Indoor Cycling Association Profile Template
Intervals at LT or FTP

By Jennifer Sage
Master Instructor
Indoor Cycling Association

This is not a standard profile on the Indoor Cycling Association. Instead, this is a template for creating all types of threshold intervals using numerous variations in cadence, resistance, position (seated/standing) and sequencing of the intervals. With the variables provided, you can literally create several dozen different profiles!

Knowing your threshold is probably the single most important factor about your fitness that you could know. Hopefully you have read and listened to the Audio Master Class on estimating threshold in your indoor cycling classes. You can do this either with a field test or using a talk test. What is important is that you have an approximation for the level of intensity that corresponds to a 7-8 on the RPE scale (1-10) with a subjective assessment of “hard” to a little above “hard”. For more fit students it should be the highest sustainable effort they can maintain for 20 minutes.

Just because threshold is sustainable for 20 minutes does not mean that in order to cause adaptations that improve threshold, or power at threshold, you have to ride at that intensity for that long. You can do shorter intervals at this intensity and still benefit. If your students are new to spending sustained periods at this intensity, and/or if it is early in a periodized program, it is wise to gradually challenge them so that they spend more and more time at this intensity over the course of a few months. You can do that by increasing the duration of each interval at threshold, and/or by increasing the total number of intervals. It is best if you do not increase both at once however. Note that as you increase the time of each interval, you may have to decrease the number until you can build it back up.

Gradually increasing time spent at threshold does several things. Most importantly, it is an excellent and very effective training technique for athletes and non-athletes alike. Pardon the cliché, but there is more “bang for the buck” at this level of intensity than almost any other in terms of the physiological benefits. Don’t interpret that to mean you should do it all the time! It’s a high intensity training session that shouldn’t be repeated more than once a week early on in a training program, and then perhaps twice a week when fitness levels have increased. Certain athletes who are peaking for a specific event that requires this intensity might devote three days a week at threshold for a few weeks leading up to their event.

The second benefit when you gradually increase the length of time at threshold is the mental aspect. Over time, your students will recognize their improvement in a very quantifiable way. For example, they might initially have been challenged with 4X4 minutes (16 min total) at this
intensity, but now after 6 weeks of gradually increasing time at this effort level, they now can handle 4X8 minutes (32 min total).

Let’s take a look at how to introduce threshold intervals, and then how you can gradually increase total time at threshold (TAT). The following template for your intervals can be modified in many ways. You can do them on hills, known as “hill repeats” or on a flat road, which will simulate a race pace. You can vary the cadence in a dozen different ways. Just mix and match and add different music and you’ve got dozens of new profiles!

**Warm-up**

Your warm-up should be at least 8-12 minutes. The warm-up should include some surges in intensity to prepare the body for the higher level of effort that lies ahead. These can be done as 2-3 short 30-45 second surges or via a “test-interval”. You can raise intensity either through speeding up the legs via cadence increases from 80-100rpm, or through increased resistance. They can be done seated or standing (except limit standing when cadence is over 90rpm).

If you do a test interval, warm-up 5-6 minutes, then have them raise their intensity for 2-3 minutes. Begin at a moderately hard level, and by the end of the test interval, their perceived exertion should be close to “hard”. Note that heart rate may not be close to threshold by the end of this test interval, and in fact, it may even be much lower than their perceived exertion. This is because for most people it takes the body awhile to raise the heart rate until it is well warmed-up. In fact, some of your students may not achieve threshold heart rates until several intervals into your main set. This is not due to lack of fitness, it’s actually a very normal occurrence. My own personal experience is that my heart rate doesn’t settle into LT until about 20 minutes into my workout, even if my RPE is up there, regardless of my warm-up.

Diving into your main set of threshold intervals too soon without these intensity surges in the warm-up will make your early intervals less effective.

**Using Functional Threshold Power (FTP) for intervals**

If you have power meters, you should perform your intervals targeting FTP rather than LTHR. FTP is obtained the same way as estimating LTHR, via a field test. It’s possible to come up with a close estimate of FTP via a talk test as well, but as fitness improves, makes sure to conduct a power test to give your students an even better approximation of FTP. (Please see the Audio Master Class on Field Tests for more information).

I also recommend using a HR monitor in addition to power so you can observe HR responses at threshold. For those with power meters, the inability to raise the HR as quickly during the first interval or two will be readily apparent, even if FTP is obtained right away. Also, many of your students may notice a higher HR when intervals are conducted at higher cadences (90+rpm) at a given FTP.

Your surges or pre-interval during the warm-up should be help at about 10-20% below FTP to prepare the body for the higher effort that lies ahead.
**Recovery in between threshold intervals**
There is no exact black and white rule for the amount of time at recovery – it is more a general rule of thumb. It depends on the duration of the interval and on the level of fitness of your students. Less fit students will need more time to recover. If they are new to these types of intervals, then using a 1:1 ratio, or a little less is probably a good idea, since you will be starting with intervals of only 4-5 minutes long.

As the duration increases, the relative recovery length can decrease. Four minutes is sufficient for intervals of six-eight minutes. Once you start getting towards ten minutes or more, then 50% of the time spent in recovery is sufficient. Two sets of twenty-minute intervals with very fit students might only require an eight-ten minute recovery.

As you can see, you are the one to make the decision about the recovery duration depending on the fitness of your students, the duration of the effort and the length of time you’ve been working on these with your students.

Recovery should be at an easy pace in Zone 1, with a low resistance*, at a cadence of 75-95rpm. I often let my students recover at their preferred cadence, regardless of the BPM of the song. You don’t want to artificially raise the HR during recovery with too fast a cadence, as this will limit their ability to go hard during the interval. (*Remember, low resistance does not mean “no” resistance!)

**Introducing intervals at threshold**
The obvious goal is to spend more time at threshold, but to a less fit student, four minutes here is challenging. However, less than four minutes is not enough time to elicit any adaptations that help to raise LT. Therefore, start with three or four sets of four minutes with equal amounts of recovery. Then the next week, make them 30-60 seconds longer.

After a few weeks, you can add another interval and start reducing the recovery slightly. Then you can lengthen them to five minutes, then six minutes, and so on. It’s an art as you put together your threshold intervals!

**Faster or slower cadence? Does it matter?**
Some coaches suggest a higher cadence to train lactate threshold because it’s less likely to fatigue the leg muscles, but others suggest that it doesn’t make a difference when you’re talking about improving LT or FTP. I believe that you can improve threshold using a wide range of cadences. Nevertheless, it’s important to understand the difference on a physiological level. Lower cadence work (i.e. hill work at higher resistance) creates a greater force on the leg muscles. This means the muscle fiber recruitment will be leaning towards fast-twitch muscle fibers, which are better at higher force production. These muscle fibers tend to fatigue more quickly because they exert more force per contraction. Fast twitch muscle fibers are also more anaerobic in nature. They use primarily glycogen as a fuel source, which is much more limited in the body. Therefore, I suggest that you limit the number of high resistance, low cadence intervals in your workout so you don’t spend a lot of time at 65rpm and below. Keep low cadence work to intervals of 4-5 minutes. Choose higher cadences (75+ rpm) for the longer duration intervals of 8 minutes and longer. This will avoid premature fatigue of the leg muscles.
Higher cadence implies that muscle fiber recruitment will lean towards slow-twitch muscle fiber recruitment. I know its counter-intuitive, but slow twitch fibers exert less force per contraction and therefore can move more quickly (to a point – once you start sprinting quickly with power against a big resistance this relationship changes). These muscle fibers favor aerobic metabolism and fat metabolism. Higher cadence work (90-100+ rpm) will fatigue the cardiovascular system more quickly, and even raise heart rate higher. Some may find it raises heart rate higher per a given power output than a slower cadence might (if you have power meters to show that). Because of this phenomenon, you might allow HR to rise a little above LTHR for your higher cadence intervals, especially at the end of a workout. This will also take into account possible cardiac drift.

This should make it apparent that cadence choice will impact how your students feel during and after the class. If you do all lower cadence work you’ll likely feel it more in the leg muscles the next day. If it’s higher cadence work, your fatigue will feel a bit different.

Understanding the difference will help you when designing your profiles based on your objective, but it’s also a good idea to mix it up. Let some of your threshold workouts focus on lower cadence climbing, some on higher cadence climbing, some on higher cadence flat road work, while others might be a total blend of cadences.

**Seated or standing?**

It’s a good idea to stand up the first 30-45 seconds of an interval, maybe a minute for longer ones, to raise the HR close to threshold. Use short standing segments of about 30-seconds to keep students engaged if necessary, and/or inspire them to stand if they feel their effort level waning or HR dropping, to bring it back to threshold. But keep in mind that standing does tend to spike the heart rate, especially when the cadence is on the higher side. You will notice this on hills of 75+rpm and on flats 90+rpm. Because your purpose is to ride at a steady state right at your LT or FTP, try to avoid situations where the intensity spikes up and down. Again, this is student-specific: if your students can maintain intensity while standing, then by all means, allow them to stand. If you are doing threshold hill repeats you may want to do each one a little different by varying when and how long you stand.

For higher cadence flat roads, just realize that you will spend more time in the saddle; it’s just a fact of cycling life!

When you have spent a lot of time in the saddle, use the recovery intervals to take saddle breaks once the heart rate has dropped. Make sure students know not to let the HR spike during recovery.

**Lexicon and explanation for the main interval sets on the following pages**

4X5@LT = four sets of 5-minute intervals @ LT (or FTP) intensity
RI 4 min = Recovery Interval is 4 min (Zone 1)
TAT = Time at Threshold
Variables to use to mix and match your threshold intervals.

1. Duration and number of intervals - increase duration over time as endurance improves

   - 4X4 min (TAT 16 min)
   - 5X4 min (TAT 20 min)
   - 4X5 min (TAT 20 min)
   - 6X4 min (TAT 24 min)
   - 5X5 min (TAT 25 min)
   - 4X6 min (TAT 24 min)
   - 6X5 min (TAT 30 min)
   - 3X8 min (TAT 24 min)
   - 3X9 min (TAT 27 min)
   - 4X7 min (TAT 28 min)
   - 1X20 min (TAT 20 min) = field test. High intermediate only.
   - 2X15 min (TAT 30 min) = Advanced only
   - 3X10 min (TAT 30 min) = Advanced only
   - 4X8 min (TAT 32 min) = Advanced only
   - 4X9 min (TAT 36 min) = Advanced only
   - 3X12 min (TAT 36 min) = Advanced only
   - 2X20 min (TAT 40 min) = Very advanced only
   - 3X15 min (TAT 45 min) = Very advanced only – will need longer than a 60-min class

You can also play with increasing/decreasing duration:

   - 5 Sets: 4 min, 5 min, 6 min, 5 min, 4 min (TAT 24 min)
   - 5 Sets: 5 min, 6 min, 7 min, 6 min, 5 min (TAT 29 min)
   - 4 Sets: 4 min, 5 min, 6 min, 7 min (TAT 22 min)
   - 4 Sets: 5 min, 6 min, 7 min, 8 min (TAT 26 min)
   - 3 Sets: 6 min, 7 min, 8 min (TAT 21 min)
   - 3 Sets: 7 min, 8 min, 9 min (TAT 24 min)
   - 3 Sets: 8 min, 10 min, 12 min (TAT 30 min)

How about reversing those, so the shorter ones are last?
For example 3 Sets: 12 min, 10 min, 8 min (TAT 30 min)

The length of time that your students can sustain at threshold in one interval will depend entirely on their endurance, or lack of it as the case may be. 5X5 min (TAT 25 min) might be much more palatable for a moderately fit student than 3X8 min (TAT 24 min), simply because they have more breaks.

The longer the TAT becomes, the more fit your students must be. Do not try the longer intervals at threshold unless you know your students very well and have been working with them progressively increasing their TAT over time. Once you start getting into 30 minutes at LT, you are talking about a very fatiguing and high level of work, more conducive for your students who are avid cyclists or at least eager to train like one. It’s not just for cyclists though – the ability to train at this intensity for this long means a high level of endurance and an enhanced capacity to burn calories. Good news for your fit non-cyclists!
You can still modify the longer workouts for less fit students by encouraging them to lower the intensity for the final set or two.

2. Cadence variables (using the sample profile of 5X5):
1. Hill repeats using a range of climbing cadences of 60-65-70-75-80 rpm.
2. Hill repeats using a lower range of climbing cadences of 64-62-60-62-64 rpm. (Note: do not use cadences this low on repeats any longer than 4 or 5 minutes.)
3. Hill repeats using a higher range of climbing cadences of 72-75-78-81-85 rpm.
5. Hill repeats using only one climbing cadence, such as all at 70rpm, or all at 80 rpm.
6. Flat road intervals using a range of cadences of 80-85-90-95-100 rpm.
8. Flat road intervals using a higher range of cadences of 90-95-100-105-100 rpm.
9. Mixed terrain, progressively faster cadence: 75-80-85-90-95 rpm
10. Mixed terrain, alternating hill @ 65rpm with flat @ 90rpm
11. Mixed terrain, first 3 are hills @ 65-75rpm, last two are flat roads @ 90-95rpm
12. Mixed terrain, first 3 are hills @ 65-75rpm, last two are flat roads @ 90-95rpm
(Obviously you can do the same variations for profiles with 2, 3 and 4 sets).

3. Changing position
On alternating hill repeats, this is an example of how you might vary the seated/standing segments in the following way:
5X5 min @ LT
1. Stand 30 sec, sit 4 min, stand final 30 sec
2. Stand 1 min, sit 3 min, stand final min
3. Stand 30 sec, sit the rest of the way to the top
4. Alt sitting and standing 30sec/30 sec
5. Sit 4 min, stand final minute

Mix and match your seated climbs with standing climbs as desired, but it’s best to sit more than you stand. Not only is it more cycling specific for those who are cyclists, even for the non-cyclists, it requires more leg strength and less body weight to turn the pedals, improving overall fitness and endurance at threshold.

On flat roads of 80-90-ish rpm, limit standing segments to 30-40 seconds, otherwise heart rate can be artificially elevated while standing. At cadences higher than 90-ish rpm (depending on the pedaling skills of your students) keep standing segments to a very short 5-15 seconds. Make sure to let them take easy out-of-the-saddle breaks during recovery.

THE SKY IS THE LIMIT with the profiles you can create!
As you can probably see by now, the different ways you can mix and match these variables to create threshold interval profiles can reach up to many dozens! Just remember to be progressive as you advance your students and never lose sight of the most important objective with a threshold interval: steady state effort at lactate threshold or FTP intensity.
Sample progression for increasing threshold work in your cycling classes

Note that this is NOT a base building program and assumes a decent fitness level and aerobic base. It is simply an example of how you might put together the variables of threshold intervals from the previous pages in a progressive manner in order to increase your students’ time at threshold and improve their endurance. Even though there are eight “classes” below, it would take longer than eight weeks to do this, as you should intersperse other types of profiles with these, and would not likely do more than one per week. Two to three per month is more like it. Make sure to include some climbing classes, shorter higher intensity interval classes, Zone 3 intervals, and aerobic work in Zones 2 and 3 into the schedule as well.

Each one of these profiles should begin with a 8-12 minute warm-up that includes intensity surges and/or a “test interval”, or assume that the first interval will be at a lower intensity (and therefore, less TAT). Finish with a 6-8 minute cool-down and stretch.

Class 1: Introduction
4 X 4 min @ LT
RI 4 min
Total TAT = 16 min
2 @ 70-75rpm, 2 @ 80-85 rpm

Class 2: hill repeats, varying cadences
5 X 4 min @LT
RI 3.5 – 4 min
TAT = 20 min
65, 70, 75, 80, 75 rpm

Class 3: leg speed repeats
4X 5min @LT
RI 4 min
TAT = 20 min
80, 85, 90 and 95rpm

Class 4: slightly longer hill repeats @ higher cadences
4X6 min
RI 4 min
TAT = 24 min
All songs 145-165bpm (72-82rpm)

Class 5: Mix and match, start getting longer
Progressive 5, 6, 7 and 8 min @ LT
RI 3, 3, 4 and 4 min
TAT = 24 min
Alt climb with flat: cadence 65, 85, 70, 90rpm
Class 6: Longer higher cadence hill repeats  
3 X 8 min  
RI 4-5 min  
TAT = 24 min  
Cadence 70-80rpm

Class 7: Race pace threshold intervals  
2X10 min  
RI 6 min  
TAT = 20 min  
75 and 85rpm

Class 8: Field Test  
1X20 min  
TAT = 20 min  
Cadence 85rpm