Want speed? Slow down!

by Dr. Philip Maffetone

A heart rate monitor is still an underrated, misunderstood training companion. Many of today's runners have monitors but don't get their money's worth from them. Heart rate monitors are really just biofeedback units. But without interpretion of the data they provide, 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." As students in the 1970s involved in a biofeedback research project, we measured responses in human subjects to various physiological inputs; sounds, visual effects, and a variety of physical stimulation, including activity. The observed reactions were evaluated by measuring temperature, sweating, and heart rate.

It became evident that using the heart rate to objectively measure body function was simple, accurate, and useful. And its application in sports was obvious. For me, this was the beginning of a long process of using heart monitors with athletes.

By the early 1980s, I was using monitors for three important running applications:

- Training
- Self-assessment
- Racing

Training

The use of a heart rate monitor for effective training entails two important aspects. The first is that all endurance athletes must build a good aerobic base, a notion that famed running coach Arthur Lydiard promoted decades ago. The second consideration has to do with the specific heart rate used during training, and how a runner determines that important number. Let's look at each feature separately.

Building a good aerobic base means training only aerobically. During the base period, no anaerobic workouts (including racing) should be incorporated. Anaerobic activity will jeopardize the efficient development of your aerobic base, so every workout is aerobic. That includes your long run on Sunday, your hilly runs in the park, and any other workouts where you're heavily influenced by other athletes or the terrain.

In addition, an aerobic base period is devoid of weight training, since lifting is also an anaerobic workout.

There may be several reasons why anaerobic workouts can inhibit aerobic base building:

- Anaerobic training can decrease the number of aerobic muscle fibers, sometimes significantly. This can happen in just a few short weeks of higher heart rate training.
- The lactic acid produced during anaerobic training may inhibit the aerobic muscle enzymes necessary for building an aerobic base.
- Anaerobic training raises your respiratory quotient. This means the percentage of energy derived from sugar increases and fat burning decreases. In time, this may force more anaerobic metabolism and less aerobic function.
- Stress can also inhibit the aerobic system. Stress is nearly synonymous with anaerobic training. Excess stress raises cortisol levels, which ultimately increases insulin levels, inhibiting fat burning and increasing sugar usage. This promotes anaerobic metabolism and inhibits aerobic activity.

Aerobic base training is often the period of training where discipline, dedication, and hard work are most important. Most athletes think these three mental attributes are related to toughing it out, grunting, and training in pain. But it's sometimes harder than that: training properly during the aerobic phase, for many athletes, is the most difficult part of my program. It's the ability to go slower, despite what other athletes are doing and saying.

For the longer running events, 95-98% of racing energy is obtained from the aerobic system. This is another reason I recommend that most training be directed at improving this process. Building a good aerobic base takes about three months. For runners who have lost their competitive edge, have chronic problems (injury, sickness), or cannot lose that extra fat, a longer base - up to six months - can work wonders.

But the question remains: what heart rate do you use for aerobic training? Perhaps the most important feature of training with a heart monitor is knowing which heart rate to use. We're familiar with the old formula: 220 minus your age, multipied by 65-85%. But this method has no basis. Your maximum heart rate is supposed to be represented by 220 minus your age. However, if you've ever pushed yourself on the track or in a race to find your highest heart rate, you may have found, as more than half of the population does, that it is not the same as the formula. Then there's the percentage: which do you use - 65%, 75%, 80%? Rather than guess, you can use a newer formula which is scientifically based. See the insert on the 180 Formula, which establishes the best heart rate for building an aerobic base.

Initially, training at this heart rate induces emotional stress in many athletes. "I just can't train that slow!" is a common comment. But after a short time, not only will you feel better, but your pace will quicken at that same training heart rate. One significant benefit of applying the 180 Formula to your training is the chemical response by the body: production of free radicals is minimal compared to running at heart rates even a little higher. These chemicals can contribute to degenerative problems, inflammation, heart disease, and cancer, not to mention speeding the aging process. By using the 180 Formula, you can run more miles without risking chemical stress.

The 180 Formula

To find your maximum aerobic heart rate:

1. ***Subtract your age from 180 (180 - age).***
2. ***Modify this number by selecting one of the following categories:***
    - ***If you have or are recovering from a major illness (heart disease, any operation, any hospital stay) or on any regular medication, subtract 10.***
    - ***If you have not exercised before, you have exercised but have been injured or are regressing in your running, or you often get colds or flu or have allergies, subtract 5.***
    - ***If you have been exercising for up to two years with no real problems and have not had colds or flu more than once or twice a year, subtract 0.***
    - ***If you have been exercising for more than two years without any problems, making progress in competition without injury, add 5.***

For example, if you are 30 years old and fit into category b: 180 - 30 = 150, and 150 - 5 = 145. This is your maximum aerobic heart rate. For efficient base building, you should train at or below this level throughout your base period.

Self-Assessment

A significant benefit of aerobic base building is the ability to run faster at the same effort, that is, at the same aerobic heart rate. And an advantage of using a heart monitor is the ability to objectively measure these improvements using the maximum aerobic function (MAF) test.

The MAF test objectively measures the improvements in aerobic speed during base building. Aerobic speed means you can run faster at the same aerobic heart rate. Traditionally, only anaerobic work is supposed to give you speed. But aerobic improvements will too, and without the wear and tear which often accompanies hard training.

You perform the MAF test on a track with your monitor, running at your maximum aerobic heart rate. Three to five miles provides good data, although a one-mile test still has value. The test is done following an easy warmup.

Below is an actual example of a runner performing the MAF test at a heart rate of 150:

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Mile 1    8:21
Mile 2    8:27
Mile 3    8:38
Mile 4    8:44
Mile 5    8:49
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During any one MAF test, it's normal for your times to get slower; the first mile should always be the fastest, and the last the slowest. If that's not the case, it usually means you have not warmed up enough.

In addition, the test should show faster times as the weeks pass. For example, over four months, we can see the endurance progress in this actual case:

	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 usually is only realized during the aerobic base. If you add anaerobic work or racing to your training schedule, your progress will not be as good, or there will be none. Perform the MAF test regularly, throughout the year, and chart your results. I recommend doing the test every three or four weeks.

The greatest benefit of the test is its ability to objectively inform you of an obstacle long before you feel it or see it in the form of an injury or declining performance. If something interferes with your progress - improper training, poor diet, excess stress - you don't want to wait until it's too late. The MAF test tells you, by way of slower times, months before that happens.

Racing

Another important aspect of the heart monitor and MAF test is that the test is predictive of performance. A direct relationship exists between your aerobic pace and your race effort. In other words, as your MAF test improves, so will your racing ability.

Data gathered on hundreds of runners over several years made it evident that the pace a runner could perform at aerobic maximum pace was positively correlated with race pace. The chart below, based on actual data, illustrates the relationship between MAF and 5K race performance.

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 use of a heart rate monitor to guide you through aerobic base periods will not only help you get healthy, it will also help you perform your best for many years.

Dr. Philip Maffetone has trained and treated many world-class and age-group athletes in most sports for almost 20 years. His most recent book is In Fitness and in Health, and his new book, Training for Endurance, is due out in December (Barmore Productions, 607-652-7610).
