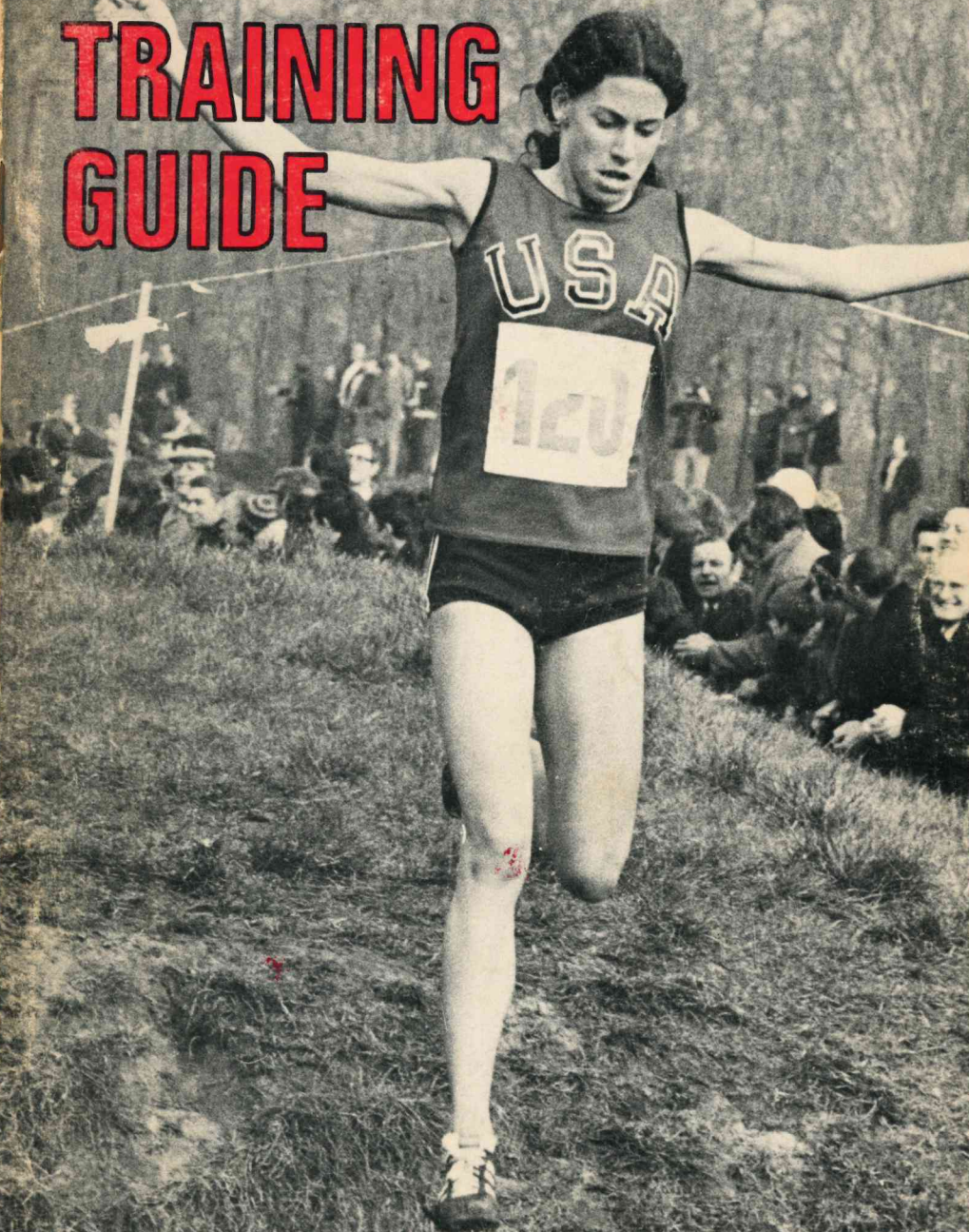


# RUNNER'S TRAINING GUIDE







\$2.50

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## FOREWORD

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**“Train (verb)**—1. *to cause to grow as desired; 2. to form by instruction, discipline, or drill; 3. to make or become prepared (as by exercise) for a test or skill; 4. to aim or point at an object. Synonyms: discipline, school, educate, direct....”*

Training, by definition, is practicing to perfect a skill. It is reaching for something better in the future than what you now have, or at least keeping from slipping below self-imposed minimum standards.

In running, the object of training is learning to go farther, faster in races. Standing in the way are distance and time, effort and pain. Training allows runners small but often significant victories over these.

The central theme of training literature is stress: minimizing it, adapting to it, living with it. The runner's everyday partner is a high stress load. He must have it or he won't improve. But if he hasn't learned to manage and control it, he'll break down. In this way, training is an individualized balancing act between enough and too much.

Stress is one of many physiological theories governing training. Exercise physiologists are playing an increasing role in running by explaining these concepts. They are the “wholesalers” of training information.

Coaches are the “retailers.” They take information from physiology, a little from psychology and more yet from their own practical experience. Then they deal it out to the runner, the “consumer” who's the final judge of a method's worth.

One problem is lack of communications among the three groups. Research findings often don't filter down to the coaches. Runners aren't made aware of their coaches' training rationale. Pure scientists who don't run can't appreciate the realities of running outside the laboratory.

If training literature is going to be worthwhile, it has to draw on the experiences of all three: physiologist, coach and runner. That's what we try to do here.

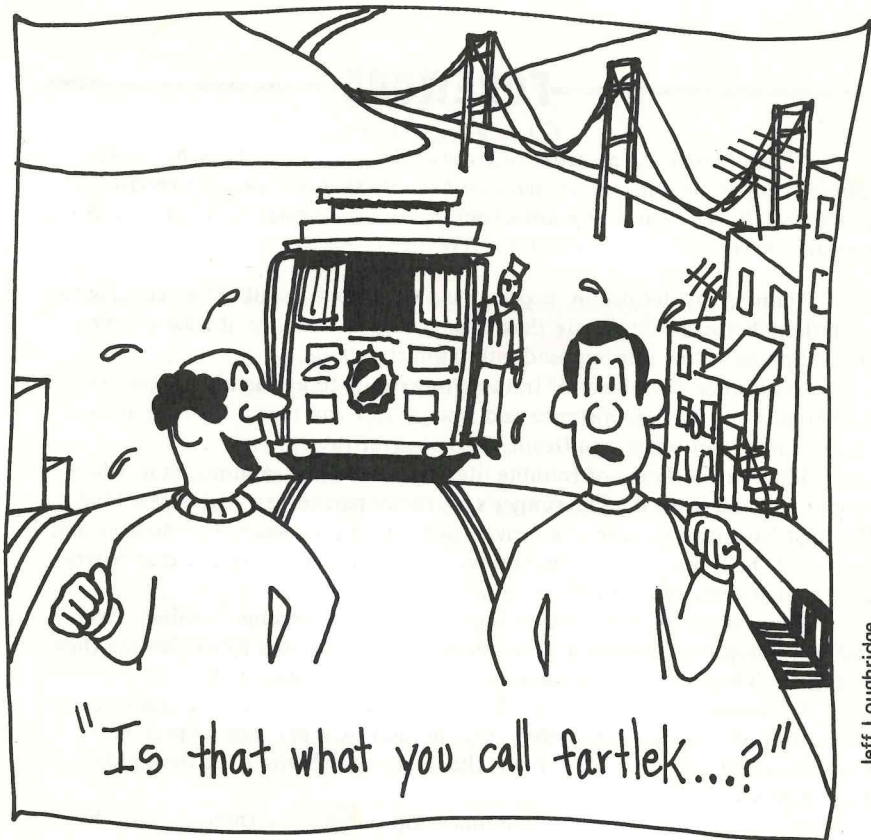
Science sets broad principles and limits, but there's an art in applying these principles and staying inside these limits. Running training, by the time it reaches the consumer, is a mixture of science and superstition, fact and fad. All are important.

For this reason, we're looking at it from a number of different viewpoints: physiological and psychological, historical and personal.

We're not pushing any one method. Instead, we're describing the groundwork that underlies all methods. Once this is known, each runner will have tools with which to construct his own best program.

It's only half-true what experts say, that there is no “one right way” to train. As long as broad limits are observed, there are any number of ways to reach the same end. But individuals react differently to the same methods and loads. We're trying to tell runners how to take their training personally.





Jeff Loughridge

## LANGUAGE OF TRAINING

The following definitions are standard throughout this booklet.

**Aerobic**—activity that allows normal breathing.

**Anaerobic**—activity involving labored breathing; see "Oxygen Debt."

**Endurance**—ability to run long.

**Fartlek**—a style of training employing frequent changes of pace with no fixed pattern; means "speed-play" in Swedish.

**Fast Distance**—steady training at slightly less than maximum speed.

**Holistic**—a philosophy of running that considers every factor in a runner's environment to be important to his training.

**Interrupted Training**—change-of-pace running such as intervals and fartlek.

**Interval Training**—alternating fast runs with rest periods on formal plan.

**Lactic Acid**—chemical by-product of anaerobic/oxygen-debt running which produces fatigue.

**Long Distances**—above six miles or 10,000 meters.

**Long Distance Endurance**—capacity for almost purely aerobic effort.

**Long Sprints**—220 yards/200 meters to 880 yards/800 meters.

**Long Sprint Speed**—capacity for running that is 50-95% anaerobic.

**Marathon**—only the 26-mile 385-yard distance.

**Middle Distance**—880 yards/800 meters to six miles/10,000 meters.

**Middle-Distance Endurance**—capacity for running that is 50-95% aerobic.

**Overdistance**—longer than one's racing distance.

**Oxygen Debt**—shortage of breath during a run.

**Oxygen Intake (Uptake)**—ability of the body to take in and use oxygen.

**Pace**—average rate at which a distance is run.

**Race**—maximum speed competitive event.

**Recovery**—rebuilding energy after a hard effort.

**Repetitions**—series of runs with recovery breaks between, as in interval training.

**Resistance**—body's ability to withstand stress.

**Rest**—complete break from training activity.

**Short Sprints**—220 yards/200 meters or less.

**Short Sprint Speed**—capacity for almost purely anaerobic running.

**Slow Distance**—steady training at well below maximum effort.

**Specificity**—physiological principle that the effects of training don't carry over from one activity to another.

**Speed**—ability to run fast.

**Sprints**—distances below 880 yards/800 meters.

**Steady State**—maximum rate at which the body can operate aerobically.

**Steady Training**—constant-paced running.

**Stress**—sum of all the energy demands on the body.

**Time Trial**—race-like run at or near all-out pace.

**Training**—activity designed to increase fitness for and improve performance activity.

**Training Effect**—physiological results of training.

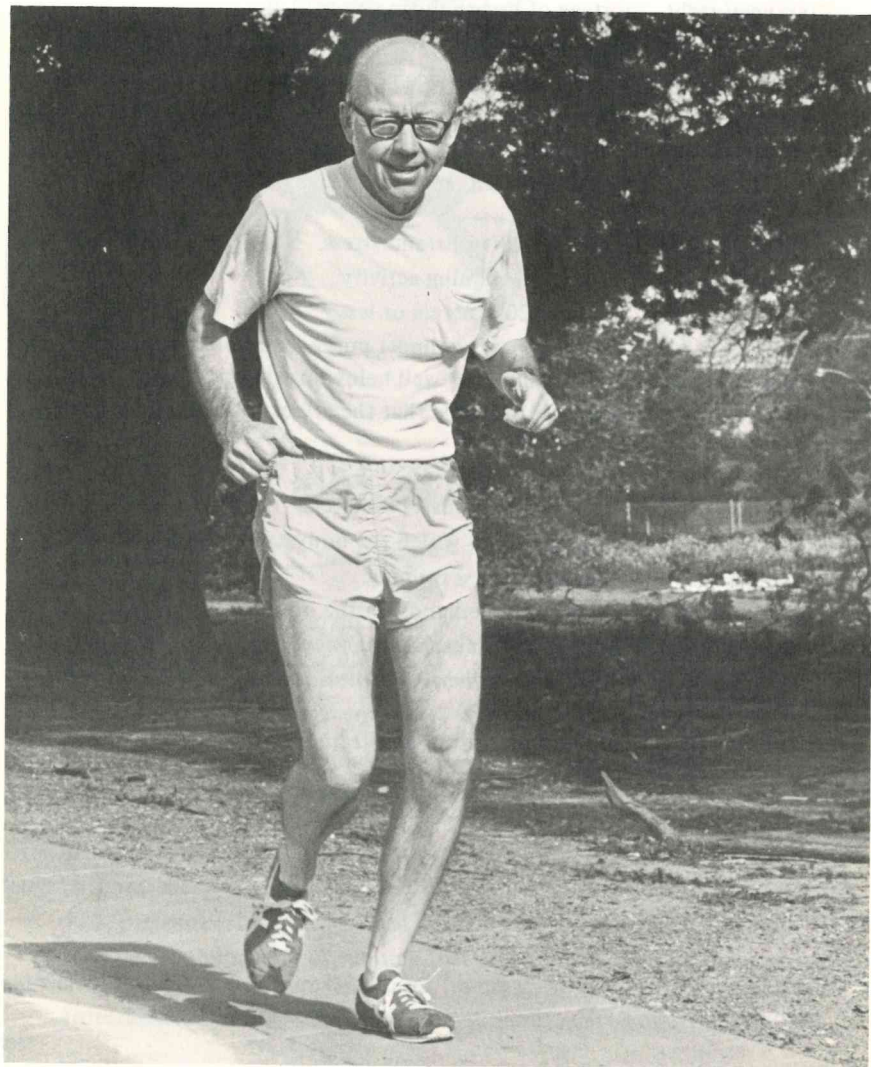
**Ultra-Marathons**—distances above 26 miles 385 yards.

**Underdistance**—below one's racing distance.

## **Chapter 1**

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# **WHY TRAIN?**



**Training offers something to everyone. Few can become champions. But through individually applied training all runners can get fit and most can improve performances. (George Beinhorn)**



# LEARNING TO LIKE IT

*"I don't think of running as 'training.' When I was asked about training and schedules last time, I told the guy, 'I didn't train. I just went for a run each day....' It has to be a pleasure to go for a run, looked forward to while I'm at work. Otherwise, no dice. This fact, that I'm not prepared to let running be anything but one of the pleasures of my life, is the reason that I fail by just so much. However, this doesn't bother me. Neither does the prospect of running 2:30 or even 2:50 marathons in the future."*

—Jack Foster

Jack Foster placed eighth in the '72 Olympic marathon and ran a 2:14 marathon when he was 40 years old. And he doesn't train.

The New Zealander says that training, to him, is bashing through highly structured workouts at maximum tolerable pace, and that he can't do it—won't do it. "If this is what physiologists and sports specialist doctors have come up with to be a champ," Foster claims, "then I must remain a mug runner."

Of course Jack does a lot of running. No one could race as he does without an established, fairly ambitious routine. But he's saying that his faster racing is almost a by-product of his view of running as a whole. He keeps running because he likes it and it fits comfortably into his working and family life. The longer he stays with it, the faster he gets. It's nice that it works out this way, but he'd still be running even if it didn't give better results.

It takes a long time for a runner, particularly a distance runner like Foster, to get fit. And fitness can be improved almost indefinitely, as Jack has shown. But the secrets to it are staying interested and staying healthy.

If running itself is drudgery which only racing relieves, a runner won't stay interested for long, because he spends 10 to 100 times as many hours preparing for races as running them.

If running is so hard that it tears down instead of builds, he won't be around long enough to find out what might have been.

Foster has learned the secrets. He knows how to keep his running in a healthy, "integrated" perspective. Kenneth Doherty, a leading American writer on technical track, calls this the "holistic" approach. He points out that the runner doesn't run in isolation. Since he's a product of his total life style, he must take into account every factor that touches him when he plans his running.

Mental and physical, social and environmental factors all act equally, as a blend. So none of these can or should be ignored.

Fitness is the product of specific stresses, carefully applied. Running of the proper type, in the right amount, at one's own best pace and with sufficient regularity will make anyone fit. The basic principles of fitness are the same for everyone, every event, every ability and age.

But the trick is finding your own best type and load of running, consistent with your likes and limits. Once you've found this, you can't lose.

# RUN WITHOUT TRAINING

BY SID GENDIN

Sid Gendin, a long-term distance runner, is a professor of philosophy at Eastern Michigan State University in Ypsilanti.

I don't believe in training—at least not as applied to running. Until I was 17 and took up running, I never heard the word “training” applied to sports. I knew about military training, of course. I knew that people had to be trained at jobs and occasionally retrained when their jobs became obsolete. And I knew that dogs were put through something called obedience training.

It always meant drudgery, a kind of disciplining that was unpleasant but which had to be put up with for the sake of “the greater end.” But I never knew it in connection with sports. Games, no matter how long, frequent or hard, were played for fun.

In the summers when I was 13 and 14, I played basketball at least four hours each day, six days each week. None of my friends ever said, “Let's go and train.” We didn't even use the word “workout.” Later, in high school, there were scheduled practice sessions you had to attend and then we did use the word as in “Wow, what a workout! I'm beat.” Still, the practicing was fun. We never were so sick of it that we wouldn't play “pick-up” games in the school yards.

My high school had no track team. Until I got to college, I had no personal acquaintance with this thing called training. Then, for the first time, I met guys who participated “seriously” in a sport they did not like. Their motivation was diverse: some went out for track in order to escape boring gym classes; some did it for the crazy reason that they were too small for basketball or football and they felt they “had” to be out for a sport. Don't ask me why. Perhaps they thought it conveyed a masculine image or that it would be a good way to impress girls.

But then there were a few who went out for track because they wanted to be runners. These were the ones that interested me because I could see, even then, that almost none of them liked running. The mystery was why they wanted to be good at it. Through the years this mystery has only deepened for me. I have never understood why anyone wants to be good at something he doesn't like if he is under no necessity to be good at it.

Any runner who divides his running into two phases—(a) training; (b) competing—is committing the worst error he can make in this sport. For, as I said, training implies drudgery undergone for the sake of some alleged greater end. That means that 95% of running won't be fun. I am not impressed by the arguments of people who say they enjoy training. I can watch them for myself and draw my own conclusions. (I admit I am talking mainly about middle and long distance runners.)

I notice that most of them like to vary their training routes. They like to run in woods, over golf courses, through parks, along roads, etc. They do this, as they put it, “to make it interesting.” Are they making it interesting?



I don't think so. What they are doing is finding a way to alleviate their boredom. They daydream and find things to look at, but the running itself remains the same old boring thing for them. You don't change the nature of running any more than you change the game of chess by playing in a beautiful tourist site in the Grand Canyon. A real chess player, however, doesn't go in for such gimmicks.

Not too long ago, someone wrote in to *Runner's World* and said that when he runs he watches his feet and thinks about the steps he is taking. He doesn't daydream or look at the scenery. I happen to think that this is a very sensible fellow. For here is a fellow who isn't constantly fighting his running. Running is what he likes, not the extras that may happen along.

If you are the sort of runner who is always looking for ways to make your running interesting, chances are you are fighting a losing battle. There will come a time—I don't care how long it takes, six months, fifteen years—when you will pack it in. Probably this will be just about the time when, from a physical fitness point of view, it is more important than ever that you should be running instead of quitting.

I hold that Peter Snell and Jim Ryun were not cut out to be runners. Now this is contrary to what most people believe because these two are examples of great talents. But they were not temperamentally suited to be runners because they did not find running pleasurable—not in the way I understand the word “pleasurable.”

Thus, time after time, Snell said he looked forward to retirement from running so that he could concentrate on golf, the game he really enjoyed. And before an audience of millions, after not making the Olympic 1500-meter final, Ryun bitterly declared on television that the years of work had been for nothing. Those were *his* words: the running had been “work” and the running had given him nothing at all. For both Ryun and Snell, there was always the pursuit of “the greater end” which drove them on. But “the greater end” has proved to be very elusive.

Witness the recent defections from the amateur ranks. Some defectors say that only now will they have something to strive for. Well, far be it for me to say they don't. It happens that getting paid for running is at least as good an idea as getting paid for writing symphonies or washing dishes. I would like to get paid for running, bad as I am. But for me that would just be an extra goodie—like eating my cake and having it, too. For those who think that *only* if they are paid is it worth going on, the running itself couldn't have been much fun. Let them deny it if they will, but their actions belie their words.

Runners frequently say now that they are out of college they can't make the “sacrifices” any more. Pity. The pity is not that they can't make the sacrifices but that they thought of running as sacrificing. Doesn't that show how much they loved doing it? I don't mean that hard work and sacrifice are antithetical of enjoyment. People do and should get satisfaction out of a hard job well done. What I do object to is the idea that the whole sport is built around sacrifice and hard work, that 95% of it has to be drudgery for the sake of a few rewarding moments.

So let me state the First and Last Law of Running: *enjoy your running!*

I realize that stated thusly it sounds trivial. But if all I've said up to



now is basically correct, then, in practice, very few runners have made this a guiding principle. On the other hand, it is easy to misunderstand me. I am not pleading for running simply as family recreation or as a form of exercise. Competitive running does involve work, and there are days when almost anyone has to force himself to run.

We all want to be good. But how good? My belief is that our striving for excellence has to be controlled by our capacity to enjoy the running *activity*. I stress the term "activity" to distinguish the pleasure of running itself from the alleged side benefits of running.

For example, many athletes are fond of remarking that running has given them the opportunity to travel, to meet interesting people, to make friends, and so forth. And presumably, even if the running itself were not enjoyable, these things made it all worthwhile. Well, perhaps, but this is usually the talk of the successful internationalist. The average runner needs simpler reasons for running. Moreover, even for the internationalist such reasons are silly—that is, as explanations for wanting to run. Once you met the interesting people and made the friends, you may be glad that running provided the opportunity, but to take up running with such goals in mind strikes me as rather odd.

So, I repeat, achieving excellence at the cost of not enjoying running is senseless. The rewards for success in this field are not dazzling. Even if professionalism is here to stay, most of us won't be affected. Trophies are nice and so is a little fame and glory, but a sense of proportion should make clear that they don't justify running. Nor am I impressed by "loftier" goals—all that talk about the challenge of competition and the self-satisfaction to be gotten from extreme dedication. Nor do I think we should gloat over the fact that our bodies can take strains that would kill other mortals.

The important thing is that you can't build a lifelong activity out of a bunch of by-products.

# WHEN YOU GO TOO FAR

BY GEORGE SHEEHAN

**Dr. George Sheehan, a specialist in cardiology and internal medicine from New Jersey, was the editor and major writer of the "Encyclopedia of Athletic Medicine"—an earlier booklet in this series.**

In the winter of 1940, when I was a senior in college, I won both the mile and the half-mile handicap races in one of those numerous meets held during the New York indoor season. My times were the best I had ever run. The following week I felt tired and worn out. I never ran another good race while I was at college.

In the winter of 1973, I set a US mark for my age (54) in the two-mile and came back to win the mile an hour or so later. The next day I won the 50-and-over division of a five-mile race. For months afterwards, I felt tired and worn out. When I ran it was with effort and without enjoyment. My resting pulse was 12 beats higher than normal and my blood smear showed 15% monocytes and many atypical lymphocytes (4% and none are normal).

The story is a familiar one whenever coaches and runners talk about the mysteries of running. A personal best performance, another push to the limits and then disaster. Being at absolute peak is just one step from losing it all. And usually it is the old sin of pride, that second race, that triggers the destruct button.

A New Jersey coach, known for his relaxed training methods, told me of two of his former runners who were sidelined with mononucleosis. Both youngsters had done well the past year under his tutelage, but their fathers thought they could do even better with more work. Double workouts and overracing finally did both of them in.

The urge toward excellence can breed a biological arrogance, a feeling that you are superior to the laws of nature. The athlete's sin is no minor one like lust and envy or greed. Lucifer was no second-class angel, and the athlete is no second-class man. The apple of being all you can be—and seeing it now—is almost impossible to resist.

So the runners we hear about are only a few of legions. For every advertised case of mono in athletes, there are hundreds you never hear of and perhaps thousands like myself who have a first cousin to the disease, a mononucleosis-like illness with all the necessary findings except a positive mono test.

For some, recovery follows in a week or two of inactivity. For others, months go by before they are able to run with competence and zest.

"I have never had three good seasons in a row," Tony Colon, a Puerto Rican Olympic runner told me. "Eventually I go completely flat and run badly for an entire season."

But there is more to this than a bad season. That is bad enough, certainly. But how many runners are lost to the sport forever? How many athletes, not knowing what is going on, push themselves harder and harder as their running deteriorates, and finally give up on the sport for which they are

# STRESSING ONE POINT

We're repeating ourselves here, admittedly. Once again the theme is adapting to stress. Three booklets have already covered the subject in detail: "New Views of Speed Training," "Practical Running Psychology," and the "Encyclopedia of Athletic Medicine."

But since stress appears to be the "central truth" of running, it's important that it be reviewed in the current context. For more complete discussions, see the other booklets, and the article "Got That Run-Down Feeling" in the September 1971 *Runner's World*.

"The human body/mind is a symphony," an article in the *Encyclopedia of Athletic Medicine* says. "Some of the individual instruments are booming, some are whispering, making melodies, harmonies and rhythms. When the individual parts are blending as intended, you don't hear the individual parts. You hear the musical whole, and it's beautiful. But a single instrument out of tune can destroy the music, and make you painfully aware of the discord. The entire symphony is thrown off."

Stresses are normal and natural parts of living. We absorb them into the pace of life. They only become obvious and harmful when they come in too heavy doses for too long a period. Then off-key notes stand out.

The signs and symptoms of oversteering are easy to spot (see the accompanying chart). If detected early, and correctly analyzed, they can be reduced before they do serious damage.

But if overall stress loads remain high, they lead to illness, injury and physical collapse.

Dr. Hans Selye, a Canadian medical researcher, has spent most of his 60-plus years studying the stress phenomenon. He believes that every disease is a symptom of excessive stress, and that many of the emotional and physical breakdowns which are common in athletes come from the same source.

"When we finished our laborious analysis of its nature," Selye writes in his book *The Stress of Life*, "stress turned out to be something quite simple to understand. It is essentially the wear and tear in the body caused by life at any one time."

He says that a person exposed to this wear and tear throws up defenses to counteract it. The body has a reservoir of "adaptive energy" for handling everyday battering, plus a reserve supply for emergencies. But if the doses of stress are too heavy and prolonged, the individual can't cope. The reserves are drained, and he goes into what Selye calls the "exhaustion phase of the General Adaptation Syndrome." This is when discordant notes surface:

Sudden drops in performance. Drastic weight change. Rapid pulse. Disturbed sleep. Carryover fatigue. Colds or fever. Pain. Anxiety, irritability, disinterest.

These are the times when it's wise to back off, to change one's habits, before getting more out of tune.

Dr. Selye says adaptation energy is like "a special kind of bank account which you can use by withdrawals but cannot increase by deposits."



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Dr. Selye says adaptation energy is like "a special kind of bank account which you can use by withdrawals but cannot increase by deposits."

He says we only replenish part of what we squander. "When superficial adaptation energy is exhausted through exertion, it can slowly be restored from a deeper store during rest. This gives a certain plasticity to our resistance. It also protects us from wasting adaptation energy too lavishly in certain foolish moments, because acute fatigue automatically stops us."

But he warns that each time a person ignores stress symptoms and digs deeper into his "frozen assets" he's risking permanent injury:

"Experiments on animals have clearly shown that each exposure (to excess stress) leaves an indelible scar, in that it uses up reserves of adaptability which cannot be replaced. It is the restoration of superficial adaptation energy that tricks us into believing that the loss has been made good. Actually, it has only been covered from reserves—and at the cost of depleting reserves.

"We might compare this feeling of having suffered no loss to the careless optimism of a spendthrift who keeps forgetting that whenever he restores the vanishing supply of dollars in his wallet by withdrawing from the invisible stocks of his bank account, the loss has not really been made good. There was merely a transfer of money from a less accessible to a more accessible form."

Okay, so what does this mean to the training runner? That he should avoid stress? Not at all. If he's going to improve his running, it is essential for him to court a specific type of stress and to walk a thin line between enough and too much.

"One solution might be to think of yourself as a huge rubber band," an article in *Runner's World* ("Got That Run-Down Feeling?" Sept. 71) advises. "Like the rubber band, you have great stretching capacity. But that potential is wasted when you and the band lie limp and unused. Only when you're stretched and exercised are you and the rubber band filling your intended roles."

But, the article continues, "The stretching can go too far. When too much pressure pulls in opposite directions, snap! The trick is to find a point of stretch, a level of activity, that holds plenty of resiliency in reserve. When emergencies come up, be able to face them by stretching out some more instead of snapping."

Selye adds, "The goal is certainly not to avoid stress. Stress is a part of life. It is a natural by-product of all-out activities. There is no more justification for avoiding stress than for shunning food, exercise or love.

"But in order to express yourself fully, you must first find your optimum stress level, and then use your adaptation energy at a rate and in a direction adjusted to the innate structure of your mind and body.... It is not easy... It takes much practice and almost constant self-analysis."

**NEXT PAGE: Racing is a stress, but not one to be avoided. It is most effective when it carefully uses reserves stores in training. Britain's 2:12 marathoner Jim Alder leads this race. (Jerome McFadden photo)**



# SYMPTOMS OF OVERSTRESS

Running doesn't exist in isolation. It's but one of many "stresses" that the athlete has to cope with. Seven or more "families" of stresses combine to work as one:

- **Work Stresses**—These include the specific stress of running, as well as the general stresses that make up a day's physical and mental labor.
- **Emotional stresses**—anxiety, depression, boredom, etc.
- **Social stresses**—alienation, isolation, overcrowding, etc.
- **Dietary stresses**—too much food, too little, wrong type, etc.
- **Rest stresses**—inadequate recovery from hard work, sleep deprivation, etc.
- **Health stresses**—injury, illness, infection, etc.
- **Environmental stresses**—heat and cold, air, water and noise pollution, etc.

All these, working together, draw on the adaptation reserves. When the drain becomes too heavy, certain mild symptoms present themselves. These are warnings that more serious trouble might develop if care isn't taken:

1. Low-level and persistent soreness and stiffness in the muscles, joints and tendons.
2. Frequent mild colds and sore throats.
3. Swelling and aching in the lymph glands, particularly in the neck, underarm and groin areas.
4. Skin eruptions among non-adolescents.
5. Excessive nervousness, depression, irritability, headaches, and inability to relax or sleep.
6. Nagging fatigue and general sluggishness that lingers from day to day.
7. Aching stomach, often accompanied by loss of appetite and loss of weight.
8. Diarrhea or constipation.
9. Unexplained drops in performance levels.
10. Disinterest in normally exciting activities.

Take note of these gentle reminders, and take appropriate corrective action (which normally means simply lowering the overall stress level). Reminders get progressively less gentle; symptoms more severe.



# THE TRAINING EFFECT

The human body is an amazingly pliable instrument. It adapts to almost any activity it's given, balking only when it must to protect itself from eventual destruction.

The responses to physical activity are standard. Everybody reacts to exercise with the same general set of adjustments. Together they're called the "training effect."

In *Aerobics*, Dr. Kenneth Cooper explains that "the training effect is a cornucopia of healthful things for your body, with a spin-off of some peace of mind."

These, he says, are the main reactions:

- Lungs which take in and distribute oxygen more efficiently than untrained ones.
- Bigger, more blood vessels, capable of carrying larger amounts of blood.
- Increased volume of blood, with a greater total oxygen-carrying capacity.
- Healthier body tissue as a result of oxygen abundance.
- Strong, healthy heart which is "slow at rest, yet capable of accelerating to much higher work-loads without undue fatigue or strain."
- Smoother digestion of food and elimination of wastes.
- Mental benefits including a reduction in anxiety and irritability, and improved ability to relax and sleep.

Dr. Cooper, who has analyzed the experiences of more than a million beginning runners, says, "I like to think of the training effect as preventive medicine. It builds a bulwark in the body against most of the common crippers.... If you've started a little late, if one of the crippers has already made its mark on you, the training effect can become curative medicine as well."

The first step in training is to clear away the wastes of a sedentary life. Reduce the fat that has collected under the skin and that may be clogging the blood vessels and making them inefficient. Tone up the muscles. Inject oxygen deep into the lungs. Correct degenerative problems if they haven't progressed too far.

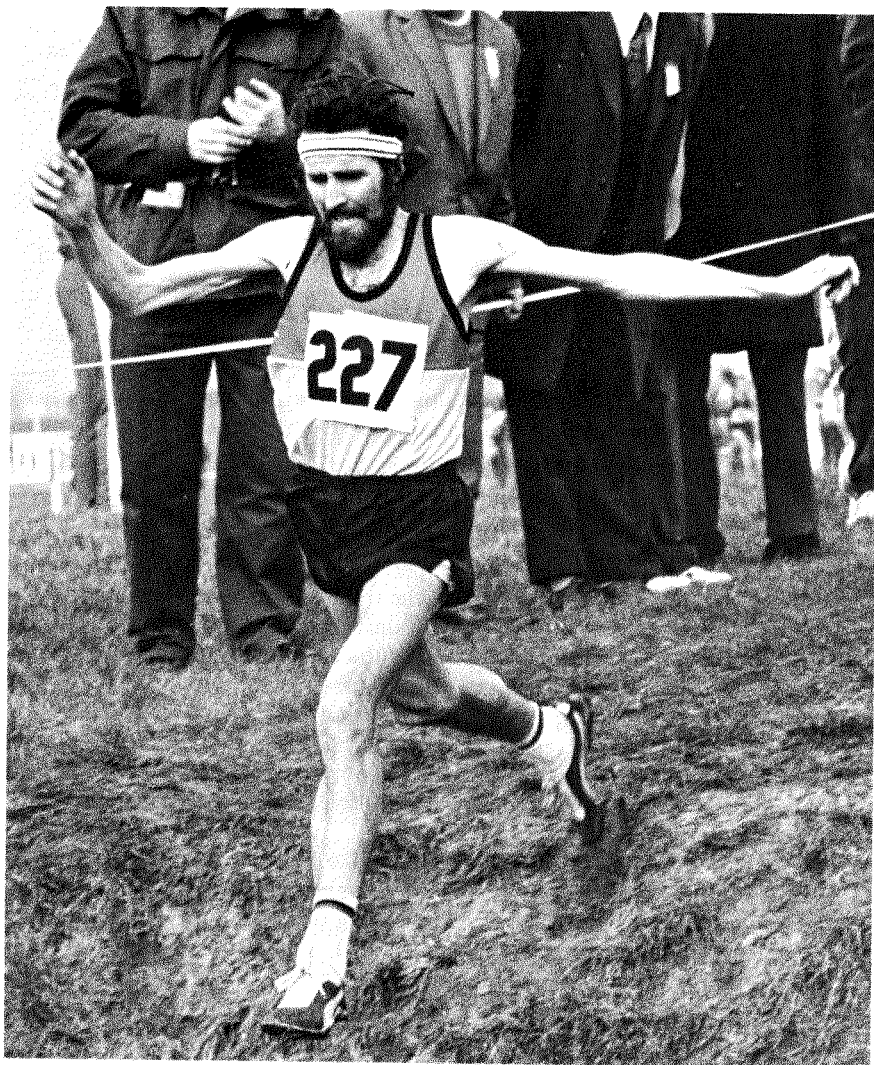
Even starting from what the physiologists like to call this "deconditioned state," changes are immediate and often dramatic. They follow Cooper's outline, and can be easily measured by keeping three types of records: (1) running performance (distance and times); (2) pulse (not only resting, but also exercising and recovery rates); (3) weight.

As training progresses, a runner should automatically go farther and faster with equal or decreased effort. The heart pumps lower at rest, can go safely to a higher maximum, and returns to normal faster than before. Weight—if it is too high at the start—almost always drops, or at least fat is replaced by firmer, more powerful working muscles.

These changes come, but they can't be rushed. They come only at their own pace, and by trying to push that pace the runner succeeds only in pushing

himself back down the fitness ladder.

With time and patience and regular application, however, anyone can accomplish the two goals of running training: increased immunity to fatigue and faster, smoother movement.



**Gaston Roelants knows the secret of balancing racing and training stresses. He has raced at the highest international levels for more than a decade. (Mark Shearman photo)**

# GUIDING PRINCIPLES

Forbes Carlile has attracted the most attention as a coach of swimmers. Shane Gould is his most famous one. But Dr. Carlile is more than a swimming coach. The Australian started as a long distance runner and graduated to studying the entire field of exercise physiology and athletic training.

Carlile was one of the first men to translate Hans Selye's stress theories into athletic terms, and as far back as the 1950s he came out with "principles of training" based on Selye logic.

Carlile listed 10 separate guidelines which he said apply to all types of athletic training and to all athletes. All these points spring from the stress-balancing ideas of Selye.

Physiologists, coaches and runners now generally agree on a set of principles that read very much like Carlile's list. These lead to the desired training effect.

## 1. PRINCIPLE OF STRESS

Stress, in manageable amounts, is the stimulus that provokes a training response. It must be regular and strong enough to stimulate adaptation. But it can't come in such heavy and frequent doses that it overwhelms the adaptation system, causing a breakdown. Running itself is only one of many stresses acting on a runner. Others are faulty diet, psychic unrest and environmental insults such as extreme heat and cold. Runners must consider the stress-load as a whole, and adapt to it. (This subject is discussed in detail earlier in this chapter.)

## 2. PRINCIPLE OF OVERLOAD

"Overload" isn't the same as "overwork." Overloading is selective stressing—enough to stimulate the desired response without producing exhaustion.

Forbes Carlile says, "The training load must be severe and must be applied frequently enough and with sufficient intensity to cause the body to adapt maximally to a particular activity." But he adds, "It is at the same time true that sustained all-out efforts in training or in races should be made only sparingly."

This is what New Zealand coach Arthur Lydiard meant by his now-famous advice: "Train, don't strain." No results can come without training, but on the other hand straining too hard and too often is self-defeating.

Lydiard said that training should be an everyday, year-round activity, but that no more than 10% of a runner's efforts should be race-like.

## 3. PRINCIPLE OF SPECIFICITY

Even though all training can't be exactly like racing, it must be a close approximation. The system adapts to the specific exercise it is given. Walk and you become fit for walking. Bicycle and you become a better bicyclist. Run and you get in shape for running. But there is little carryover from one to another.

The effects are even somewhat specific within running, with sprinting

and distance running each requiring and producing different actions and reactions.

How much fast repeat work can help a distance runner and how much slow endurance work helps a sprinter is still the subject of some controversy. But it is apparent that the bulk of one's training must be within a reasonable range of racing distance and/or close to racing pace to be most effective. (There's more on this subject in Chapter Three.)

#### 4. PRINCIPLE OF REGULARITY

Almost any kind of running, any amount, will "work" if only it's done regularly. Once a runner has the daily running habit, it's hard not to improve.

Physiologists say that runners need to train at least every other day—three or four days a week—to gain and maintain fitness. Every day is better. Some say twice a day is best.

Conditioning comes quickly, with speed arriving somewhat faster than endurance. But the reverse is true, too. Conditioning *vanishes* quickly during layoffs, with sharpness disappearing somewhat quicker than endurance.

"The usual thought," says Dr. George Sheehan, the *RW* columnist, "is that speed suffers if you go five or more days without speed training, and endurance if you go over a week without distance. One study of the Danish Olympic crew showed that they completely lost their conditioning after one month of inactivity."

#### 5. PRINCIPLE OF PROGRESSION

Obviously, progress is quickest and most apparent at the start, and it slows as one approaches his maximum potential. The more he progresses, the harder it is to keep improving.

Progress, however, doesn't go in a smooth upward curve. There tends to be a "plateau effect," with a series of sudden jumps separated by stagnant periods. The runner has to be prepared to work through these periods of no apparent improvement, waiting for the jumps.

All else being equal, however, it is possible to hold the ground gained and move from strength to strength as condition and confidence increase.

Middle-distance runner Mark Winzenried compares progress to breaking through snow drifts. "The way I'm preparing for a race," he says, "is kind of like taking a big snowplow and just moving that snow out of the way. The next time I run, I have the place plowed, and it's much, much easier (to get through). Then I plow a little bit more. The first time it's hard, the second time it's a little bit easier, and the third time you're kind of floating."

Each succeeding run over old ground seems easier, he's saying. Arthur Lydiard has found this to be true with his long runs. "It is a big job building up to 20 miles the first time," he writes in *Run to the Top*. "But in succeeding years there will be no difficulty whatever in reaching the distance again, even with comparatively light training. In other words...you only have to do the hard work once. You won't be coasting later, but you'll find it so much easier that it won't seem like work at all."

#### 6. PRINCIPLE OF DIMINISHING RETURNS

The first mile is the most helpful one as far as conditioning goes. Each succeeding one gives less benefit than the one before. In other words, runners



work more and more for less and less.

Hal Higdon explains with an analogy of the process at work. Hal is a longtime runner and free-lance writer who often covers air and water pollution stories.

“A manufacturer said it costs very little to get 90% of the mercury out of the water,” Hal says. “But it cost considerably more to eliminate the next 5%, and an astronomical rate to take out the last little bit. That remaining percentage of mercury, though, can still have serious consequences.

“It is somewhat the same with running. It doesn’t take much to get 90% fitness—only a few miles a day. But it takes progressively more training as you get closer to your ultimate potential, until at the highest levels you’re putting in a huge investment for a very small gain.”

But Higdon notes, “It’s the small gains that make the difference between winning and losing.”

## 7. PRINCIPLE OF RECOVERY

The interval system has a bigger meaning than simply mixing fast and slow running in a track workout. The principle of alternating effort with recovery and rest applies to all training, regardless of specific method used.

Forbes Carlile writes, “Recuperation periods are essential both during a single training session and throughout the year. Rest, with consequent physical and mental relaxation, must be carefully blended with doses of exercise. A rhythmic cycle of exercise and recuperation should be established....”

Bill Bowerman, the highly successful coach at the University of Oregon (see Chapter Four), has pioneered what he calls the “hard-easy program.” Bowerman staggers the intensity of workouts, having a hard one only every two or three days. He thinks this allows athletes to handle a higher work load with less strain, and that it stimulates faster improvement than a same-load-every-day plan.

All sound programs leave room for rest and recovery. “There is a time for strenuous activity and a time for resting,” Forbes Carlile says. “The rigidity of a too definite program of training may easily drive the athlete to exhaustion.”

## 8. PRINCIPLE OF SEASONS

Sub-maximal training can be viewed as putting money in the bank; all-out racing as withdrawing it. No one can withdraw indefinitely. Eventually he has to go back and restore the reserves. This is why it is important to race sparingly during the season and to allow race-free training periods during the year.

Arthur Lydiard states flatly, “You can’t race well the year-round because your condition will only take you so far. When you’re racing hard, you can’t train hard. If you compromise, you can hold your form for three or four months. But then you’re going to have to go back and start to build up again.”

If a runner is lucky, Lydiard and others say, he may squeeze two peak periods of racing from a year—each lasting no more than about three months and staggered with recovery breaks.

But higher peaks are less long and frequent. Lasse Viren, the Olympic 5000 and 10,000 champion, says, “Top shape can be timed fairly accurately

and, at least in my case, top shape will stay for a period of three weeks. It is not possible to conserve good form for a long time."

## 9. PRINCIPLE OF PACING

Pace has two meanings. One type is obvious: the speed a runner travels during an individual run. The other is less obvious, but just as important. This is the kind of pace he maintains week to week, month to month, year to year.

One principle rules both kinds of pacing: the harder and faster a person goes, the shorter he'll be able to go. Fast pace gets you there quickly; slow pace lets you run longer.

Set the pace according to the distance of the run *and* the projected length of the career, so as not to run down midway through.

## 10. PRINCIPLE OF INDIVIDUALIZING

There is no one plan for everyone. Each has to be custom-made to suit the individual user's likes and needs, abilities and goals.

Forbes Carlile says, "Always the most important consideration must be how the individual is responding to training, whether the athlete is carrying the physical load of training without strain or whether his body is slowly losing its capacity to adjust itself. Therefore, training will always be an individual problem.

"No fixed training schedule should be followed rigidly. Blindly following any written schedule is unwise. Training must be tailored to suit the individual for best results."

# ADVICE TO BE IGNORED

These can't exactly be called "myths" of running training. They're more like half-truths, which because of the misconceptions they convey can be worse than lies. There's enough truth in them to lure runners into traps.

Everyone who runs hears these statements. They all trace back to ignorance or misapplication of the basic principles outlined in the last section.

- "The harder I work, the better I'll be."

This relates to the great American pill fantasy—the idea that if one aspirin or vitamin is good, then two must be better, and three better yet. It doesn't work that way. Dosages are specific, and scaled to needs.

Think of training as a prescription that won't work if taken in too small amounts and can be dangerous if swallowed too heavily. There's a happy medium which is most effective.

- "The methods that give the best results are the ideal ones for everyone."

Only the good results of a method become public, and often a runner succeeds *in spite of* rather than because of the way he trains. Failures of a system and comparisons with other systems aren't easy to see.

It appears, too, that the methods which work best on a short-term basis aren't always the best over the long haul. Tom Osler writes in *The Conditioning of Long Distance Runners*: "It is ironic that those techniques which produce the quickest improvement over a period of a few months do not result in the greatest possible improvement when continued for several years. This is because their effects are short-lived and do not necessarily result in significant gain in conditioning the body."

- "You get better by forcing yourself to do things you don't like to do."

No one is going to find fun in every minute of every running day. Running can't promise that. But when we talk about enjoying running we mean that the overall effect of it is pleasant and rewarding.

"If a person likes his activity," Bill Bowerman says in *Practical Running Psychology*, "there's no need to force him to do it." And by implication the Oregon coach is saying if a runner doesn't like it, he won't tolerate it for long.

Bowerman continues, "I think a person can make the most of his running experience if he is enjoying it, if he has a plan, if his objectives are realistic and if he carries on over an extended period of time. If he becomes tired of running, he should lay off for awhile. If he's still tired of it after that, maybe he ought to look for another activity."

- "If I want to keep improving, I have to do more and more work."

There are other ways to do better besides doing more. In fact, that may be one of the least efficient ways to go about improving. Running mileage and time-investment can only escalate so far before it starts conflicting with other obligations. That's when it gets to be a drag.

Instead of trying to do more, why not get more from what you do? Concentrate on improving *quality* of running instead of quantity. Instead of add-

ing 10 miles a week, stay where you are and cut off 10 seconds a mile.

- *"I have no place (time) to train."*

No one says you have to have an indoor armory for the winter, a Tartan track for sprint, a grassy expanse of golf course for summer and a forest path for the fall. Running places are anywhere and everywhere. "Open your door," Bill Bowerman says, "and you're in business."

And no one says you have to spend two or three hours a day at it. Do what you can, and adjust your racing ambitions accordingly. Remember the "principle of diminishing returns." The first miles are the best. A mile or two a day is 100% better than nothing.

- *"Training is too complicated; I can't figure out what I should be doing."*

Training is simple. It means doing moderate and specific exercise regularly, and racing infrequently—taking care to recover completely after all hard efforts.

The intricate training patterns that spring from simple base, according to Arthur Lydiard, are "just a lot of eyewash. You go to the track and do 440s, I do 220s, and he does 660s, but we all create an overload and we all come in tired. We're going to get the same results.... All the athlete has to do is create the overload."

- *"If it works for him, it'll work for me."*

Fad and superstition surround training styles. The ways of current champions are widely copied, in the hopes that some of the magic will rub off. It invariably ends up rubbing the copier the wrong way.

The champions are strong, experienced runners whose schedules are tailored to their own needs. Others must do the same for themselves. And even if they can handle the same loads, the results aren't guaranteed to be equal. There are many other factors in a champion's makeup besides training method.

- *"Resting never got anyone anywhere."*

Except perhaps out of a destructive fatigue cycle that ends in lowered performance levels, illness, injury and disillusionment.

Hal Higdon says, "You can go backwards while appearing to jog forwards. Sometimes you can achieve more for yourself physically by taking a day off. You will be able to train harder following a day of rest, or comparative rest."

If you don't take your rest voluntarily, when it's needed, nature forces it on you.

- *"I can't race at long distances by training at short ones, or race faster by training slower."*

Nick Costes (see the booklet *Interval Training*) ran a sub-2:20 marathon on intervals of no more than a mile in length.

Amby Burfoot ran an 8:44 indoor two-mile on nothing less than steady seven-minutes-a-mile running.

Whatever turns you on.



- "If I run enough, no other exercises are necessary or advisable."

Runners tend to get overspecialized, turning over all their energy to running. Even though other sports and activities don't directly condition one for running, they do have their benefits. They maintain otherwise unused muscles in the upper body, they give variety, and they provide an essential stretch.

Robert Bahr, managing editor of *Fitness for Living* magazine, says runners are ignoring flexibility exercises, at a high cost. "Strengthening and endurance exercises, while essential to total fitness, nonetheless act to shorten muscles and reduce flexibility," Bahr writes. "Most cases of muscle tears and pulls and strains occur because of a lack of flexibility."

If something as simple as touching the toes is impossible, corrective exercises are needed.

## Chapter 2

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# BACKGROUND



Today's high school runners are training more—and racing faster in many cases—than the national champions of the 1930s and earlier. (John Marconi photo)

# TRAINING'S EVOLUTION

*"It takes all the running you can do  
just to keep in the same place.  
If you want to get somewhere else,  
you must run at least twice as fast as that."*

—Lewis Carroll

Beside today's year-round, twice-a-day routines involving upwards of 100 miles a week for everyone except sprinters and joggers, the training of the 1930s was laughable.

Running historian John Lucas writes that middle-distance runners of that era "managed remarkable performances despite the classic weekly training of overdistance (1½ miles), underdistance (2 x 880), pace work (1320), speed work (3-4 x 440)—usually not over 15 miles a week."

Lucas cites Glenn Cunningham's training before his world-record 4:04.4 mile:

Sunday—long walk. Monday—rope-skipping, shadow-boxing, bag-punching and calisthenics. Tuesday—2 x 660 "fast." Wednesday—4 x 440 (62, 63, 61, 58 with 440 walk recovery). Thursday—jogging, starts, wind-sprints. Friday—rest. Saturday—race.

Most of the top runners of the '30s trained along these lines—no fartlek, no intervals, no long runs. They simply raced and filled the days between with race-like time-trials. They did what they knew best, and what had to be done. When no races were in sight, they rarely trained.

A paradox in this race/time-trial form of training that had evolved was that runners went too hard without doing enough. The frequent hard bursts were too exhausting to let them carry on into the higher endurance-building range.

Training in the 1930s, in short, was too structured and too intensive, yet at the same time too skimpy to be fully effective. Competition demanded better ways, as it always does, and runners tinkered with them, as they always do.

Fartlek training grew up in Scandinavia and intervals in central Europe to fill this need. They provided effective alternatives to time-trials. These primitive (by current standards) programs gave runners the speed they needed, but also were mild enough and continuous enough to let them go longer than their predecessors.

The Swedes, Gunder Hagg and Arne Andersson, enjoyed great success during World War II while training on their free-form, instinctive "speed-play" in the woods. A bit later, Emil Zatopek added more structure and quantity to the fartlek pattern, and enjoyed even greater success. He employed what German medical doctor and coach Ernst van Aaken calls the "classical interval training method."

"This running was long distances with rhythmical changes of speed," says van Aaken. "This method was fundamentally new in that Zatopek: (1) ran at relatively slow speed, and (2) did 400-meter runs, broken by 200-meters jogging, at sub-racing speed over distances that would have been thought

impossible at Paavo Nurmi's time (the 1920s and early '30s). Zatopek covered 35 kilometers (22 miles), even 50 kilometers (31 miles) every day, with occasionally increased speed over the individual 400 meters."

In other words, Zatopek was merely doing change-of-pace endurance training—not high-speed work. His increased speed, as van Aaken says, came only "occasionally."

After Zatopek, though, interval training evolved to the level of high science. Elaborate workout patterns developed. Zatopek's simple change-of-pace endurance work became rigidly patterned speedwork. Whereas Zatopek had used pure speed only as a supplement, high-speed training became in the '50s the meat and potatoes of the runner's daily diet.

Oh yes, results improved. But running, a basically simple and non-technical activity, almost required a slide rule to practice. Training had become a technological nightmare. It lost some of its natural appeal when confined to quarter-miles in prescribed time with a prescribed rest break, always on the track.

Then Percy Cerutti, through miler Herb Elliott, abruptly began a back-to-nature movement in the late '50s. Little or no track running. Little or no pre-planning. Lots of "instinctive" running over "natural" terrain. Cerutti's ideas were a bit too far-out for most runners to swallow whole, but they took pieces of his fresh approach and started changing the direction of training. Cerutti prepared them for Arthur Lydiard, the leading training innovator in the last two decades.

With the successes of Lydiard's New Zealand athletes in the 1960s, training theory apparently was revolutionized. But it wasn't a revolution at all. Running had simply completed an evolutionary circle.

Lydiard convinced runners everywhere that they could abandon their daily quarters and build an endurance base somewhat as their ancestors did in the early 1900s—by straight, slowish runs, with harder and faster running done only sporadically and selectively.

But alas, we're still caught in the cycle and appear doomed to repeat it. From the sound concept of a lot of basic endurance work topped by a small but significant amount of speed sharpening, runners are again darting off in other directions away from the basics.

One runner says, "All I need is slow running—the more the better." Another says, "If slow distance is good, fast distance must be even better." While taking opposite roads, they both make the same mistake. Slow Joe gets so wrapped up in his LSD that he can't use the endurance he stores up; he doesn't have the sharp edge. Fast Fred ends up going so hard in his training that he drains his endurance instead of storing it; he's too tired to race well. Both need more judicious mixture of slow and fast work.

The point of this book is to show just what a "judicious" mixture of slow and fast work entails, and how good methods go wrong.

There are no inherently bad methods of training. They are no better or worse than the person applying them and the way they're applied. Unfortunately, running history is littered with methods that runners have abused, exploited and then discarded as useless—blaming the methods instead of themselves.

Coaches and runners flit from one type of training to another, thinking



that methods are advancing. This thesis is open to considerable question. Regularity and quantity are improving, there's no doubt about that. But the basics of good training don't change. When we stay close to these basics, running flourishes. When we stray from them, we run into trouble.

A "new and revolutionary" training approach inevitably rallies followers primarily because it has shed the burdens that were dragging down the old one.

Traditionally, when a fresh approach makes the scene, there's an initial rush to the bandwagon and a jump in performances. Then, gradually, but inevitably, the same old burdens return: too much...too rigid...too complex...too serious.

There isn't one "best way" to run. Any of them can work if they're moderate yet regular and substantial in quantity, are based to a large degree on day-to-day instincts and feelings instead of unbending schedules, are simple and are enjoyable in and of themselves.

The "best methods" are those which give an adequate balance of speed and endurance for the race in question, are emotionally appealing and which free the runner physically for long, unbroken stretches of building.

As long as the runner satisfies these few essentials in his training program, he needn't worry about specifics. He can do 50-yard intervals or 50-mile runs. Both are as good as the runner using them.

# SOURCES OF SYSTEMS

Man is a born runner. But it doesn't necessarily follow that he's a born racer.

"Primitive man may very well have loped barefoot over the veldt in pursuit of his dinner," *RW* writer Desmond O'Neil says, "but he did his loping on soft surfaces, with only occasional high-speed bursts. Certainly he rarely had to run long distances at a fast steady pace on hard road surfaces, and therefore never evolved the body necessary for that sort of activity. That leaves us, his descendants, ill-equipped for our own self-appointed tasks, which we perform without even the reward of a meal."

Running we've done since our earliest days of standing upright. But racing long and steady, in shoes, on hard roads and tracks, against the stopwatch is primarily a 20th century phenomenon.

The kind of racing we do is something of a corruption of man's urge to run. Man in the natural state, and his cousins the wild animals, would never run to the extremes of fatigue that we invite.

Arthur Newton, one of the best ultra-marathoners of all-time, once wrote, "Just consider wild animals, which on the whole are certainly much healthier than the average modern man. They run plenty, but never at any time for all they are worth unless obliged to by absolute fear. Even then it is only being scared stiff that will make them extend to their utmost."

Animals certainly do go fast, but only for short distances, stopping before they are exhausted. It apparently is unnatural for them to run for long in a state of oxygen debt. Therefore, the all-out sprints they take are short ones.

Ernst van Aaken, the German running researcher, claims that it isn't natural for man to go more than 100 meters at full-tilt. An Italian colleague of his, Rodolfo Margaria, gives a possible reason why in Chapter Three. He says that lactic acid—one of the body's main fatigue products—begins building after about 15 seconds of anaerobic (oxygen debt) running. An average human runner can cover 100 meters in that time.

Modern racing then can be called an artificially-induced fear or hunger that causes man to push past his natural limits.

Does this mean we should stop racing the way we do?

"Of course not," says Des O'Neil. "Regular training can inure the body to many of the stresses of this sort of activity. Through gradual and careful stressing in workouts, we can prepare for the demands of racing, whipping our hearts, lungs, circulatory systems and muscles into shape for the miles which lie ahead."

How to do this: By running the way man has always run, but with the cautious addition of extra stress in hopes of adapting to the specific demands of racing.

Primitive man took gentle, loping runs, broken occasionally by short and sharp bursts and with walking or rest when he tired. Children and dogs still run this way. And grown-up running training is a more formalized version.

There's nothing new in running training. There are just new ways of

looking at it and new ways of combining the various elements.

Fred Wilt, perhaps America's leading authority on training, says, "It is sometimes assumed that so-called modern methods of training are of recent origin. In truth, much of what runners do today in preparation for competition was common practice among the Greeks more than 2000 years ago."

"However," says the editor of *Track Technique* magazine, "the athletes of old did not have the benefit of scientific justification for their training routines as we do in many cases today."

Racing progress in the last 30 years has resulted mainly from smarter and more thorough application of centuries-old techniques, from imaginative combinations of change-of-pace work and sub-maximal steady running.

These are the two "families" from which all training methods spring. Each family has two phases: an innocent, child-like one and a rational, mature one.

The change-of-pace family includes fartlek and intervals.

- **Fartlek** is the Swedish word for "speed-play." If one type of running were to be called the most natural, this would be it. It mixes every type and speed of running, and relies on the instincts to tell when to speed up and slow down. It most resembles the play of children.

- **Intervals** are an outgrowth of fartlek. Instead of going by the whims of the moment, intervals are carefully planned. They are repeated portions of the racing distance, usually on the track and timed, with short recovery periods between the hard efforts.

Slow distance and fast distance make up the steady-running family, "slow" and "fast" of course being relative terms based on the runner's own abilities.

- **Slow distance** is something like fartlek in that it relies on instincts to regulate effort. It is run at a pace well within the runner's capabilities. "Comfortable" pace is the word most often used by its proponents.

- **Fast distance** requires more work. It is run at near all-out pace, and is very much like racing in distances run and demands imposed. Runs are more carefully planned and timed than in slow distance.

The lines between the types of training are blurred. Few runners use one type exclusively. But these four have been, are and will remain the major components of all training—regardless of how they're blended or disguised. We can't escape our breeding.

# FARTLEK TRAINING

“Let the imagination and intuition run wild,” the booklet *New Views of Speed Training* advises. “Change the pace endlessly. Charge the hills. Stretch out going down. Accelerate. Sprint. Stride. Jog. Walk. Let fartlek bursts occur naturally when avoiding onrushing cars at busy intersections... responding to the challenge of a jogger who thinks he’s Jim Ryun...escaping an enraged dog...or just when feeling particularly bouncy for no particular reason.”

If it sounds more like play than work it’s because fartlek was designed that way. “Fartlek” is a Swedish word that translates to “speed-play.” Playing with speed, not working with it as in some other forms of fast training.

A Swede named Gosta Holmer is credited with developing the fartlek style in the 1930s. He wanted a form of running that took advantage of the Scandinavian forest paths, simultaneously developing speed and endurance while giving “the feeling of self-creation, of individuality.”

Billy Squires, track coach at Boston College, writes in a so far unpublished book on training, “This system of fartlek is hard to explain, for it is less a formula for training and competing than an expression of a strange breed of athletic artists. Maybe if one could understand it, though, one could appreciate its power—a power that sent Gunder Hagg and Arne Andersson through to mile records that stood unbeaten and unmatched for 20 years.”

Few runners understood and appreciated fartlek when it was in vogue in Sweden. Those were the war years of the early ’40s, and few runners had time to run—let alone “play” at running.

Fewer still would understand and employ it correctly in years to come. They inserted a few odd surges into an otherwise long steady run and called it a fartlek session. They missed the point. They equated fartlek with slow endurance training when in fact it is more closely related to intervals.

Fartlek, done properly, is a blending of distances and paces, of effort and recovery—as interval training is. But they differ in format. In fartlek, there is no set format. There’s no such thing as a fartlek schedule, *New Views* says, “because that’s a contradiction of terms. Fartlek is as varied as the individuals who use it, and the circumstances under which they use it.”

Canadian running researcher Brent McFarlane says the big plus factor in speed-play is that it is a “happy contrast to our term ‘workout.’ Play is activity for its own sake, activity in which awareness of effort and even of oneself is lost in the doing. The activity of play can be demanding, as much so as any work. But the sense of exertion is lost in the fun of playing. Fartlek adherents describe it as ‘getting tired without *feeling* tired.’”

It is a change-of-pace in more than the speed sense. It allows runners to get interval-like results—both aerobics and anaerobic benefits in the same session—without being married to the track and the stopwatch.

“When the conditions are enjoyable,” McFarlane says, “even time will slip away and the runner will realize only after the workout how much work he has actually accomplished. Much of fatigue is related to an attitude of mind. We feel tired because we are aware of how much work we have done. Remove



that awareness, and fatigue falls away. Fartlek is a way of removing awareness. It thus permits greater physical effort."

The disadvantage of fartlek is that it lacks the specific goals some runners need. They want to see progress: in distances run, in times recorded, in carrying out set tasks. Free-form fartlek doesn't allow easy measurement.

A related problem is the absence of control. Each race has specific demands in terms of endurance and speed combinations. It may be hard to arrive at the proper combination when runs go untimed and unmeasured.

McFarlane says, "Immature and inexperienced runners may misuse the freedom of fartlek, either by not doing enough, or, more likely, by attempting to do too much, too fast, too soon."

Because of these weaknesses, fartlek quickly gave way—after the brief era of Swedish domination—to more exacting intervals. These have the built-in danger of going too far in the other direction.



# INTERVAL TRAINING

Interval training is the product of scientists, the first result of laboratory testing methods being applied to running technique. As such, it contains both the benefits and shortcomings of scientific application.

Crude forms of intervals were used earlier, but the method was formalized in the 1930s by two German doctors. Woldemar Gerschler, a physiologist-coach, and Hans Reindell, a cardiologist, refined stop-and-go training to an exact science before World War II.

The doctors relied on precise timing and distances, controlled recovery phases as measured by heart-rate recovery, and work loads expressed in formulas like 20 x 100 meters.

In 1939, a Gerschler pupil named Rudolf Harbig whacked almost two seconds from the world 800-meter record, a mark which was to stand for 16 years.

After the war, eastern Europeans quickly turned to intervals based on the Gerschler-Reindell principles. Emil Zatopek, then Mihaly Igloi's Hungarians and finally Soviets Vladimir Kuts and Pyotr Bolotnikov continued taking great chunks from the world records.

Though interval training was diluted somewhat by steady endurance running in the 1960s, it still is a part of almost everyone's program regardless of event. If it has gotten a bad name in recent years, it is only because of its misuses.

The beauty of this method is its endless adaptability. It can be used as endurance training, as pace work, or as speed sharpening—or as combinations of the three.

Fred Wilt points out the five variables that an interval trainer has to play with, identified by the code word *DIRTY*:

- **Distance** of the fast run.
- **Interval** of the rest or recovery between fast runs.
- **Repetitions** of the fast run.
- **Time** of the fast runs.
- **Your activity** (walking or jogging) between fast runs.

"Interval," Wilt says, refers to the recovery period rather than the runs themselves. This traces back to the developer's theory that the hearts' action during the recovery phase is the decisive factor.

They call this the Gerschler-Reindell law:

"The running effort in interval training should send the heart rate to around 180 beats per minute. From this point, the heart is allowed 90 seconds to return to 120-125 beats per minute. If it takes longer, the effort demanded has either been too violent or too long."

**LEFT:** When runners are going six miles at 4½ minutes each, as Frank Shorter (left front) and Jeff Galloway (right front) do, they require large amounts of speed work. (Bob Kasper)

Early interval training centered on 100- and 200-meter runs. Gerschler and Reindell maintained that these were the most effective in drawing out the desired training effect. They said 400-meter repeats were too long and tiring. (Rodolfo Margaria's research, reported in Chapter Three, supports this.)

However, 400-meter (or 440-yard) and longer intervals later became common practice, partly out of custom (this is the way Zatopek trained) and partly for convenience (one lap on the track).

Whatever the format, interval training has a number of clear advantages over other methods. The first is its versatility, which we've mentioned. The second is the ability to plan and apply specific workloads, and to do more work, easier, in a shorter period of time. In other words, it's efficient. Third, as a number of tests have shown (see Chapter Three), it gives the fastest improvement of all the techniques.

The disadvantage of the interval system is that it can become overly technical. It can take on an almost machine-like quality: every day on the track, every run timed, every recovery heart-beat counted, every step planned.

Under these circumstances, interval training can become a bore. But there's no excuse for running becoming rigid and sterile in a method as adaptable as this.

"Interval training," we said in *New Views*, merely implies that a (fast-slow) pattern is followed—one that involves control over distance, interval, repetitions and time. Nothing in the rules states that 440s are inherently superior to 390s, that 20 of them are vastly better than 19, or that running them on an asphalt track gives far better conditioning than running them on an asphalt road."



# SLOW DISTANCE

"Since the year 1928," writes Ernst van Aaken, "when I watched Paavo Nurmi at the Amsterdam Olympics warm up for two hours before a race, it has been clear to me that modern civilized man is not lacking in speed but in endurance. This one thing, then, is necessary for all runners—to acquire the quality of endurance at the outset and then fight daily to keep it."

Van Aaken, a medical doctor and coach from Germany, has spent much of his time since 1928 using, experimenting with and teaching his "Waldniel Pure-Endurance Method." It goes by other names in other places: Tom Osler's "Base Training," Joe Henderson's "Long Slow Distance" (LSD). Whatever it's called, it means steady running at an easy pace.

What is easy? Van Aaken says it's effort that brings the heart rate only up to 130 beats per minute. Henderson says, "Whatever's comfortable for you at the moment," adding that this usually means about 80% of maximum speed for a given distance—or about a minute per mile slower than all-out.

Many runners in the late 1960s and early '70s turned to slow distance as an instinctive reaction against over-speeding, or because abuses in that area had left them too sore or exhausted to do anything else.

Van Aaken, who has more than instinct to back his beliefs, says such reactions are to be expected: "The continual practicing of high speed, beyond racing speed, is uneconomical and leads to a decrease in reserves. I have always observed that when the athlete's performance remains at a standstill, the cause was an accumulation of very fast 200-meter runs, done one after another. But as soon as the runner switched to the longer training distances, done at a slower, softer pace, an improvement was started at once."

Slow distance has two aims. The most obvious is to build endurance which can be translated into racing speed. This is Osler's "base" conditioning.

"By base conditioning," he writes in *The Conditioning of Long Distance Runners*, "I mean that inner basic strength of a runner which produces a performance without specific muscular adaptation for that event. That is to say, it is the combined effect of natural ability, years of training and overall stamina conditioning. Distance runners often develop their base by using long slow runs at a pace well within their capability for a long period of time."

The second aim is to maintain a zest for running that translates into long, unbroken building periods.

"LSD isn't just a training method," Henderson writes in the introduction to his book on it. "It's a whole way of looking at the sport. Those who employ it are saying running is fun—all running, not just the competitive part. Training isn't an exhausting, anxiety-filled means to an end that's barely tolerated. The simple, unhurried, unworried, nearly painless daily tours of the countryside come to be as much fun in their own way as racing."

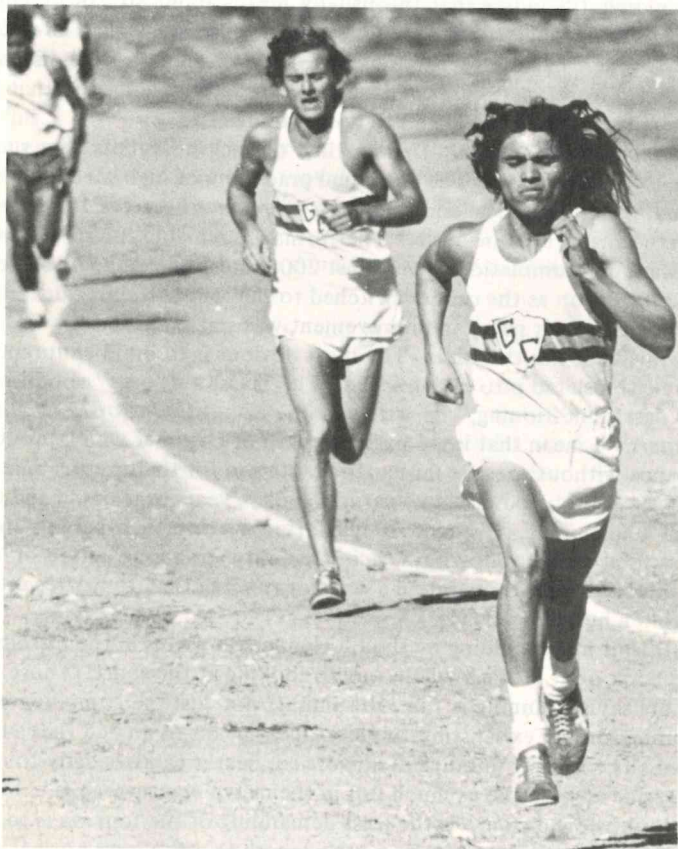
No doubt slow distance is the least demanding of the four ways to run. It is almost entirely aerobic, asking so little breath that it allows normal conversation en route. If van Aaken feels his runners are getting too tired during a run, he tells them to stop and walk for awhile. (These breaks, he says, are an application of the "interval principle.")

The problem facing all trainers is to do enough running to stimulate

adaptation, and not so much that it exhausts them. The first part is a particular problem with slow distance running—doing enough running of the right kinds to adapt to racing stresses.

The main criticism of easy-paced distance running is that it is “non-specific.” It doesn’t relate closely enough to racing to be effective, detractors say. Even van Aaken, Osler and Henderson admit that slow distance alone won’t produce top racing fitness. Van Aaken recommends a fast run at the end of each slow session. Osler advises fartlek-like bursts inserted into slow runs during peak racing periods. Henderson says regular racing is a must.

Where they differ with other running theorists is in the emphasis given to these components.



**Slow distance advocates say this kind of training translates into fast racing, provided runners race regularly. (Brad Mosher photo)**

# FAST DISTANCE

“Long slow distance is better than nothing,” training authority Fed Wilt says, “but it’s not nearly so good as long *fast* distance.”

Wilt feels fast distance running is essential to simulate the effects of racing, and therefore to stimulate adaptation to those effects.

Fast distance is one short step removed from racing, and only a few percentage points of effort separate the two. Nearly every runner uses some form of it—whether by pushing the pace in a road run, doing a track time-trial, or running a race at less than full speed.

The leading spokesman for fast distance has been Arthur Lydiard, the New Zealander who coached Peter Snell. Lydiard is often thought of as a slow-training advocate. He rejects the title and doesn’t want to be linked with the LSD school of thinking.

“In the US,” he says, “many people believe in the LSD method of running—long slow distance. Let’s realize that by running this way you’re going to get fine cardiac efficiency. But you also have to realize you haven’t got 20 years to develop this efficiency. We have to use a few years’ time to best advantage.”

“A runner,” he continues, “should be working at speeds just under his maximum oxygen uptake. He should be working at a rate which puts some pressure on his heart. So what the LSD runner does in two years, maybe he can do in one.”

Lydiard urges his runners to keep pushing. Push down the pace as condition improves so the “steady state”—the pace one can run without laboring—continually is pushed higher.

He cites the example of triple Olympic champion Snell. Snell was a bulky runner, heavily muscled and prone to turn fat when not training consistently.

When Snell joined the Lydiard group, the coach sent him over the standard 22-mile training course. Snell came back at a stumbling jog, crying from the effort. It took him nearly 3½ hours to make the run. Snell kept at it, though, kept pushing, and his steady state improved vastly. Eventually, he was doing the same course in just over two hours—with far less effort than the first one had required.

Lydiard says runners make a mistake by settling on a comfortable pace—seven minutes per mile is the one erroneously associated with him—and not trying to improve it.

In the early ’60s, a group of Australians took up the seven-minute pace idea. They wouldn’t budge from it. Ron Clarke began running with them.

“He got fitter and fitter,” Lydiard says, “but as he got fitter suddenly he realized that these guys were going too slow. They wouldn’t go any faster. They kept this seven-minute mile running, so he started going faster and faster and faster, progressively. As his steady state rose, he ran his best aerobic speeds, so he improved.” He set more than a dozen world records. The others went nowhere, according to Lydiard.

He tells runners to stick very close to their own aerobic-anaerobic border line during long runs.

And there's another facet to Lydiard's fast-distance training. This is time-trials during the sharpening phase of the season.

training. This is time-trials during the sharpening phase of the season.

The Lydiard schedules list one or two such trials each week, at approximately racing distance. They aren't all-out runs, but are the next thing to them. The emphasis is on carrying a fast, yet controlled and relaxed, pace. Speed is perhaps 5-10%, or roughly 15-30 seconds per mile, below maximum.

This thinly-disguised racing gives quite specific fitness, and is nearly as exciting and straightforward as racing itself. These are the main benefits of training this way.

However, the negative feature is the work load it imposes. A runner working on fast distance is tempted to slip from training into straining.

There's an escalation factor at work. Improved times on training courses are a measure of improved condition. Each time one improves, it gets that much harder to improve again. This effort cost may climb. And there's a psychic investment in timed training runs as well. Slow times can be discouraging.

"Realize you're training to race," Lydiard advises. Be careful, he says, not to waste your best runs in practice.

# WHERE ARE WE GOING?

Questions come up about where running training is going. In the 1940s, there was the fartlek revolution. In the '50s, it was intervals. In the '60s, endurance distances. So far, there hasn't been any revolution in the '70s. No new guru along the lines of a Holmer, Gerschler, Igloi, Cerutti or Lydiard has yet surfaced, and the decade is almost a third over.

Will there be another "revolution" in the '70s?

Or could it be that all major sources of running improvement already have been tapped? Could be. Nothing as dramatic as Gerschler's work with interval training is likely to happen again. The research gains of the future probably will be small ones by comparison.

But progress will come as long as runners are willing to invest more and more time and effort for proportionately smaller gain. The trend is towards increasing training time and mileage. This is the age of the super-trainer.

Does this mean the champions of the future will be fanatics who spend most of each day training, and yet are lucky enough to be born with bodies that don't break down under that strain?

Will only the independently wealthy and indestructible be able to survive as runners? Apparently so. The point of no returns still hasn't been reached in terms of mileage and training time. One avenue that running can take is still more effort.

Ernst van Aaken predicts, "The uniquely new factor of successful training in the future is really this: that one runs 'playfully' all day long, with pauses, in an endless variation of rhythm, number of steps and stride length and amount of training—as long as his training isn't maximal."

Van Aaken says the would-be 3:30 miler will have to run at least 40 kilometers (25 miles) a day, broken up into five daily segments over an 18-hour period. He says the winner of the future won't train differently than anyone else—only more.

Do you want to train five times a day?

Or would you rather take short-cuts? That's the other avenue open to running training. Perhaps physiological manipulation can give runners a boost without going through all those hours and miles.

Valeriy Borzov reportedly has a half-dozen coaches and scientists studying his bodily functions, looking for ways to save a thousandth of a second.

Czech researchers have discovered that breath-holding during training can reduce the total amount of running needed to produce training effects.

Altitude training is said to increase the blood's oxygen-carrying capacity by 10-20%. Runners are advised to live for extended periods at 8000 to 10,000 feet elevations.

But Swedish physiologists say the same effects can be produced more simply through "blood-doping." This involved draining a portion of the runner's own blood, then reinjecting it later.

Then there are drugs that might super-charge a man's energy and make him resistant to fatigue.

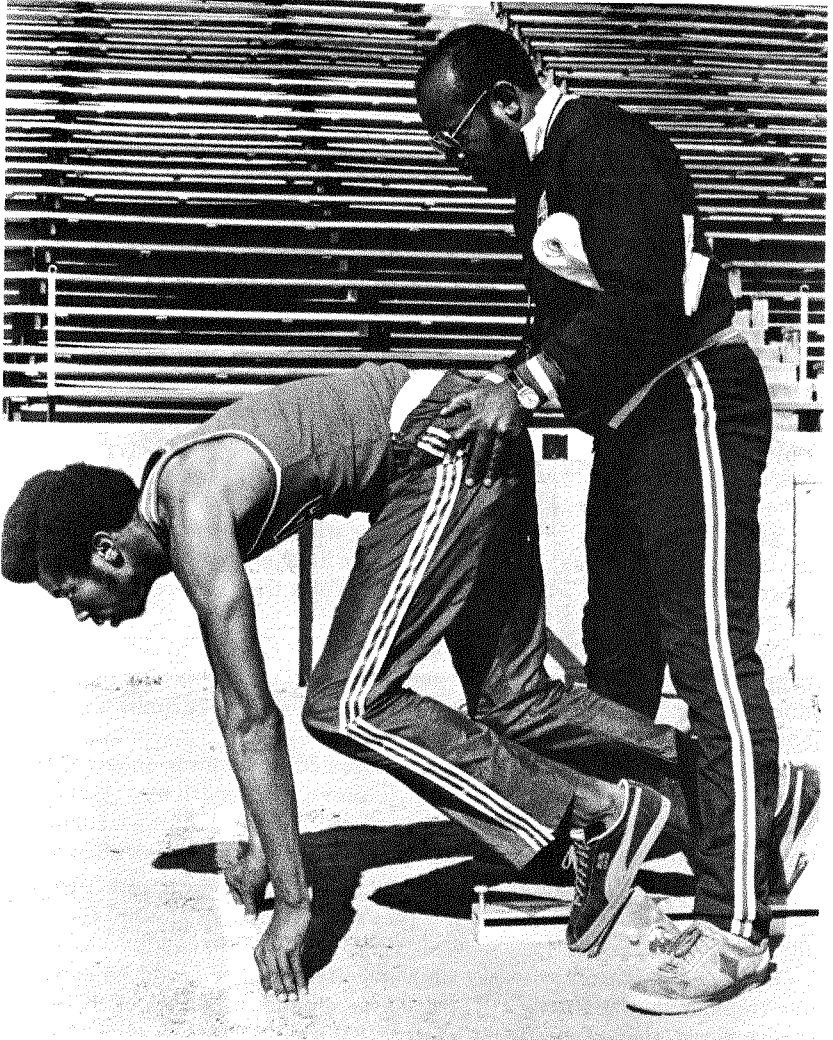
Nineteen eighty-four is just over a decade away. Where will running be in 1984? And what will have become of running for fun?



## Chapter 3

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# SCIENTISTS



The margin for error grows smaller as runners get faster. Scientists deal with techniques to shave hundreds of seconds. Coaches interpret the findings. Runners use them. (Steve Sutton)

# INTERPRETING RESEARCH

*“Revelations on training—as defined by exercise physiologists, past and present—generally are ignored or little understood by the people who should be most concerned. We know a lag exists between the conceptualization of ideas and their conversion to different behavior patterns. Yet the time lags in applying scientific insights to improving running training are growing into decades rather than the expected several years.”*

—Dr. Walter Boehm

Walter Boehm has seen running from every perspective during his nearly three decades with the sport. In the 1950s, he toured Europe with a US team, picking up training ideas as yet unknown in his own country. Later, he coached in North Africa. And now Boehm heads the newly established State Department office of international athletics.

All along, Walt has been fighting the battle of the information gap. The research findings have been available for years, and the body of data on running training is growing steadily. But either it's not filtering down to the coaches and runners who need it, or they refuse to believe what they hear.

Boehm picked up valuable information on interval training when he was racing in Europe. “John Cherry and I described these findings in two articles written for *Scholastic Journal* and *Athletic Journal* (magazines aimed primarily at high school coaches) in 1957. As far as I can tell, their impact on the US coaching fraternity was nil. I have no explanation other than to surmise that the ideas contained in the articles were too sophisticated for the time, or the authors had not been world-beaters.”

Boehm says there is a “considerable gap between available knowledge and its applications to problem solving, regardless of subject. The accumulated body of knowledge on running is the base upon which coaches and runners should plan and develop future training programs. In reality, this isn't happening.”

Although great numbers of articles are written about training in the US, he contends, “an inordinate percentage of them are subjective and intuitive, (lacking) any scientific rationale.”

Fred Wilt has tried his best to fill this gap, with his publication *Track Technique*. But the magazine's readership is limited and a number of the articles are difficult for the non-scientific running public to understand and apply. It's partly a semantic problem, partly one of mutual mistrust.

Christian Zauner and Edwin Reese, physiologists at the University of Florida, explain in *Track Technique*:

“There is no shortage of research aimed at clarifying the physiology of man during exercise. Thousands of articles fill scholarly journals which gather dust in our university libraries. The scientists who so carefully pursue these studies ridicule the coach because he fails to read them, pointing out the mental shortcomings of those who neglect to utilize all available information pertinent to their trade.

“Coaches, on the other hand, overlook this body of knowledge, commenting that it is divorced from the practical situation, and they rely instead

upon hit-or-miss research of their own and/or copy successful practices of their colleagues.”

Neither side is blameless, they say. “An important scientific aim is to improve practice. Acquiring new knowledge, then, is but a part of the scientist’s job, for regardless of the critical nature of that knowledge, if it is not communicated to the practitioner it shall never be employed. Our belief is that the obstruction between scientist and coach is a semantic one for which both parties share the blame. The scientist too often writes for his own edification or to impress fellow scientists. On the other hand, the coach seldom makes an effort to learn the language of science.”

Compounding this dilemma is the fact that much of the best research on running is going on in Europe—primarily the Soviet Union and Germany. This means that information has to go through a number of tedious translations before reaching the ultimate consumer—the runner himself.

First it has to go from Russian, or German, into English. A great deal of information never gets this far. If it does, it has to go from the language of the scientist into practical terms that the coach can assimilate. Then coaches turn around and interpret it again for runners.

Not surprisingly, there is a time lag. And the information loses a lot of its original flavor as it’s passed along the chain.

This chapter helps in the interpretation. It isn’t meant to be a complete scientific dialogue on running training, but merely a simplified analysis of the more important but little understood research in the field.

Be forewarned, though, that applications of the scientific method to running are far from perfect. There is still a shortage of carefully controlled, long-term studies of runners because runners aren’t easy to control and study for long periods.

Doctors can define the “best” system, but they also have to convince runners to like it and believe in it.

Ron Clarke, the multi-record setter from Australia, has said, “Doctors and physiologists can argue the benefits of (my) type of training, but I feel that despite all the medical research they have not yet distinguished between the super-fit and the very fit. They are not capable of telling which type of training will provide great times, because if they could the Russians would be far in front of the world. Their research is excellent, but they have yet to produce the runners to match their research achievements.”

# STICKING TO SPECIFICS

BY TONY SUCEC

Tony Sucec coaches the successful cross-country team at California State University in San Diego.

Track and field literature has recently brought an important concept to our attention—namely, the role “specificity” may play, or rather *should* play, in an athlete’s training program.

The concept of specificity was brought to the attention of physical educators by F. M. Henry in 1958. He demonstrated how as early as 1930 research clearly supported the idea that various skills were high specific. That is, one’s ability in a given sports skill is not related to his ability in another.

Henry’s thesis was not warmly accepted in the world of sport since physical educators had long held that athletic skills were mostly general in nature. The all-around, “natural” athlete was offered as an example of a person who had a high level of general sports ability. The concept of specificity does not deny the existence of these athletes; it simply explains that they have many specific motor skills.

Implicit in the theory of specificity is the idea that practice in one skill will not transfer to another skill and improve performance there, even though these skills may be somewhat similar.

How does this apply to the training of runners? First of all, it obviously means that the best way to train for running is to run. But an extension of specificity is to investigate just how specific running itself is. That is to say, will *any* type of running improve a given running performance? Apparently not. So the next question is, how much of each kind of running training should be done?

Coaches have tended to make this determination on the “guess-or-by-golly” method. In this regard, experience has been a moderately successful, if not efficient, teacher. The point is, however, there are better ways of making these determinations. The theory of specificity should be involved in training decisions.

Before we can make training decisions, we have to be aware of how various training activities affect physiological capacities and performance. Many physiological capacities contribute in differing proportions to race performance. The amount each capacity contributes is related to the nature of the race. A sprinter, for example, depends largely upon anaerobic metabolism and muscle power, while the long distance runner requires a highly developed aerobic capacity and muscular endurance. Each needs training that centers on developing his most important traits.

Specific physiological capacities that contribute to a given running performance can only be increased by employing the running activities which will increase those capacities. In other words, sprinters must train mostly with sprints, and distance runners with distance runs.

The theory of motor specificity dictates that training activities must be specifically designed for the purpose in mind (speed, endurance, strength, etc.). Certain activities, although similar, may not contribute to running performance

because there is little or no transfer of training effects. The specificity of various running activities must be taken into account when designing training programs for runners.

Before it is possible to efficiently assign training activities, we must know what physiological capacities we want to improve and, in turn, what training activities will increase these capacities. If we correctly apply the appropriate training activities to the capacity we want to increase, we can expect improvement.

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# MEETING OXYGEN NEEDS

Don't let the word "specificity" scare you. It isn't so hard to understand and apply. Simply keep the race you're running in mind, and train in more or less the same fashion you'll be racing. Being specific in training means being race-like, only at scaled-down intensity.

Each race has its own demands, involving in the simplest sense various combinations of speed and endurance. All-out speed is an *anaerobic* function, and slow distance running is *aerobic*. In other words, the shorter and faster a run is, the more strain it puts on the breathing system. In the shorter races, this system temporarily goes into debt—*oxygen debt*—during the race, and only repays it later. In longer runs, however, most of the debt is repaid en route.

"Aerobic" means working with adequate oxygen. "Anaerobic" means working without it. You don't need to understand the detailed physiology of it. But knowing the principle is important in seeing how training works.

All races are partly aerobic, partly anaerobic, with proportions varying according to distance. At the extremes, sprints (100 and 220 yards) are run almost completely in oxygen debt. The marathon is almost entirely aerobic.

A number of researchers have worked out relative percentages for different events. Ken Doherty balances their findings in his *Track and Field Omnibook*.

## AEROBIC-ANAEROBIC NEEDS BY RACING DISTANCE

Race	Aerobic %	Anaerobic %
440y/400m	25%	75%
880y/800m	50%	50%
Mile/1500m	70%	30%
2 miles/3000m	85%	15%
3 miles/5000m	90%	10%
6 miles/10,000m	95%	5%
Marathon	99%	1%

This chart gives an approximation of what training emphasis should be. A half-miler, for instance, might spend about half of his time doing oxygen-debt type work, half on easy-breathing efforts.

"In everyday running terminology," Doherty says, "we tend to equate aerobic running with long, slow, continuous running, though slower-paced interval training can also be aerobic. Anaerobic running tends to be related in both research and actual practice to repetitions of faster-paced distances, as in interval training. But fast-paced continuous running is equally anaerobic."

In general, however, runners tend to use interrupted work such as intervals and fartlek for their anaerobic building, and steady work for the aerobic side. (See the next article.)

However it is taken, anaerobic work has its main effect on the heart itself. Aerobic work primarily affects the blood vessels and oxygen supplies throughout the body. Anaerobic running increases explosive muscular power; aerobic running increases staying-power.

Hans Reindell, the co-developer of interval training, found his type of work markedly increased the size of the heart in as little as 20 days after beginning training.

But Australian physiologist Richard Amery says, "Initial enthusiasm for interval training was perhaps somewhat tempered by the finding that maximal oxygen uptake was not found to keep pace with the rapid increase in heart size. Researchers Andersen and Wilson found, for example, that while subjecting a group of 20 young, healthy adults to training over a five-week period, heart size increased by an average of 15%, while maximum oxygen uptake for the corresponding period was increased by only 6%."

Increased oxygen uptake levels come through proper aerobic training. Amery says, "It has been found that in adults the degree to which maximal oxygen uptake can be improved as a result of training is rather limited; an amount of 10-20% is usually given. Coupled to this has been the finding that participants in endurance sports (such as distance running) change their maximal oxygen uptake very little after reaching peak values despite years of continued running."

It apparently takes much longer, however, to reach one's maximum level in oxygen uptake than in heart capacity. Reindell's research indicates that heart growth slows almost to a stop after the first month of training.

Okay, so how do you know what is anaerobic and what is aerobic in nature—what is stimulating the heart and what is stimulating the oxygen supply system? There are two easy guides: breathing and heart rate.

Breathing is simple to assess. If you're laboring to get air, there's oxygen debt. Therefore, the run is anaerobic. The more you labor, the more anaerobic it is. If there's no oxygen debt, it is aerobic.

Pulse rates give another indication of training effects. Tony Sucec has reviewed a great body of training research for *Runner's World*. He says tests indicate "running at a pace that requires a heart rate of below 130 beats per minute will not improve heart function or oxygen supply. Therefore, steady runs must be at a faster rate." (Some prominent scientists say the base figure is as low as 110.)

Sucec continues that steady running in the 130-150 pulse range "improves peripheral circulation, but not central circulation."

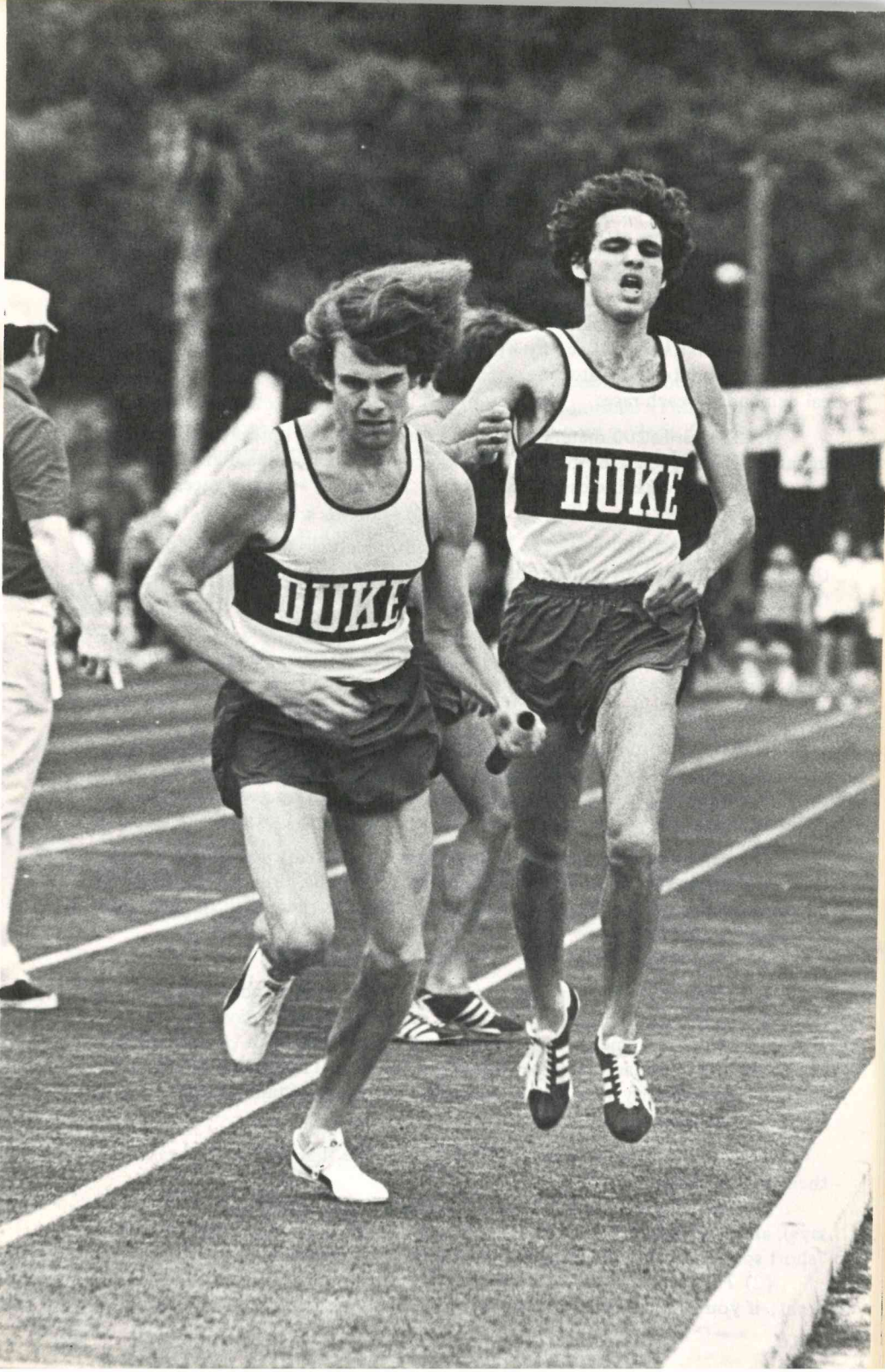
Effects on the oxygen carrying system may continue to be felt above the 150 pulse rate, but as the heart approaches its maximum the training effects are more and more localized in that particular muscle.

Do what the race demands. If training resembles racing closely enough, the body automatically takes care of the oxygen and pulse details.

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**NEXT PAGE: US Olympian Bob Wheeler (left). (Bob Kasper)**



# THEORIES IN PRACTICE

Now the objective is to find out which methods of training go with which types of racing. At best, this is a generalized interpretation of research data.

We've seen that fast interrupted work (intervals and fartlek) primarily stimulate the heart, increasing the size and power of that muscle and other speed muscles. Steady distance running promotes internal efficiency, in terms of respiration and circulation.

From charts formulated by Ken Doherty and Fred Wilt, we can break running down into four categories. These are based on the main physiological demands of each race:

1. **220 yards/200 meters and less:** These are almost entirely anaerobic in nature—perhaps 95% or more of the oxygen needs being repaid after the run. “Short speed” is the essential ingredient in training for these races. (See below.)

2. **220 yards/200 meters to 880 yards/800 meters:** More than half of the effort in these races is anaerobic, making “long sprint speed” the crucial factor. This means being able to maintain near-maximum speed over extended distances.

3. **880 yards/800 meters to six miles/10,000 meters:** The bulk of the work here—50-95%—is aerobic, yet there is still a certain speed factor in these events. The emphasis, then, is on “middle distance endurance.”

4. **Above six miles/10,000 meters:** Since these long distances draw almost entirely on aerobic resources (less than 5% of the effort involves oxygen debt, according to Doherty's sources), most of the attention goes to “long distance endurance” running.

The titles given the types of training effect admittedly are arbitrary, and there is a certain mixing of effects in any kind of running. But this oversimplification helps us identify results of training, and link them with the methods discussed in Chapter Two.

We'll take them in the order that they appeared there:

- Fartlek, Fred Wilt says, gives about a 50-50 aerobic and anaerobic balance (depending, of course, on how it is carried out day to day). It can give all-round development—from “short sprint speed” through “long distance endurance”—or one factor can be singled out for special attention. It's that flexible. It apparently would be most useful for middle distance runners—track runners from the half-mile up.

- Intervals come in so many different varieties that we have to look at them in three parts:

(1) *Sprinting intervals* are run all-out (heart rate near maximum, Wilt says), anaerobically, and can't last more than about 30 seconds; they develop “short sprint speed” and are most valuable to short sprinters.

(2) *Pace intervals* by definition relate to the speed and distance of one's event; if you're a half-miler or less, the pace-work has best results as a “long

sprint speed" builder; if you race above a half-mile, the main benefit is "middle distance endurance." Any type of track runner can use them, since they're self-adjusting to his own race.

(3) *Endurance intervals* are done at slower than race pace, and are designed to allow heavy work loads that are broken up to delay fatigue; they're more aerobic than anaerobic, and build either "middle or long distance endurance," depending on pace. Long distance runners get best results from these.

(In this connection, Tony Sucec says after analyzing training research, "To get maximal stress on the circulatory and respiratory systems, an interval run of 1½-3 minutes is required. Sprints of 30-60 seconds can produce maximal stress to the muscular system as well as anaerobic capacity.")

- Slow distance runs, Wilt estimates, are 95% aerobic. In other words, there's little direct stimulation on the heart and speed muscles. Pulse rates generally don't exceed 150. The most obvious result here is "long distance endurance" building, which best serves runners above six miles/10,000 meters.

- Fast distance runs are more closely related to racing in pace and stress than are slow distances. Fred Wilt theorizes that the heart rate needs to stay consistently above 150 in these runs. Their effects depend on the distance being run. If it's a half-mile or less, "long sprint speed" is most involved; if above a half-mile, "middle distance endurance" is the leading benefit. At the two extremes, even "short sprint speed" and "long distance endurance" can be gained.) Runners in any event can profitably apply this kind of running.

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## SUMMARY OF TRAINING NEEDS

Race Distance	Category	Aerobic Needs	Anaerobic Needs	Training Emphasis
100y/100m	Short sprints	less than 5%	more than 95%	"Short sprint speed" gained through sprint intervals (30 seconds or less, all-out) or high-speed fartlek.
220y/200m	Short sprints	5%	95%	Same as 100, but perhaps adding some sub-maximal pace intervals or fartlek because these races border on the long sprints.
440y/400m	Long sprints	25%	75%	"Long sprint speed" gained through pace intervals (close to racing pace, but at shorter distances) or fartlek and fast distance runs.
880y/800m	Middle distances	50%	50%	"Middle distance endurance" gained through pace intervals, fartlek, or fast distance runs (paces related to one's racing ability).

Mile/1500m	Middle distances	70%	30%	Same as 880/800, but with adjustments for racing distance and pace.
2 miles/3000m	Middle distances	85%	15%	Same as 880/800, but with adjustments for racing distance and pace.
3 miles/5000m	Middle distances	90%	10%	Same as 880/800, but with adjustments for racing distance and pace.
6 miles/10,000m	Middle distances	95%	5%	Similar to the other middle distances, but perhaps adding slow distance runs or endurance intervals because these races border on long distances.
Over 10,000m	Long distances	more than 95%	less than 5%	"Long distance endurance" gained through slow distance runs, fast distance runs, or endurance intervals-fartlek.

# TESTING THE RESULTS

All of these theories on training look very orderly when they're listed in story and chart form. But how do they test out on the track, under practical conditions?

Testing the relative merits of training methods out there isn't easy for exercise physiologists. Individuals react differently to the same training doses. Controlling statistically representative groups of runners is difficult. Methods that work best in the short run often aren't the best from the long-term point of view.

The results that count, the ones that say exactly what training will do to improve racing performance, aren't readily available. More thorough comparative studies need to be done yet.

One of the most comprehensive ones done thus far was carried out in the Soviet Union in the late 1960s by three researchers at Tartu University.

A. A. Viru, Y. U. Urogenstein and A. P. Pisuke used 94 previously untrained students as their subjects. They divided the new runners into nine groups and assigned each a specific training routine:

1. Long steady runs—25-30 minutes.
2. Fartlek—20-20 minutes.
3. Long sprints—full-speed, 200-600 meters.
4. Interval sprints—full-speed, 40-50 meters, jogging between.
5. Series of intervals—3-4 runs to a set with full recovery between sets (total number, distances and paces not indicated).
6. Endurance intervals—60-80% speed, with "comparatively short" recovery breaks.
7. Pace intervals—80-90% speed with 1½-3 minutes recovery.
8. Uphill intervals—15-degree slope.
9. Combination—long steady run, fartlek and intervals (exact proportions not listed).

All runners took 100-, 400- and 800-meter time-trials at the start of the training period, and again six weeks later. This tested the training effects in a short sprint, a long sprint, and a middle-distance race. They also were checked for changes in heart volume, oxygen uptake, etc.

Even with this short training period, the students improved dramatically in every event and with every type of training. (See accompanying chart.)

The best results throughout came from the pace and uphill interval groups. This isn't surprising since all three of the index events have high speed factors. The only type of training more intensive than pace and hill intervals is sprint intervals (which shows up almost as well in the 100, but does not do as well in the longer races).

The researchers say, "Training exercises of an anaerobic nature, such as hill running and interval training, caused a significant increase in heart volume... Expansion of the heart accompanied the improvement of its functional capabilities."

Knowing what we now do about training theories, it is understandable too that long steady runs and endurance intervals consistently rank at the bot-

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## MEAN IMPROVEMENTS IN RACING TIMES

Method	100m	400m	800m
1. Long steady	0.10 sec.	2.60 sec.	6.30 sec.
2. Fartlek	0.15 sec.	2.05 sec.	7.65 sec.
3. Long sprints	0.20 sec.	3.90 sec.	8.40 sec.
4. Interval sprints	0.25 sec.	3.40 sec.	7.80 sec.
5. Interval series	0.20 sec.	2.95 sec.	8.00 sec.
6. Endurance intervals	0.10 sec.	1.95 sec.	7.50 sec.
7. Pace intervals	0.30 sec.	3.60 sec.	11.05 sec.
8. Uphill intervals	0.30 sec.	3.85 sec.	12.85 sec.
9. Combination	0.25 sec.	3.30 sec.	9.35 sec.

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tom in these tests. They simply don't offer enough specific stimulation for this kind of racing.

However, the Soviet scientists say, the slower, more aerobic training methods were "most effective with respect to an increase in oxygen capacity of the blood. (Long steady running) contributed most to a decrease in pulse rate at the finish of the 800-meter run, which compels us to consider the economizing action of this training method."

They conclude with the observation that no one training system should be used exclusively. They say, "The utilization of only one of the training methods results in an intensified development of only one function, sometimes even to the detriment of other functions. Of course, such uncoordinated development cannot guarantee stable success."

They recommend skillful combining of specific ingredients.

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# HOLDING OFF FATIGUE

Fatigue is the enemy. All runners have to deal with it. They can build resistance to it, but never escape it entirely. In long distances, it creeps in slowly to numb the system. In the sprints and middle distances, it hits with a sudden, sharp, muscle-tightening blow.

Fatigue slows and eventually stops runners, and training is the counter-attack against it. Effective training teaches the body to hold off fatigue by raising the level at which it starts accumulating.

An Italian physiologist has made an incredible statement concerning fatigue and training loads. Rodolfo Margaria claims that by carefully regulating the length of their runs and the recovery periods between them, sprinters and middle distance runners can handle up to 30 times their normal amounts of work without getting any more tired!

Dr. Margaria's claim takes some explaining. In the primarily anaerobic races through a half-mile, and to a lesser extent in longer ones, a substance called lactic acid forms as a by-product of exercise.

When a runner exercises with adequate oxygen supplies, most of his energy comes from oxidation. But when effort becomes anaerobic, he shifts to glycolysis for energy supplies. This produces lactic acid, which wears him out very quickly.

Margaria's test have indicated, he says, "that ordinarily the maximum (energy) provided by oxidation is about 220 calories per minute per kilogram of body weight. The production of lactic acid usually began when the energy requirement passed that level." He has found that this level is the same amount in both trained and untrained persons.

But he adds, "Another significant finding is that trained athletes (middle-distance runners) were able to obtain an unusually large share of their energy need from oxygen consumption, so that lactic acid production began at a somewhat higher level of exertion than it does in non-athletes."

The point is this. Training lets runners make more efficient use of their energy supplies. By training, they drive up the dividing point between aerobic and anaerobic running.

The most significant feature of Margaria's research is the trick he has found for "cheating" the fatigue system. He has learned how to give sprinters and middle-distance runners the aerobic work they must have, while stalling the formation of lactic acid. The net result is more training of a specific nature, which in turn may raise the "steady-state."

Margaria says the lactic acid mechanism is sluggish. It takes about 15 seconds to snap into action during an all-out run. But once activated, it drives the runner to exhaustion within the next 15-20 seconds.

"Because there is always a certain period of delay in the onset of lactic acid production, even in highly strenuous exercise," Margaria notes, "one can avoid this production by limiting the activity period to a short enough time.

"This suggests that, in the case of exercise or work that may push the energy requirements beyond what can be furnished by oxidation (aerobic activity), the muscles can be used most effectively by adopting a schedule of intermittent activity and rest, each activity period being short enough to fore-



stall lactic acid production and each rest period long enough to pay off the alactic oxygen debt contracted during the period of strenuous activity.”

Margaria tested runners on his treadmill with 10-second sprints, with a 10-second rest between. There was a rather high lactic acid accumulation (1.5 grams per liter of blood) because recovery periods weren't long enough to repay the oxygen debt.

He then allowed 20 seconds between runs. Runners covered considerably more total distance with less lactic acid buildup.

Finally, with 30-second breaks between hard runs, “the subjects were able to go on with runs indefinitely and showed a lactic acid content in the blood of only about 0.2 grams per liter.”

He puts this in practical training terms:

“These findings can be projected to predict potential performance in sports events on the track. For example, a trained runner sprints 400 meters at top speed will finish the race with a state of acidosis that will require a rest of at least an hour and a half for recovery. Thus, in four hours he could make only three such runs at most, covering a total distance of 1200 meters.

“If instead the runner cuts the runs to shorter ones, sprinting only 100 meters each time (at the same speed) and resting for 30 seconds, he would not accumulate any lactic acid, and in four hours could make 360 runs, covering a total distance of 36,000 meters.

“In other words, by limiting the individual runs to 100 meters with the short resting intervals, he could accomplish 30 times more work than with 400-meter runs.”

Margaria is convinced that the way to increase work efficiency is to say acid-free, either through aerobic running in the case of long distance runners, or short “alactic” intervals for sprinters and middle-distance athletes.

“By proper pacing of the work and the intervals of rest,” he says, “a person can produce more work than by driving himself relentlessly.”

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## Chapter 4

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# COACHES



Steve Prefontaine (right) and coach Bill Dellinger. (Jeff Johnson)

# METHODS OF MASTERS

*"The coach is considerably more than a technician. He's blessed with a dizzying number and variety of functions and roles. Besides being a training/racing planner, the coach may be a friend, a substitute father, a doctor, a public relations man, a disciplinarian, an amateur psychologist, and above all a teacher and student—both of the sport and of human nature."*

—from *Coaching Distance Runners*

Coaches are the interpreters of training. To be successful in their many-faceted job, they have to understand both the technical language of the scientist and the everyday needs of the runner—and then combine the two in a workable formula.

Whether it's the formula or the man interpreting it that breeds successful running is a debatable point. The coaches who make the biggest names for themselves almost always are strong personalities with unwavering confidence in their way of doing things. This they pass along to their runners.

A. M. La Sorsa writes of Arthur Lydiard in *Coaching Distance Runners*:

"He reveals almost classically the *sine qua non* of nearly all such individuals (or 'prime movers,' as they are sometimes called)—an unswerving, unquestioned, indomitable faith in himself and belief that he is right. It is also the secret of their success because this profound faith is transmitted to and acquired by their followers. In Biblical terms, this kind of absolute faith, once incorporated in a person's life, can move mountains."

La Sorsa adds, "In the case of a coach, as long as he and his athletes have this absolute faith in their method of training, the actual method is of little real significance. Hence, the observable: coaches with widely differing approaches to training have all produced champions."

He's saying we can't separate the mechanics of the method from the personality of the man applying it. Confidence breeds confidence. Success breeds success. An athlete with faith in a leader with a record of excellence can make almost anything work.

When this kind of strong personality combines with an inventive mind, the result is a coach's coach. His system produces a string of fast runners, not just one or two. His innovations are widely copied.

This chapter centers on three of these men—Bill Bowerman, Mihaly Igloi and Ernst van Aaken. We chose them because of close similarities in the men and wide diversity in the methods.

All three are at a stage in their coaching careers where full recognition for their work is due them. Bowerman has retired from the University of Oregon coaching job. Igloi has left the United States to coach the national team of Greece. Van Aaken is making a slow recovery from a traffic accident that cost him both legs and almost his life.

All three coaches are in their 60s now. All started as athletes, graduated to coaching, and have spent at least four decades perfecting their ideas.

They came from strikingly different athletic traditions—Bowerman from the school-oriented US system, Igloi from the state-supported Hungarian system, and van Aaken from club-centered West Germany.

This explains the differing amount of influence they have over their runners. Igloi expects almost total subservience from his runners. Bowerman has to balance running with studies. Van Aaken, a medical doctor, serves only as an advisor.

They represent two extremes of training methodology, and a happy medium. The Igloi plan involves almost solely interval training on the track. Van Aaken uses little else but long slow running. Bowerman employs his own mixture of the two.

The innovations: Bowerman is best known as author of the "hard-easy" philosophy of training. Igloi has taken a highly varied and personalized approach to interval training. Van Aaken could be called the "father of LSD," having made endurance training his lifelong study.

Bowerman and Igloi have had the greatest influence on US training methods of any coaches in the '60s and '70s. Van Aaken has a large following among Europeans, and his methods are increasingly popular in the US.

The articles that follow are a tribute to these men and their methods. Bowerman is no longer coaching. Igloi has left the US. Van Aaken is at least temporarily out of athletics. But their work goes on through their former runners. Bill Dellinger at Oregon, Laszlo Tabori in southern California and Manfred Steffny in Germany, speak for the masters.

# BILL BOWERMAN

BY JANET NEWMAN

Janet Newman, a long distance runner from Eugene, has run a 3:33 marathon using Bowerman training principles. She is a regular RW contributor.

The day after Bill Bowerman retired from his head coaching position at the University of Oregon, Oregon's distance runners made their 1973 debut. Steve Prefontaine stole the headlines, as usual, with his 27:09 American record for six miles. Prefontaine's teammates produced some fine early season times, too: a 1:49.6 half-mile, a 4:05.9 mile and a 13:24 three-mile. The performances weren't entirely unexpected.

Behind a series of stars like Prefontaine, Ken Moore, Dyrrol Burseson, Jim Grelle, Wade Bell and Arne Kvalheim are scores of runners who chose to be little fish in the big pond, in hopes that the Oregon system would mold them into top running form. Few won national notice, but most made national rankings.

Bowerman, the man credited with developing the "Oregon System," says simply, "It's not that we have better cabbage than other people. It's the result of the program."

Bill Dellinger stepped in as head coach after assisting Bowerman for five years. The move was expected as Dellinger had increasingly taken on the coaching load, particularly with the distance runners. Dellinger coached the cross-country team to a national title in 1971 as well as second (1970) and third ('69 and '72). Bowerman always remained as a benevolent tyrant father-figure for the runners, but Dellinger made up the workouts.

When Bowerman wrote a book on track and field training principles, he asked Dellinger to write the section on distance training. Dellinger, an Olympic bronze medalist in the Tokyo 5000, coaches from experience as a runner himself and as a student of Bill Bowerman.

The principles of the Oregon System are no secret, says Dellinger. They are mainly a combination of principles from all over the running world.

He says the Oregon System is a "blend of Bowerman's personal philosophy designed to fit our climate and terrain, blended with what we've learned from many experiences in international competition and through experimentation with other coaches."

At a 1972 Olympic Trials coaching clinic in Eugene, Dellinger explained the Oregon combination of straight intervals (in the Stampfl-Igloi tradition), Lydiard runs (long and steady) and Holmer fartlek (speed-play off the track).

He listed 15 basic beliefs that influence the Oregon combination system:

1. *It is better to be undertrained than overstrained.*

Bowerman really pushes this principle for all types of runners. Dellinger is more inclined to increase his runners' mileage over the 70-80 miles a week that Bowerman maintains is sufficient when done as consistent high quality work. Pat Tyson has been running at Oregon for five years and he has noticed a change since Dellinger started coaching distance runners. The runners still don't do much more than 100 miles a week, but there has been an increase in



mileage on "easy days," from 4-5 miles under Bowerman to 8-10 with Dellinger.

2. *A varied program should be designed to fit the individual.*

Dellinger likes to vary workouts with different combinations of intervals and fartlek, hard and easy days. Some runners can take two hard days of running with only one light day to recuperate. Others may need two easy days between hard workouts.

Dellinger also points out that a well-trained runner with an excellent sense of pace could do all his training off the track, fartlek style. But since few runners have such an instinctive pacing clock in their body, Dellinger sends most of his runners through intervals.

A typical interval workout often includes a 3-6-mile run through a park after the bulk of interval work. Runners return to the track for another short session of quick intervals.

3. *Proper rest is important.*

Rest includes sleep as well as the "rest" of any easy day of running. Bowerman is famous for his lectures about spreading oneself too thinly over too many activities. He has always maintained that runners have only enough time to concentrate on their school work and running. Runner involvements with the opposite sex generally received an official Bowerman frown. Marriage, Bowerman gloomily predicts, spells the end for a running career. Obviously many runners have defied the prediction. But, also obviously, the less mature runner may have trouble adjusting to emotional upsets from extracurricular activities. And late night dating can cut into needed sleep hours.

4. *A runner must be consistent with his program, morning and night, day after day, 52 weeks a year.*

Running is a year-round activity and consistency is a must. The serious runner must be dedicated.

5. *A progressive goal pace-date pace program provides the framework for the individual workouts.*

When a runner enters school at Oregon he runs his distance at a comfortable pace without hearing any splits. A 4:11 high school miler may run comfortably at 5:00 pace. That would become his date pace. Runner and coach then make a subjective rating of the runner's goal. Prefontaine, a 4:06 miler in high school, came to Oregon wanting to run a 3:48 mile. He and Dellinger finally agreed that 3:56 was a more reasonable goal. He ran 3:57 his first year.

Workouts are made with the runner's volume of work at his date pace. A bit of goal pace is integrated with the date pace work, i.e. 6 x 330 at goal pace for a miler. Constant testing, every one to three weeks, keeps the date pace changing, until ultimately date pace is goal pace.

6. *Proper running posture must be developed.*

A coach can help spot defects in running posture—overstriding, awkward arm carriage, etc. Oregon coaches frequently use a camera to help point out to the athlete some of his technique problems.

7. *A runner must be calloused for his distance.*

Dellinger is a firm believer in this principle, and includes a "bear" work-

out every 21 days or so. One Oregon distance runner says the workout is "unbearable because you're going to be in an unbearable situation in a race." Dellinger feels that this occasional brutal workout builds the confidence a runner will need to have to run his distance at goal pace.

8. *Proper care of feet, shoes and legs is a necessity.*

Bowerman is forever tinkering with track shoes and UO runners give those shoes the test run. Bowerman came up with the Cortez design for a training shoe because no other shoe offered the kind of cushioning a distance runner needs to absorb the shock of constant pounding. The elevated heel of the Cortez model also relieves strain on the achilles tendon. Almost any kind of training shoe can have an extra heel wedge inserted.

Many Oregon runners are trying out the "waffle" shoe or have glued a layer of waffle material on the heel of a spiked shoe. The extra heel material provides both grip and cushion for the distance runner.

The UO track is very hard. While it is great for competition and some interval work, a softer lane inside the curbing provides relief for sore legs. Shredded tire rubber or sawdust can be used for the inner lane. Easy jogging and rest intervals are always done on this soft surface. Runners with chronic leg problems will sometimes do their entire interval workout on the soft surface.

Oregon is fortunate to have a cinder track next to its all-weather track. Dellinger often has his distance runners train on the softer cinders, particularly during cross-country season. Cross-country is also the season for some wet workouts on nearby golf course hills. Even sprinters join in for some of the hill workouts. A soft but firm surface helps reduce shock and wear on legs.

9. *Light weight training should be used on an individual basis.*

Dellinger prescribes some light weight training for the frail runner. But, again, the amount needed by each runner must be individually determined.

10. *The individual's program must be flexible.*

No workout program is so holy that it can't bend to weather, facilities or the health of the runner. Common sense is the key. If a runner is injured, his program is cut back. He may do some light running or swimming, or he may rest. Likewise, the runner with a cold may also cut back a bit on his program to avoid lowering his resistance and catching something more serious.

11. *More can be accomplished in a training session than during an actual race.*

Competition is necessary, says Dellinger, but he'd like to have a runner race every two or three weeks rather than weekly.

12. *The longer you run and compete, the better you'll be.*

Dellinger speaks of a 10% improvement over 10 years. "We never cut a track man," he says. Oregon runners train with the idea that their running doesn't stop after graduation. Ken Moore is a good example of the post-graduate running process.

13. *Run twice a day, except Sunday.*

Dellinger doesn't check to see if his runners go out for their morning run. He just assumes that they do. "We're not babysitters and we're not going to force them to run in the morning. They just do it on their own."

**Bowerman: "I don't think anyone can do anything without working. But you have to be careful how much work you do..."**



*14. Confidence builds a better runner.*

Confidence in oneself as a runner comes from four sources, says Dellinger:

- (1) Success in competition; (2) Selected brutal workouts; (3) Year-round program that gives the runner a feeling of being fit; (4) Confidence in the coach.

*15. Running should be a way of life for runners.*

Running at Oregon is based on individual and educational experiences but it is also enjoyable, says Dellinger. Running has been a way of life for Dellinger for many years, through three Olympics, two indoor world records, an American record and five years of coaching at Oregon. The 39-year old coach is still fit and runs every night after the younger Oregon trackmen have completed their workouts.

Most Oregon runners agree that, like snowflakes, no two workouts are ever alike. Workouts are made with certain situations and conditions in mind. More importantly, workouts are made for individuals.

Dellinger generally prepares workouts weekly, although some will cover three-week periods. He splits up the runners by event: 880, mile, three and six miles and steeplechase. He may even split up the runners within the event, fitting each runner to a group near his own date pace. And within each group are the individual goal and date paces.

"Prefontaine is on a goal pace to run a 12:45 three-mile, while the next



runner, Paul Geis, may be aiming for 13:00 or so," Dellinger said in early 1973. "Running 4 x three-fourths mile at goal pace, Pre would run around 3:10 or 3:11 while Geis would be around 3:15."

Competitiveness during workouts can be a problem of immature runners in particular, says Dellinger. Splitting runners into groups can help, but most runners have to learn through experience that if they compete during training they may have little left to compete with in a race.

Dellinger likes to use a varied pace form of interval workout, designed to help the runner learn to recover more quickly between intervals, and eventually to run the whole distance at the interval pace. A six-miler may run a three-quarter at 70-second pace, then rest for one lap at 90-second pace—repeating the interval six times, covering the 24 laps he'll have to run in his race.

Another favorite workout, used during the fall, is a 10-mile control run. Distance runners run three-quarters of a mile on the track at 70-second pace, then take off on the roads at six-minute mile pace. After two miles on a fairly hilly route, they run another 1320 at 70-second pace. The same pattern is followed for the rest of the 10 miles: three-quarters hard followed by two miles sustained. One Oregon runner admitted that sometimes "we get too competitive and go faster, around 5:30 or 5:45 pace."

Oregon runners simulate race conditions in workouts before major meets. If a runner will have to compete three days in a row, then he will prepare by training hard for three days in a row. Dellinger usually schedules the last hard workout 10 days before major competition.

In very general terms, a week of training on the Oregon System includes an easy morning run, Monday through Friday, with another easy run late Saturday afternoon. Hard workouts fall on Tuesday and Thursday afternoons and Saturday mornings. The Saturday workout might include a test effort to determine date pace. The hard workouts include some fartlek and some interval work. Easy days—Monday, Wednesday and Friday—probably include six to 10 miles of Lydiard running. A long run, 12-15 miles at 6:30 pace, is the only Sunday workout.

## IDEAS OF BOWERMAN

Bill Bowerman outlined his philosophies of training and coaching in a January 1972 *Runner's World* feature. These are key excerpts.

● **On work loads:** In every case, I would prefer to undertrain a runner rather than overtrain him.... I don't think anyone can do anything without working. But you have to be careful *how much* work you do.... Working too hard contributes to fatigue fractures and colds and all sorts of other ailments. But, gee, even if nothing happens, how's a guy going to have any fun if he's doing so much running?

● **On training mileage:** Young runners tend to think the farther they run and the faster they run in training, the better it's going to be for them.... A runner can have just as much success, if not more success, by finding what his limit is in relation to his progress. It just doesn't make any sense to think, "I'm going to win a gold medal because I have run farther than anyone else." The gold medal is going to come to the guy who makes the very best preparation, and has the talent to go with it. If all there is to it is covering more miles...well, they ought to give a medal for that. Maybe that would take care of all these fools who want to put in so many miles.

● **On his system:** I think the principles remain the same. Types of *application* change, but basic principles don't. They're like the Law of Gravity. People talk about the "new" method of interval training. Interval training—in crude form—is probably as old as running itself. Continuous, steady running is as old as running, too. All that has changed is our use of these methods.

As far as actual workouts go, there is nothing startlingly new about ours. We mix steady distance running with fartlek and intervals, keeping in mind we're training for racing. Some runners say they enjoy running out in the hills. Fine. But I tell them if they're going to race on the track, they'd better practice the things that are going to happen on the track. They must practice pacing and bursting and sprinting, whether they're running on the track, or on the golf course, or on the hill-sides.

● **On coaching:** Several of my critics have said, "Bowerman just tacks up a piece of paper in the locker room and turns his runners loose." They're partially right. I do give the athletes a relatively free rein, and for good reason. One of those principles I was talking about is "*don't overcoach.*" This is for the runners' benefit as well as mine.

The university track coach works with athletes in 10 types of events. There's no way he can be with all these athletes all the time. I figure I can be with a man or a group of men once a week. I actually see them only once every 10 days.

So I tack up a schedule and leave it to the athlete to do the work. If I'm doing my job right, he will run—not because he's constantly being watched but because he enjoys running and sees value in it.



# MIHALY IGLOI

BY JON SUTHERLAND

Laszlo Tabori trained with Igloi longer than any other runner. They were almost like father and son, starting together in Hungary in the early 1950s, setting world records in the middle of the decade, then fleeing to the United States together after the 1956 revolt. They continued working together in the US until Tabori retired. Laszlo then began assisting Igloi, and finally went out on his own, still keeping most of his teacher's methods. Jon Sutherland has trained with Tabori since 1969.

As a coach Mihaly Igloi has few equals. But even now that he is in Greece, more remains of him in the US than just a memory. One of the finest coaches in the country, and heir apparent to Igloi as interval training's leading credit, is Laszlo Tabori.

Tabori's track career was a long and distinguished one. In 1955, he became history's third sub-four-minute miler. Later that year, he tied the world record for 1500 meters (3:40.8) and was involved in a dozen other races in which he and his Hungarian companions broke every world mark from 1500 to 10,000 meters except the mile.

Unfortunately, the Russian invasion of Hungary curtailed his chances at Melbourne as he was diverted from training immediately before the Games. However, under extreme pressure he still placed fourth in the 1500 and sixth in the 5000.

After the Olympics, Tabori defected to the United States and settled in Santa Clara, Calif. The Olympics and all the politics had disillusioned him, but he slowly returned to form after a year of inactivity to again beat four minutes. Still without citizenship, Tabori was without a country to send him to the Rome Olympics. Then in the early sixties, in collaboration with Igloi, he helped in the education of Jim Beatty and Bob Schul into world class runners. Shortly thereafter, Tabori retired.

Several years later, Tabori was contacted by George Ker, track coach at Los Angeles Valley Junior College. Ker offered him a part time job. He couldn't offer much money. Valley doesn't have scholarships, and recruiting wasn't picking out what you want but accepting what talent showed up the first day of class. Ker could only offer minimal compensation as a "recreation director" and reserve the track at convenient times.

But Tabori's love of the sport overcame the obvious details and soon he had become an institution at the college. He's still at Valley College most afternoons, guiding the workouts as only he can.

Here is a man, a former world record holder, who has a world of knowledge and is extremely generous with his time. He is paid about \$50 a month for all the hours he puts in.

But he doesn't mess around. He creates each workout the night before, according to the general overall schedule he has formulated in his mind for each individual. Then he comes to the track and gives the training to the motliest crew you ever saw: a couple of national-class athletes, joggers, many local high school studs, and freaks who wander over just to see why the lights

are on. To each one of these people he has something that will improve that person in a hundred ways.

As a coach, Tabori has had direct influence on runners such as Mark Covert, a 28:08 six-miler and seventh placer in the Olympic marathon trial, and Jacki Hansen, women's winner in the 1973 Boston marathon. His runners have set seven national junior college records and have won three state JC cross-country titles. At one time, his alumni runners were number one men at five different California colleges.

He only has most runners for two years, at best, before they go off to another school, so there's little chance for him to set up long-term programs with them.

Each runner who comes to Tabori, whether he's an NCAA champion, a middle-of-the-pack JC runner, or an overweight jogger, is treated with equal concern. This has endeared him so much to his runners that they contributed enough money to pay his way to the Olympics in Munich. Part of his success must be due to his personal relationship with each individual. To no one does he sit off like a detached coach. If one is willing to do the work and show up regularly, Laszlo is willing to give you his time and offer his experience.

When a runner shows up for the first time, he is asked to write down all his previous best marks, which gives Laszlo a basic idea of the runner's potential. (Incidentally no runner who has ever spent more than a couple of months with Tabori has failed to improve on all his PRs.)

The next important concern is with running form. Far too often the form is ragged and wasteful, so before any seriously bad habits develop, a demonstration of the necessary corrections occurs.

He advocates grass as the best training surface and firmly believes that the only way to deal with the pain involved in a race is to constantly recreate the situation, push it, then recover so the work will do some good.

Fall is traditionally a building period where mileage is important and the interval sessions often reach as much as 16 miles. All training is geared towards the important meets in late November, when generally the distance is modified slightly to include some sharp speed.

In the period between racing seasons, long runs are encouraged on the days between intervals. But generally the speed begins to increase in preparation for track. This is where the real quality begins. Quarters and halves become considerably faster than race pace.

When track season begins there can be no real avoidance of speed (especially when the racing distance is as short as the 880 or mile). Another interval day is added about halfway through the season. So from the middle to the end of the track season a solid Tabori man would be running four days of interval each week, using the other days to add distance or recover. Ideally, at the end of the season the background should be so immense that heavy racing should come quite easily.

Summer training is a much more informal time. Absolute participation is diluted, people come and go because of jobs, vacations, etc. But once July is over Laszlo usually picks a day in August when serious cross-country training starts up again. (As with Igloi himself, it is almost impossible to generalize about a Tabori schedule. It's so varied it almost defies description. But it does follow a fairly standard pattern. It incorporates Igloi training language, interpreted below.



Monday—During cross-country, Monday is reserved for a long run of 12-15 miles in the hills, with instructions to push it up the hills and not to let the pace drag. If hills are unavailable, the next best bet is to run for an hour and a half wherever this is possible. At the end of track season, Monday becomes another day of interval (similar to Tuesday but a bit shorter).

Tuesday—Usually the hardest day of the week. The structure is basically the same during cross-country and track, except that the distance vary and more attention is on speed in track. A typical hard workout structure: (1) warmup (about 20 minutes jogging); (2) shakeups; (3) mid-range tempo runs; (4) a hard set; (5) recovery run; (6) and (7) a hard set; (8) mid-range tempo runs; (9) recover run; (10) a hard set; (11) recovery run; (12) shake-ups with a couple of all-out bursts of 150-250 meters.

Remember, this is merely an outline of what happens, not a complete time table made to be followed religiously. No Tabori runners have ever repeated the same workout twice, and they probably never will.

Wednesday—A day of recovery, the easiest day of the week. Usually the instructions are to run for an hour in the park.

Thursday—An abbreviated version of Tuesday, only about half as difficult if you race on Friday. If you race on Saturday the workout would be a little stiffer. If you're training through, it would be a hard day (see Tuesday).

Friday—A good warmup is necessary if you race. If you race on Saturday, an extended warmup (use your imagination but also common sense). If you're training through, it's your choice to do as you please.

Saturday—The day after a race is a hard session like Tuesday. A good warmup if you race. If you're training through, a hard session.

Sunday—Everybody's free day. If you need the rest, jog for an hour. If you're feeling well, it's entirely up to you.

Morning workouts are strictly up to the individual. Laszlo encourages them but doesn't demand them. Generally the more serious runners find time to run sometime in the AM.

The training terms take some explaining:

*A hard set* is difficult to define because it is left up to Laszlo's creative imagination and can be influenced by a myriad of factors. The shorter the racing distance, the shorter the repeats and vice versa. The most frequent distances are 800, 1200, 1600 and 2000 meters. In cross-country, the emphasis is on the longer ones; in track, on the shorter ones, concentrating on speed and tempo.

*Recovery run* is a jog of two or three laps at a comfortable pace, concentrating on form.

*Shakeups* are 110s.

*Mid-range tempo runs* are usually hard runs over 200-400 meters at faster than race pace speed (number can vary).

*Quickness repeats* are usually 150 meters concentrating on acceleration and starting (number can vary).

## IDEAS OF IGLOI

Mihaly Igloi doesn't talk much about himself and his methods. He is protective of his hard-won knowledge and dismisses questions by saying, "My secret is my experience." He refuses to give out his runners' training schedules because "without the reason for the schedule, the schedule is nothing." We rely here largely on comments from his athletes and other close observers.

- **Rationale:** Igloi compares his athletes with violin players preparing for an important concert. They repeat the same piece thousands of times, repeat parts of it, and are for hours occupied with their task. The runner who prepares for an important meet cannot get bored running around on the circular track. Like the artist, he has an important aim—to play the first violin in the concert of the world's best trackmen. (Arnd Kruger)

- **Interval system:** Igloi introduced sets or series of short, intense repetitions of running, which produced an oxygen debt. This oxygen debt was repaid during the recovery periods between sets of fast, short repetitions. Thus, the athletes using this method developed the ability or capacity to tolerate greater oxygen debt.

Igloi has improvised, to a certain degree, individual units of training by varying the speed of individual repetitions in order to provide great diversity of running stimuli and thereby cause the body to react as nearly as possible to the stress requirements experienced by the athlete in actual competitive racing.

Igloi's system of training is based to a large extent on his personal intuition and ability to sense and interpret the reaction of his athletes to various workouts. Igloi's secret is the uncanny ability to sense and detect the "feeling" of athletes to training and adjust their workouts according to individual differences—an ability not transferrable to others. (Jan Mulak)

- **Training sessions:** It is impossible to give a picture of an average Igloi training plan. He has over 40,000 different ones. (A. Kruger)

- **Training planning:** In matters of racing and training, Igloi possesses a photographic memory which enables him to remember every workout he has ever given. This asset, plus his knowledge of physiology, is used to good advantage when he gives a similar workout to comparable runners of past and present. This inevitably leads to improved methods. (Peter Mundle)

- **Relations with runners:** The training is largely based upon the confidence of the athletes in Igloi, and their obedience to him. The athlete is frequently surprised with the variation and variety in his training assignments. He (the runner) does not have to think about his workout program, and he loses no sleep over training schedules. Thus the training is psychologically easy on the athlete. (Jan Mulak)



Current Number One Exhibit for the Bowerman style of training is Steve Prefontaine. (Jeff Johnson photo)



# ERNST VAN AAKEN

BY MANFRED STEFFNY

In a cruel and ironic twist of fate, German Dr. Ernst van Aaken was run down by a truck in late 1972. This man who had run and studied running all his adult life was taken to a hospital near death. He survived, and credits his endurance capacity with saving his life, but both legs had to be amputated. Manfred Steffny, a German Olympic marathoner who trains on the van Aaken system, writes of this unusual doctor-coach.

Four and a half months after his severe running accident, 20 bone fractures, eight blood transfusions, amputation of both legs and loss of weight to 90 pounds, Dr. Ernst van Aaken was fit again. The well-known athletics medicine man, running trainer and founder of the Association of Veteran Long Distance Runners started training again soon after he regained consciousness. "A person has to grab fate by the throat," said Ludwig van Beethoven. Ernst van Aaken did it, and because of it is once again an example for a large number of people, this time the physically handicapped who might think of giving up on themselves. He is systematically engaged in overcoming his severe physical injuries by physical training and mental exercise.

In the emergency hospital of Duisburg, 40 kilometers from his home town of Waldniel where Dr. van Aaken had been run over by a truck in the night while training, he prepared a little shock for his colleagues in white coats who earlier had given him up for dead.

Scene: a visit by the chief physician of the hospital followed by a crowd of doctors. The door to Dr. van Aaken's room is opened. The medical men look up at the ceiling, where the patient is doing gymnastics on a bar which he has had installed above his bed. He does stomach flexions, and, thanks to his strongly developed abdominal muscles, is able to balance horizontally on the bar, which demands a great deal of control over his still painful leg stumps.

Van Aaken smiles impishly when he remembers the astonished doctors: "They thought, there's an ape, swinging on the chandelier!" Soon after, van Aaken was successful in promoting his release from the hospital.

This was the great debut of gymnast van Aaken, later and in a completely different way than he had imagined. The first sentence of an old biographical sketch reads: "Born on May 16, 1910, I was attached to gymnastic and artistic exercises from earliest youth, and dreamed of performing as a circus artist."

Consequently, little Ernst did gymnastics with zeal and also lifted weights. Then he heard of Paavo Nurmi and was enthused by running. He saw Nurmi and other Finnish stars run at the Olympic Games in 1928, and immediately dived into literature on long distance running. He didn't linger long on the current fashion in stylistic details, but immediately recognized that Nurmi was better than the world elite because he ran more kilometers than the others.

Van Aaken did the same, and ran 2:50 for 1000 meters at age 19. As a medical student in Bonn, he discovered the pole vault and, with a primitive pole and little technique, won the West German university championship in 1934. The pole which Olympic sixth-place finisher Kiyoshi Adachi had given him after the Olympics in 1936 went along with cavalryman van Aaken on the Russian campaign, for thousands of kilometers!

Gymnast and pole vaulter van Aaken was a heavy man, at 175 pounds. Still, he ran the 800 meters in 2:01 at age 26, the 1000 in 2:37.4 at age 27. But then things went downward. The doctor, who had opened a practice in the little town of Waldniel and had trained 13 German champions, was his own worst student. Eight times he dropped out of marathons before finishing at last with a 3:17 at 40. At the time, van Aaken's weight had dropped to 155. Over the years he was remodelling his body into that of a typical long distance runner. He was down below 140 pounds at age 50 when he ran his first 1500-meter time of 4:41.

But further attempts to lower his marathon best time were denied him. The restless doctor, inspired theoretician, skilled trainer and combative advocate of endurance running, was too much in the center of things. Three hours of sleep were the rule when his office didn't empty before midnight; lectures and travels had to be prepared, and letters answered. Van Aaken wrote 300 scientific works, which predominantly taught the basis of endurance athletics. Six thousand letters about training and life were answered. Hundreds of runners were examined and advised. He fought intensely against Freiburg interval training, and back in 1947 came out in favor of a type of training which in its basic features is still valid today.

Van Aaken led Harald Norpoth to the silver medal in the 5000 meters in the 1964 Olympic Games, and Anni Pede-Erdkamp to a world's best women's marathon time. In 1962 he founded the Association of Veteran Long Distance Runners against heavy resistance. The association now has 2000 members (age 40 and up) in 30 countries. His prediction about the development of peak class long distance running and the senior and women's divisions of the sport were the subject of incredulous laughter, but have been substantiated.

Nowadays, van Aaken doesn't come to the door when the bell is rung. In his visitation room, surrounded by his huge library, he sits in his bed. The auto accident is not the great and final blow in his life, just a temporary bend. Van Aaken sits relaxed and alert in his bed. During conversation he is constantly moving. He puts his hands down on the mattress and raises his trunk in a handstand, or swings his leg stumps here and there. Van Aaken has written several scientific works since the accident. One is dedicated to Prof. Herbert Reindell, with whom he had for years had differences related to interval training.

In the next room, previous champion runner Anni Pede's husband is building a bath tub with a trapeze for gymnastic exercises. Van Aaken is full of plans. He doesn't know yet if he'll accept a government pension, since that would mean giving up all his medical activity and scientific publications work. He may soon reopen a practice for private patients.

"I am mostly interested in women at the moment," Dr. van Aaken says. Marathon-running women have improved much faster than even van Aaken's radical predictions. He now believes that a woman's hydrogen metabolism is more favorable for endurance performances than a man's.

Somewhere in an article written after the accident is the sentence, "Anyone who has two legs can run!" Dr. van Aaken would now like to try running without legs. He refers to the prosthetic legs he'll soon receive as "thick soles." While others are celebrating his mere survival as a miracle, he is planning an organic buildup based on daily 15-kilometer rides on a "home-trainer" bicycle.



His pulse has to come down—80 is too high. If it falls to 60, he wants to begin athletic movement on two legs. "If everything comes out right, I'll compete in a 10-kilometer jogging run," said van Aaken.

Van Aaken will train himself during rehabilitation along much the same lines he uses for world-class runners. Why not, he says. The principles are the same for everyone. Only the quantities and speeds vary.

Basically, the doctor believes that 95-98% of one's exercise should be moderate and aerobic—at a pace determined by pulse and breathing. He has found that lactic acid begins accumulating at a heart rate of about 130, so he tells runners to stay below 130. Breathing should never be strained. If it is, or if pulse rates go too high, he recommends walking breaks to bring them back into line.

Speed runs are only taken as supplements to the basic distance running, but they are done year-round at the end of steady sessions. They are a portion of the racing distance, and no faster than racing pace, with adequate recoveries in between. These, along with racing, make up no more than 2-5% of the total mileage, according to van Aaken.

He says he has found that ambitious racers need approximately the following amounts of running in terms of daily averages: 400m—6 kilometers/4 miles; 800m—10 kilometers/6 miles; 1500m—15 kilometers/9-10 miles; 3000m—20 kilometers/12-13 miles; 5000m—25 kilometers/15-16 miles; 10,000m—30 kilometers/18-19 miles; marathon—42 kilometers/26 miles.

Van Aaken is a great advocate of low body weight. He says that modern man eats too much and weighs too much to be an effective endurance performer. The doctor advises reducing body weight to 20% below normal figures, and eating less than 2000 calories a day.

Here, in summary, are his principles of training:

1. You learn what you do. Running is learned mainly by training on level ground, and not by pronounced hill training which adversely affects running form.
2. The most important biological functions of running training are to improve oxygen intake capacity, reduce weight and to improve mechanical efficiency.
3. Endurance is gained by running at medium speed, determined by individual aerobic capacity limits. Training is always kept several per cent below the limit, except on rare occasions.
4. The continued practice of high speed beyond aerobic limits, is uneconomical and leads to decreased reserves.
5. Speed runs are best practiced at racing speed and over portions of the racing distance. The number of repetitions and length of breaks is determined by recovery.
6. The "interval principle" allows the runner, through rest breaks, to cover more total distance without fatigue.
7. All anaerobic stresses (speed runs) must be preceded by an aerobic warmup and followed by aerobic recovery runs.
8. Avoid inactivity as if it were a severe illness. Practice endurance activity every day of your life.

# IDEAS OF VAN AAKEN

These comments from Ernst van Aaken have been compiled from a few of his hundreds of articles on endurance training.

● **On "interval" training:** It is just children who are born long distance runners... Any healthy boy or girl is able to run as much as three miles at a moderate pace. The play of children is nothing more than a long distance run because in a couple of hours of play they cover many kilometers with several hundred pauses. The play of children is a primal form of interval training.

● **On future training:** The runner of the future will not train differently from anyone else. All will just run playfully in a state of respiratory balance, and there must always be—even after hours of training—the desire for and a joy in running faster, and the ability to do so. Naturally the distances in kilometers and intensity will be individually reduced for others as compared with the class runner. But even a beginner at any age must be able to cover about 10 kilometers daily, as soon as possible. To reach this level one must insert many walking breaks at the beginning, perhaps for a minute every 400 meters. Thus even children of eight years and senior runners beginning at age 50 will immediately reach five kilometers in training. Even coronary patients have been, and are being, trained in this manner.

The training of the future will be based 98% on the practice of endurance, which is done daily for several hours. A person who wants to run a marathon at racing speed will have to run 42 kilometers slowly and very often in his training, and distances far beyond this. An 800-meter runner of the future will no longer reach his potential best performances without 20 kilometers daily. Nor can the sprinter do without a large number of kilometers of warmup running. But the uniquely new factor of successful training in the future is really this: that one runs "playfully" all day long, with pauses, in an endless variation of rhythm, number of steps and stride length and amount of training—as long his training isn't maximal.

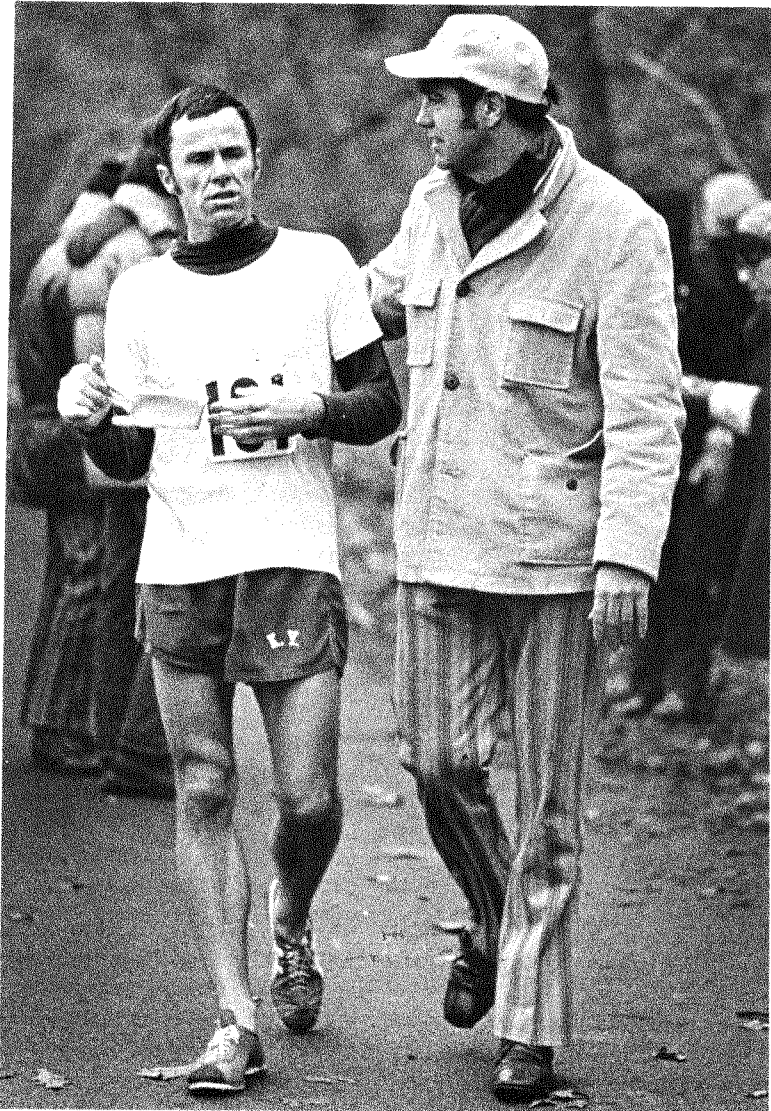
● **On racing speed:** It is increasingly observable that runners who had behind them many long runs at a moderate pace became not worse but even better in their times, showing better sprinting ability, especially in the long dashes, with consistent good performances—and became faster without specialized sprint training because they had become more skilled runners and ran more economically.

● **In summary:** Run every day, run slowly and with creative walking breaks. Run many miles. Do tempo runs only over parts of the racing distance with your speed not being faster than the racing speed envisaged. Get your weight down to 20% below the so-called normal. Be moderate in eating. Bear in mind that breathing is more important than eating, and that continual breathlessness during your training runs overtaxes you, destroying your reserves.

## Chapter 5

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# RUNNERS



Methods are only as good as their users. (Mary Rosenfeld)



# MIXING INGREDIENTS

*"You get writers who think there's some kind of magic formula, and they want to be the first to tell the world how to do it. What's the secret? Yogurt? Vitamins? Maybe, I don't know. But I'll tell you one thing. You don't run 26 miles at five minutes a mile on good looks and a secret recipe."*

—Frank Shorter

In training, there are just a few basic ingredients—perhaps no more than four, earlier chapters suggest. But there are hundreds, perhaps thousands, of different variations for combining the four staples.

Knowing the ingredients is the easy part of training. Blending them into working recipes is more difficult.

It isn't as simple, for instance, as lifting Frank Shorter's Olympic marathon winning formula and applying it to yourself mile by mile. What worked for Frank won't necessarily work for anyone else, because training doesn't travel well from one individual to another. Each schedule has to be customized.

It's tempting, though, to imagine there is magic in what a current champion is doing—and that some of this will rub off by copying his recipe.

Walt Boehm, the US State Department's resident running expert, writes, "When a high level of performance is achieved by coaches and athletes, those still ascending the ladder of running success follow dutifully. Too many articles, books and interviews of champions are read as 'how-to-do-it' guides. In spite of admonitions against such an approach, the weakest are the first to follow and the first to break."

Boehm urges instead that runners *first* learn the physiological basics. Then read the methods of champions if they wish, copying the basic premises of their training if they wish—but only as these methods fall in line with the scientific principles and one's own abilities.

Training is and will remain a matter of custom—"fad" if you will. Customs change as fast and as often as track's leadership changes. Currently we're in a high-mileage, distance-oriented era which has lasted for a decade. Before that, interval training dominated running. But regardless of specifics, the top runners have stayed quite close to fundamental running truths.

We aren't so interested here in identifying the specifics of their training as in showing the basic patterns underlying them. These are remarkably constant from runner to runner.

To see these patterns, we have to look at fairly large numbers of runners. *Runner's World* recently surveyed the training habits of its reader-runners. Nearly 2000 of them responded.

We've taken the fastest 20-30 runners per event and analyzed their methods. They are, in all, 200 of the most successful racers in the United States, so their training ideas obviously are sound.

These generalizations come out of the study, many of which aren't particularly startling.

- Nearly all the athletes, regardless of event, use a combination of methods: fartlek, intervals, slow and fast distance. Only the proportions vary.

- As racing distances increase, there is a corresponding rise in the amount and regularity of training—in terms of workouts per day, days per week, weeks per year, and total training mileage.

- As racing distances increase, the amount of speed work drops steadily. Only in the case of 100-yard sprinters is the majority of the training with intervals and/or fartlek. Slow distance runs make up at least half of the training mileage for the groups 880 and up. All those from the 440 up favor steady training over the interrupted type.

- Only the shortest sprinters do the bulk of their work on the track (the amount is barely 50% in the case of 100-yard dashmen). From there, the amount of track running drops steadily to a low of 13% among road racers. There's a corresponding rise in road running throughout, while cross-country ("natural" surfaces) running is constant from event to event.

- Though the proportion of interval training shrinks as distances grow, there's a fairly steady use of fartlek by runners all the way from the shortest sprints to the longest road races.

- Regardless of event, the amounts of racing are almost identical—6% of the total mileage in sprints and middle distances, 7% in the long distances. This goes along with theories proposed by Ernst van Aaken and Joe Henderson. They say that racing should be limited, making up no more than 5-10% of the total.

- Distance runners who train well apparently can race over a wide range of distances. The runners in this study who are best in the mile to six-mile range also tend to race best in the long distances through the marathon. Training of middle and long distance runners is all but identical.

We don't have exact figures on amount of multiple workouts taken (more than once a day), or on year-round variations in routine (layoffs, changes in training emphasis, etc.). But it's safe to assume that runners train more frequently and regularly as their racing distance increases.

Most runners apparently practice some form of peaking for racing, which runner-coach Pat Lanin of Minnesota describes graphically:

"Conditioning a runner can be likened to making a steel knife. These are the three basic steps in knife-making:

"1. Preparation of the raw material and tempering to produce durability and toughness. The ultimate quality of the finished product depends on how well this step is done. A sloppy job at this point cannot be covered up later on, regardless of how much care is taken later. You may be able to get a good edge, but it's unlikely it will hold.

"2. Grinding and shaping to produce a rough cutting edge. If this step is done too quickly, you may get excessive heating and lose some of the temper. If this happens, your cutting edge will have soft spots and tend to dull easily.

"3. Polishing and honing to get a razor edge and a bright finish. If this step is overdone, the edge may become too thin and crack or fold over on itself, and produce a poorer edge than you had in step two."

All these steps have parallels in running. First comes the work on raw material, the endurance work. Then gradual sharpening with faster, more spe-

cific training. Finally, adding the “racer’s edge” which is extremely sharp yet fragile.

(No hurdlers, steeplechasers, or ultra-marathoners are included in this study because there wasn’t sufficient information on them. However, they train like sprinters, middle- and long-distance runners respectively, with hurdlers-steeplers adding technical work over the barriers and ultra-marathons usually adding distance.)



Runners, regardless of their racing distances, use a variety of methods—interrupted and steady.

(John Marconi photo)

## SURVEY OF TRAINING PATTERNS

Race	Ave. Time	Days/Week	Miles/Day	Types of Running* (% of each)			Training Site (% of each)		C-Country		
				S.D.	F.D.	Int.	Flk.	Race		Track	Road
100 yards	9.8	5.8	4.8	17%	16%	49%	12%	6%	50%	30%	20%
220 yards	21.9	5.9	5.0	35%	12%	39%	10%	4%	37%	37%	26%
440 yards	48.8	5.9	7.5	40%	12%	35%	9%	4%	44%	33%	23%
880 yards	1:52	6.4	9.0	55%	17%	17%	7%	4%	28%	50%	22%
One mile	4:10	6.8	10.5	55%	19%	15%	6%	6%	22%	52%	26%
Two miles	9:00	6.8	11.0	58%	18%	11%	7%	6%	17%	60%	23%
3 miles	13:50	6.8	12.8	53%	26%	9%	8%	4%	18%	50%	32%
6 miles	29:00	6.9	13.0	59%	21%	10%	4%	6%	18%	63%	19%
9-15 miles	---	6.9	13.0	51%	21%	5%	15%	8%	17%	54%	29%
Marathon	2:26	6.9	13.1	51%	25%	5%	13%	6%	13%	63%	24%

\*S.D. = slow distance; F.D. = fast distance; Int. = intervals; Flk. = fartlek.



# SPRINT DISTANCES

Charles Greene, a top American sprinter in the 1960s (he's still co-holder of the world 100-yard and 100-meter records), used to say he trained on a few starts and a few strides—on his *hard* days.

Greene exaggerated. He did a bit more than that, but he was never known as a diligent trainer. Sprinters often are characterized as such. They're thought to be born with natural ability, and that only a little technical work and leg-stretching are necessary to maintain it.

The stereotype isn't valid if our survey of top sprinters is any indication. From a composite of 32 sprinters, 100 through 440 yards, we get the picture of a runner who trains six days a week and puts in more than 30 miles during that time.

Valeriy Borzov is another good case for higher work loads among sprinters. When Borzov was "discovered" by the Soviet scouting system, he was 14 years old and hardly appeared to be Olympic-winning material. His best time for 100 meters was 13-flat.

Whether or not Borzov could have won the 100 at Munich if the US top two had run is debatable, but it's clear that he has come farther than perhaps any other sprinter. He's the product of an intensive training program set up by Valentin Petrovski. Petrovski has developed tests and tables for spotting sprinting weaknesses, then training centers on those weaknesses.

An *RW* story on Borzov says, "Initially Petrovski's tables showed Borzov lacked speed. He worked on fast sprints with long recoveries—60-meter dashes with emphasis on complete rest between and high numbers of repetitions. Borzov built endurance with 30-minute cross-country runs and repeat 800s."

Borzov doesn't worry about losing his sharpness with this endurance work. "Petrovski is a scientist," he says, "and this is why I believe we make fewer errors in choosing the best possible training methods. Like the repeat 800-meter runs I sometimes do. They help me develop will-power and endurance, as well as helping polish running technique. So far there is no reason to believe such runs hurt my speed."

The runners we surveyed seem to agree. Even the 100 men do a third of their training with steady distance runs. Half of their running is off the track.

Looking at the three sprints together, 51% of the running is interrupted (fast intervals or fartlek), 43% is steady, and the remaining 6% is made up of racing.

Borzov progresses steadily through the year, pointing for the major outdoor championships in the summer and early fall. He gives little emphasis to early season races, and both before and after his Olympic victories in the 100 and 200 he lost frequently to Americans on the indoor circuit.

In recent years, long sprinters from UCLA have been dominant. But for a leg injury, John Smith might have been Olympic 400-meter champion. He holds the world 440 record. His teammate Wayne Collett finished second at Munich. While in school, their coach Jim Bush wouldn't even let them run



indoors. They too pointed for the big meets, and consistently got their best performances there.

Fred Wilt reports Smith's pre-record training in 1970-71. It essentially was the same schedule from October through July but at progressively faster speeds:

Monday—550 yards (starting at 75 seconds in October, gradually reduced to 63 by May); 440 (60 seconds down to 48); 330 (45 seconds down to 35); walking as long as needed to recover between runs.

Tuesday—sprints up 508-yard grass hill (starting with one in October, up to five by January); adding 8 x 100 fast striding in January, with 100-yard jog after each.

Wednesday—3 x 330 (starting at 45 seconds, down to 32-34 seconds), walking between.

Thursday—same as Tuesday.

Friday—5-6 x 150 (15 seconds in October down to 13), walking between; or 4 x 220 (24, 23, 22, 21 seconds with running start, down to 22, 21, 20+ and 20 seconds), walking between; or rest if racing on Saturday.

Saturday—race, or rest.

Sunday—rest.

Smith and his UCLA teammates are atypical of sprinters in our survey in that they don't list any steady distance running. However, they make up for it in intervals. They put in the stiff doses of running that even sprinters need.

# MIDDLE DISTANCES

The half-mile record is almost two seconds faster now than in 1960. The mile record was 3:54.5 then, it's 3:51.1 now. The three- and six-mile marks have improved by almost a half-minute and a minute apiece.

Peter Snell, Ron Clarke, Jim Ryun, Kip Keino, Emiel Puttemans, Lasse Viren. Australasians, American, African, Europeans. They've all contributed. It hasn't been a one-man or one-country spree as it had been with the Finns in the '20s and '30s, the Swedes in the '40s, or the eastern Europeans in the '50s.

This has been a wide-spread revolution, apparently made possible largely through the rise in training quantity (and in most cases through the increased use of steady distance training).

As noted in Chapter Two, Arthur Lydiard's New Zealanders were responsible for turning training around in the early 1960s. It went from being primarily an interval exercise on the track to steady running over roads and cross-country. Intervals still have a very definite and valuable place in middle distance runners' training, but they now have a less than dominant role.

We questioned 130 current middle distance runners—half-mile through six miles. The half-milers put in about 75 miles a week, and the six-milers go 90 on the average. Three-fourths of this training is steady distance, a majority of it being what they term "slow." Almost 80% of the training is off the track.

It's hard to generalize about a field as broad as the middle distances, so let's take it in two parts:

- **880 yards/800 meters and mile/1500 meters**—A funny thing happened here. The best half-milers have been milers. Snell held records in both the mile and 880/800. So did Ryun. Both gave more attention to the longer race. Dave Wottle came down from the mile to tie the world record and win at Munich. This seems to indicate that two-lap running is less related to the sprints than to the longer distances, and that miling endurance serves a two-lapper well.

Even though Ralph Doubell, 1968 Olympic champion, was something of a specialist at two laps, he was known to take regular road runs and to log 100-mile weeks—as has Munich runner-up Yevgeniy Arzhanov. Our half-mile study group trains 60-70 miles weekly, three-fourths of this being steady distance.

Training for the mile is quite similar to the half. This is understandable in the light of what's been said about Snell, Wottle and Ryun jumping back and forth between the two races.

Between his half-mile record and his 3:51.3 mile in 1966, Ryun was training on a well-mixed program of intervals and distance runs. Here's an excerpt from his diary:

Sunday, July 3—12 miles in 1:10.

Monday, July 4—easy 10 miles in approximately one hour.

Tuesday AM—660 in 1:33.6, jog 440, 2 x 550 (73.8 & 74.9, 220 jog), jog 440, 3 x 440 (58-60, jog 220s), jog 440, 4 x 330 (45, 44, 43, 42 sec., jog 110s), jog 440, 5 x 220 (27-29 sec., jog 220s); PM—5 miles in 30 minutes.

Wednesday AM—5 x 330 (41-43 sec., walk 110s), jog 440, 5 x 220 (26-27 sec., jog 220s), jog 440, 5 x 150 (17-18 sec., jog 150s), jog 440, 5 x 120 (14-16 sec., jog 120s); PM—5 miles.

Thursday AM—10 x 150 (jog 150s), jog 880, 10 x 150.

Friday AM—4 x 440 (61, 59, 57, 56, jog 220s), jog 440, 4 x 330 (41-43 sec., walk 110s), jog 440, 4 x 220 (25-26 sec., jog 220s), jog 440, 4 x 150 (jog 150s), jog 440, 4 x 80 (jog 80s); PM—5 miles.

Saturday AM—8 miles; PM—5 miles. Total for week: 69 miles.

The third great miler of the '60s, after Snell and Ryun, was Kip Keino. He had a far different approach than either of the other two, doing fewer long runs than Snell and fewer intervals than Ryun.

Fred Wilt reports that Keino typically ran only four days a week:

“Morning, 5-10-mile road run; afternoon, repetitions of 220, 330, 440 and/or 660 yards, each at faster than anticipated racing pace. When tired, three to six repetitions, but when feeling fresh 12 repetitions, jogging an equal distance after each.”

Wilt notes, “The above workouts seem unusually light by modern standards. However, as a physical training instructor, Keino is engaged in constant strenuous physical activity, which undoubtedly supplements his formal training.” In addition, “all of his training is done at an altitude of 6000 feet, which has a favorable effect on his physical condition.”

● **Two miles/3000 meters to six miles/10,000 meters**—The unquestioned leader in these events during the '60s, in terms of time, was Ron Clarke. He repeatedly broke world records, the most spectacular of which was his 10,000. It stood untouched from 1965 until the Munich Olympic final.

Clarke had his own straightforward style of training, something like that of the New Zealanders but without their emphasis on peaking. Clarke believed his “peak” to be where he was at the moment.

Fred Wilt says, “He did not believe in attempting to gradually build up his physical condition to a peak for a maximum effort at certain times of the year, nor did he advocate training slowly in one season of the year and very fast in the other. Rather, he remained racing-fit the year around, and gradually increased the quality of his training over his athletic lifetime.

“For Clarke, training was a continuum. He seldom trained on a track and never used a stopwatch during workouts.” This consisted of mainly road or cross-country runs twice or even three times a day. Most runs were less than 14 miles, at paces approaching five minutes a mile.

Clarke did some interval training. He said an occasional series of fast spurts was “essential. I adapted it into a series of 100-yard repetitions,” Clarke said, “but the distance doesn't matter as long as it is not over 150 yards.”

Emiel Puttemans has replaced Clarke as world record holder at three miles and 5000 meters, and has the fastest 3000-meter and two-mile times as well. The Belgian's training is fairly light by 1970s standards. A sample:

Mornings the year round, except Saturdays: 7½ kilometers (4½ miles) at a “good pace.”

Winter afternoons: Monday—18 kilometers (11 miles); Tuesday—20-25 x 100 meters sprinting, jog 100s; Wednesday—15 kilometers (9+ miles); Thursday—3 x 800 meters in 2:15, jog 10 minutes; Friday—15 kilometers; Saturday—30-minute warmup, 2 x 400 meters in 58 seconds; Sunday—cross-country race.

Summer afternoons: Monday—18 kilometers; Tuesday—10 x 400 meters in 58, jog 150s; Wednesday—15 kilometers; Thursday—3 x mile, alternating 50m sprints and 50m slow, 5-minute walk between series; Friday and Saturday—light running; Sunday—race.

Note that Puttemans, like Clarke, stresses fast distance running (he continually tries to better his times on training courses) and does a large number of short, sharp intervals.

Lasse Viren, the heir to Clarke's 10,000 record, doesn't say much about his training other than that he follows a "mixed recipe," does about 120 miles a week and uses his races as "speed-work." Viren has been influenced by Arthur Lydiard. Viren claims that he can plan a peak to the day, but that he can only hold it for a few weeks before he has to back off and rebuild.





# LONG DISTANCES

Training for the long distances, through the marathon, simply means running slower and running more, right? No, not quite.

Marathoners do turn in impressive mileage totals. But the figures from our survey indicate they do no more than the six-milers from the track. In fact, many of the leading six-milers *are* the top marathoners because they combine this high mileage—upwards of 90 miles a week—with their natural speed advantage.

A curious feature shows up in the training breakdowns of the long runners. You'd expect them to do more slow distance training than track people do. Wrong. In our sample, the marathoners do less slow distance than any of the middle distance runners—even the half-milers. But there is a small increase in the amount of their fast distance and a great jump in the percentages of fartlek.

Perhaps here the definition of “fast,” “slow” and “fartlek” may be responsible for the differences.

The top marathoners in recent years have been Derek Clayton, Ron Hill and Frank Shorter. Clayton and Hill are the only men to have broken 2:10. Shorter, of course, is the Olympic champion and has a 2:10:30 best.

Clayton, like his sometime training partner Ron Clarke, followed a high-mileage, fast-distance program. He said, “If your aim is to run five-minute miles in a race, then it's no good doing six-minute miles in training.” He bashed along as fast as he could stand to run, hardly bothering to taper off for races.

This was Clayton's week of work before his world marathon best of 2:08:33.6 in 1969:

Saturday, May 24 AM—7 miles; PM—16 miles hard.

Sunday, May 25 AM—6 miles; PM—12 miles hard.

Monday, May 26 AM—7 miles; PM—16 solid miles.

Tuesday, May 27 AM—7 miles; PM—12 miles solid, last four very hard!

Wednesday, May 28 AM—5 miles; PM—12 miles steady.

Thursday, May 29 AM—only 6 miles steady.

Friday, May 30 AM—3 miles easy; PM—Marathon in 2:08:33.6.

Hill's basic work occurs to and from work each day—a 7½-mile trip. In the morning, he goes at about seven-minute mile pace. Coming home he varies the pace on a pattern he's reluctant to discuss.

Clayton and Hill both raced Shorter in Munich. But Derek had broken down in the legs after his fast race in 1969. Hill had never regained the form that let him run 2:09:28 and 2:10:30 in 1970. Neither was close to Shorter.

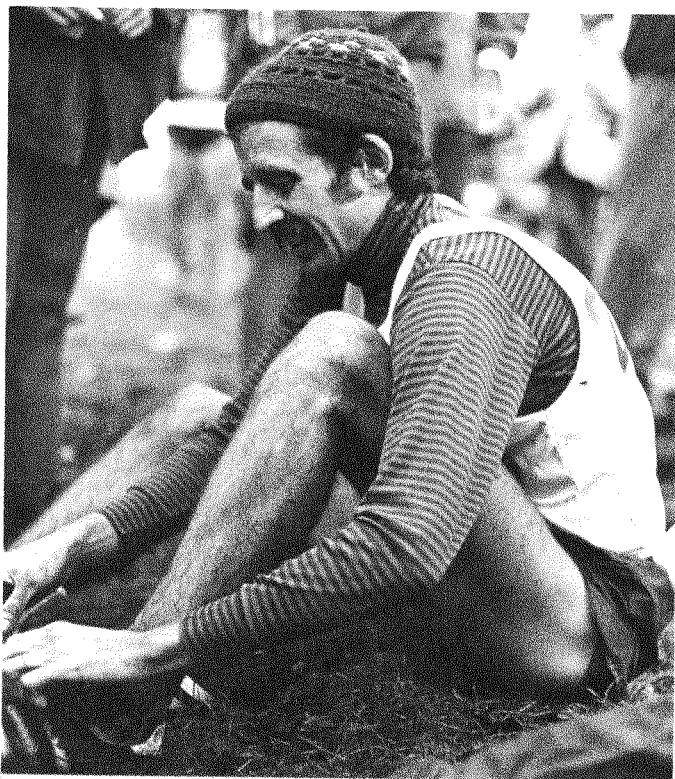
Fifteen months before the Olympics, Frank wasn't even thinking of himself as a marathoner. But he'd made himself one without realizing it. His training already matched Clayton's and surpassed Hill's in quality, if not quantity. And Shorter has more track speed than either of them.

**LEFT: Training for road races doesn't necessarily mean always running steadily on the roads. (George Beinhorn photo)**

Before the Games, Shorter's training consisted of 8-10 miles every morning at 6:30-7:00 mile pace, and either fast steady runs or intervals in the afternoon. The Shorter interval style is a hard dose of quarters—say, 20 of them in 62 seconds—with a very short, very fast recovery *run* of 110 yards in between.

Shorter's pre-Munich training site was Vail, Colo., at 8000 feet elevation. It has been estimated that his 150-175 miles of training there would be equal to something over 200 at sea level.

That mileage helped, of course. But it would be a mistake to assume it was only the mileage, and not the fifth-place-in-the-10,000 speed, that brought Shorter his gold medal.



**Frank Shorter trained like a 10,000-meter man as well as a marathoner before the Olympics. It apparently helped him in both races. (J. McNally)**

# ULTRA-MARATHONS

BY KEN YOUNG

Ken Young, a doctoral candidate in meteorology at the University of Chicago, holds American track records at 30 and 40 miles and 50 kilometers. He is one of the few Americans to have run 100 miles. Although his discussion here centers on ultra-marathon, much of it applies to marathons and shorter road races as well.

An ultra-marathon by definition is a race at longer than the standard marathon distance. However, to the runner it is much more. It is going into a race *knowing* that you won't finish without undue pain. In a marathon you hope you won't. Here, you know you won't.

Thus, the mental strength of the runner is frequently more important than his physical strength. You have to "psyche down" for an ultra-marathon simply because you can't comprehend it fully. You lull your mind into a sense of well-being, hiding from it the inevitable agony to come. A nice, easy workout pace...a feeling you can run forever, and ever, and ever.

Then when the physical strength gives out, the mind is fresh and ready to drive the body on. One mile at a time, each the last one you can possibly run. By this time, the pace is hardly a respectable jog, more of a shuffle, the mind driving the pain-deadened body on. Walking breaks are almost as painful as the shuffle and nearly as fast. The distance already covered is inconceivable. The distance yet to go is unthinkable. No beginning. No end.

From this basic description of an ultra-marathon, two distinct parts of the race can be seen. The first stage of easy running relies on energy stored in the body and that which it can take in while running. This phase can last up to five or six hours. The second state is almost all mental. The available energy derived from glycogen is exhausted, and severe dehydration and mineral imbalances occur. It is only the strength of the mind over the weakness of the body that forces you on.

The energy required to run an ultra-marathon is roughly proportional to the distance covered. In a 100-mile run, the total energy expenditure is roughly 12,000 calories. If you did nothing but gorge yourself, it would take three days to accumulate this much excess energy. Since it is virtually impossible to store this much energy, at some point in the race energy reserves will be exhausted. The runner will reach his "collapse point," more commonly known as "the wall" or "the bear."

The purpose of training then is to increase your collapse distance, i.e. increase the glycogen storage capacity of your body. A secondary purpose of training is to increase your mental toughness to meet the challenges beyond the collapse point.

A useful guide in determining your collapse point is to take the greatest number of miles run in two consecutive months and divide by 20. For example, before my 100-miler my peak months were 450 miles (November) and 490 miles (December). The collapse point works out to 47 miles, almost exactly where I "collapsed" in the race.

One-twentieth of two months' mileage seems more valid than one-tenth of one month's mileage. The reason, I feel, is the time required to produce a training effect—which is roughly 6-8 weeks, i.e. two months rather than one.

I feel this is definitely the reason so many low mileage runners hit the wall at around 20 miles of a marathon. I know Frank Shorter claims he runs out of energy around 20 miles also, but I doubt that he ever met the bear since he "slows down" to 5:10-5:20 pace rather than collapsing to the eight-minute pace or slower which would characterize the collapse point.

Shorter does mileage which suggests two-month averages of 150-175 miles per week. This gives a collapse point of well over 60 miles. If he ever tries an ultra-marathon, he is going to smash all the current records, assuming he can handle the mental problems that go with it.

At any rate, the collapse point theory provides a useful guide to training. For a 50-mile race, 500-mile months should provide the necessary base, even if only continued for two months.

This brings up another important precept for ultra-marathoning, that of energy expenditure as a function of pace and distance. According to Kenneth Cooper, (*Aerobics*), it takes roughly 50% more energy to run the same distance at five minutes a mile than at seven minutes a mile. This means that you expend just as much energy running a 10:00 two-mile as a 21:00 three-mile. Since the object of training is to force the body to store more energy, it is the total energy consumed that is important, i.e. the mileage you run is more important than the speed at which you run it. However, running at a faster pace enables you to expend more energy in less time plus improving your speed. For these reasons, a varied training schedule is advised, avoiding a steady diet of pure LSD training.

Energy requirements in the second (collapse) phase of the race are met by the metabolism of fats stored in the body. This is a relatively slow process, yielding energy at a rather low rate. It is this rate of energy production through fat metabolism which determines the speed you can maintain after passing your collapse point. From the results of my own training, it seems possible to significantly increase the rate of energy production from fat metabolism.

This is accomplished by running moderately hard distance workouts with low glycogen storage. In order to reduce the glycogen levels prior to such a workout, it is generally necessary to train fairly hard for periods of three to six days without consuming large quantities of carbohydrates.

The development of mental strength relies on what I term "character-building" workouts. The workout doesn't need to be fast or long, just painful. The pain should be over an extended period of time in contrast to interval type training where it is periodic. The duration should be at least 30-45 minutes, simulating on a smaller scale actual race conditions.

An alternate method of increasing your collapse distance is to run to and beyond your collapse point. This can be repeated at intervals of three to six months. Thus, reaching your collapse point in an ultra-marathon should improve your performance in the following one.

**NEXT PAGE: (l-r) Jim Crawford, Grant McLaren and Tracy Smith in an indoor two-mile. (Stan Pantovic photo)**







# LONG-TERM COMPARISON

BY ORVILLE ATKINS

Orville Atkins, a Canadian now living in Los Angeles, was within about two minutes of a 2:30 marathon for 12 years before finally breaking it in 1973. He produced similar times on three quite different types of training: first a conventional mixed system in Canada, then with Mihaly Igloi, and finally on an all-slow program. With this experience behind him, Atkins makes comparisons.

From 1959-64, I was coached by Fred Foote of the East York Track Club in Toronto. All my workouts were under his eye, and most outdoor training was in spikes on a cinder track. I wanted to run marathons, but neither of us had experience in this area. So I raced on the track and prepared by doing much of my training with Olympic 800 silver medalist Bill Crothers and 13:17 three-miler Bruce Kidd.

Summer training went like this (actual week of workouts):

Sunday—rest, short walk. Monday—10 x 440 in 70-72 seconds, jog 220s. Tuesday—slow steady run of six miles. Wednesday—3-mile race in 14:47. Thursday—50-minute steady run on road. Friday—45 minutes steady on grass. Saturday—45 minutes steady on grass.

Winter training was similar, except that most of it was indoors on an unbanked board track, 11 laps to the mile. With this background, I ran two marathons—both 2:31—two weeks apart.

Method Two was the year and a half I spent with Mike Igloi. All workouts were done on the grass infield of the track, often in spikes and always under his watchful eye and strong voice.

With Igloi, each athlete's program is mapped out well in advance and then revised daily as the athlete progresses. The athlete is never told what he will be doing in the future. In fact, each portion of the workout is given him piecemeal after the athlete has finished the previous portion.

Workouts consist of using two leg actions—"swing" and "speed"—and various speeds for each. Swing tempo is a kind of striding, or longer extending of the leg. The knee must be lifted as high as possible when the foot is off the ground. When running "speed," the foot never moves in front of the knee and the runner is driving off his feet as forcefully as he can.

Each of these leg actions is done at varying degrees of quickness—"easy," "fresh," "good," "very good," "hard," "very hard," and "all-out."

"Shakeups," easy 100-meter jogs in which the runner tries to relax and loosen up, are done as part of the warm-up and cool-down. Except when I was having an easy day and was doing an easy run (still on a grassy field under the coach's eye), my warmup consisted of 30 minutes of very easy running (close to a nine-minute mile) and 14 or 15 shakeups. My cool-down was usually 10-20 shakeups.

I ran over 2900 miles of very hard work in a six-month period, with the biggest month being 540 miles. None of this consisted of long runs away from the track. A sample:

Day One AM—25 big laps (630 yards), 220 at “good speed” every other lap. PM—12 x 440 “good speed,” jog 220s; 10 x 660 “fresh swing,” jog 220s; jog 1320s between sets.

Day Two AM—8 sets of 3 x 150, jog 50s; jog 220s between sets; alternating sets of “good swing” and “good speed.” PM—8 sets of 4 x 440, jog 220s; alternating between sets of “good speed” and “good swing.”

Day Three—one hour easy jogging, both AM and PM.

Day Four AM—20 laps alternating “easy” lap and “fresh” lap. PM—20 x 150 “fresh speed,” jog 70s; 10 x 880 “good swing,” jog 330s.

Day Five AM—20 big laps (630 yards), “good swing,” every fifth one. PM—20 big laps; 4 sets of 8 x 100, 3 sets of fresh speed and the last one good speed buildup. (On several occasions, I did 100 x 100 yards in sets of 20, with a 440 job between sets.)

And so it went. It was hard! Igloi was proud of the fact that no two workouts were ever the same. They weren’t—except that all were hard. My log is full of comments such as “foot sore,” “boy, am I tired,” and “pain in back.”

Racing was infrequent and even then I was continuously preparing for the future. I did twice the mileage of any other period in my life and at much more hard effort than I had done previously.

I felt that my body was not given enough time to recuperate and that two things were lacking for a marathon runner. Other than jogging for warming up and on easy days, we had no sustained runs over a mile. The body was used to hard work with regular rests, not long running. Also the legs never became accustomed to running on the roads. We were always on grass. The legs cramped up when I raced on the roads.

I ran the marathon in 2:33 with Igloi.

Over the next few years, I quit running to improve or for “big” goals and gradually did less and less repetition work. I drifted into my long slow distance (and often *short* slow distance) phase.

Now I always take at least one day off a week and on occasions as many as three. I run once a day. In 1971 and half of 1972, I ran 25 miles on a very hilly course on Saturdays at eight-minute mile pace, and 15 miles on Sunday at the same pace. I found this to be too tiring, so have dropped the Saturday run to 10 or 12 miles. Therefore, my weekly mileage has dropped from 70 to 55.

During the week I get in three or four runs of an hour to an hour and a half on the same grass oval that I used when Igloi was here. The pace varies from eight down to 6½ minutes a mile.

I race sparingly but use the few I run as my speed training. Anytime there is a marathon race and I’m not running it seriously, I’ll run it at eight-minute pace with a friend and enjoy the scenery and a good long chat.

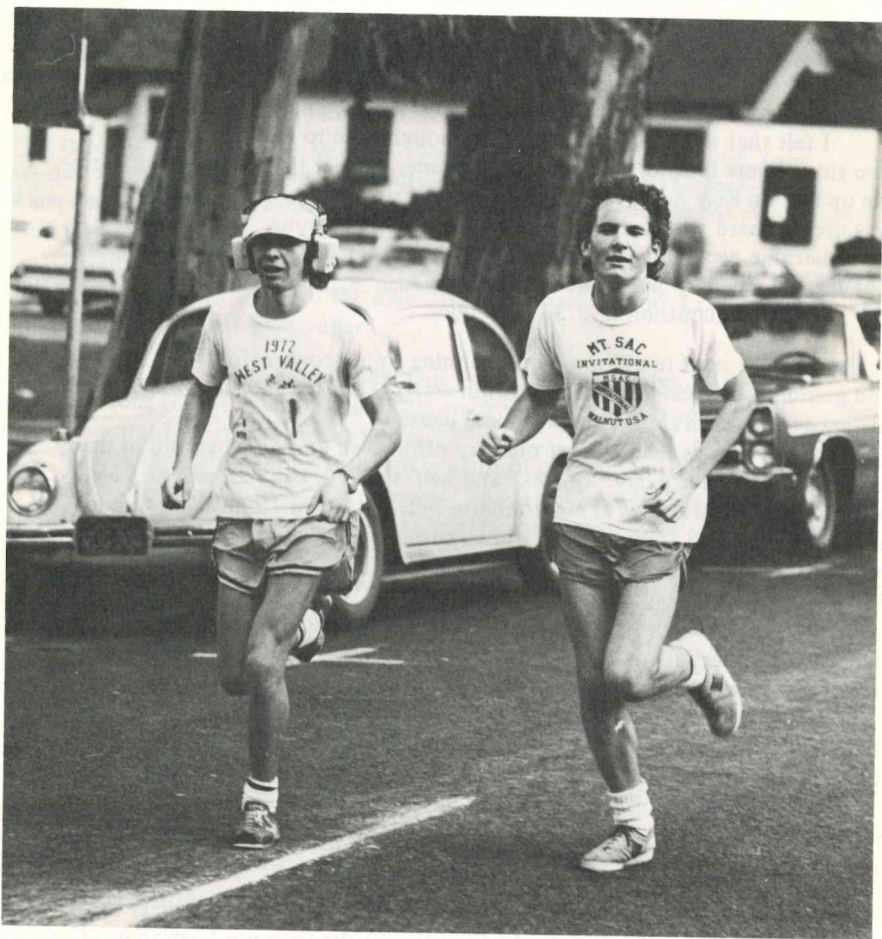
Over the last couple of years, I’ve had many of my best races and times at the longer distances. In 1971, it was three marathons under 2:31:30 within nine weeks. In January 1973, I finally broke 2:30.

Now what does all this prove? There certainly has been a variety in the quality and quantity of training. And yet the results have not been that different. In fact, the hardest work seems to have gotten the poorest results. Looking back, I realize that I could never endure Method Two again. Method One on a modified basis can be fun, but the other runners must be available as

company and there is a risk of injury which may even increase as one grows older. Method Three can, at times, be monotonous. But running mates are easier to find, and it is the easiest method for me.

I think we must realize that we are all different physically and psychologically. Each of us must experiment—not copy. How else can we each find what we enjoy most?

I never do the exact same training two months in a row. There are also workouts and types of training that I am sure I could benefit from but will always avoid. I get more fun out of the sport by doing so. I think it is better that I should be actively enjoying the sport 10 years from now, rather than cutting a minute off my marathon time and then getting fed up with the work it takes and quitting.



One way to enjoy the miles on the road—with a radio built into a headset. (George Beinhorn photo)

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### FRONT COVER:

America’s top woman distance runner Francie Larrieu. (Mark Shearman)

### PHOTO LEFT:

Olympic marathon champion Frank Shorter. (Jay McNally photo)