The test is a continuous, ramp, type test, and continues until the rider can no longer keep at the correct power. I then average the final minute of the test, termed maximal aerobic power - MAP. These intervals can then be performed at 78 - 84 % of MAP, depending on ability, and fitness (an already excellent TTist may perform these at a higher level than a 'pure' roadie).

Physiologically speaking, this session improves VO₂ max, maximal aerobic power output, and the relative, and absolute percentage of MAP that you can sustain for around a 1 hour time trial.

The above test and intervals should only be carried out by people who are physically fit, are not ill, or have a medical condition. If you are in any doubt about your suitability to perform these intervals then please speak to your health care provider in the first instance.

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The importance of interval training

To determine precisely which were the important differences between sub-elite cyclists in categories 2-4 in the US (category 1 being elite), the research team of Tanaka et al at the University of Tennessee-Knoxville assessed both the maximal aerobic and anaerobic capabilities of 32 male and 6 female cyclists ('Aerobic and anaerobic power characteristics of competitive cyclists in the United States Cycling Federation', International Journal of Sports Medicine, 1993, vol. 14, no. 6, pp334-338)..

For the males, both aerobic and anaerobic performances seemed consistently higher as the standard became higher, suggesting a dual importance of both forms of energy production in achieving success. VO₂max values ranged from 4.5-5 l.min⁻¹, or expressed another way 63-70 ml.kg⁻¹.min⁻¹, which agreed with other previous research. Surprisingly, anaerobic performance was even higher than has been observed previously in power athletes such as gymnasts and wrestlers, although this may be partly a reflection of the cyclists' familiarity with the testing mode in all these studies - cycling itself..

The results for the females could not be used to discriminate between standards because of the small sample size, although high values were still observed for both aerobic (3.4 l.min⁻¹, 52 ml. kg⁻¹.min⁻¹) and anaerobic measures, displaying the same balanced physiological development..

The researchers suggested that the years of strenuous interval training that the subjects had endured, especially the higher category competitors, had in fact served to increase both aerobic and anaerobic function - each of these has previously been shown to be affected positively during relatively short-term training programmes. Thus the conclusions from this study include a large emphasis being placed on the importance of interval training for competitive cyclists. A controversy still exists about how well each of the two energy systems can be developed simultaneously, without a sacrifice having to be made in favour of one or the other..

VO2 max and body fat

A unique cycling event is the 4000m individual pursuit, where a competitor from a stationary start must propel himself as fast as possible over the specified distance using a fixed gear. At international level, competition times are around 4.5 minutes, rising to 6 minutes and over at sub-elite levels. At elite level it can compare quite nicely with middle-distance running with its similar demands, and is generally accepted to have an anaerobic/anaerobic energy requirement of 80%/20%..

Craig et al used this event to assess 18 experienced male cyclists ('Aerobic and anaerobic indices contributing to track endurance cycling performance', *European Journal of Applied Physiology*, 1993, vol. 67, pp150-158). The purpose of the study was to supply numerous measures of the cyclists' body types and physiological characteristics, and to use this data to determine mathematically the factors that most contribute to success..

Using relatively non-invasive methods, the two most important factors were found to be VO2max and body fat. Even though, unlike running, there is no need to move it vertically against gravity, unnecessary body fat in cyclists still has a detrimental effect on three counts: an increased energy cost of acceleration at the start of the race, increased rolling resistance of the wheels on the floor, and increased frontal area of the cyclist - and thus increased air resistance. Of these, the increased air resistance is the most important - 5 kg of extra weight add about 4 seconds to race time due to this factor alone..

Do I need a Heart Rate Monitor ?

No you don't need a heart-rate monitor. You can get extraordinarily fit without having one. It's nice to have one however, and it may help you take an interest in what your body is doing.

Equally, concentrating too much on it could get in the way of learning how to use your own natural in-built sensors to monitor your body.

Using a heart-rate monitor relies heavily on their being a direct tie up between the LACTIC and your HEART-RATE. What you're looking for is exercising just short of where the LACTIC builds up in your muscles: just below what is known as the LACTIC THRESHOLD.

If you exercise at your peak levels you can produce a lot of power for a short time, but you soon get that tight stinging feeling in your legs. That pain is caused by LACTIC ACID building up. You've gone into 'oxygen debt'. Your body can't get enough oxygen to your muscles, and your exercise is said to be ANAEROBIC.

On the other hand, if you exercise at lower levels, you can keep going until the fuel runs out. Your 'engine' is burning Carbohydrates and Oxygen and turning them efficiently into Water (sweat) and Carbon Dioxide (your breath). As you get used to regular exercise, you begin to develop a good feel for that best point for 'cruising along' at 'maximum endurance speed'. If you find that by increasing your speed a bit you begin to feel the LACTIC in your muscles, then your original rate of exercise was just right. Your exercise is said to be AEROBIC.

Whilst I accept that this connection is very close for a particular set of circumstances, I personally find that my heart-rate for this all-important threshold varies slightly from one day to the next, and I can't be right on the optimum point if I simply stick to a single figure on the dial. Even if you have a heart-rate monitor, without detailed testing it's certainly not possible to give figures for you to exercise at. Your heart-rate read-outs are personal to you. For example, my read-outs are all lower than anyone else's I've ever come across, from 'Resting Heart-Rate' right through to 'Maximum Heart-Rate'.

However, by carefully noting your own personal heart-rate monitor readings during different levels - and indeed types - of exercise, you'll eventually home in on a consistent set of readings. You'll get used to seeing certain figures and will immediately know if for instance you are likely to be overdoing things.

One good idea is to note down your resting heart rate every morning before you hop out of bed. You'll soon learn to relate a higher-than-normal reading with possibly over-doing things, or perhaps as an advanced warning of having caught a virus or something.

So please don't become fixated on trying to get a particular reading on the dial. Interpret readings intelligently. It's only a MONITOR, and of only ONE aspect of your performance