

INTENSITY

By Rob Maxwell, M.A.

You can run long and you can run hard, but you should never (except in racing) run long and hard. Runners seem to obsess about how many miles they run, but rarely do they talk about how hard they train. I'm here to tell you that INTENSITY is the biggest factor when it comes to improving your running or endurance training. It's all about how easy to run on easy days and how hard to run on hard days. Total miles mean nothing in comparison to tracking intensity.

EXERCISE PHYS 101

Let's take it from the top. You start out into a jog. At this very aerobic pace, you're using your slow twitch muscle fibers (type I—Red) exclusively. You're also using predominantly fatty acids for fuel. As you continue to pick up the pace a little bit, you'll eventually hit the AEROBIC THRESHOLD (AeT). This typically occurs at 70% of your VO2 max (75% Max Heart Rate). After you cross the AeT, you're still using mostly the slow twitch muscle fibers (for a little while longer), but also the fast twitch (type IIA) just a little bit. You now also start using glucose (carbs) more than fatty acids for fuel. As you continue to ramp up the intensity, you will start to get into the threshold zone, which typically occurs about 10 beats or so before your ANAEROBIC THRESHOLD (AT). At this stage, you can still cruise along quite comfortably, and you're using a mix of slow twitch and fast twitch IIA fibers. At this level, your body does start accumulating lactic acid, but the body can still process it without too much trouble—but you are fatiguing. If you keep upping the intensity, you will hit the AT. This is the point at which you become anaerobic (without oxygen). At this point, your body now produces more lactic acid than it can rid itself of. Thus, you start slowing down. You now have pretty much bullied your slow twitch muscle fibers out of the game. At this intensity, you may try to hold this anaerobic pace as long as you can—say in a 5K. If you ramp it up one more time, maybe 400 meters out from the finish of a 5K, you will be completely anaerobic in a full-on sprint and using the fast twitch type IIB fibers only.

Runners utilize both the aerobic and the anaerobic energy systems. An ultra-marathon is a purely aerobic event, and a 200 meter race is a purely anaerobic event. But many different long distance running races utilize more than one system. So really, all of the different training intensities need to be trained. The one that is the most unimportant, in my opinion, is training the pure anaerobic system utilizing the fast twitch type IIB fibers. Typically this just leaves you sore (running all out 100 meters), and how often does even a 5K really come down to that? If that were the case, I'd be a happy camper, because I can hammer a 200 meter race!

THE BENEFITS OF TRAINING THE AEROBIC SYSTEM

Yes, believe it or not, training the aerobic system is more than just avoiding overtraining, it's about getting faster and more fit as well. Yes, I know, I know—you need speedwork to maximize speed, but speedwork must come AFTER you've fully developed your aerobic system or it's like building a house without a foundation—soon it will all come crashing down. I see this all the time. Most people train in what is called “no man's land” which is usually THRESHOLD pace.

Threshold pace gets an unfair reputation. You see, it's productive to train in this zone—VERY. You just don't train there all the time like most people do (it's simply called "no man's land" because it's comfortable and you're not quite *all the way* anaerobic yet). Why is the aerobic system so badly neglected? Do you realize that even a "short" 5K is still 95% aerobic—meaning using the aerobic system and metabolism? Yet, it's so undertrained.

One way to guarantee yourself aerobic benefits is to train often and on a regular basis (especially in the base building period) under the AEROBIC THRESHOLD (AeT). Remember, this is NOT the Anaerobic Threshold. The AeT is the point at which below it you are burning predominately fatty acids for fuel versus carbohydrates, and again typically around 70% of the VO2 max (A VO2 Max/Anaerobic Threshold Test can tell you exactly where this point is).

Here are the benefits to training in the pure aerobic zones.

- **YOUR HEART GETS BIGGER AND STRONGER:** Your heart (left ventricle) gets bigger (hypertrophy). This is not to confused with the bad heart hypertrophy that is associated with heart disease. This is the good kind. You're heart is a muscle, and it can grow up to 30% larger through cardiac exercise.
- **INCREASED STROKE VOLUME:** This occurs from the bigger and stronger heart. This can lead to the heart dispelling 2.5 liters of blood to the working muscles. More blood equals more oxygen; more oxygen means you go faster!
- **INCREASED MITOCHONDRIA:** The mitochondria are the powerhouse of the cell. Aerobic training increases the number, size, and distribution of mitochondria. This means more red blood cells (oxygen) can be processed. The more "powerful" the mitochondria of each cell, the more aerobic you can stay and thus go **FASTER!**
- **INCREASE OXIDATIVE ENZYMES:** By increasing oxidative enzyme activity, you'll improve the rate of oxygen that is delivered to the working muscles. Again, it's all about getting more oxygen to the muscles. The more you do, the faster and more efficient you'll go.
- **INCREASED BLOOD VESSELS IN THE WORKING MUSCLES.** With greater profusion of running muscles with blood vessels, more capillaries become active and distribute blood to working muscles.
- **HERE IS THE BIGGIE! TEACH YOUR BODY TO BURN FAT:** Be more efficient! Remember, distance running is an AEROBIC event. Aerobic means with oxygen; the primary fuel source is fat. If you spend enough time training your body (making it make adjustments to your training and not the either way around), your body will become more efficient, and you will be able to stay in fat metabolism longer. Remember, when you start to go anaerobic, you start to use CARBS for fuel. With using carbs comes lactic acid, the byproduct of glucose metabolism. With that comes what? You slow down. So we can improve this by teaching our bodies to delay going anaerobic, but we must spend tons of time in this zone to force your body into all the changes that I listed above.

BENEFITS OF ANAEROBIC TRAINING

Once the aerobic foundation is built, there is no doubt you need to crank up the anaerobic work and top off your speed. The biggest reason to do anaerobic work is to raise the *anaerobic threshold*. This is what endurance speed is all about. Lance Armstrong's anaerobic threshold

was about 95% of his HR max in his prime. The higher it is, the faster you go, and you get there by training, some of which is anaerobic. The key is some. A little bit goes a long way. For most fit runners, the AT is around 85% of their maximum heart rate (a test is really the only way to know for sure), but remember we start to go anaerobic before we actually hit the AT—typically about 10 beats before the AT (Threshold Zone). A little bit of anaerobic training goes a long way. Ten percent of the weekly volume should be anaerobic. How many of you can say that you really keep 90% of your training purely aerobic? I see where some “experts” have a million and one zones for being anaerobic, but really there is ONE—you’re anaerobic or you’re not. What about threshold zone, “no man’s land”? Guess what? That still counts as anaerobic because you’re burning mostly carbs for fuel, which produces lactic acid and fatigue. So we can use two anaerobic zones, but really anaerobic is anaerobic. And the thing is, you don’t have to go that high to get the benefits. There are many ways to structure speed workouts, and that is not the point of this article. Just know that when you get close to your AT (93% of it), you’re going anaerobic, and when you cross AT—you’re totally anaerobic. Just cross it. Like aerobic training, the information is wide, so I will limit to stating the benefits of anaerobic training:

- **RAISES THE ANAEROBIC THRESHOLD:** By spending time just below, at or above the AT, the body becomes fit at buffering and utilizing lactic acid and brings about changes so the level becomes higher. What you’re doing is raising your cruising speed.
- **TRAINS THE FAST TWICH MUSCLE FIBERS.** Both Type IIA and IIB. The IIA need the conditioning to be best developed for racing, and the IIB for the final kick (but again, don’t overthink that one).
- **INCREASED CARDIAC OUTPUT:** All of the cardiopulmonary changes mentioned under aerobic training, such as a bigger stronger heart which improves stroke volume, occur here too. The heart just likes to exercise!

SO HOW DO I KNOW?

This is the million dollar question. None of this information does you any good unless you find a way to know and track your intensity. There are different ways to track intensity: Tracking heart rate, pace, and perceived exertion are the most popular ways. By far the best is tracking heart rate. It’s the only one that tells most of the story. Pace does not take into account weather, terrain, or fatigue levels. There are some really good pace formulas out there, and used WITH heart rate work great, but use them alone and you’ll most likely overestimate. Say you figure from a pace formula that your LSD run should be at 8:00 miles, but it’s super windy out? What do you do? Or what if you’re slightly tired? If you wore a HRM and knew your zones, you would see how this happens often. If you’re not 100% physically fit, yet you hold to a pace that was taken from a race (pace formula), you may see that your HR is elevated 5-8 beats more than usual just trying to hold that pace. How is that the same workout? And is a 8:00 mile at 50 degrees the same 8:00 mile at 85 degrees? Not even close—probably a 15 beat difference. HR takes into account all of these things. Yes you run slower when you’re not feeling good or it’s hot, but you’re in the correct zone and getting the benefits.

Perceived Rate of Exertion (PRE) may be a little better than pace. Why? Simply because if you’re really being honest with yourself, you’ll go easy when you’re supposed and not feel obsessed to hold a certain pace. If you train out of guilt or fear, PRE will NOT work for you,

because you really won't be listening to your signals to slow down. You know that easy should feel easy, and you leave the ego at home. It is still a guess though. But I've found that after you learn your correct HR zones, and really LEARN by paying very close attention to what an intensity feels like, then you can leave the HRM at home for many runs—going by feel. But this is after really learning yourself.

USING HEART RATE is the most objective. There is no doubt about that. If you know your AeT heart rate is 153 and you're staying below that, no matter the temperature, terrain, or how you feel, you are getting all the aerobic benefits associated with training in the AeT zone. The key is knowing either your VO2 Max or anaerobic threshold. You can't use the 220-age or any other formula. They flat out are not accurate. You may as well use PRE if you're going to do that. There are many formulas out there to guesstimate, but none of them are worth much. There are some field tests out there to determine MAX heart rate—essentially going all out in a race and sprinting at the end will tell you what your MAX is, and that's not bad. And there are some field tests to determine the anaerobic threshold. But those are not quite as good because they still have no way of knowing any of the metabolic issues. Remember too that both VO2/MAX heart rate training and anaerobic threshold training use heart rate to measure. Knowing the VO2/Max heart rate without knowing the AT is limited due to everyone having a different percent of when they go anaerobic, so we can say for sure it's at 85% max heart rate, although that's the norm for conditioned athletes.

So the outright best way to know your zones is to get a metabolic test. This way, you learn what your Max VO2 is, what your aerobic threshold is, and what your anaerobic threshold is. From that, all the zones can be determined.