Want speed? Slow down!

Dr. Philip Maffetone

Training slow has always been considered a sign of weakness or laziness. However, if you want to run, bike, or swim faster, a successful and intelligent approach is to slow down! Along the way, you'll get healthier, prevent injury and burn more body fat too.

Traditionally, it is thought that only anaerobic training – speed work – builds speed. However, developing the aerobic system first, before attempting hard work, is ideal: you get faster without the wear and tear – and injury – that often accompanies anaerobic training. Using a heart rate monitor, a basic biofeedback device, makes it even easier.

Heart Rate Monitoring

Despite the boom in heart monitor use by athletes, it is still a misunderstood training companion. While many athletes use these devices, they often don't get their money's worth from them. Today's monitors are simple to operate, and are a valuable tool for developing the most important aspect of training – aerobic speed.

Heart rate monitors are really just simple biofeedback units. But without interpretation of the data they provide – heart rate changes – their true benefits cannot be realized. Dorland's Medical Dictionary defines biofeedback as "the process of providing visual or auditory evidence to a person of the status of body function so that you may exert control over that function." In practical terms, using a heart monitor to control workout pace can help build aerobic speed, improve overall health and burn more body fat.

As a student in the 1970s, I was involved in a biofeedback research project that measured heart rate changes in humans subjected to various physiological inputs, including running. Once in clinical practice, it became evident that using the heart rate to objectively measure aerobic function was extremely useful. This began a long process of clinical research (which continues today), and the development of techniques that help improve human performance on all levels.

By the early 1980s, all the athletes I trained used heart monitors. These were cumbersome but accurate, and unlike today's monitors were large, bulky and not made for athletes but cardiac and other inactive patients. (While more user-friendly, modern monitors still use old technology.)

Working with beginner to professional athletes in all sports, I developed applications for heart monitor use in three key areas: 1) training, 2) self-assessment and 3) competition.

Training

During training, a heart monitor can help athletes develop their body's *aerobic system*, which includes the red, aerobic, "slow twitch" muscle fibers. This process is referred to as building an *aerobic base*, and is the foundation of good endurance. Especially important, as outlined below, is for each person to find their specific training heart rate that will allow this optimal aerobic development.

Building a great aerobic base is accomplished by training *exclusively* aerobic for a certain number of weeks and months. During this period, *anaerobic* workouts (including higher heart rate training, competition and weight work) should be avoided. Anaerobic activity can actually impair the aerobic system, therefore, each workout during aerobic base training should be only aerobic.

The aerobic system plays a vital and primary role in all physical activity. For example, between 95 and 99% of the energy used for endurance sports, including competition, is derived from the aerobic system. This is true for events lasting more than a few minutes, and races from the mile to the marathon, and beyond. In addition to the traditional endurance events such as running, biking and swimming, aerobic-based sports also include tennis, golf, basketball and most others.

There may be several physiological reasons why anaerobic workouts can reduce aerobic function:

- Anaerobic activity can lower the number of aerobic muscle fibers, sometimes significantly. This can happen in just a few short weeks of anaerobic training.
- Lactic acid, produced during anaerobic work, may inhibit aerobic muscle enzymes necessary for aerobic function.
- Anaerobic training increases the respiratory quotient (a measure of fat- and sugar-burning) indicating the body is burning less fat.

In addition, excess stress in any form (mental, physical or chemical) can inhibit the aerobic system due to increases in the stress hormone cortisol. This, in turn, can increase insulin levels, further inhibiting fat burning and increasing sugar usage (and adversely affecting blood sugar). Anaerobic training increases cortisol too, often dramatically.

Building a great aerobic base takes at least three months. For athletes who have lost their competitive edge, have chronic injury or ill health, have difficulty burning body fat, or are just starting an exercise program, a longer base period – up to six months or more – may be needed. Some athletes have learned that training aerobically is all they need to compete better than ever.

This approach is sometimes difficult initially for athletes because in almost all situations training at the prescribed level is painfully slow. In addition, there may be a social issue as your training partners may want you to work harder. And, because a normal 5-mile run, for example, will take a longer period of time at a slower pace, instead of "miles" it's best to workout by "minutes." Our athletic culture is still entrenched in the myth of "no-pain, no gain" making proper training a mental challenge at times. But serious training requires discipline. Hang in there: improvements in speed, health and fat-burning are on the way!

What's the best heart rate for aerobic training? The answer to this is individual, and key to building a great aerobic body. Many are familiar with the old heart rate formula: 220 minus your age, multiplied by 65% to 85%. But this method has no scientific or clinical basis. For example, an individual's maximum heart rate is supposed to be represented by 220 minus the age. However, if you've ever pushed yourself on the track or in a race to find your highest heart rate, it may not be close to this formula as more than half of the population finds. Then there's the percentage factor: which do you use – 65%, 75%, 85%? That's an extremely wide range, and impractical. Rather than guess, use a scientifically-based formula.

One effective way of finding an optimal heart rate for aerobic training – called the *maximum aerobic heart rate* – is to evaluate certain physiological parameters on a treadmill, such as respiratory quotient versus heart rate. Seeing the success of this approach, I ultimately found a simple mathematical formula that predicts the same heart rate (typically within one or two beats), and in the early 1980s began using this *180 Formula*. (Treadmill testing is still ideal but not readily available, and is relatively expensive.) One unique feature of the 180 Formula is individualization – the person's general health status is factored into the equation, something automatically incorporated into treadmill testing, but not part of other formulas.

The 180 Formula

To find the maximum aerobic heart rate:

1. Subtract your age from 180 (180 – age).
2. Modify this number by selecting a category below that best matches your health profile:
   a. If you have, or are recovering from, a major illness (heart disease, high blood pressure, any operation or hospital stay, etc.) or you are taking medication, subtract an additional 10.
   b. If you have not exercised before or have been training inconsistently or injured, have not recently progressed in training or competition, or if you get more than two colds or bouts of flu per year, or have allergies, subtract an additional 5.
   c. If you've been exercising regularly (at least four times weekly) for up to two years without any of the problems listed in a or b, keep the number (180 – age) the same.
   d. If you have been competing for more than two years duration without any of the problems listed above, and have improved in competition without injury, add 5.

For example, if you are 30 years old and fit into category b:

180 – 30 = 150, then 150 – 5 = 145.

During training, create a range of 10 beats below the maximum aerobic heart rate; in the example above, train between 135 and 145 staying as close to 145 as possible. To develop the aerobic system most effectively, all training should be at or below this level during base building. As the aerobic system develops, you will be able to run faster at the same maximum aerobic heart rate.

Once a great aerobic base is developed, an athlete can develop anaerobic function, if desired. In some cases this may not be necessary or the time and energy is not available for such endeavors. (Successful anaerobic training can be accomplished in a relatively short period of time, a topic discussed in my book, *Training for Endurance*.)

One other significant benefit of applying the 180 Formula is the biochemical response: production of free radicals is minimal at this training level compared to training at higher heart rates. Free radicals contribute to degenerative problems, inflammation, heart disease, cancer and rapid aging.

As important as finding the correct aerobic training heart rate is the process of self-assessment.

Self-Assessment: *The MAF Test*

A significant benefit of aerobic base building is the ability to run faster at the same effort, that is, at the same heart rate. A heart monitor can help objectively measure these improvements using a test I developed in the mid 1980s called the *maximum aerobic function (MAF) test*.

Perform the MAF Test on a track, running at the maximum aerobic heart rate. A one- to five-mile test, with each one-mile interval recorded, provides good data. The test should be done following an easy 12–15 minute warm up, and be performed about every month throughout the year. Below is a 5-mile MAF Test of a runner training at a heart rate of 150:

Distance	Time (min:sec)
Mile 1	8:21
Mile 2	8:27
Mile 3	8:38
Mile 4	8:44
Mile 5	8:49

During an MAF Test, it is normal for the running times to slow each mile – the first mile should be the fastest and the last the slowest. If this is not the case, it may indicate the lack of an effective warm up. In addition, the test should show faster times as the weeks and months pass. For example, over a four month period, we can see the endurance progress in the same runner from the above MAF Test. Note the aerobic speed improvement between April and July:

	April	May	June	July
Mile 1	8:21	8:11	7:57	7:44
Mile 2	8:27	8:18	8:05	7:52
Mile 3	8:38	8:26	8:10	7:59
Mile 4	8:44	8:33	8:17	8:09
Mile 5	8:49	8:39	8:24	8:15

This improvement is typical during the aerobic base period. Some improve at a faster rate, others slower. Most importantly, if you're not improving within a three- or six-month period, it means something is wrong. It may be a dietary or nutritional factor, excess stress, overtraining (such as too many miles), etc. In some cases, it may be the maximum aerobic heart rate is too high (often from choosing the wrong category in the 180 Formula). Moreover, a reversal of aerobic function, i.e., slowing of aerobic pace during base training, may indicate an impending injury – enough of a reason to perform the MAF Test regularly.

Progress should continue in some form for three to six months or more before aerobic benefits may reach a *normal* plateau. Adding anaerobic work to the schedule before this plateau may impair (and ultimately even reverse) further aerobic progress.

The greatest benefit of the MAF Test is that it objectively demonstrates aerobic improvement in the form of aerobic speed. These changes also reflect competitive improvement.

Competition

A direct relationship exists between the maximum aerobic pace (as measured by the MAF Test) and competition. Essentially, increasing aerobic function improves competition (recall that events lasting more than two minute's duration obtain most energy from the aerobic system).

Data gathered on hundreds of runners I trained over a period of several years showed that the MAF Test was positively correlated with race pace – as the MAF Test improved, so did competition. The chart below, based on actual MAF Tests and 5 kilometer running race times, demonstrates this relationship.

MAF Min/Mile	5K Race Pace	5K Time
10:00	7:30	23:18
9:00	7:00	21:45
8:30	6:45	20:58
8:00	6:30	20:12
7:30	6:00	18:38
7:00	5:30	17:05
6:30	5:15	16:19
6:00	5:00	15:32
5:45	4:45	14:45
5:30	4:30	13:59
5:15	4:20	13:28
5:00	4:15	13:12

The above runners included those who developed an aerobic base, and raced on a flat, certified road course, or track. Most did not perform any anaerobic training, and for most, this was their first competition of the spring or fall racing season. Moreover, 76% of these athletes ran a personal best time for this distance! Similar relationships exist for longer events and for other sports.

The use of a heart rate monitor takes the guess work out of training and can help increase aerobic speed. It can also help prevent injury, ill health and burn more body fat.

Dr. Philip Maffetone has trained many world class athletes in all sports since 1977. His books include In Fitness and in Health *(4th edition, Barmore),* Training for Endurance (2nd edition, Barmore)*,* Fix Your Feet *(Lyons Press) and many others. Permission is granted to reproduce this article only in whole and with acknowledgement of the author and www.philmaffetone.com.*