Understand the Training Principles

As I've mentioned, you should resist copying a coach's or champion's training regimen just because it works great for him or her; each runner's training schedule should be based on sound principles of training. Of course it's possible that through pure luck the coach or champion you're copying follows a schedule that's ideal for you, but this is rare. It's best to know and understand why you're doing what you're doing.

Runners should understand exactly what each day's training is designed to accomplish. Ideally, they should also know how long it might take before they realize the benefits of their training. Further, understanding how the body reacts to various stresses can help prevent overstressing and allow runners to maximize all the systems of importance in achieving their running goals. Here are some principles of training that answer often-asked questions regarding how the body reacts to the stress of training.

Principle 1: The Body Reacts to Stress

There are two types of reactions to the stress of exercise. The first is an acute reaction, such as you would experience if you got up from your seat, went outside, and ran to the corner. Your heart rate speeds up, your stroke volume (the amount of blood your heart pumps with each beat) increases, your ventilation rate and depth of breathing increase, your blood pressure rises, and your muscles feel some fatigue. If you perform an exercise on a regular basis, you experience regular reactions to the activity. The second type of reaction to the stress of exercise is the training effect, which results from repeated, chronic exercise.

Training produces changes throughout your body that over time allow you to perform the daily run to the corner with less discomfort (and probably in less time, as well). The muscles that you stress with this exercise become stronger, and blood flow to the muscles is increased. Changes inside the muscle cells provide more energy for the muscles, and less lactic acid accumulates during the bout of exercise. Your resting heart rate undoubtedly becomes slower (because a stronger heart can pump more blood per beat it and thus requires fewer beats to deliver the needed blood). You probably also develop a lighter, springier step (because your leg muscles are more fit), lower resting blood pressure, lower body weight, and less fat under the skin. All of these reactions to the stresses you impose on your body lead to improvements in how you react to stress, the increases of stress you can tolerate, and how prepared you'll be to handle new stresses and competitive efforts.

Principle 2: Specificity of Training

The system you stress during exercise is the one that stands to benefit from the stress. Training for one sport usually has little or no beneficial effect on your ability to perform a second sport; in fact, in some cases there might be a detrimental effect, such as the negative effect that long-distance running has on performing explosive leg activities, such as sprinting and jumping. It works the same way for bodybuilding and distance running: The extra muscle mass developed through bodybuilding can act as dead weight and interfere with distance-running abilities.

The principle of specificity means that to become accomplished at an activity, you must practice *that* activity and not try to achieve gains through performing another activity. Doing another activity takes time away from your primary interest and might produce results that limit performance in your main activity. You must give considerable thought to every aspect of your training, and you must know what everything you do is doing for you and to you.

Please don't take the specificity principle so literally that you limit *all* your training to running (although if you have limited time for training, you might be best off spending what time you do have on running). Most runners can realize definite benefits through some nonrunning (supplemental) training sessions—because flexibility and strengthening exercises can help ward off running injuries common among runners who spend all their available training time running. I address supplemental (support-system) training in chapter 10.

Specificity of Overtraining

The specificity of overtraining is a corollary to principle 2. Just as training benefits those body systems that are properly stressed by the exercise, overtraining has a negative impact on the systems that are overstressed.

It's possible for a single, overstressed system to affect a variety of activities other than just the activity that caused the damage. For example, a stress fracture in the leg, caused by too much or improper running, can prevent a runner from performing other activities that stress the injured extremity. Too much running doesn't always mean you become overtrained in other types of physical activity, and it might be beneficial to limit running for periods of time in favor of other types of training. When you have an injury that eliminates running for a while, this might be a good time to do some deep-water running or to work on an elliptical trainer, either of which might work some leg and hip muscles even better than running would. Keep in mind that when you've been away from running for a period of time, you should work your way back into it with reduced intensity (see chapter 4). We quickly learn to appreciate the frailty of our bodies when we depend on everything to go right at all times as we try to reach our goals.

Specific Stress Produces a Specific Result

This corollary to principle 2 might be somewhat obvious, but its importance makes it worth mentioning. The benefits that you can expect from doing three one-mile runs at eight minutes each, with five minutes recovery between runs, three times a week, are specific to that frequency (three times each week), amount (three miles of running per session), intensity (eight-minute pace), and recovery between runs (five minutes). Someone who performs this training regimen regularly will reach a level of running proficiency that will remain stable (and that will differ from the proficiency level reached if the training program consisted of five one-mile runs at seven minutes per mile). Figure 1.1 shows how a new level of fitness is reached over time.

Adding a new level of stress on top of your current training further increases your fitness level. If you have performed this training regimen regularly and reached a stable level of proficiency, many training modifications are possible. You could increase the training frequency from three to four (or more) days per week, you could increase

the amount of training from three to four miles per session, or you could increase the distance of each interval from one mile to one and a half miles each. Another possibility is to increase the intensity (the speed of each mile) from 8:00 pace to 7:40 pace, for example. A final possibility is to change the recovery time allowed between the mile runs within a workout. Any one of these changes in training (frequency, duration, intensity, or recovery) or any combination of these changes will affect the result of the program, leading to a new level of fitness (see figure 1.2).

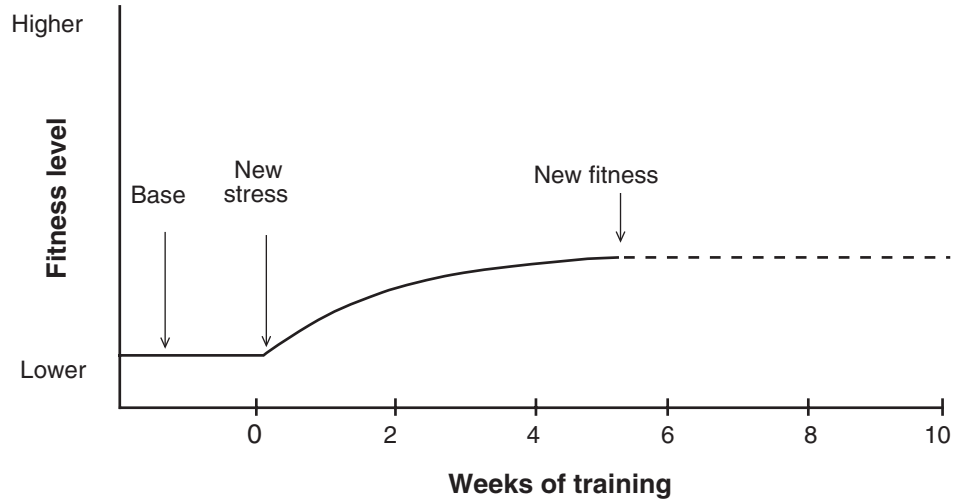

Figure 1.1 Increased fitness as a response to a new stress introduced to training.

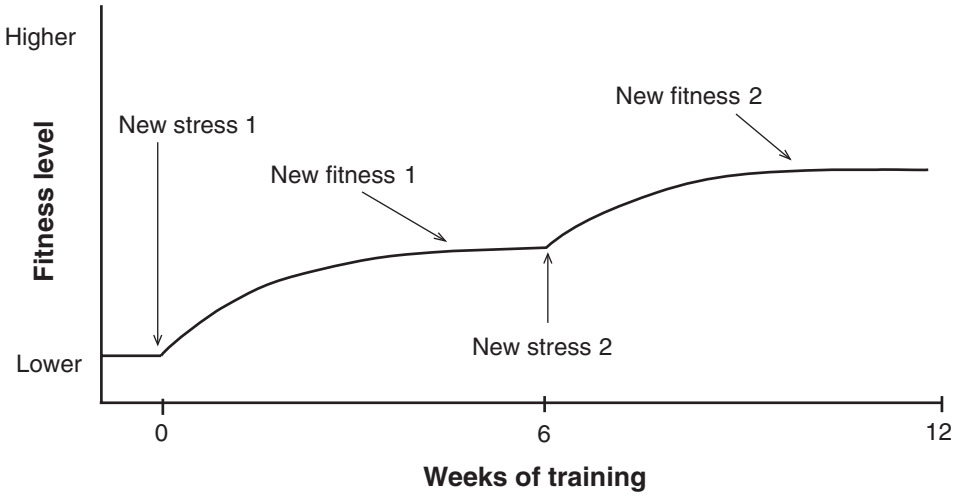

Figure 1.2 Increased fitness as a response to adding a new level of stress (new stress 2) onto prior training (new stress 1).

Principle 3: Rate of Achievement

Notice in figures 1.1 and 1.2 that the rate of achieving the benefits of a training program is rapid at first and then tapers off over time. If you look at the time scale on

these two figures, you see that most of the benefits of a particular training regimen are adequately realized within about six weeks. Sticking with a training program for longer than six weeks, however, can produce more benefits. Without an increased stress of training, changes in body composition (loss of unnecessary fat, for example) can continue, leading to better performance.

You might realize adequate benefits within a matter of weeks; however, if you want to increase training, a good time to do so is after six weeks of adapting to the previous training stress. Changes you impose after fewer or more than six weeks of a program would follow the curves shown in figures 1.3 and 1.4, respectively. The primary danger of increasing training too often is an escalated risk of injury and overstress caused by taking on too much too fast. It's difficult to get a feeling of what a particular training

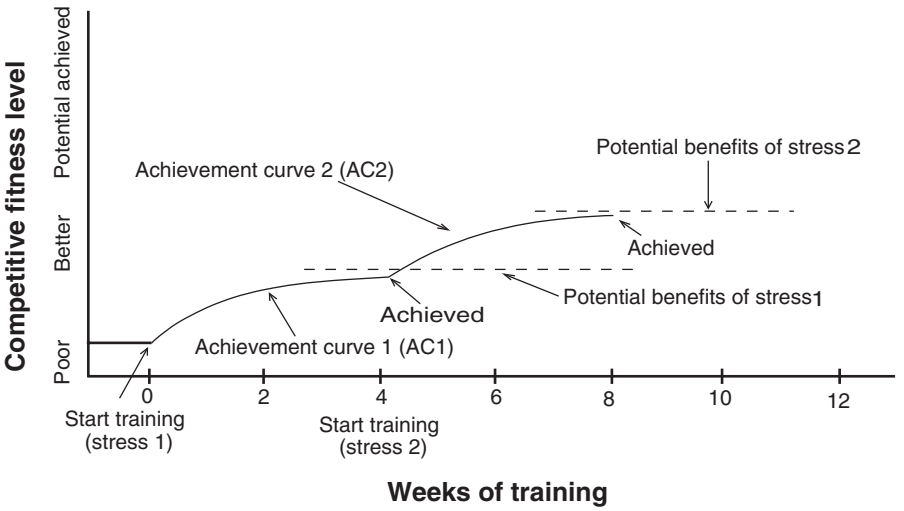

Figure 1.3 Changing the training stress you're doing within a phase of your program too soon prevents you from achieving the maximum benefits from that phase.

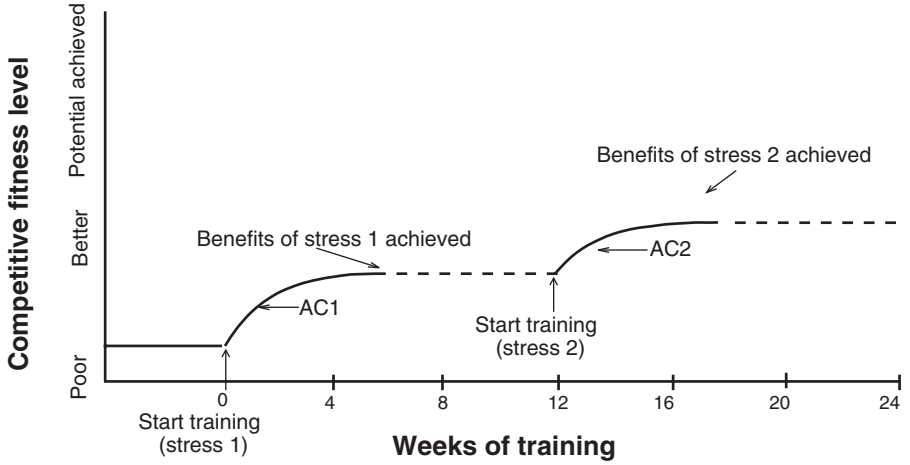

Figure 1.4 To progress beyond any achieved level of fitness, the training stress must be increased or you'll reach a fitness plateau and never exceed it.

load is doing for you if you don't stay with it a while. You might be ready to increase your training stress after fewer than six weeks, and on occasion that's perfectly acceptable, but I think you should give any particular amount of stress at least three, preferably four, weeks before increasing training. I prefer that my runners feel that one amount and intensity of training is getting easier before they try running more or faster.

Principle 4: Personal Limits

Another principle of training related to the curves presented in figures 1.1 through 1.4 is that each individual has unique limits. In fact, you could probably say that every system in a person's body has limits. For example, there's a limit on how tall you will be, how strong a particular muscle in your body can get (including the heart), how much air you can breathe in and out of your lungs, how much blood can be transported to your running muscles, how much oxygen your running muscles can use in converting fuel to energy, and how fast you can run a mile, a 10K, or a marathon. Different people will reach different degrees of success, which are greatly dictated by personal limits. The good news is that few people *realize* their limits, relative to running, and improvement is almost always possible.

Having limits presents us with the dilemma of testing the "no pain, no gain" theory. Let's say you've been gradually increasing your training every six weeks for the past six months, and your performances are steadily improving. After several weeks of even more difficult training, you feel tired and can't do the workouts very well. When a race comes along, your performance is subpar. Your reaction is likely to be, "I need to train harder," but it should be, "Maybe I have reached a personal limit and need to reassess my training program." Something has to be done, and the train-harder approach, although quite common, is usually not the answer. Often the limit is seasonal, and the next year your performances will begin to improve again, to a new limit. I often see limits varying among college runners, largely because of changes in class schedules, work, and personal relationships. When an athlete's results don't meet expectations, the athlete might be the victim of the personal (perhaps temporary) limit principle. On the other hand, the principle is also often at play when runners achieve a breakthrough season. In most cases, physiological performance should and usually will continue to improve over many years; a subpar season is often the result of outside influences, which are usually temporary.

Principle 5: Diminishing Return

As training increases in duration and intensity, the benefit—or return—from the training decreases. This doesn't mean that increasing training decreases fitness; it means that the fitness increases later in training aren't as great as they were earlier in training. To clarify this principle, the benefits of increasing weekly mileage are shown in figure 1.5, with an all-inclusive term, competitive fitness (or percent of potential achieved), plotted against weekly mileage. Take the example of someone who starts training at 10 miles per week, doubles the weekly mileage to 20, doubles it again to 40, and finally reaches 80 miles per week, allowing a couple of months at each level.

Regardless of how gradually the runner progresses from 20 to 40 to 80 weekly miles of training, the benefits reaped from 40-mile weeks are not double those realized at 20-mile weeks, nor are the results of 80-mile weeks double the return of 40-mile weeks or quadruple the benefit of 20-mile weeks. Adding more and more mileage to your weekly training doesn't produce equal percentages of improvement in competitive fitness. The same principle of diminishing return applies to increasing the amount of faster quality training. The difference between this principle and the rate-of-achievement principle (principle 3) is that the rate of achievement applies to each degree of achievement along the curve of diminishing return, shown in figure 1.5. It still takes an equal amount of time to reach the benefits of a new level of training, but each new level achieved will be less of an improvement than the previous one was.

It's a sad but true fact that harder and harder training results in less and less improvement; even so, improvement *will* continue as long as the accelerating setback principle (number 6) doesn't become too large a factor. Still, even small improvements, which might be associated with greater-than-ever increases in stress, might pay off, especially when only a second or two separates runners at the end of a race or when an athlete is contending for an Olympic medal.

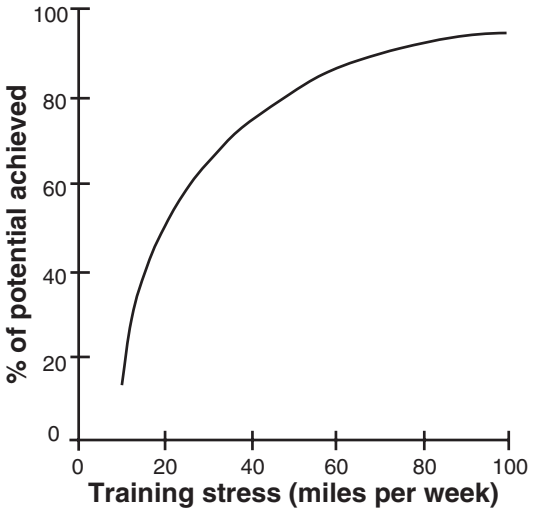

Figure 1.5 The principle of diminishing return states that as you continue to increase the amount of stress in your training, you get less benefit from the increase. This is why beginning runners make vast improvements in their fitness and elite runners don't.

Principle 6: Accelerating Setbacks

The setback principle states that low levels of training cause few setbacks (such as injury, illness, or reduced interest in training), whereas high levels of training increase the risk of setbacks occurring. The curve that depicts this principle is a reverse image of the diminishing returns curve (figure 1.5). In figure 1.6, increases in training stress are plotted against the chance of encountering a setback.

A setback is a setback and must be avoided at nearly all costs. Thus, this principle is one to be wary of, especially in more important seasons. It's very difficult to say what's too much for any particular runner, and it might take several seasons of working

together before a coach and an athlete can arrive at what's enough and what's too much. It's particularly important to log your responses to different amounts and intensities of training so that you can refer to earlier seasons, how much you did, and how you responded to various types of training. I hope the new point system presented in chapter 2 is useful in this regard.

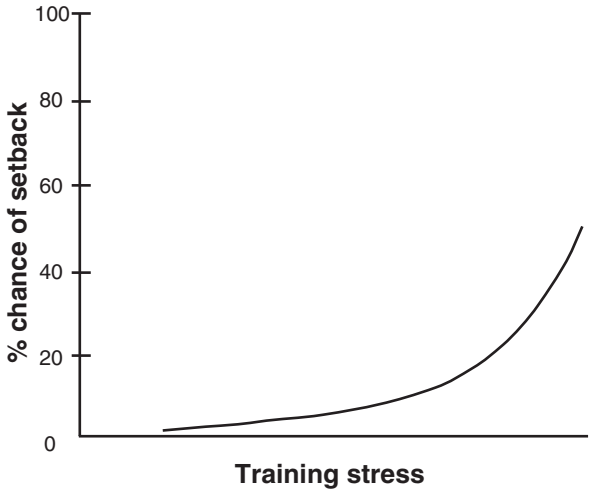

Figure 1.6 Increasing your training stress increases your chance of setback caused by injury or illness.

Principle 7: Ease of Maintenance

This principle applies to maintaining a level of competitive ability, which is at least partly a function of reaching a particular level of confidence. Although I'm referring primarily to physiological fitness, it's no secret that psychological factors play an important part in how fast you can race. Once you break the barrier of the five-minute mile, or any other personal goal, the training effort required to repeat the task is usually well short of what it took to reach the goal in the first place.

The maintenance principle is important when planning a long-term training program. It allows you to shift your training emphasis from one system (e.g., development of cellular adaptations that respond favorably to long, easy mileage) to another system (e.g., repetition work for the enhancement of economy) and still maintain the original benefits through less frequent attention (to the longer runs). The ability to improve a system and then maintain it while building up another system relies heavily on the maintenance principle.

This principle can be of particular importance for runners involved in another sport between cross country and outdoor track season. Basketball, for example, helps a runner maintain some impact–stress conditioning that will be of benefit when returning to running as the primary sport. By taking advantage of previous conditioning maintained through less-than-major involvement in running, you can make it easier on yourself when it comes time to set up for a new running season. Whereas some runners might have to start from scratch each new season, those who retained some

fitness while away from running can take on more demanding workouts earlier in the season and perhaps progress to a greater level of achievement.

Be Flexible in Your Training

Education is a never-ending process, as is the search for improvement in any endeavor. I continue to learn about coaching and training by talking to other coaches and runners and trying to answer their questions. Sometimes I don't have the answer, but the question prompts me to evaluate the situation and come up with what I consider a logical response—often a new approach to training.

Some local high school coaches asked me how their cross country teams could get in some training when they were required to compete every Tuesday and Saturday. I don't like training (other than easy running) for two days before a competition, so that left only Wednesdays as the day for training. Further, because racing 5,000 meters provides benefits similar to those of a good interval session, it wasn't necessary to add an interval session to the weekly schedule. Thus, by treating Tuesdays (race days) as interval days, I opted for a threshold session (a few miles of comfortably hard running; see chapter 7 for details) on Wednesdays, creating back-to-back quality days each week. If a Tuesday race wasn't too demanding, the teams did some fartlek running (mixing fast and slow runs of various distances; see chapter 2) over the race course following the race, making Tuesday a full-blown, quality interval day.

After a season or two, so many high school coaches reported success with this approach (back-to-back quality days on Tuesdays and Wednesdays) that I incorporated the same approach into my cross country training system and have stayed with it ever since. Of course, we don't all have Tuesday races, so that becomes a good long-interval quality day, which I follow with another quality (threshold) day on Wednesday. I continue to follow this system to some extent during track season because the back-to-back training has at least three advantages. (1) It allows my runners to adapt to racing on consecutive days. (2) Muscle soreness is often greater the second day after a stressful session than it is the very next day, so the follow-up quality day comes before the negative effects of the first day have occurred. (3) For younger, overzealous runners, the knowledge that tomorrow brings another quality day might calm their enthusiasm somewhat and make overtraining less likely.

As I've discussed in this chapter, my approach to training runners is getting to know their individual needs and applying the principles of training to those needs. I've arranged the chapters that follow to apply this training focus to the demands of the event being trained for and to finding the proper mix of training that best meets the event's demands, thus optimizing a runner's performance.