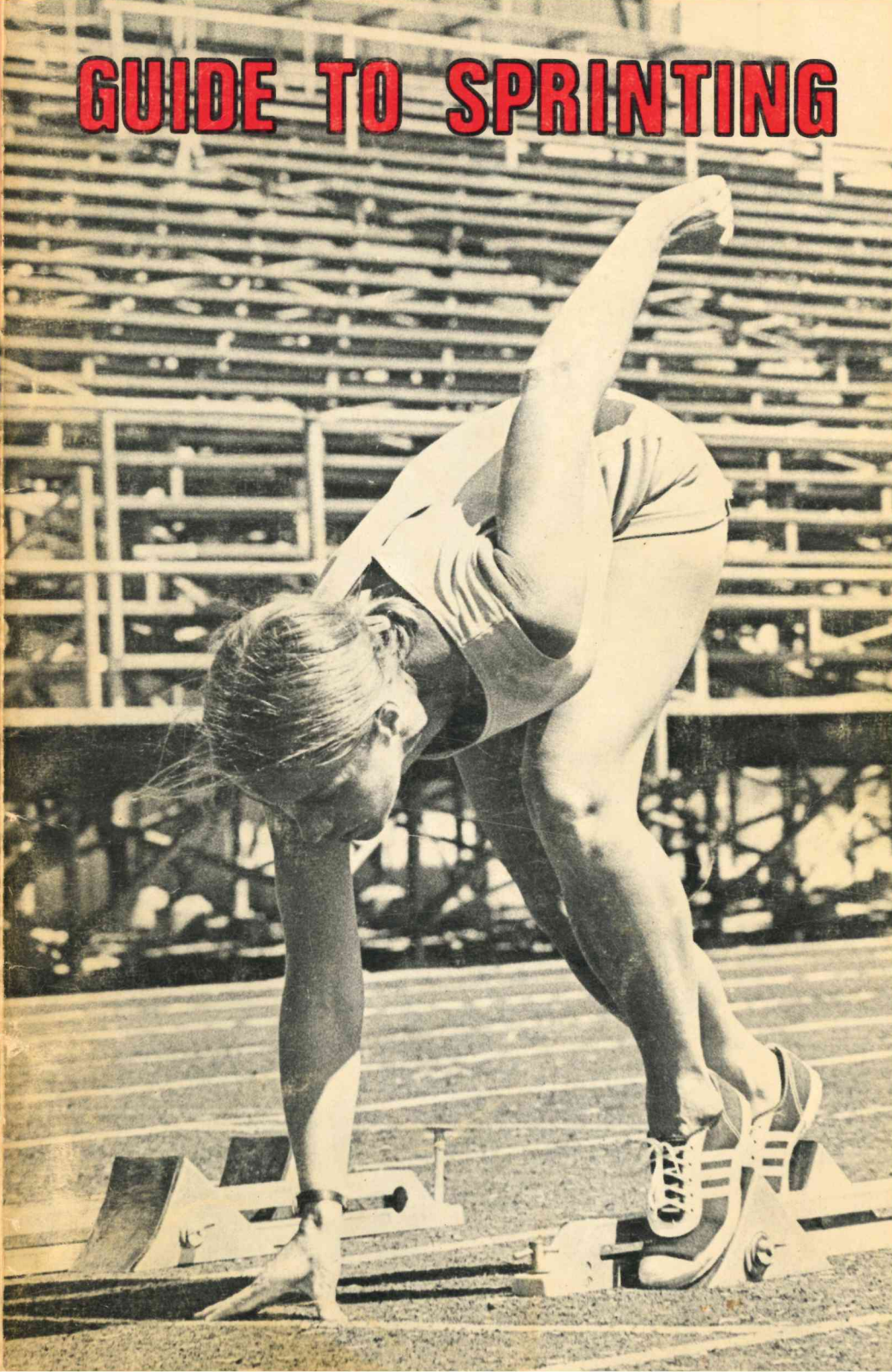
GUIDE TO SPRINTING



One Dollar

GUIDE TO SPRINTING

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FOREWORD

Speed. Is it a gift like eye color that is inherited, therefore unchangeable? Or is it an ability like endurance which can be developed and honed?

Too often we treat it as the former. Sprinting is viewed as an inborn trait that one either has or doesn't have. Alphonse Juilland, a French-born sprinter now living in the US, says, "There is nothing that has hurt more the development of American sprinting than the notion that sprinters are born, but that middle and long distance runners are made. We think that sprinting is a natural talent."

He says those young runners identified as naturally talented stay with sprinting, while the less gifted either advance to longer distances or quit the sport. Those who stay often coast along on their talent, not bothering to perfect technique. Those who might profit by perfecting technique leave before they learn it.

There's more to learn about sprinting than any of them may realize, and more improvement awaiting those who do their homework. Good sprinters are born with a gift of speed. But the best sprinters are the ones who take their gift and channel it into fully-developed racing talent.

Never was the value of combining nature and nurture brought out more dramatically than when Valeriy Borzov won both short sprints at the 1972 Olympic Games. When Borzov was 14 years old, he ran 100 meters in 13-flat—good time, but nothing to distinguish him from thousands of others his age. Eight years of intensive training and scientific attention to technique cut off three full seconds.

Borzov brought in a new era of hope. He showed sprinters that improvement is possible in the sprints when they get the same serious attention as the other events.

Admittedly, the margins of improvement in the sprints are small because the time spans are short. The distance events are demanding because they're long. Sprints are demanding for precisely the opposite reason, because they're so short. But there's no reason why a tenth-second improvement in a 100 shouldn't be as rewarding as a minute in a marathon.

These are exacting events because everything happens so fast. Hopes of a good race can be dashed before a sprinter takes his first step out of the blocks. He has to focus his attention on single steps and fractions of seconds.

Guide to Sprinting is for the serious sprinter who sees improvement as possible, regardless of the gifts handed to him at birth. The booklet spells out how this improvement can come at distances where time is short and the speed is all-out all the way, where margins of improvement are small and margins for error are smaller yet. The booklet speaks to the exacting sprinter who wants to cut down the margin of error, thereby increasing his chances of beating the clock through that tight corridor of time. It can be done.

Chapter 1

SHORT & FAST

World record holders Jean-Louis Ravelomanantsoa (left) and Eddie Hart (beside him) at top speed. (S. Pantovic)

A MATTER OF SECONDS

It all happens so quickly.

An instant of calm. Runners poised on their fingertips, ready to explode. A gunshot. Metal blocks protesting as powerful legs lash out for their first step. Arms pumping. Legs blurring. Head and shoulders dipping into the string. The supply of air and nervous energy gone, so soon.

Ten seconds after it started, the race already is over. Few events in sports are as short-lived as a 100-yard dash, and few compress so much furious activity into such a short span of time. The sprinter lives in a world where the distance from one end of his race to the other is clearly visible, where the time difference between first and last place is the blink of an eye, where there can be but one speed, and where trivial matters have exaggerated importance.

Sprinters aren't well understood, and sprinting is a little appreciated art because we tend to judge them and their sport by the time they spend on the track. We compare them to distance runners.

- A 100 lasts about 5% as long as a mile, so it takes only 5% as much effort.
- A sprint involves pure speed, without the pace regulation of distance running, so sprinters have no need to develop racing sense.
- Sprinting is a natural talent. Speed, unlike endurance, can't be improved, no matter how hard one works on it.

Each assumption is easy enough to make when comparing sprints and distance runs. And each one is wrong. A sprint is not simply a short distance race. It cheapens the sprints to think of them that way. The sprints are a separate and equal part of the running game, with their own special set of psychological and physiological requirements and benefits.

Alex Pappas, a veteran sprinter from Los Angeles, says, "Unlike the distance runners with time and space to analyze, change and adjust their stride, pace, breathing, etc., the sprinter finds himself in a world that is shrunken not only into seconds, but into tenths or even hundreths of one second. He runs in a corridor of time where there is no wiping off of perspiration, no sip of Gatorade, no turning of the head."

The explosive effort of sprinting is every bit as demanding, in its own way, as the drawn-out drain of the middle and long distances. Learning to start is as difficult as learning pace. And sprinters, world record statistics show, are still improving just as fast as distance runners.

The problem with the sprints, though, is that they happen so fast only a true connoisseur of the events can see them as anything but blurs. Only the practiced eye can see improvement when it comes, or isolate ways in which it can come.

The way to speed up sprinting is first to slow it down. Look at the sprinter as a flexible individual, not as a "natural." Look at sprinting a step at a time. Take it apart component by component, and work on sharpening each of the pieces. Then put it back together. The result should be an even faster race than before.

EXPLOSIONS OF SPEED

Sprinters are the drag racers of running, as different from distance runners in construction and purpose as dragsters are to Volkswagens. Distance runners are as economy minded as commuters. They tend to be introverted, skinny and patient, careful never to waste a penny, a word, or a calorie of energy.

Sprinters, though, are tuned for the briefest explosions of speed, and they have the explosive bodies and personalities to accomplish this. The good ones are powerful, taut, outwardly competitive. They're quite willing to hurl themselves against speed limits.

Alex Pappas, one of these sprinters, describes the man at the starting line:

"He knows that in a few seconds he has to literally explode out of the blocks—a stilled, motionless figure who in a matter of some six seconds will be hurtling along the track at a speed of 18-26 miles per hour."

Pappas adds, "It doesn't take a professor of physics to figure out that any such force that can accomplish this can also stretch ligaments and tendons like they were frail rubber bands, can tear muscles away from bone, and in fact can even cause stress fractures in the bone itself."

No other runner puts himself under so much stress so quickly. Within seconds of leaving the blocks, the sprinter's heart triples its resting rate—reaching a maximum of more than 200 beats per minute by the time he hits top speed. Oxygen intake can't keep pace with him. Breaths come in hot gasps.

Calories are burning 10 times faster than they do in distance running. They'd be burning at the rate of about 160 a minute, if a sprinter could go all-out for a full minute. He can't. Lactic acid starts flowing into the muscles after the first 100-150 yards. It's a rare sprinter who holds back this flow well enough to maintain near-maximum speed beyond even half a minute.

Distance running is a circulatory activity. It builds internal pumps and pathways that efficiently supply extra fuel to the extremities during long periods of stress.

Sprinting is muscular. It builds powerful muscles that can explode for a few seconds, hopefully without breaking down in the process. It's a thin line the sprinter treads between maximum power and speed, and breakdown.

Distance injuries usually come on gradually. Sprint injuries, like the activity itself, are sudden and violent. The start, that ouburst from inertia, is the cause of many small muscle tears in susceptible muscles. (And most sprinters are susceptible because the tight, knotted muscles required for this work are the very ones that are injured easily.) He accelerates. Between 40 and 70 yards, he hits peak speed. This is where major tears in the great muscles of the upper leg—most often the hamstring—usually occur.

Endurance runners train mainly to withstand distance and the fatigue it brings. Sprinters train to withstand speed and the injuries it brings. The sprints have two somewhat conflicting demands: staying explosive and loose at the same time. Sprinters have to stay relaxed at high speed in order to sustain speed, and powerful yet flexible to avoid injury.

This isn't easy. It takes time and patience to learn how to resolve this conflict. And by nature sprinters are impatient individuals.

Valeriy Borzov, the best sprinter of the early 1970s, says he has the basic personality characteristics of all good sprinters. "I like speed," he says, "in cars, cycling, skating and skiing. Sometimes I can't even walk, and I change automatically to a running stride before realizing I am in no hurry."

Sports psychologist Bruce Ogilvie thinks sprinters are less patient than distance runners because the dashmen are more outgoing. Dr. Ogilvie says, "The dashmen tend to be much more extroverted than distance men. Our research supports this. Extroverts don't seem to have the staying power introverts do."

Undoubtedly there are quiet, inward-looking sprinters and talkative distance runners. But the general pattern of the two types of runners is a fairly clear one. One 100-220 runner confirmed this when he tried to move up to the quarter.

"I hate the 440," he said afterwards. "I get bored in it. I don't know what to think about on the backstretch."

Sprinters are accustomed to spending their effort all at once, not sustaining it. This trait serves them well when they're racing, but it also can keep many from sticking around long enough to see improvement that can come to those who wait.

RECORDS DO GO DOWN

John Carlos—100 yards in 9.1. Tommie Smith—200 meters in 19.8, 220 yards in 20.0, 1968 Olympic champion. Lee Evans—400 meters in 43.8, 1968 Olympic champion. All had Bud Winter as their coach. Years after Winter had left coaching, all three still held world records.

Winter retired at San Jose State in 1969, leaving a coaching record no one else has matched. He was convinced at the end that sprinters can be developed and improved.

"I do not believe that sprinters are like poets," Winter says, "that they are born, not made. I believe that everybody can be made to run faster. It is true that a jackass never won the Kentucky Derby. But even a jackass can be made to run faster."

While Winter was coaching, he concentrated on recruiting sprinters with apparent "natural speed," and then worked on the other aspects of their running which are open to change. There are many of these. Together, they help put down the myth that sprinting ability is a trait fixed by accident of birth.

Lionel Pugh, former British national coach who now advises Canadian athletes, agrees with Winter's summation. Pugh says, "With sprinters, natural ability is no longer enough at any level, but (is) only an essential basis upon which the carefully nurtured product is molded. However much natural ability an athlete may bring to the track, there is as much to learn in this event as in any other. Good sprinting is very much learned. Relaxation, smoothness, rhythm, bounce, running economy—all are products of good teaching, and, of course, good conditioning."

Alphonse Juilland is living proof of what sprinters can learn. Juilland, a professor at Stanford University in California, is one of the "sprint connoisseurs" mentioned earlier. He has been sprinting since his youth in France, and now is past 50 years old. Juilland contends that sprinting is "perhaps the most *unnatural* " of events, and that the unnatural aspects are most subject to improvement through practice.

"In a marathon," Juilland says, "you have accumulated a certain amount of power and you expend it in 2½ hours. If you run six miles, you expend it in a half-hour. But in the 100, you expend it in just 10 seconds. You have accumulated all that power, and you have to burn it all in 10 seconds. Body physiology is such that when we explode like that, our muscles contract and get tense. This is not the case when we expend our energy in a half-hour or an hour."

The point is, according to Juilland, "Sprinting is unnatural because you have to learn to expend all your power while keeping the muscles relaxed. This is learned."

Relaxation is the basis of Bud Winter's teachings. He talks of it in chapter three. Juilland says relaxation is one of the five main traits in sprinting ability. The others are natural rhythm (basic speed), power, running form and starting technique.

"Of these five factors," he says, "only one can be said to be natural—rhythm. Power can be improved immensely. I have improved my power on leg pressed from 300 to 500 pounds. Form obviously can be improved, as can relaxation and starting technique." (To this he might add sprint-endurance,

the ability to maintain near-maximum speed for extended distances. This, too, can be boosted.)

The professor isn't speculating idly about the results of training. He first gave serious attention to the sprints in masters competition in 1969, at age 45. He ran the 100 in 11.3 that year, and the 220 in 26.2. Four years later, he was the leading sprinter in the world for his age, with times of 10.6 and 23.6.

Although Alphonse himself has improved dramatically, he says sprinting suffers from a relative "invisibility of improvement."

"In sprinting it is very difficult to see improvement. Take, for instance, 100 yards. To improve your personal record, starting from a base of 10 seconds, you have to go a tenth-second faster. That's one percent. But in 10,000 meters, if you improve by one percent you can go 18-20 seconds faster. You can improve your personal record here by dropping just *one-tenth* of one percent."

Time is a psychological barrier to sprinters because the running period is so short and progress so hard to see. "When you're a 10-flat sprinter," Juilland says, "improving by any measurable amount may be a matter of one or two seasons' work. It may take years to come down by only one-tenth of a second. This seems to discourage sprinters and makes it difficult to sustain effort."

Sprinters who are having trouble improving can take comfort in the fact that the sprints are definitely not events where time stands still. Appearances to the contrary, sprint records in the 1963-1973 decade improved *faster* than those in the middle and long distances.

Forget time differentials for now. Look at percentages. Of the Olympic track distances, the most improved record is at 200 meters. Tommie Smith's mark there is 3.52% better than the 1963 record holder's. Average progress rate for the men's 100, 200 and 400 is 2.35%. But for the 1500, 5000 and 10,000, it is only 1.74%.

The same is true in women's running. Ten years ago, the longest women's race was 800; the 400 was considered a middle-distance event. These two records have come down by 2.11% since then. But the 100 and 200 meters have improved by 2.52% during the same period.

If this is happening at the very top, where sprinters supposedly are running out of room for improvement, progress should come even more quickly among slower individual runners—if they know how to look for it.

OPPORTUNITY FOR ALL

Starting sprinters can count on getting faster if they employ the right techniques and practice them long enough. This is the good news.

The bad news is that sprinting still is inherently unfair. Nature's handicapping system sets up hereditary, age and sex barriers that no amount of willpower and work will break down completely.

Starting points are important. All else being equal, the sprinter who begins with a 10.5 hundred is going to stay ahead of the one who starts at 13.5. A 25-yard deficit in the beginning is too much to make up in this kind of racing.

Age is a limiting factor. Runners best combine speed and power, the essential elements of sprinting, in the third decade of life—between 20 and 30. High schoolers are approaching this maximum. But before age 15, children are poorly equipped for this kind of running.

Ernst van Aaken, a German sports doctor, says in *The Young Runner* booklet, "Children can't take very well explosive muscle functions such as long sprints. What children do badly are such exertions as sprinting, particularly in excess of 100 meters."

Young sprinters, those under 15, haven't matured muscularly to the point where they can compete equally with adults. A few manage, but only because they're vastly superior in native speed. They should get better with age.

But only to a point. Peak sprinting occurs only within a narrow range of years, much narrower than in endurance running. Mel Pender is an exception. He set a world 60-yard dash record at age 35. But most sprinters have lost much of their snap by then. They've gone brittle and are injured easier than previously. Healing is slower.

Continued sprinting in the 30s, 40s and beyond requires increasing attention to the training buildup and warmup. Because of the sudden stresses on the muscles and heart, sprinters are better candidates for injury than are distance runners. Sprinting is not the place to find maximum fitness, or the place to beat younger runners.

And, of course, women can't hope to compete equally on man's own turf. Dr. van Aaken points out that "woman is by nature an endurance athlete; man, because of his musculature, a sprinter." A woman such as Natalie Cullimore, the only American ever to finish two 100-mile races, may be able to outlast any man. But she couldn't outsprint many fit ones.

Does this mean that the slow, the old, the young, or the female shouldn't compete, just because they're handicapped against the best of the sprinters? Not at all.

Look at what has happened in long distance running since the mid-1960s. The sport is wide open. There is no discrimination on the basis of ability, age, or sex. There is no stigma against finishing well back. There's opportunity for everyone to compete regularly, and the chance to take pride in personal achievement—no matter how humble.

Sprinters could take a hint from their long running cousins. They could, but so for they haven't. "It's a shame," *Runner's World* said in an editorial

several years ago, "for there must be as many people—from as diverse a range of abilities, ages and backgrounds—who'd like to sprint and hurdle as those who thrive on road and cross-country racing. But not only do they have limited or non-existent opportunity; they also have to face the prevalent attitude that sprinting and hurdling slowly isn't socially acceptable."

It should be. One's own times, even a 15-flat hundred, should be the most meaningful reward in running. Anyone should be able to look for these times, the way they can in distance running.

The sprints obviously can't have mass starts like the distances, where everyone competes together and yet because of the length and terrain of the races everyone is alone, too. In sprints, the fields are necessarily smaller. Because they're on the track, these races are more visible and competitive, which scares away sprinters who think they can't compete well enough. It shouldn't. "Well enough" should get a more personal definition, as it has in the long distance "fun-runs."

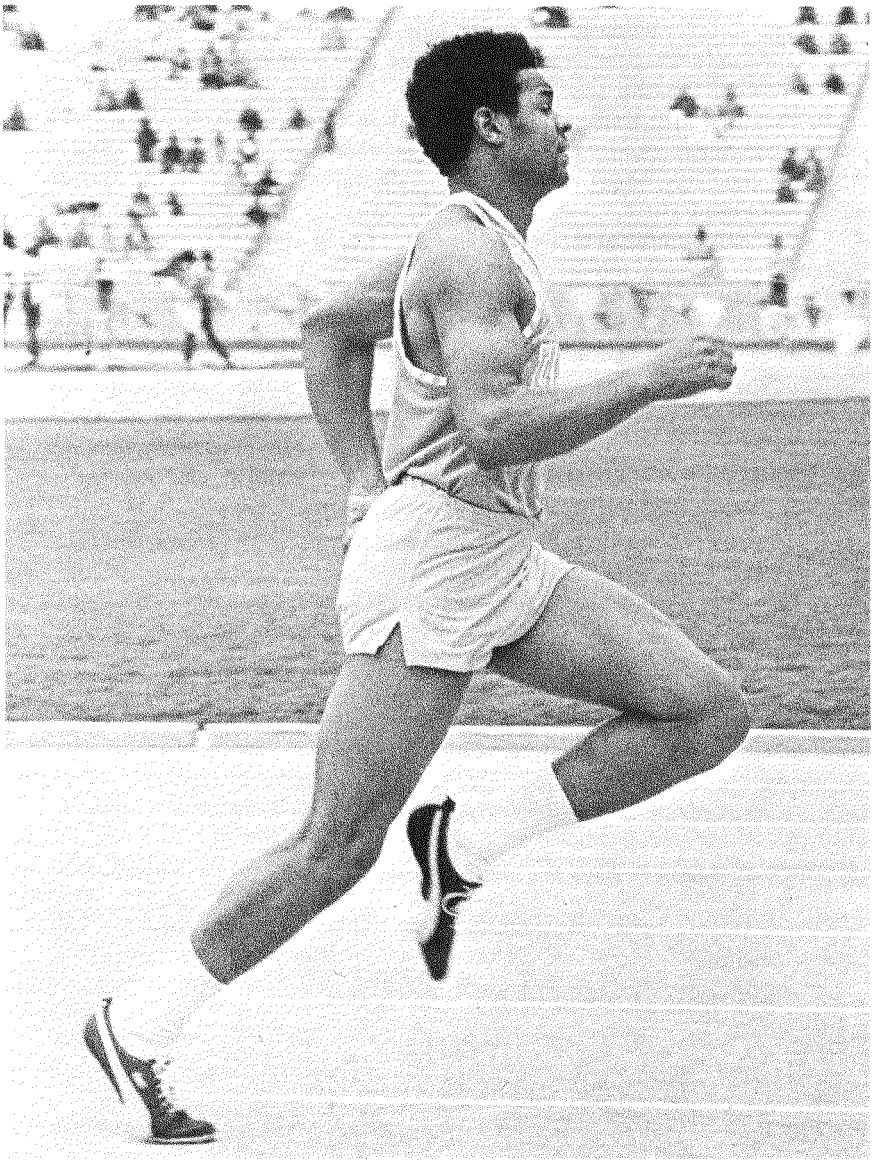
The fun-running idea should carry over to the sprints. It could, with only minor adjustments in organization. The long road runs are fully integrated. But the sprints would be better off with a "separate but equal" arrangement.

Invite everyone out to the local track. Then divide the races up into separate sections, so that everyone competes more or less against his or her equals. That way no one needs to feel embarrassed. Time everyone and stress that one's own performances are the most important result.

The unfair feature of sprinting is not that runners are created unequal, but that slow, young, old and women sprinters are forced to feel that way.

Chapter 2

GETTING SET



UCLA football star Kermit Johnson turned to sprint training and racing to improve his speed. (Pantovic)

TRAINING FOR SPRINTS

The object is to make the whole race faster, from start to finish. And the best way to do this is first to slow the event down, separate it into its components, and examine and work on each piece.

There are three pieces, according to the coach of double Olympic champion Valeriy Borzov. Valentin Petrovskiy says the three are:

- **Acceleration**—power that takes a sprinter from the blocks to top speed in minimum time.
- **Absolute speed**—highest rate a runner can generate.
- **Speed-endurance**—ability to maintain that speed for an extended distance.

Sprint preparation centers on these three components. Running training lays a foundation of quickness and staying power. Technical work polishes starting style and running form. Strength and flexibility exercises promote explosive power, flowing motion and injury-free legs.

Each of the three areas—running training, technique and strength-flexibility—needs a book of its own to be covered fully. Good books are available on all three, so all we want to do here is review the fundamentals.

The general principles of training are the same from event to event. Selective application of stress, regularity, progression, recovery, seasonal variations. All have to be followed, whether preparing for a 100-yard dash or a 100-mile endurance test.

But the details of training are specific to each event. To the sprinter this means he has to do most of his training by sprinting. Without that specific stress, there'll be little or no improvement.

Sprints are overwhelmingly anaerobic. They're run in a state of oxygen starvation, in other words. Hundred-yard races are 95-100% in oxygen debt; 220s are 90-95% anaerobic, and 440s are 75-80%. This indicates that the bulk of training needs to be in a similar breathing state.

Though slower endurance running has little direct effect on speed, it is a valuable supplement to sprint training. Sprinters need a stamina base to support their speed. Longer and slower runs contribute to speed-endurance. Weight training and similar strength-building exercises contribute to the power base which is most vital in the start and acceleration.

As in distance running, the logical progression of work is from stamina-strength to speed-sharpening. Put down the rough foundation first, in the preseason, and then add the fine final touches as the racing comes.

RUNNING TRAINING

From their extensive testing, the Soviets know speed can be improved. And they're fairly certain of how to do it. Summaries of four different research projects tell what they've learned.

The first compared nine different styles of training. Previously untrained subjects used the methods for six weeks, taking time trials at the start and finish to measure improvement.

Among 100-meter sprinters, best results came from uphill interval running and pace intervals (80-90% of maximum speed). Runners improved three-

tenths of a second with each. They improved least (0.1 second) on long steady runs and endurance intervals at 60-80% speed.

In 400-meter trials, the subjects responded best to long sprints–full speed runs of 200-600 meters. They dropped their times 3.9 seconds this way. The improvement on uphill intervals was only slightly less (3.85 seconds). Again, the least effective method was endurance intervals (1.95 seconds).

However, the scientists conducting this study recommend against using a single training method, advising instead to find a suitable combination. Pisuke, Viru and Urgenstein 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."

The scientists recognized that the early results from this short training period may not be lasting. Another Soviet researcher, S. Kaledin, conducted a much longer experiment. He followed 14-16-year-olds for a full year.

"It was discovered right from the start," Kaledin says, "that a mixture of short and relatively long distances with fixed recovery intervals had the best stimulus to the organism. The use of only short or only long distances was less effective to develop speed and speed endurance."

Using a mixture of distances, Kaledin weighed the value of short vs. long recovery intervals. Each of two groups ran four series of the following, four days a week: 30m, 60m, 80m, 100m, 300m. The only difference in training was rest time between intervals. One group took one minute, 1½, 1½ and two. The other recovered about 50% longer after each run.

A year later, Kaledin tested the young sprinters at three different distances. At 30 meters, both groups were equal. Average improvement was 0.4 second. But at 60 meters, the short-recovery group had a decided advantage, 0.9 second faster compared to 0.6 for the longer resters. The difference was more pronounced at 300 meters, where the short-recoverers had a 4.5 to 3.1 edge in improvement.

While Kaledin showed that varied distances and short breaks are effective, Edwin Osolin, a former international sprinter himself, divided his test subjects into four groups and controlled their training schedules: (1) 40-50m repetitions at maximum speed; (2) 100-150m at 75-80% speed; (3) 80-100m at varied speed (changing pace in each repetition); (4) control group using "orthodox" training methods.

Osolin timed the sprinters at the beginning, and again 10 weeks later. The short-distance, high-speed runners in group one lacked speed-endurance. Average improvement was 1.27%. The longer and slower runners in group two lacked speed. They improved 1.56%. The control group lacked both speed and speed-endurance, and showed only a 1.10% drop in time. But the varied-pace sprinters showed strongly in all areas. Their gain: 2.51%.

Osolin says, "The research indicated that variation in speed appears to be the best method to develop sprinting components, particularly speed-endurance. The method is most successful when several speed variations are included in each repetition of the training exercise."

Another Soviet named Osolin, this one being Nikolay, contends that speed increases fastest under artificially-created training conditions. He says that over-difficult or over-easy sprinting produces "varied training stimuli"

that lead to improvement on return to normal conditions.

Osolin says, "Speed in its various forms should constantly improve with the athlete's training age. Unfortunately, however, we can frequently observe cases of unnecessary leveling off in the development of speed due to wrong training processes."

He has found that when conventional sprint training is constantly repeated it becomes automatic, and a "dynamic stereotype is established which slows down improvement. A speed barrier develops and the athlete's performance fails to progress."

Osolin thinks the easiest way to break out of this rut is by training on hills, up or down. The Soviets tested sprinters on a downward slope of 2-3% and measured stride frequency—a good gauge of speed. Immediately after downhill sprinting, stride frequency on the level increased by an average of 17%.

Osolin warns, however, that the hill must not be too steep because "the method is only reliable when it develops a new speed level which appears within the reach under normal conditions. Downhill sprinting must not be carried too far." In other words, free-wheeling eight-second hundreds down a mountainside won't do any good.

The Yugoslavs also have checked out hill training, with interesting results. National coach Milan Milakov says, "It is possible that training on the downhill slope will accomplish an increase in frequency of strides, increase in length of stride and adjustment to speeds faster than those attained on the flat surface.

"Training on the uphill incline will increase leg strength, knee lift, rhythm and speed-endurance. By training on a combined downhill-uphill surface, the rhythm can be changed and all the aforementioned attributes accomplished —for instance, by running downhill to develop speed, uphill to develop strength, and then downhill for relaxation running."

Milakov tested three groups: one doing only flat running, one training only on hills (both up and down) and the third combining hill and flat work. The combination trainers showed the best results.

Sprinters, Milakov says, need a combination of abilities that no one method of training can give. Acceleration, absolute speed, and speed-endurance come from a variety of sources.

(Valentin Petrovskiy talks of these sources in more detail in the following article on Borzov's development. A great number of running training books are available. An earlier one in this series, *Runner's Training Guide* digs deeper into the fundamentals.

STRENGTH-STRETCHING

"Track athletes should be more concerned with the application of their strength potential in terms of increased speed and endurance than in possession of strength potential, per se," says John Jesse, one of America's leading authorities on weight training in track and field.

Jesse says the sprinters want power, which "reflects his ability to develop fast and explosive movements at maximum speed during starts and acceleration, where strength is a major factor, and produces a high rate of work over specified distances in the shortest time..."

Power can come from non-running activities, of which weight training is the most practical. Jesse says, "If the emphasis is on speed-oriented power

development, the (weight) loads should range from 3-10% of maximum for the arms, shoulders and hip flexors. For the heavy extensor muscles of the hips and legs, the loads should range from 10-40%. Increases in the loads can be made progressive in nature."

A second feature in supplemental strength training is "muscle-balancing." Sprinters overdevelop certain working muscles while others coast and grow weak. When these muscles get out of balance, injuries aren't far behind. So weight training can also be a worthwhile injury-preventive measure.

Even more important in this regard, though, is regular stretching, every-day stretching of a specific type.

Robert Bahr, former managing editor of *Fitness for Living* magazine, thinks runners too often ignore flexibility in their quest for speed, strength, and stamina. And without adequate stretch, the others may be wasted.

"Most cases of muscle tears and pulls and strains," Bahr says, "occur because of a lack of flexibility. And as time goes on and we grow older, the symptoms become even more severe."

A few minutes of stretching each day acts as an injury-preventive. We hesitate to use the word "exercises" here because exercises present an image of quick, jerky, often painful movements. This kind of effort is self-defeating, according to Dr. Herbert de Vries. De Vries writes in his book *Physiology of Exercise for Physical Education and Athletics,* "Stretching by jerking, bobbing, or bouncing (as in calisthenics) invokes the stretch reflexes, which actually oppose the desired stretching."

Robert Bahr says that de Vries means "when a muscle is jerked into extension, the natural reaction is for the muscle to jerk back, thus shortening itself again. But when the stretch is achieved slowly and held for a period of time, another reaction takes place, which helps relax the muscles being stretched."

The ideal stretching, then, resembles the postures of a yoga master, or the slow-motion limbering up of a ballet artist. Besides holding off injuries, this may have the bonus effect of adding an inch or two to the normal stride length and making that stride smoother. This can translate into speed.

(John Jesse's book *Strength, Power and Muscular Endurance for Sprinters and Hurdlers* covers both strength and flexibility work. He contributed to *Exercises for Runners*, which is part of this booklet series.)

TECHNIQUE

Starting style, running form and relaxation, finishing technique and tactics affect all three phases of sprinting—acceleration, absolute speed and speed-endurance. Racing technique is the subject of chapter three, in which Bud Winter is prominent. Winter has written two useful books, *The Rocket Sprint Start* and *So You Want to be a Sprinter.*

Once you have technique and strength-flexibility and running training, put them all back together for a full-speed, flowing sprint...realizing that the race will only be as strong as its weakest point.

THE BORZOV TECHNIQUE

By Valentin Petrovskiy

Through Valeriy Borzov, coach Valentin Petrovskiy introduced the Brave New World of sprinting. Petrovskiy, a biology professor and head of the sports faculty at the Physical Education Institute in Kiev, "manufactured" Borzov. He led a team of scientists which polished him to Olympic championship form. The work had gone on for six years by the time the Soviet sprinter won the 100 and 200 at Munich. The following article by Petrovskiy appeared in Leichtathletik magazine, and was translated and adapted for this booklet by George Beinhorn.

I regard sport to be an exact science and the coach as a scientist. In the near future, success in sport will depend more on science laboratories than the athletes themselves. It will be similar to industry depending on science today.

To turn Valeriy Borzov into a 10-flat 100-meter sprinter was the work of a whole team of scientists, not unlike the design of a motor car or airplane. University laboratories were responsible for deciding mathematically how "Model Borzov-70" was going to function. Only after completion of all research facts and figures did we begin to put the results into action. It was a delicate matter, similar to a ballet star who is aiming to establish the correct and complete movement.

Of course we didn't bother Borzov with all the details of our research. It would only have confused him. And he had an excellent mind, great spirit and sufficient independence to provide the required competitive self-reliance.

In 1968, after two years of work with him, it became clear to me that he had the necessary complex of characteristics for great sprint performances in the near future. Borzov had good preparation, excellent physical qualities and handled training loads well. In the past two years, his performances at 100 meters had improved from 10.5 to 10.2, and at 200 meters from 22.0 to 21.0.

He was a purposeful athlete. Not a single time did he miss a training session or go against the prearranged training plan. But it must be said also that he was never given tasks he was not capable of performing.

On the basis of these facts, we proposed the following goals for the coming four years: (1) in 1969, a 10.0 100 and the Soviet championship; (2) to continually win against the strongest European sprinters; (3) to try and beat the American sprinters, who at the time were considered the best in the world; (4) to prepare for the 1972 Olympic Games in the 100, 200 and 4 x 100 relay.

Before we proceeded to work toward these goals, we had to clarify two questions: What would be the optimal model for achieving stable performances in the region of 10.0? What level of condition, judged by standard physiological measurements, should a sprinter have to be able to run this fast?

We were able to obtain and analyze statistics on the world's best sprinters, including precise measurements for those competing in the USSR between 1961 and 1968. We got the impression that the best sprinters have (a) very high starting speed; (b) very high absolute speed; (c) the ability to sustain their speed, or "speed-endurance."

On the basis of this material, we constructed a model of optimal running factors for the 100 meters. Average values for the best sprinters in the world were taken as the bases for this model. In 1968, Borzov was still trailing these sprinters in start acceleration as well as absolute speed. Comparison of actual and desired running factors enabled us to discover concrete differences and decide on training tasks.

It remained for us to find out how much the components of condition could be raised, and what signs should be weighed to measure the change. We decided on the following factors:

- Running time for 30 meters from a flying start (to test absolute speed).
- Running time for 30 and 60 meters with a block start (starting speed).
- Performances at 100 and 200 meters (speed endurance).

By observing the training states of Soviet and foreign sprinters, we were able to develop and continually refine tables in which we attempted to evaluate the state of preparation of sprinters. (See table below, which projects test distances to expected overall times. If times don't match, a weakness in one or more of the phases—start, absolute speed or speed-endurance—is suspected.)

Speed (m/sec)	30m Flying	30m Blocks	60m Blocks	100m Blocks	200m Blocks
12.0	2.5	3.4-3.6	6.3-6.5	9.8-10.0	20.1-20.3
11.5	2.6	3.5-3.7	6.4-6.6	10.0-10.2	20.5-20.7
11.1	2.7	3.6-3.8	6.5-6.7	10.2-10.4	20.9-21.1
10.7	2.8	3.7-3.9	6.7-6.9	10.5-10.7	21.5-21.7
10.3	2.9	3.8-4.0	6.8-7.0	10.7-10.9	21.9-22.1
10.0	3.0	3.9-4.1	6.9-7.1	10.9-11.1	22.3-22.5

According to the chart, Borzov had to run at least 2.6 for the flying start 30 meters to be capable of his 10.0 performance. Once he attained this absolute speed, his goal was within reach. If the results were worse, however, it indicated an error in one of the other aspects of preparation—starting or speed-endurance.

Since the start section depends in great measure on the runner's muscle power, so-called "explosive power," we also used figures obtained from the standing triple jump. From the literature and our own observations, we arrived at the following relationships:

100-meter performance	Standing Triple Jump
10.0 to 10.4 seconds	31'2" to 32'5¾"
10.5 to 10.8 seconds	27'10¾" to 29'10¾"
10.9 to 11.0 seconds	26'1" to 28'0¾"

To understand the relationship between performances at 100 and 200 meters, and to have the basis for choosing a main distance, we again had to compare performances run by the best sprinters in the world. According to

average values, the comparison looks like this: the 200-meter time is twice the 100-meter mark plus 0.4 second.

In 1972, Borzov ran 10.0 and 20.0 for the two distances, the 200-meter time being exactly double. But earlier he had shown more strength in the 100, so we chose that as his main event.

In the course of training, we used the above test exercises year-round to monitor changes in Borzov's state of preparation and to judge the effectiveness of conditioning techniques. All methods were used for the purpose of preparing him to do the work necessary to accomplish the main task: development of a specific degree of running speed and endurance.

Remember that speed of movement and running speed can only be increased by appropriate specific exercises, and by running fractional distances at maximal and near-maximal speed. Repeat runs at competitive distances (100 or 200 meters, in Borzov's case) at racing speeds in training are neither possible nor helpful, because the consequence is rapid exhaustion. Therefore, the principal method of developing absolute speed and speed endurance consists of specific exercises plus runs over fractions of the racing distance (30-60m) from both block and flying starts at near-maximal or (less often) maximal speed.

Here we're not talking about the overall training pattern, but individual sessions intending to develop and maintain starting spurt, absolute speed (the highest speed a runner can develop over a short distance) or speed endurance (ability to maintain specific speed for a given time or distance).

I repeat, a person can only reach a particular level in these motor characteristics by repeat runs over fractions of the racing distance, although the sprinter can and should be prepared for such work by other means, among them longer runs at moderate speed for endurance.

Borzov did the necessary combination of training. His subsequent performances may have been termed "surprises" or "upsets" by foreign experts, but to us his victories were entirely predictable.

Chapter 3

RACING FORM

The quarter-mile style of Benny Brown. (Stan Pantovic)

STARTING OUT RIGHT

On your marks. S-e-e-e-e-t. Bang!

A tenth-second or so after the starter's gun fires, the message reaches the legs. Another tenth-second later, the rear leg is driving off the block, reaching for the first step. So much depends on that first step that the race may already be won or lost when the spikes first dig into the track.

A good start gets a sprinter out of the blocks and into full-speed upright running form in the shortest possible time. This comes from reacting quickly to the gun, and accelerating explosively. Concentration, block placement, starting style, practice—all play a part in shortening reaction and acceleration times.

All runners experience some lag between the gun and the first movement. It averages between 0.15 and 0.20 seconds for most sprinters. For this reason, electronic devices at the Munich Olympics automatically recorded a false start for any sprinter getting out faster than a tenth-second.

The Junghans company recorded reaction times on more than 1000 starts at Munich. Sprinters there averaged 0.15 seconds. Valeriy Borzov, however, was considerably quicker than normal. In the first three rounds of the 100, Borzov made his first move after just 0.12 second, and in the final (which he won) he was out in 0.13. No other sprinter in the Games reacted faster.

Not so coincidentally, Soviet scientists had been studying reaction times and how to improve them before Borzov won in Munich. Ruudi Toomsala says, "The reaction time is often regarded as an inherited characteristic, and little effort is made to improve it in training. This appears wrong."

The Soviet physiologist thinks reaction time is shortened by "suitable training, quiet surroundings and optimal intensity of the stimulus. Reaction time also is reduced by rises in air temperature, sauna and through warmup procedures. Lack of proper warmup brings unfavorable results."

Of these factors, Toomsala found concentration and training to produce major reductions in reaction time. His tests showed, for instance, that concentration wanes when a sprinter is racing.

"The average reaction time of 30 sprinters," he says, "dropped from 0.153 seconds in training to 0.189 in competition. What were the reasons? Some of the difference can be blamed on starting alone in training, while in competition a whole field starts together. In starting alone, the athlete concentrated either on the gun or the beginning of a certain movement. But in competition several other factors added to his concentration: 'Can I get out together with my rivals?' 'Will I have a break (false start)?' "

According to Toomsala, concentration is related also to the holding period in the "set" position. "To achieve a fast start," he says, "requires the concentration to reach its maximum at the time of the starting signal. Practical experience indicates that it is virtually impossible to concentrate on one objective longer than two to three seconds. The most efficient reactions appear to occur when the pause between the command 'set' and the firing of the gun is within the limits of 1.4 to 2.5 seconds."

He found in studying sprinters that a pause of a half-second is too short for maximum concentration, and that lapses of three seconds or more too long to sustain attention. He quotes research figures from the 1956 Olympics, where

the average interval between "set" and the gun was 1.75 seconds (the range, 1.4-2.8). Not one sprinter was disqualified for false starts.

In start training, Toomsala recommends that sprinters practice separately on reacting to the gun and on accelerating from the blocks. "Little improvement is in sight," he says, "when the practice starts combine development of movement speed and reaction time—two separate components. Movement pattern has to be learned first without a starting signal. Development of reaction speed follows when the starting movements are performed automatically. Only after both components have been perfected can they be practiced together."

Reaction time is important, but at best it means gaining a few hundredths of a second on the first step. Rapid acceleration can slash tenths. Therefore, a good start is judged not so much by who leaves the blocks first, but who is first when the sprinters hit top speed 20, 30, 40 or more yards into the race. Starting technique helps decide this, too.

Most sprinters use crouching starts, of which there are two general types: (1) bunched, and (2) "open," "power," or "rocket."

The theory of the bunched start, which puts the blocks close together and close to the starting line, is that a sprinter comes out fastest as he uncoils from his rather cramped position.

Lloyd Percival, editor of Canada's *Sports and Fitness Instructor*, says of this style, "The old bunched start has pretty well become passe in favor of the power start and its variations, with the blocks well back. This allows the runner to get maximum power or drive in the first stride. And while it may not be as quick off the blocks as the bunched start, the power runner quickly overtakes the bunched runner, all things being equal, because of his superior momentum."

Bud Winter, the former San Jose State coach, popularized a form of open start. He uses the same logic as Percival. Winter says, "The objective is not to see who clears the blocks first, it is to see who is ahead at 20 yards. It is important to get out in good running position, to eliminate low gear. You should not run the first 10 yards and then decide to go. That is running in low gear. Get into the running position from the first step." (Winter talks more of starting technique and running form in the following article.)

Surprisingly, runners may find that the best technique for them isn't a crouched start at all. Beginners in particular may get away faster with a standing start.

Former British national coach Lionel Pugh maintains that "the inordinate amount of time given to practicing crouch starts at the schoolboy and club levels is out of all proportion to its production of sprinting improvement. A reliable and sound start is imperative, of course, but at novice level the most important thing to stress is good quality running and lots of it. Given an efficient, good-class sprinter, a good start is easy to perfect."

The easiest, Pugh says, is the standing start. "I believe that good standing should be first taught from a standing position, to instill into the athlete the idea that there is nothing unnatural or particularly involved in the sprint start technique. He must learn that it is simply a process of good running from a low position—a natural position which will provide him with a better opportunity of using whatever acceleration he might have."

A South African coach, Major John Short, tested standing starts with a

group of 30 sprinters. None of them had used this technique previously; all were crouched starters. Twenty-six of the 30 "immediately improved by no less than two- or three-tenths of a second over 50 meters," Short reported. Hurdlers reached the first barrier two- to three-tenths faster from the stand than from the crouch.

Either style of starting, though, is something of a compromise, says American technical expert Tom Ecker. Ecker thinks the best starting position is somewhere between the crouch and the stand, and may be impossible to achieve.

Ecker writes that the optimum trunk position for quickest acceleration "is actually higher than that assumed in the set position of the crouch and lower than the set position of the standing start... Optimum trunk position can never be attained instantly."

Experiment. Find the method that gives the best times for perhaps the first 30-40 yards of the race. The Soviets use 30 meters as their standard testing distance, assuming that reaction and acceleration have done all they can by that point.

STAYING FAST, LOOSE

By Bud Winter

Long after his coaching career at San Jose State College had ended, Bud Winter still had world record holders in all three sprint ranges: short (John Carlos, 100y), medium (Tommie Smith, 200m and 220y), and long (Lee Evans, 400m). And Bud is still recognized as a leading authority on the sprints. He now works as a touring coach and lecturer. His remarks here on starting and on sprint form, are adapted from the US Track Coaches Association's "Track and Field Quarterly." Many of Winters' methods are considered unorthodox, if not faulty, by some coaches. But Bud's success is his best rebuttal.

In the days of Jesse Owens, sprinters started as close to the line as possible. They figured the closer they were to the starting line, the closer they would be to the finish line, and thus would have an advantage. This wasn't the case.

Armin Hary, the German who won the Olympic 100 in 1960, had his blocks farther back that anyone else there. And yet he got his first step out farther and faster than anyone else in the field. He showed that when you place the front block too close to the starting line, there is too much bend in the front leg and it will not react.

The ideal angle for the legs should be 102 degrees. The legs will move faster from that 102-degree angle than from any other. If the leg is cramped into a smaller angle, it cannot move as fast. So block placement to assure proper leg angle is vitally important. Experiment with it.

Once the blocks are placed, stand behind the blocks and stretch to get the muscles loose. Stretch both hamstrings. Back into the blocks as you roll to the ground. At this point, the legs should be as relaxed as they can be. Place the front leg into the block first. Extend the back leg and place it on the back block.

At the "set" command, look for lower legs that are parallel with the ground. The legs should have no tension. The elbows are locked and turned inward to keep them locked. The knees point straight ahead and are relaxed. The feet are at least 10 inches apart. The weight should come all the way forward. The head comes up and the front knee raises one hand-span off the ground. Hold this position.

Think "motion." Do not think about listening for the gun, then the gun, then moving. If you do that, you're thinking about too many things. Imagine that the gun is holding you back. Think "Go! Go! Go!" Sometimes it helps to close the eyes to keep from being distracted, especially if you have a tendency to jump the gun.

At the gun, throw the lead arm forward. A long low first step, and a short second step are needed. Therefore, the back block should be fairly well back of the starting line, to give that long and low step. The toe must come under the knee to make it possible to handle the second step. If you overstride, you stumble. Finally, drive hard off the front block, using the arms vigorously and going directly into high gear.

From this point, form and relaxation determine how you are able to

use your speed. The ability to sustain sprint form and relaxation is the essence of good sprinting ability.

Bob Hayes could run a top speed of 16.9 miles per hour, reaching this at 75 yards before decelerating. Tommie Smith, however, not only didn't decelerate between 75 and 100 yards but accelerated. He lifted his knees, he pumped his arms and he accelerated.

When Tommie ran 19.5 (a world record) for 220 yards on a straightaway, we had brushed off the track so we could check his footprints. His stride measured 8'6" at 100 yards, 8'8" at 150, 8'10" at 200, and his last three strides were 8'11½". Since the last three were longest, he actually was still accelerating at 220 yards!

This was Tommie Smiths' secret: The ability to sustain his sprint form while everyone else was getting tired and decelerating. Other runners can achieve this, and they should practice the techniques Smith has used.

We have used every method we can to sustain speed and to make leg speed faster. Leg speed is the first element in good sprinting, of course. If another runner moves his legs faster than I do, it is a pretty good bet he will beat me at a shorter distance.

The second way a runner can beat me is through stride length. If we have equal leg speed and he gains an inch on me every step without losing speed, then he's going to be three yards ahead of me after 100 strides. So we must try to increase stride length.

The third way to improve in a sprint is to maintain top speed. If my competitor has a top speed of 26 miles per hour but can only maintain it for three yards before deceleration, yet I can maintain my 22 m.p.h. peak for 15 yards or more, I'll give the man a good race. Ability to maintain speed can be improved, too.

Improvements in leg speed come through practicing: (1) relaxation; (2) sprint form, and (3) short, fast dashes performed daily at top speed.

The first prerequisite for increasing stride length is high knee action. Raise the knees high and straight when sprinting. Develop the muscles that lift the knees. This is an unnatural movement, so you have to concentrate on it.

The second prerequisite is foreleg reach. There is no use getting the knees high unless the forelegs reach out to take advantage of the extra lift.

I recommend several exercises to improve sprint form:

1. Hold your hands in front of the body, waist high. Running in place, bring the knees up forward and high to the hands. Once you can do this properly, high on the toes and relaxed, run down the field this way. Continue to work at getting the knees up higher and keeping relaxed.

2. Maintain the knee action of exercise one and add the reach of the foreleg. The tendency will be to lean backward like a drum major. Don't! There is also a tendency to point the knees out. Keep them together!

3. Now work on arm action. The arms are a source of speed and power. The faster the arms go, the faster the legs will have to go. Begin by dropping the arms to the sides. Hold the hands cupped and relaxed. Now bring the arms up to almost 90 degrees, palms upward a bit to keep the elbows close to the sides. Swing the arms parallel to each other, not across the chest. By pumping the arms parallel, you can gain some inches. Keep the hands

and arms low and forward. If the arms go too high, you run too high. If they go forward, the body goes forward. Again, run in place until the form is acceptable, then run down the field, working on the previous drills at the same time.

4. Keep the chin and chest out, and look at the tape. In the old days, we used to think that an exaggerated lean was necessary, which meant running with head down and the caboose sticking way out in back. We now know that sprinters have to "run tall." To do this, they must push the chest out, pull the caboose in and run high on the toes. This position is similar to that of a soldier standing at attention. Do drills on this position. Run Tall! Keep the eyes right on the finish tape all the way.

5. You gain more ground by bounding forward than by bouncing up and down. Learn this by locking the knees and running from the ankles. Keep the head level and don't look at the ground. This exercise develops a strong "ankle flip" which all good sprinters possess.

At the end of his race, a sprinter begins to tire and his sprint form begins to deteriorate. His knees drop lower, the stride shortens, and he is in trouble. At this point, it is important to reaffirm the sprint form fundamentals all the way through the finish. The sprinter needs extra lift to keep from decelerating.

One of my former sprinters, Dennis Johnson, said when he got to 60 yards he would tell himself "lift!" What he lifted most were his knees. Johnson got a share of the world record at 100 yards, and often came from behind to beat other good runners.

In doing finish drills, lift the knees. Get up higher on the toes. Pump the arms harder and faster. If you can't pump your arms harder, then reach with the arms, thus increasing the stride length.

Don't think anything that condones tension. Do not think "big" or "go" or "get them." Think "fast" or "reach fast and stay loose". What hits the sprinter at this point is tension. Tension destroys sprint form. When you get tense, the head goes back, which in turn shortens the stride still more. All the muscles tense up and you can't move as fast. When the antagonistic muscles are relaxed, the sprinter is more efficient.

THINKING IT THROUGH

Steve Williams, the brightest sprint prospect of the 1970s, says the only time he loses a race is when he messes up on tactics.

Wait a minute. "Tactics?" In a sprint race? What's tactical in a pure speed event? Quite a lot, the sprinters and their coaches say. The tactics are more subtle than the pacing and strategic maneuvers of middle and long distance racing, but they exist in sprints just the same.

In races with as few as 40 steps, every move is a tactic. The start and the initial acceleration are tactical in the sense that they're planned and practiced with the object of gaining a precious tenth-second or two. From that point, as Bud Winter emphasizes, running form and relaxation are most important.

Steve Williams says, "I'm forced to have tactics if my start is bad. I'll work the first 40 yards on straightening myself up—getting into the best, most efficient running form I can. This usually comes at 55 yards, and at 55 I make a 'kick' that my teammates say looks like a quarter-miler's finish. I just start lifting my knees and driving with my arms. It's just like splitting the race in half. The first half is to get in form, and the last half is to run as fast as I can in that form."

Williams echoes the advice of Bud Winter, and of British coach Lionel Pugh. Pugh says that once top speed is attained, sprinters should only attempt to hold that rate. Fighting for more speed creates unwanted tension.

Pugh says, "He should have a strong sense of objective, which, in sprinting, should center on two things: (1) his concentration should be directed to to the tape or line, and (2) his concern should be with his own sprinting and the maintenance of an inexorable rhythm, no matter what the pressure.

"My advice then is quite simple: Go flat-out for 50-60 yards, saying to yourself, 'faster, faster, faster!' Then settle for what you've got and preserve this speed through the maintenance of relaxation and rhythm. Concentrate only on yourself and on the tape."

Finishing is another tactic in itself. Sprints are won and lost at the finish line. *Track Technique* editor Fred Wilt tells sprinters to "run through the finish with no gyrations, gymnastics, lifting of arms to breast the tape, etc. If a lunge or drop finish is used, reserve it for the final one or two strides."

Bud Winter adds, "One thing we can do is to lean forward at the finish. But our competitors have read the same books we did, so they lean forward also. Is there anything else we can do to beat them at the tape? Yes. We can roll the nearest shoulder. Lean forward and roll the shoulder into the tape. It must be practiced until the timing is perfect and it is habitual."

Leaning finishes are a gamble. Mistimed ones are worse than a straight-up romp through the tape. In 1973 alone, the top US 100 sprinters Steve Williams and Herb Washington both lost important races because they lunged at the wrong line. This is easy to do in a sprint, where the finish area may have as many as a half-dozen stripes. Sprinters need to know their course as well as cross-country runners know theirs.

Pacing starts becoming a factor in the 200-meter/220-yard races. Here, running the turn is a tricky art, requiring a degree of speed control.

Sprinters at their marks have to think of little things—the start itself, every step after that, staying fast yet loose, pacing if it is a long sprint, finish lean if the race is close. Little things mean a lot at these distances. (John Marconi photo)

Fatigue starts to be a prime factor in the long sprints—400 meters/440 yards. Jim Bush, the UCLA coach who has had more success than anyone else in the world with one-lappers, says of pacing:

"The quarter-mile, I think, should be broken into four segments, 110 yards each. Each 110 yards is run a certain way, especially the first three. I tell runners to run the first three *my* way and the last 100 *their own way,* because I have no control over how they're going to feel in that last 110.

"I have them run the first 110 very fast. They learn to come off the first curve as relaxed as they can, and they run the backstretch without slowing down, yet without using up too much energy.

"The key is that third 110. This is where too many people slow down. We drill into these runners that when they hit that second curve, they must start to work again. Everybody seems to think this is the place to slow down, so they will have power to come off that last curve and kick the straightaway.

"Well, there isn't anybody that is going to kick in on the last straightaway because fatigue is settling in. I teach my quarter-milers to run that second curve hard. This is not easy to teach. We work all (school) year long, from October to May, on relaxing in that second curve and in that second curve running it fast."

Pacing also is a season-long outlook, and again is a tactical feature of running. It's generally assumed that because distances are short, sprinters can race at a high level indefinitely.

Statistics don't support this. A review of world ranked sprinters shows that their racing season is much like the distance runners'. Sprinters hold their peak form two to three months at most. During that period, they run only 8-10 races against top-class competition. The fastest race typically comes in about race number seven, after a steady buildup. The message, then, seems to be this: Even sprint seasons have to be planned as to length, and number and frequency of races.

Lane draw, running surface and condition, temperature and wind. All of these are matters of luck, which can work either way. Yet all require tactical adjustments just the same.

Sprinters have to think of little things.

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GUIDE TO SPRINTING . . . is for the serious sprinter who sees improvement as possible, regardless of the gifts handed to him at birth. The booklet spells out how this improvement can come at distances where time is short and speed is all-out all the way, where margins of improvement are small and margins for error are smaller yet. The booklet speaks to the exacting sprinter who wants to cut down the margin of error, thereby increasing his chances of beating the clock through that tight corridor of time. It can be done.

FRONT COVER:
The starting style looks unorthodox, but "unorthodox" new developments are leading the way to sprint improvement. (Steve Sutton)

LEFT:
Sprinter Steve Williams. (Stan Pantovic photo)