

AN INVESTIGATION OF TECHNIQUES USED FOR TRAINING DISTANCE
RUNNERS AND THE DEVELOPMENT OF A TRAINING PROGRAM
FOR HIGH SCHOOL DISTANCE RUNNERS

by

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A THESIS

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I. S.

ABSTRACT

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Purpose

It was the purpose of this study to investigate the techniques of training used by the world's leading distance runners and coaches. From this study a program of training was formulated that could be applied to high school distance runners.

Methods

The methods used to obtain data for this study were (1) examination of numerous books and magazines; and (2) interviews with high school track coaches.

Findings

From the evidence presented in this study the following conclusions were reached:

1. All training systems discussed have their respective merits.
2. The Fartlek system is more suited to more mature athletes.

3. The Interval system is best for high school and college athletes.

4. The Lydiard system is more suitable for long distance runners.

5. The suggested program for high school athletes is best suited to the Texas Gulf Coast region.

Approved:

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Supervising Professor

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CHAPTER I

THE PROBLEM AND DEFINITION OF TERMS USED

In recent years the tremendous improvement in times and distances recorded by modern day track and field athletes has caused many people to wonder what training methods are used by these athletes. Nowhere in track and field has this improvement been as noticeable as in the area of distance running. This improvement has been due, in part, to the application of detailed and exacting training schedules of the type discussed in this study.

I. THE PROBLEM

Statement of the problem. It is the purpose of this study (1) to investigate some of the modern techniques used in the training of distance runners; (2) to show how these techniques have been used by some of the world's greatest distance runners; and (3) from this investigation determine a suitable training program for high school athletes.

Importance of the study. Ever-increasing popular interest in competitive sports, plus the accelerated national and international drive to excel in competition, is making it increasingly more important that an athlete should know the best methods by which he can achieve his ultimate goal.

This goal, whether it be a local championship or an Olympic gold medal, is relative to the individual's own capabilities. Not everyone can be an Olympic champion, but everyone can achieve the best his body can produce if he knows and understands the best way to do this.

There is little doubt that the distance races at the Olympic Games are the glamor events and the most widely publicized. These races over 800 meters, 1,500 meters, 5,000 meters, 10,000 meters, and the marathon are events that require tremendous efforts and sacrifices of the athletes competing. These athletes, most of whom run from ten to twenty miles a day, usually adopt a training program of Fartlek running, Interval running, or use the Lydiard system of training.

Limitations of the study. Although there are many different techniques used in training distance runners, this study is limited to an examination of those most widely used, namely the Fartlek method, the Interval method, and the Lydiard system.

Methods of investigation. The following methods were used to obtain data for this study; (1) books and magazines from various sources were studied; (2) unpublished training diaries of the investigator were used to reinforce the published material discussed and to show the application of the various techniques; and (3) the opinions of several

successful track coaches were sought for the compilation of the third chapter.

II. DEFINITIONS OF TERMS USED

Fartlek. A system of training that is derived from the Swedish word which means "play of speed" or "speed play." It is a type of training involving informal fast-slow running that was popularized by Gosta Holmer, former National Coach of Sweden. Fartlek involves great quantities of running at a variety of speeds, preferably (though not necessarily) over natural surfaces such as woods, forest paths, bridal paths, beaches, fields, golf courses, or any open country.

Heart rate. This refers to the number of times the human heart beats every minute. The normal resting heart will beat about seventy-two times per minute while the heart of the trained athlete will beat in the region of forty to sixty times per minute. Peter Snell, former record holder for the one mile run, had a resting heart rate of thirty-two beats per minute.

Interval running. A system of training that involves formal fast-slow running. It involves four variable factors including: (1) the distance of the fast runs, (2) the number of repetitions of the fast runs, (3) the speed of the fast runs, and (4) the duration of the recovery period after

each fast run. Interval running involves repeatedly running a specific distance at a pre-determined speed, resting for a specific length of time, and then repeating the fast run again. A typical Interval running workout would be ten repetitions of 440 yards in sixty-five seconds with a 440 yard jog for recovery after each fast run.

Jogging. This means running at a speed of from two to three minutes per 440 yards, or approximately five to seven miles per hour. In jogging the steps taken by the athlete are very short, the arms may hang relaxed to the side of the body, and the athlete tends to plant his foot in flat-footed position. It is usually part of the warm-up and warm-down activity and generally used during the recovery period following fast runs.

Marathon. The marathon is an endurance race of 26 miles 385 yards. It is usually charted on the roads between two towns or cities or on an "out-and-back" course. That is, the runners start and finish at the same point after having run out for a total of just over thirteen miles and then retrace their steps to the start.

Middle distance running. This is the name generally given to track races over the one-half mile and one mile distances. The broader term, distance running, encompasses all distances above a sprint; namely, the 880 yards, one

mile, two miles, three miles, six miles, and marathon races, and their metric equivalents of 800 meters, 1,500 meters, 3,000 meters, 5,000 meters, 10,000 meters, and 42,195 meters for the marathon distance.

Repetition running. The term, as used by Franz Stampfl, is a refinement of Interval running in that the runner runs a specific distance, usually more than 440 yards, and then rests completely before attempting to repeat the run again. Most coaches, however, use the term Repetition running and Interval running as one and the same.

Sprint. To sprint means to run at maximum speed possible.

Sprint-jog. A form of training in which the athlete walks fifty-five yards, jogs fifty-five yards, strides fifty-five yards, and sprints fifty-five yards. This process is then repeated.

Stroke volume. (Systolic discharge) This is the volume of blood pumped into the aorta by each contraction of the left ventricle of the heart. The stronger the heart-beat, the larger the systolic discharge or stroke volume.

Sullivan Award. A memorial trophy given in the memory of James E. Sullivan and presented to the "amateur athlete who, by performance, example and good influence, did

most to advance the cause of sportsmanship during the year."

Training. A series of physical activities deliberately planned and carried out for the purpose of increasing efficiency in running and racing. To the dedicated athlete, intent on achieving the maximum of his potential, training is apt to become a way of life. Not only does he devote time to physical activity, but also governs his personal life, aside from physical activity, in regard to sleep, food, and social activities according to the best interests of training.

Warm-down. The warm-down is exercise, gradually diminishing in intensity following severe exertion, for the purpose of facilitating return of the circulatory system and bodily functions to a normal or pre-exercise state. This warm-down usually involves very slow and easy jogging and then walking for a period of five to ten minutes after the completion of a workout or race.

Warm-up. This refers to the preliminary exercises done in preparation for a strenuous physical effort. In the case of the runner this warm-up usually consists of jogging, calisthenics, striding, and acceleration running to sprint speed, interspersed with periods of walking.

Workout. A term that is often used interchangeably with training. Specifically, though, a workout refers to

the physical activities that take place during one session of the training program. As an example, a runner might plan a year-round training program calling for one workout a day. This program might specify that every Tuesday his workout include running 20 x 150 yards and every Thursday it might call for running 20 x 220 yards.

CHAPTER II

REVIEW OF THE LITERATURE

Much has been written in regard to the various methods used in the training and conditioning of distance runners. However, this brief summary will concern itself with the more commonly used techniques applied by some of the most successful coaches and athletes of the past few years.

I. LITERATURE ON THE FARTLEK SYSTEM OF TRAINING DISTANCE RUNNERS

Gosta Holmer, coach of the Swedish Olympic Team, is generally regarded as being the father of the Fartlek system of training.¹ Holmer rejected the American methods used in the 1930's of running set distances on a track and devised a system whereby the individual athlete was responsible for setting his own speed and the duration of his workout according to how he felt on that particular day.

He wanted a system of training more suited to the Swedish athletes temperament and easily adaptable to the nature of the Swedish countryside. He felt that his athletes should train according to their own individuality and

¹J. Kenneth Doherty, Modern Track and Field, (New Jersey: Prentice-Hall, Inc., 1963), p. 167.

not to any pre-arranged schedule on a confining track.

This system, which Holmer called Fartlek (meaning in English, play-of-speed, or speed-play) is best described by the French coach, Major Raoul Mollett.²

Fartlek was perhaps the most alluring discovery since the beginning of the century in the realm of training A window was opened on the forest, and at the same time an idea of training emerged which one could classify as "happy." Fartlek, with its walks, its runs at slow pace through the woods, its short sprints, was able to revolutionize the training of the track world There is without doubt not a single irreconcilable sedentary person who would not feel a twinge of nostalgia when faced with the thought of a man running barefoot on springy moss, in a setting of forests and lakes reflecting the sky. Faced with this picture, the track world felt an irresistible rise in spirits.³

From its beginning in Sweden, Fartlek has been adopted by athletes all over the world and adapted to conditions at hand in numerous countries. From the rugged beaches, sand dunes, and bush paths of Australia, the mountain trails of New Zealand, the rolling hills and meadows of England, to the golf courses of America, athletes have trained and excelled with their own particular version of Fartlek running. But no matter what the terrain, the primary consideration is to run hard and get tired without feeling tired. The physical exertion and effort are soothed

²J. Kenneth Doherty, Modern Training for Running, (New Jersey: Prentice-Hall, Inc., 1964), p. 78.

³Major Raoul Mollett, "Interval Training," How They Train, Fred Wilt, ed., (Los Altos, California: Track and Field News, 1959), p. 97.

by the constantly changing scenery and the variation of pace.⁴

A typical Fartlek training session, according to Holmer, should take from one to two hours each day and would include the following:

1. Easy running from five to ten minutes as a warm-up.
2. Steady, hard speed running for one to two kilometers.
3. Rapid walking for about five minutes.
4. Easy running, broken by wind-sprints of from 50 meters to 60 meters and repeated until you feel tired.
5. Easy running with three or four swift steps now and then. (In reality, these steps would be like the sudden speeding up of a runner during a race when he tries to fight off a challenger who is trying to pass him. The body suddenly lurches forward, and three or four quick, sudden steps are taken).
6. Full speed uphill 150 meters to 200 meters.
7. Fast pace for one minute following this trial of strength described in (6). The above described work can be repeated until the end of the period of the workout; but every athlete should well remember that he must not feel tired but rather stimulated after the training.⁵

The first athlete to fully exploit the Holmer system of training was the Swedish soldier, Gundar Haegg. Haegg,

⁴J. Kenneth Doherty, Modern Training for Running, (New Jersey: Prentice-Hall, Inc., 1964), p. 78.

⁵Gosta Holmer, "A Training Program," Track and Field News, XI, (April, 1949), p. 6.

who held every world record from 1,500 meters to 5,000 meters in the period 1940-1945, trained almost exclusively on a 5,000 meter course in the pine forests of northwest Sweden. This course followed the bank of a river and ran alongside a lake. It contained two fairly steep hills and one very steep hill that Haegg used to exert maximum effort on. The rest of the course meandered through the woods and Haegg would run anything from short, quick bursts of speed to longer, slower sustained efforts. In this manner Haegg built up both the speed and endurance necessary to make him the world's leading distance runner.

Although he seldom ran for more than thirty minutes in a workout, he ran very hard for this period, never allowing himself to run at a slow tempo or to completely recover from one effort before attempting another. In other words, he would vary the pace and distance considerably, inserting fast bursts with even-pace running, and never permitting himself a chance to recover until the whole workout program was completed.⁶

While doing military training in the far north of Sweden, he ran daily over the following 5,000 meter forest path, shown in Fig. 1, from December, 1939, to the spring of 1940. Often in winter, Haegg had to fight with both arms

⁶Jesse P. Mortensen and John M. Cooper, Track and Field for Coach and Athlete, (New Jersey: Prentice-Hall, Inc., 1959), p. 96.

and legs through the huge snow drifts to complete the course, frequently in temperatures much below zero (C). These were always continuous runs and Haegg always found himself very fatigued after each run. A considerable amount of skiing and military marching was also included in his training.⁷

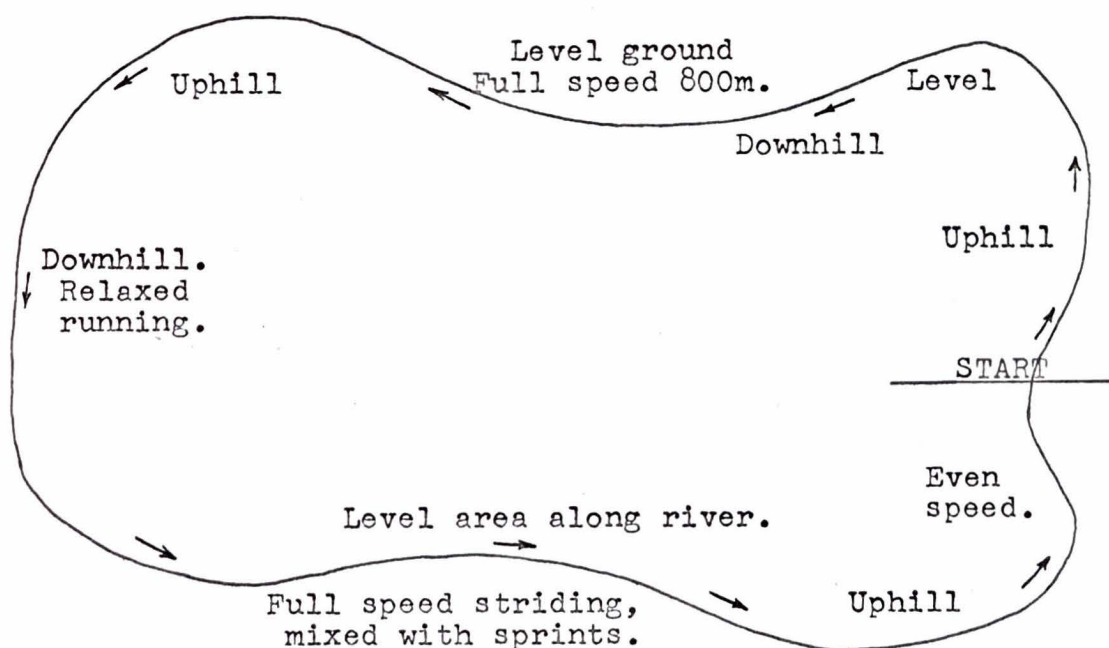


FIGURE 1

TRAINING COURSE USED BY HAEGG
IN THE SPRING OF 1940.⁸

⁷Fred Wilt, How They Train, (Los Altos, California: Track and Field News, 1959), p. 27.

⁸Ibid.

The winter of 1941 found Haegg residing in northwest Sweden. During this time Haegg walked in deep snow, took long ski hikes (15-30 kilometers) and ran over the following 5,000 meter forest path (see Fig. 2) once or twice daily whenever possible.

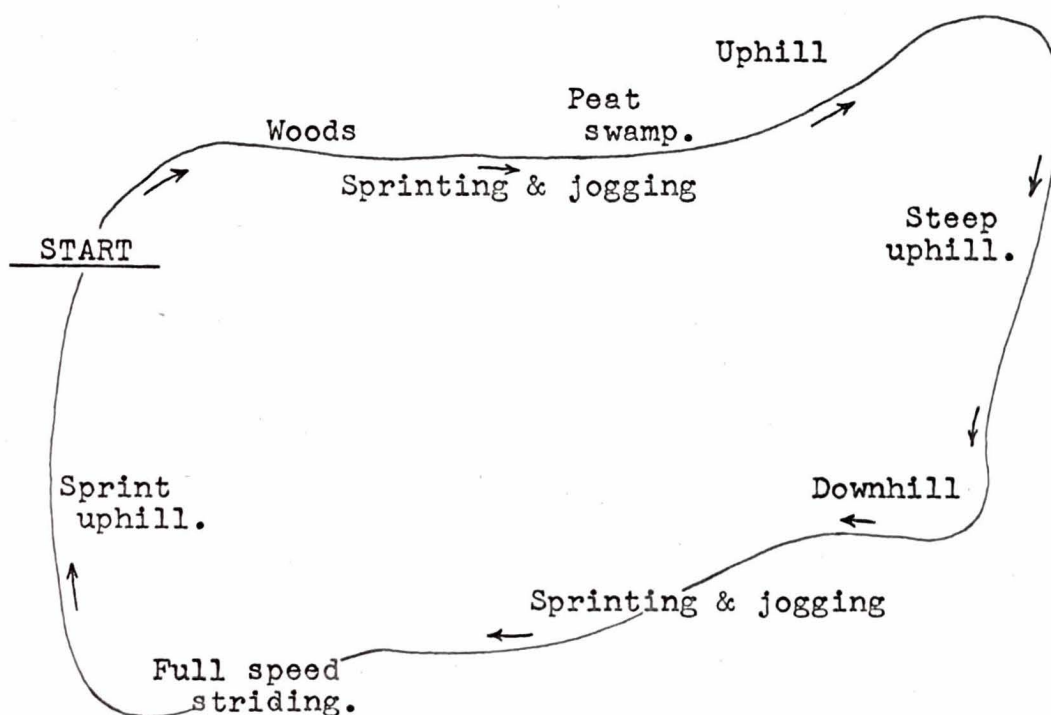


FIGURE 2

HAEGG'S TRAINING COURSE AT VALADALEN,
NORTHWEST SWEDEN.⁹

⁹Ibid.

This course discloses three areas in which he ran with bursts of energy, four hills, one of which was very steep, two bogs or marshy areas in which the footing was very heavy, and at least one area of hard, fast running.¹⁰

The summer following his winter stay at Valadalen, Haegg established ten world records in seven different events within the space of eighty-two days. Twenty-five years later his times of 3:43.0 for 1,500 meters, 4:01.3 for the one mile, 8:42.8 for two miles, 13:32.4 for three miles, and 13:58.2 for 5,000 meters are still among the world's best.¹¹

Along with Haegg, Arne Andersson, Rune Persson, Lennart Strand, Rune Gustafsson, and Arne Ahlsen were all among the world's finest distance runners and besides all being from Sweden, they were all advocates of the Fartlek system of training.¹²

Although the Fartlek system of training had its origin in Sweden and met with tremendous success there, it has produced world record holders and Olympic champions at all distances from 800 meters to the marathon in Australia. Its near neighbor, New Zealand, a tiny island of nearly

¹⁰Ibid.

¹¹Ibid.

¹²J. Kenneth Doherty, Modern Track and Field, (New Jersey: Prentice-Hall, Inc., 1963), p. 241.

three million people has almost duplicated this record.

There must be a reason for this, and Percy Cerutti, Australian coach of numerous record holders, believes he has the answer. This answer, according to Cerutti, is in the system of training these athletes use. At Portsea, Cerutti's home and training camp located on the rugged Victorian coast, these athletes would lead a Spartan existence that consisted of running up forty-five degree sand hills, running mile after mile in loose sand, splashing through knee-deep water as the surf came rushing in, speeding over the soft grass of a golf course or lifting heavy weights until the body refused to take anymore punishment. If these Spartan athletes desired more there were numerous trails to run along or even a long ten mile run over the hilly, twisting coast road to Rye, a small coastal resort town, and back. This type of training has produced such athletes as John Landy, former world record holder for the mile, Olympic champions Herb Elliott and Ralph Doubell, and such prolific world record holders and British Empire champions as Albie Thomas and Dave Power, as well as former world six mile record holder Dave Stephens.¹³

Of these athletes probably none dominated world track as much as did Herb Elliott in the years 1957-1960. In

¹³Percy Cerutti, Running with Cerutti, (Los Altos, California: Track and Field News, 1959), p. 17.

these four years Elliott remained unbeaten in the 1,500 meter and one mile runs and captured two world records, one Olympic gold medal, and two British Empire championships.

Cerutty's training system was but a variation of that used by Haegg. Whereas, Haegg battled snow drifts and steep hills, Elliott would run through the surf and up the adjacent sand hills.

However, Cerutty took Holmer's free, unregimented training program and added his own ideas. The result was complete freedom from the demands of civilized living, civilized foods, civilized clothing and shelter, freedom from exacting training schedules and frequent competitive racing. In other words complete, uninhibited individual freedom.¹⁴ Cerutty explains it this way.

As I developed my ideas I almost entirely abandoned the orthodox and traditional way of training for running--that is, running on level ground, tracks, etc., walking or running up hills slowly, i.e., conserving energy, and trying to become faster and stronger by repeated efforts on the track.

In place of these customary athletic activities I "trained" by long walks in our mountains, covering such distances as 220 miles in ten days--as an example--carrying a rucksack with food, tent, etc., and recording eventually 200 miles in five days, two of the five being rest, or nonactive days.

Instead of running on hard surfaces I commenced running on soft surfaces, until now much of our training in the winter conditioning period is done running on the soft, dry, loose sand of our

¹⁴J. Kenneth Doherty, Modern Track and Field, (New Jersey: Prentice-Hall, Inc., 1963), pp. 82-83.

Australian beaches. Also we run up the steep sides of sand dunes, and when in urban areas, select the steepest hills in parks or streets and run as vigorously up them as we are able.

Such activities use the body as resistance, and I hold that for the development of the legs and lungs and heart little or no other exercise is necessary.¹⁵

To Cerutti running is free expression or an outpouring in which the runner should not be inhibited, regimented, formalized or dictated to in any way. In this outpouring the runner should be able to release all the strength of his musculature in a free, uninhibited, attempt to run from one point to another. Man is an animal who has conditioned himself to routines of daily living that demand suppression of all his animal instincts. What could be more unnatural than to further cage these natural instincts by regimenting oneself to grinding around a track, stop watch in hand? To quote Cerutti again, "How much better to run with joy, sheer beauty and strength, to race down some declivity, to battle manfully to the top of another."¹⁶

As Cerutti sees it man has little chance to escape from the monotonous, humdrum routine of everyday living, so why add his athleticism, his exercise, to the ever-growing list of everyday compulsions? "Athletics should be, and

¹⁵Percy Cerutti, Athletics, (London: Stanley Paul & Company Ltd., 1960), p. 52.

¹⁶Percy Cerutti, Running with Cerutti, (Los Altos, California: Track and Field News, 1959), p. 17.

with me is, the prime means to escape from these imprisoning conditions, to exult in liberty, free movement, capacity to choose."¹⁷ Training should be a thing of pleasure, of joy, of hard, battling exhaustion and enthusiasm. It should not be a chore or a daily grind.

At Portsea, Cerutti's athletes run along cliff top paths or descend to the beach and run for miles on the soft, heavy sands, sometimes in knee deep water, as the surf comes crashing, swirling, and pounding in.

Sometimes three or four training sessions a day are undertaken. Long steady runs on the dirt roads for twenty or thirty miles or back packing into the mountain ranges for several days.¹⁸

To find out why Elliott was so far superior to any of his challengers one would have to study the rigorous training routine undertaken by him on his visits to Portsea. Australian track writer, Joe Galli, best describes a typical day for Elliott.

Arrived Saturday afternoon. Elliott and two friends had just returned from a thirty mile hike over the rugged terrain, sleeping under the stars at night. A day previously Herb had run a mile in four minutes. We dived into bunks at Cerutti's headquarters and slept nine hours. At 5 a.m. we were up. We jogged half a mile to the beach. Spent thirty minutes running along the hard sand and plunging into the surf, then back for breakfast. Soon we were off

¹⁷Ibid.

¹⁸Ibid.

again, running over a sandy, bush track course of just over a mile with two killing climbs. I was proud to break ten minutes for the course. Herb ran it five times, never in more than 6:10. Next--weight lifting. Elliott lifted 200 pounds in the ordinary dead lift, 125 pounds in the press. Lunch was followed by a discussion of training. Then we tackled a giant eighty foot sandhill. One run up the hill finished me. I found it even hard to walk through its deep loose sand. Elliott scampers up as though it were a moderate grass slope.¹⁹

Elliott finds that orthodox training is drudgery because "it's so unnatural to run for hours on end on a circular track."²⁰ Elliott tended to vary his training from day to day, running on a golf course one day, the next day in a park, then on a race course, up and down the hills flanking the Shrine in Melbourne, along the Yarra River bank, and even over cow paddocks. The constant change of scenery, the music of the birds and the sight of grazing cattle and sheep, made training a real joy to Elliott, and eliminated drudgery that can sometimes come from constant running on a track. Elliott, who trained eleven months of the year, devoted half of that time to strength work. A typical week of training during this strength building period when Elliott was eighteen years old follows:

Monday: A ten-mile run at any pace I felt like setting, always finishing hard over the last two miles or so.

¹⁹Joe Galli, "A Week-end at Portsea," World Sports, (London: Country and Sporting Publications Ltd.), November, 1958, p. 6.

²⁰Herb Elliott, The Golden Mile, (London: Cassell & Company Ltd., 1961), p. 147.

- Tuesday: Six or seven miles in the morning.
Weight lifting in the evening.
- Wednesday: Ten miles hard against the clock.
- Thursday: Six or seven miles in the morning.
Weight lifting in the evening.
- Friday: Rest.
- Saturday: Faster 'fun' workout at lunch time on the track. A hard five miles or so in the evening.
- Sunday: Eight to ten miles in the morning. Eight to ten miles hard in the afternoon.²¹

Two years later Elliott was running ten miles daily in the parks around Melbourne during the week. On weekends he would motor to Cerutti's seashore camp, sixty miles from Melbourne, and run as many as four or five workouts a day. These workouts were done along the beach, over a rough mile and a quarter long bush circuit with a sandy surface, on a golf course, and up an eighty foot sandhill with a grade of two in one. Most of Elliott's running was of the continuous variety in that he rarely rested or took recovery intervals in his workouts. Elliott has been known to run continuously for as much as thirty miles and spend as long as four hours on one workout.²²

Another observer of Elliott's training during his build-up for the 1960 Olympic Games describes it thusly:

²¹Ibid., pp. 147-148.

²²Wilt, op. cit., p. 20.

After an early morning fourteen mile run down a sandy road, round and round the rolling Portsea golf course, Elliott sprinted a final hundred yards and slumped to the sand. Catching his breath, he kicked off his trunks and mouldy shoes, and plunged into the frigid waters of the Bass Strait. Then to an eighty foot sand hill over which he sprinted and continued through scrub and roots, over barbed wire fences to a clap-board ski-hut, into a cold shower, and to bed for 30 minutes of sound sleep. Then a meal of raw carrots, cabbage, brown bread, cheese and milk. Next weight lifting with heavy barbells and heavy slabs of rail. This Saturday morning work-out was only the beginning of two grinding days of running and exercising at a fitness fanatic's home-made commando course. Four days during the week, resting only on Friday, Elliott had lifted weights and run ten miles daily in Melbourne's parks. He would run 50 miles during the weekend at Portsea, before shaving and returning to Melbourne. Elliott trains his hardest in the off season and during the track season relaxes, races, and does a little jogging.²³

This Spartan existence led by Cerutti's athletes is best described, maybe somewhat lightheartedly, by Bill Stacey, a frequent visitor to Portsea:

A runner stood at the Pearly Gates,
His face was worn and old,
He bravely asked the man of fate
Admission to the fold.

'What have you,' St. Peter said?
'To seek an entrance here.'
'I trained at Portsea, that was my task,
For many and many a year!

Then wide the gates did open,
The angels clanged their bell.
'Come in and take a harp,' he said,
'You've had enough of Hell.'²⁴

²³J. Kenneth Doherty, Modern Track and Field, (New Jersey: Prentice-Hall, Inc., 1963), p. 171.

²⁴Elliott, op. cit., p. 45.

Stacey's runner, like Elliott, might have completed years and years of self-disciplined, rigorous training that no coach would ask of any athlete. The athlete would do this training without a schedule, without a track, without a stop watch, and without a coach to drive him on. He would be inspired to these efforts by a slim, wiry, grey haired wisp of a man who knows what it is to punish oneself to the limit and beyond, and to do it because he felt better for it when his task was completed.²⁵

To Cerutti the all important key to athletic success is in conditioning. This conditioning does not only come from running; in fact, some of Cerutti's most successful athletes spend as much time on conditioning as they do actually running. What is conditioning then? According to Cerutti it is anything that conspires to make us stronger, freer, more resilient, conquering, all that trains us to endure, sustain suffering, that calls on our best qualities, continually--this to Cerutti is conditioning.

This conditioning comes from lifting heavy weights in the gymnasium, using the horizontal and parallel bars, doing "sit-ups" and "press-ups" at any odd time, mountain walking, hiking, swimming, cycling, in fact anything that demands hard physical effort. This is Cerutti's method of preparing

²⁵Percy Cerutti, Running with Cerutti, (Los Altos, California: Track and Field News, 1959), p. 17.

that usually took him to the finish line ahead of his rivals. A typical week of training for Wood would look something like this:

- Monday: Twelve miles hard Fartlek running over hilly cross country course.
- Tuesday: Training in woods. Ran three miles at a good pace, then 20 x 300 yards at racing speed. Covered a total of ten miles.
- Wednesday: Training in woods. Ran six miles at a fast pace with accelerated bursts of from fifty to one hundred yards.
- Thursday: Training over cross country course. Ten miles of hard Fartlek running with several fast strides of from four hundred to a thousand yards.
- Friday: Easy running in the woods for five miles.
- Saturday: Competition.
- Sunday: Training over cross country course. Five miles of easy pace running followed by five miles at a fast pace.²⁸

This workout program was taken from Wood's training diary and was typical of his summer season training. His build-up or winter conditioning program was very similar; but instead of running about sixty miles a week, this was usually increased to about eighty miles a week with the emphasis more on long steady running and cutting down on the shorter fast runs.²⁹

This then is Fartlek as a system of training. It

²⁸Wilt, op. cit., p. 33.

²⁹Ibid.

has definite advantages and disadvantages. On the plus side it:

1. Develops self-dependent and resourceful runners. The athlete alone decides how fast he will run, where he will run, what he will run, and when he will run.
2. Its proponents claim that it is physically challenging and mentally invigorating and refreshing.
3. It provides a natural pattern of activity where the athlete can run as hard and as long as he pleases, then rest until he is ready to begin again.
4. It provides basic endurance training for all running events. It will help the athlete maintain his natural speed for a longer duration of time.
5. The runners cover more miles in training but are not aware of tiredness and fatigue because these factors are usually associated with the awareness that one has run a certain number of repetitions or that one ought to be feeling tired. Fartlek is a way of removing this awareness, thereby, permitting greater physical effort.
6. Running on soft surfaces such as grass or forest paths encourages greater general relaxation and results in less muscle soreness.
7. Fartlek can be practiced anywhere at any time of the day or night. The more obstacles, such as snow or howling winds, the more challenging it becomes. It is not dependent on carefully prepared tracks.

8. Because the majority of Fartlek workouts are taken on uneven ground, it tends to develop a shorter, more economical stride--a definite advantage in the longer distance runs.³⁰

The disadvantages are as follows: (1) Immature and inexperienced runners may take advantage of the freedom it offers by not doing enough, or in some cases doing too much, too fast, and too soon. It places a burden on the coach to teach the responsibilities and specific goals of Fartlek, not only in terms of hard work but when and why certain types of workout are called for at a specific time. (2) The idealic conditions of Portsea or Valadalen are not readily available to everyone.³¹

The Englishman, W. R. Loader, described his early training experiences through the sooty brick and stone deserts of Clydeside and Merseyside, which display foundries, coke ovens, shipyards, blast furnaces, and machine shops, but little of the inspiration of nature found at Portsea. He tells of the derisive jeers of onlookers, the taunting street urchins as they run alongside, mocking exaggeratedly the runners stride, and the barking, snapping

³⁰J. Kenneth Doherty, Modern Training for Running, (New Jersey: Prentice-Hall, Inc., 1964), pp. 84-86.

³¹Ibid., p. 86.

mongrels who seemed to be waiting around every street corner!³²

The advocates of Fartlek tend to extol the wonderful glories of nature to be experienced by running on sea-beaches, forest paths, and the exhilaration of running over hill and dale. However, most of the runners of the world are like Loader, they face concrete walks, paved streets, exhaust fumes, and even jeering pedestrians who cry "Look, Mary Ann, it's a runner! He's got no clothes on!"³³ But, to quote Doherty:

Even the worst cities have cemeteries and river banks and zoos and golf courses which the determined will seek out, even though forced to do so at hours when decent folk--and the police are indoors.³⁴

II. LITERATURE ON THE INTERVAL METHOD OF TRAINING

Interval training has been widely used under different names since the early 1920's. It has gradually evolved from a training routine consisting of "ins and outs" or "wind sprints" into a highly systemized program of training in which the athlete makes repeated efforts over a

³²W. R. Loader, Testament of a Runner, (London: William Heinemann, Limited, 1960), p. 61.

³³J. Kenneth Doherty, Modern Training for Running, (New Jersey: Prentice-Hall, Inc., 1964), p. 86.

³⁴Ibid.

measured distance at a predetermined pace.³⁵

Franz Stampfl, former English coach and now at Melbourne University, Australia, claims that Interval running is more flexible since it can be adapted to the varying needs of all athletes at any stage of development. Stampfl defines Interval running as a method of training involving continuous changes of pace over accurately measured and timed distances, a fast run being followed by a slow one.³⁶

Roger Bannister, the first man to run one mile in less than four minutes, followed a rigorous system of Interval training in which he ran repetition quarter and half miles, each one slightly faster than the speed he expected to maintain in a race.³⁷

Fred Wilt describes Interval running as a form of training featuring formal fast-slow running involving four variable factors including: (1) the distance of the training runs, (2) the number of repetitions of the training distance, (3) the speed of the training run, (4) the duration and type of recovery after each training run (walking or jogging).³⁸

³⁵J. Kenneth Doherty, Modern Track & Field, (New Jersey: Prentice-Hall, Inc., 1963), p. 175.

³⁶Franz Stampfl, Franz Stampfl on Running, (London: Herbert Jenkins, 1955), p. 47.

³⁷Roger Bannister, First Four Minutes, (London: Putnam, 1955), p. 183.

³⁸Fred Wilt, Run, Run, Run, (Los Altos: California: Track & Field News, 1964), p. 259.

As a system of training, it is undoubtedly the most popular and widely used and, like other systems, it evolved over a period of years. The great Finnish distance runner, Paavo Nurmi, during his training before the 1924 Olympic Games, ran long repeated sprints of from 200 to 600 meters. However, as Nurmi tended to keep his training methods secret so as not to reveal them to his opponents, not too much is known of his exact training program.

Woldemar Gerschler of Germany, in the period prior to World War II, used this system in training the great German half-miler and world record holder, Rudolf Harbig.³⁹

However, it was not until the post war period with the advent of such runners as Zatopek, Reiff, Pirie, Bannister, Chataway, Kuts, Landy, and Ibbotson that Interval running came to be widely accepted.

The success and record breaking performances of these athletes led many coaches to investigate the training methods used by these men. It was found that Emil Zatopek, a Czechoslovakian army officer, ran as many as sixty repetition 400 meter dashes in about seventy seconds with a 200 meter rest or jog interval between each fast run. Zatopek nearly always ran his training distances on the track. However, he refused to be timed or to use his stop watch on any

³⁹J. Kenneth Doherty, Modern Track & Field, (New Jersey: Prentice-Hall, Inc., 1963), p. 177.

of his training runs, preferring to rely on his judgment of pace. His actual training then was a combination of Interval runs and runs at alternating speeds. Usually he would run 5 x 200 meters, then 20 x 400 meters, and then back to 5 x 200 meters, all at racing speed. Each of the fast runs being linked together by fast jogs of about 200 meters. Many leading runners who use this system of training change to a walking pace in the recovery intervals, but Zatopek is particularly insistent on the fast jog. Zatopek's reason for this is that it allows his body to recover its breath in the course of running and to maintain the rhythm of running, even when very exhausted.⁴⁰

For one period of fourteen consecutive days prior to his world record 10,000 meters in 1949, Zatopek ran 5 x 200 meters, 30 x 400 meters, and 5 x 200 meters. That meant for a full fourteen days he ran more than twenty kilometers a day, fourteen of which were at racing speed.⁴¹

It was this training that led to a total of twelve world records and four Olympic gold medals, three of them coming in the 1952 Olympics where he scored the almost superhuman feat of victories in the 5,000 meters, 10,000 meters, and the grueling 26 mile marathon.

⁴⁰Frantisek Kozik, Zatopek the Marathon Victor, (Prague, Czechoslovakia: Artia, 1954), pp. 209-220.

⁴¹Kozik, op. cit., p. 111.

Franz Stampfl sets up a seven day schedule to be repeated each week of the month by his athletes. For a three mile or 5,000 meter runner hoping to run three miles in fourteen minutes the training schedule would look like this:

NOVEMBER

Seven-day Schedule to be repeated each week of the month

- 1st day: 20 minutes warming-up.
5 minutes rest.
15 x 440 yards Interval running, 75 seconds, with 2 1/2 - 3 minutes recovery lap.
Warming-down.
- 2nd day: 20 minutes warming-up.
5 minutes rest.
15 x 440 yards Interval running, 75 seconds, with 2 1/2 - 3 minutes recovery lap.
Warming-down.
- 3rd day: 20 minutes warming-up.
5 minutes rest.
8 x 880 yards Interval running, 2:30.0, with 6-7 minutes slow 880 yards recovery laps.
Warming-down.
- 4th day: 20 minutes warming-up.
5 minutes rest.
15 x 440 yards Interval running, 75 seconds, with 2 1/2 - 3 minutes recovery lap.
Warming-down.
- 5th day: Indoor training--calisthenics.
- 6th day: Easy cross-country, 10-12 miles.
- 7th day: Rest.

DECEMBER

Seven-day Schedule to be repeated each week of the month

- 1st day: 20 minutes warming-up.

5 minutes rest.
 15 x 440 yards Interval running, 73 seconds, with 2 1/2 - 3 minutes recovery lap.
 Warming-down.

2nd day: 20 minutes warming-up.
 5 minutes rest.
 8 x 880 yards Interval running, 2:25.0, with 6-7 minutes slow 880 yards recovery laps.
 Warming-down.

3rd day: 20 minutes warming-up.
 5 minutes rest.
 15 x 440 yards Interval running, 73 seconds, with 2 1/2 - 3 minutes recovery lap.
 Warming-down.

4th day: 20 minutes warming-up.
 5 minutes rest.
 5 x 3/4 miles Repetition running, 3:40.0, 10 minutes rest between each.
 Warming-down.

5th day: Indoor training--calisthenics.

6th day: 1 hour Fartlek over country.

7th day: Rest.

JANUARY

Seven-day Schedule to be repeated each week of the month

1st day: 20 minutes warming-up.
 5 minutes rest.
 20 x 440 yards Interval running, 73 seconds, with 2 1/2 - 3 minutes recovery lap.
 Warming-down.

2nd day: 20 minutes warming-up.
 5 minutes rest.
 8 x 880 yards Interval running, 2:20.0, with 6-7 minute slow 880 yards recovery laps.
 Warming-down.

3rd day: 20 minutes warming-up.
 5 minutes rest.
 15 x 440 yards Interval running, 71 seconds,

with 2 1/2 - 3 minutes recovery lap.
Warming-down.

4th day: 20 minutes warming-up.
5 x 3/4 miles Repetition running, 3:35.0,
10 minutes rest between each.
Warming-down.

5th day: Indoor training--calisthenics.

6th day: 1 hour Fartlek over country.

7th day: Rest.

FEBRUARY

Seven-day Schedule to be repeated each week of the month

1st day: 20 minutes warming-up.
5 minutes rest.
20 x 440 yards Interval running, 71 seconds, with 2 1/2 - 3 minutes recovery lap.
Warming-down.

2nd day: 20 minutes warming-up.
5 minutes rest.
8 x 880 yards Interval running, 2:18.0,
with 6-7 minutes slow 880 yards recovery laps.
Warming-down.

3rd day: 20 minutes warming-up.
5 minutes rest.
15 x 440 yards Interval running, 69 seconds, with 2 1/2 - 3 minutes recovery lap.
Warming-down.

4th day: 20 minutes warming-up.
5 minutes rest.
5 x 3/4 miles Repetition running, 3:30.0,
10 minutes rest between each.
Warming-down.

5th day: Indoor training--calisthenics.

6th day: 1 hour Fartlek over country.

7th day: Rest.

MARCH

Seven-day Schedule to be repeated each week of the month

- 1st day: 20 minutes warming-up.
5 minutes rest.
20 x 440 yards Interval running, 70 seconds, with 2 1/2 - 3 minutes recovery lap.
Warming-down.
- 2nd day: 20 minutes warming-up.
5 minutes rest.
5 x 3/4 miles Repetition running, 3:30.0,
10 minutes rest between each.
Warming-down.
- 3rd day: 20 minutes warming-up.
5 minutes rest.
15 x 440 yards Interval running, 69 seconds, with 2 1/2 - 3 minutes recovery lap.
Warming-down.
- 4th day: 20 minutes warming-up.
5 minutes rest.
3 x 1 1/4 miles Repetition running, 5:50.0,
15 minutes rest between each.
Warming-down.
- 5th day: Indoor training--calisthenics.
- 6th day: 1 hour Fartlek over country.
- 7th day: Rest.

APRIL

Seven-day Schedule to be repeated each week of the month

- 1st day: 20 minutes warming-up.
5 minutes rest.
20 x 440 yards Interval running, 60 seconds, with 2 1/2 - 3 minutes recovery lap.
Warming-down.
- 2nd day: 20 minutes warming-up.
5 minutes rest.
5 x 3/4 mile Repetition running, 3:27.0,
10 minutes rest between each.
Warming-down.

- 3rd day: 20 minutes warming-up.
 5 minutes rest.
 15 x 440 yards Interval running, 65 seconds, with 2 1/2 - 3 minutes rest between each.
 Warming-down.
- 4th day: 20 minutes warming-up.
 5 minutes rest.
 3 x 1 1/4 miles Repetition running, 5:50.0,
 10 minutes rest between each.
 Warming-down.
- 5th day: 10 minutes warming-up.
 5 minutes rest.
 4 miles run, 20 minutes.
 Warming-down.
- 6th day: 1 hour easy Fartlek over flat country.
- 7th day: Rest.⁴²

It can be seen from the rather detailed and lengthy schedules how, over a period of six months, the athlete has, by degrees, improved his time over the 440 yard runs by 10 seconds, the 880 yard runs by 12 seconds, and the 3/4 mile runs by 13 seconds. The ultimate objective of this schedule is to run three miles in an average of 70 seconds for each 440 yard lap. By the first week in May, prior to major competition, the training takes on a more severe routine as can be seen from the following weekly schedule.

MAY

- 1st day: 20 minutes warming-up.
 5 minutes rest.
 15 x 440 yards Interval running, 65 seconds, with 2 1/2 minutes recovery lap.
 Warming-down.

⁴²Stampfl, op. cit., pp. 130-135.

- 2nd day: 20 minutes warming-up.
5 minutes rest.
8 x 880 yards Repetition running, 2:10.0,
10 minutes rest between each.
Warming-down.
- 3rd day: 20 minutes warming-up.
5 minutes rest.
2 mile time trial, 9 minutes 20 seconds.
Warming-down.
- 4th day: 20 minutes warming-up.
5 minutes rest.
20 x 440 yards Interval running, 67 seconds, 2 1/2 to 3 minutes rest between each one.
Warming-down.
- 5th day: 20 minutes warming-up.
5 minutes rest.
4 x 1 1/4 mile Repetition running, 5:40.0,
10-15 minutes rest between each.
Warming-down.
- 6th day: 30 minutes easy Fartlek over flat country.
- 7th day: Rest.⁴³

The training has progressed from running predetermined distances of from 440 yards to two miles at a pace slower than racing speed in the fall, to a speed faster than racing speed in the spring and early competitive season.

This principle was applied by the English runner, Roger Bannister, in his build-up for an attempt on the four-minute mile. Bannister, limited by his studies as a medical student, could only manage to train one hour a day, this being usually during his lunch time break from 12:30 p.m. to 1:30 p.m. Basically this is how Bannister approached his

⁴³Stampfl, op. cit., p. 136.

build-up for his record attempt.⁴⁴

In December, 1953, we started a new intensive course of training and ran several times a week a series of ten consecutive quarter miles, each in 66 seconds. Through January and February we gradually speeded them up, keeping to an interval of two minutes between each. By April we could manage them in 61 seconds but however hard we tried it did not seem possible to reach our target of sixty seconds.⁴⁵

To Bannister it was going to be impossible to run a mile in four minutes unless he could run ten consecutive quarter miles in at least sixty seconds, with the customary two minute rest interval between each one. After coming to a standstill at sixty-one seconds, he decided to take a five day vacation to go mountain climbing. Returning from his vacation in early April he found he could now run the quarter miles in sixty seconds or below. It was then he felt sure he was nearly ready to run the world's first four-minute mile. Two weeks before the record attempt his training was as follows:

April 22	10 x 440 yards at an average of 58.9 seconds.
April 23	3/4 mile paced in exactly three minutes.
April 26	3/4 mile in 3:14.0, rest 10 minutes, 3/4 mile in 3:08.6.
April 28	3/4 mile solo in 2:59.9.
April 30	880 yards solo in 1:54.0. Ceased training.

⁴⁴Bannister, op. cit., p. 165.

⁴⁵Ibid., p. 183.

May 6 Competition: 1 mile in 3:59.4.⁴⁶

Gordon Pirie, British record holder for several middle and long distances, used a two and sometimes a three-a-day, workout program. A brief summary of the program he followed leading up to his world record 3,000 meter run in Stockholm, Sweden follows:

- August 3 6 p.m. 8 x 440 yards. Average 60 seconds. Interval jogs 220 yards.
- August 4 11 a.m. 4 x 3/4 mile. Average time 3:11.0. Interval jogs 440 yards.
6 p.m. 15 x 440 yards. Average time 61.5 seconds. Interval jogs 220 yards.
- August 5 Rest and travelling to Freiburg, Germany.
- August 6 Treadmill exercises to exhaustion in Gerschler's clinic.
- August 7 12:30 p.m. 50 minutes strong running.
6 p.m. 1 1/4 hours, including 4 x 1 1/2 miles fast in the forest.
- August 8 12 noon. 10 x 440 yards. 59.0 seconds average. Interval jogs 220 yards.
- August 9 9 a.m. 1/2 hour run in boots.
1 p.m. 8 x 880 yards. Average 2:07.0. Interval jogs 440 yards.
7 p.m. 6 x 880 yards. Average 2:06.0. Interval jogs 440 yards.
- August 10 12:30 p.m. 10 x 440 yards. Average 62.0 seconds. Interval jogs 220 yards.
- August 11 11 a.m. 6 x 3/4 mile. Average 3:16.0. Interval jogs 440 yards.
6 p.m. 8 x 440 yards. Average 58.5 seconds. Interval jogs 220 yards.

⁴⁶Ross McWhorter, "The Long Climb," Athletics World, Vol. II, No. 5, (May, 1954), p. 35.

- August 12 11 a.m. 4 x 880 yards. Average 2:05.0.
Interval jogs 440 yards.
6 p.m. 8 x 220 yards. Average 26.0 seconds.
Interval jogs 220 yards.
- August 13 1 p.m. 4 x 440 yards. Average 56.0 seconds.
6 p.m. 2 x 880 yards, 1:56.1 and 1:57.6.
Interval jog of 880 yards.
- August 14 4 p.m. 40 minute run.
- August 15 12 p.m. 35 minutes fast-and-slow running.
6 p.m. 2 mile race in 8:42.6.
- August 16 12:45 p.m. 3 x 1/2 mile and 3 x 3/4 mile
in 2:08.0 and 3:12.0 respectively.
6:30 p.m. 3 x 1/2 mile and 3 x 3/4 mile,
times as in midday training.
- August 17 12:30 p.m. 15 x 440 yards. Average 62.6 seconds.
Interval jogs 220 yards.
- August 18 Rest and travelling.
- August 19 11 a.m. 3/4 mile in 3:12.0, 1 mile in
4:21.0, 3/4 mile in 3:15.0.
- August 20 12:30 p.m. 6 x 880 yards. Average
2:03.0. Interval jogs 440 yards.
6 p.m. 6 x 880 yards. Average 2:04.0.
Interval jogs 440 yards.
- August 21 12:30 p.m. 4 x 3/4 mile. Average 3:12.0.
Interval jogs 440 yards.
6:30 p.m. 1/2 hour run and weight lifting.
- August 22 12:30 p.m. 8 x 880 yards. Average
2:09.5. Interval jogs 220 yards.
6:30 p.m. 10 x 440 yards. Average 61.0 seconds.
Interval jogs 440 yards.
- August 23 12:30 p.m. 15 x 440 yards. Average 62.5 seconds.
Interval jogs 220 yards.
7:30 p.m. 20 minute run.
- August 24 12:30 p.m. 15 x 440 yards. Average 62.6 seconds.
Interval jogs 220 yards.
7:30 p.m. 20 minute run.

August 25 5 p.m. 16 x 330 yards. Average 46.0 seconds.

August 26 Day lost, had my car stolen.

August 27 12:30 p.m. 25 minute run in heavy rain.
6:30 p.m. 25 x 220 yards. Average 27.5 seconds. Interval jogs 220 yards.

August 28 12:30 p.m. 4 x 880 yards. Average 2:06.0. Interval jogs 440 yards.
6:30 p.m. 3,000 meters in 8:40.0.

August 29 12:30 p.m. 40 minutes fast-and-slow running.
6 p.m. 20 minute jog.

August 30 12:30 p.m. 40 minutes fast-and-slow running.

August 31 Rest.

September 1 Rest.

September 2 7 a.m. 40 minute run. Travelled to Sweden.

September 3 10:00 a.m. 40 minute run.
6:00 p.m. 40 minute run.

September 4 6 p.m. Set up world-record 3,000 meters. Time: 7 minutes 52.8 seconds.⁴⁷

Derek Ibbotson of England, who surpassed Bannister's mile time with a 3 minute 57.2 second mile in 1957, is reported to have used workouts such as these:

Summer training:

Monday: 10 x 440 yards in 62 seconds. Jog 220 after each.

Tuesday: 20 x 440 yards in 62 seconds. Jog 220 after each.

⁴⁷Gordon Pirie, Running Wild, (London: W. H. Allen & Company, 1961), pp. 25-26.

Wednesday: 10 x 440 yards in 62 seconds. Jog 220 after each.

Thursday: 20 x 440 yards in 62 seconds. Jog 220 after each.

Friday: Rest.

Saturday: Race.

Sunday: Run on golf course or play tennis.⁴⁸

Interval running then, as applied by Zatopek, Kuts, Bannister, Pirie, Ibbotson, and Stampfl, involves four variables: (1) distance of the fast run, (2) speed of the fast run, (3) number of repetitions of the fast run, (4) duration of recovery after each fast run.⁴⁹

The first variable, distance of the fast run, can be anywhere from 110 yards to 2 miles. The distance, of course, being determined by the event the athlete will compete in. The 880 yard runner would tend to run distances of 110 yards, 220 yards, 440 yards, and occasionally 660 yards.

The miler on the other hand would probably run 220 yards, 440 yards, 880 yards, and occasionally 1,320 yards. As the athlete's competitive distance increases so does the length of his fast runs in training, so that an athlete who intends to race over the 6 mile or 10,000 meter distance might run 6 x 1 mile or 4 x 1 1/2 miles in a speed the same

⁴⁸Fred Wilt, How They Train, (Los Altos, California: Track & Field News, 1959), p. 28.

⁴⁹Fred Wilt, Run, Run, Run, (Los Altos, California: Track & Field News, 1964), p. 11.

or slightly slower than his intended racing speed.

The 880 yard runner on the other hand would run 8 to 10 x 220 yards or 4 to 6 x 440 yards in a speed slightly faster than the intended racing speed.

The total training volume for each workout may be two to three times the actual racing distance, exclusive of warm-up, and recovery or slow running. An example would be for a miler to run 16-24 x 220 yards, 8-12 x 440 yards, 4-6 x 880 yards. The total distance of these fast runs would be from two to three miles or two to three times the actual intended racing distance.⁵⁰

The second variable, the speed of the repetition runs, again is flexible according to the natural speed of the athlete and to the estimated time the athlete wishes to run his races in. Generally speaking the athlete would try to accomplish the following times during his fast runs:

(1) Repetition 110 yards would be run at a speed 1 1/2 to 2 1/2 seconds slower than the runner's best time. (2) Repetition 440 yards would be run at a speed 3 to 5 seconds slower than the runner's best time. (3) Repetition 440 yards would be run at a time 1 to 4 seconds faster than his average racing pace.

Thus a four-minute miler would run his 440 yard repetitions in from 56 to 59 seconds. Distances longer than

⁵⁰Fred Wilt, How They Train, (Los Altos, California: Track & Field News, 1959), p. 113.

440 yards would be run at racing speed, but the athlete should take care not to run more than half of his racing distance at this speed. For example, a runner who intends to race over the mile distance would run 660 yards and 880 yards at racing speed, but would not attempt to exceed 880 yards at racing speed during his workouts.

Repetitions of longer than half the racing distance would be run at a speed of from 3 to 5 seconds slower per 440 yard. For example, the runner who is aiming at running three miles in fourteen minutes would have to run twelve consecutive 440 yard laps in 70 seconds. If he wanted to run a time trial over two miles, he would try to run each 440 yard lap in from 73 to 75 seconds.

The speed of the repetition runs will increase as the athlete's physical condition improves and he is able to tolerate a faster pace. However, the 110 yard and 220 yard repetitions will not show much speed variation as the best time over these distances achieved by the athlete would tend to remain constant. The speed of the 440 yard repetitions may increase from 1 to 2 seconds each four to six weeks as was evidenced in the schedules of Stampfl and practiced by Roger Bannister.⁵¹

The third variable, number of repetitions of the fast runs, again is very flexible. As already stated, Zatopek

⁵¹Fred Wilt, Run, Run, Run, (Los Altos, California: Track & Field News, 1964), pp. 44-45.

ran as many as sixty repetition 440 yard runs in one workout. Many European runners are known to do the following workouts: 15 x 100 meters in 13 to 14 seconds with a 100 meter jog between each fast dash. This workout is repeated ten times with the athlete taking a 100 meter walk at the end of each set of 15 dashes. This makes a total of one hundred and fifty 100 meter dashes in one workout. This is often used as a morning workout followed by an equally intense workout in the evening.⁵²

The number of the repetitions tends to be related to the mileage desired, and many authorities agree that mileage should be the first consideration in endurance training. Many coaches tend to set their athletes schedules that keep the pace slow but the number of repetitions at a high level. On the other hand if the pace was relatively fast, the number of repetitions would be decreased.

Woldemar Gerschler, coach of Gordon Pirie, said that although Pirie had run 40 x 100 meters during a single workout, he was sure this was too much and would work against the best development of the athlete rather than for it.

The best rule of thumb in determining the number of repetitions that an athlete should run is that when his pulse rate fails to return to 120 to 140 within about 90 seconds after running, the workout should be terminated.

⁵²Ibid., p. 37.

Gerschler has also made the statement that twenty repetitions should be a sufficient number to produce optimum development in a single workout.⁵³

The fourth variable, duration of recovery after each fast run, is again very flexible and can be from the four minute jogs of Bannister to the 45 second jogs of Kuts and Ibbotson. Whereas Bannister would jog a full quarter of a mile rest interval between each fast quarter mile run in about 2 to 4 minutes, Ibbotson would cut the rest interval to about 45 seconds or a short 110 yard recovery jog.

The originator of the formula which brought me the world mile record was a Russian--Vladimir Kuts. During the winter of 1956-7, when I was training one lunch time with Gordon Pirie and Brian Hewson at Chelsea, we began a discussion on schedules. Pirie said he was going to try the Kuts method of reducing the interval between each set run My ambition was to become the leading 5,000 metre runner in the world and avenge the defeat I suffered from Kuts in the Olympic Games. What could be better than to use his own ideas? It was no easy task reducing the interval of rest between each training run, and after much gruelling application I managed to get down to 45 seconds compared to my usual 90 seconds. Most people, including coaches, thought I was mad, but the results proved I was on the right lines.⁵⁴

The rest interval between the fast runs, according to Kuts and endorsed by Ibbotson, should be kept to an absolute minimum. There is a definite scientific basis for this in

⁵³J. Kenneth Doherty, Modern Training for Running, (New Jersey: Prentice-Hall, Inc., 1964), p. 98.

⁵⁴Derek Ibbotson, The 4 Minute Smiler, (London: Stanley Paul & Co., 1960), p. 130.

that the exertion of the heart, as shown by stroke volume, is greatest immediately after the exertion has been completed. The duration of this greatest stroke volume is from 30 to 60 seconds depending upon the intensity of the work and the condition of the athlete.

Professor Joseph Nocker of West Germany came to this conclusion with regard to the rest interval:

We conclude therefore that 30 seconds should be a minimum recovery interval and that, in general, the maximum should not be above three minutes. Frequency of pulse is one valid indicator of recovery. It should not be above 180 at any time and need not be below 120 to 130 at the beginning of the next run.⁵⁵

Leo Lang, National Coach for middle and long distance runners in Yugoslavia, also cites Kuts and reinforces the views of Professor Nocker with the following statement:

Kuts used jog-intervals between his 400 meter runs of only 30 seconds. In winter however he, on an average, used 70 second jog-intervals. He made these short intervals purposely to avoid complete recovery. This could be expressed best by the number of pulse beats: After the run it was up to 170 beats per minute and before the beginning of the next run it was 130. According to the old theories the recovery should be greater, and one should have waited till 90 heart beats per minute. Today we do not think this purposeful.⁵⁶

After severe exercise the heart rate of most healthy athletes will seldom be above 180 beats per minute or 30 beats in 10 seconds. Ideally the athlete should allow a

⁵⁵J. Kenneth Doherty, Modern Training for Running, (New Jersey: Prentice-Hall, 1964), pp. 102-103.

⁵⁶Fred Wilt, Run, Run, Run, (Los Altos, California: Track & Field News, 1964), p. 106.

recovery interval long enough for his heart rate to return to two-thirds of the maximum of 180 or to about 120 beats per minute. Generally speaking this will take approximately 1 1/2 minutes if the athlete walks between the fast runs and about 2 minutes if he jogs. If after 1 1/2 minutes the pulse has not returned to 120 beats per minute, the fast run was either too long or too fast. In this case the athlete should either reduce the speed or the distance of the fast runs. If on the other hand the pulse fails to reach the 170-180 range, the fast run was either too slow or the distance run was too short.⁵⁷

In preparation for the 1956 Olympic Games in Melbourne, Australia, the Russian Vladimir Kuts was observed doing the following training by British Olympian Ken Norris:

At the 1956 Olympic Games in Melbourne, Kuts was running 25 x 440 in approximately 65 seconds each, jogging only 110 yards after each, before starting the next 440. This 110 yards jogging took about 30 seconds. Sometimes he jogged only 60 to 70 yards after each 440. He took this 25 x 440 workout every other day. His training on the alternate days varied. Sometimes he ran 2 to 3 hours fartlek running, and sometimes an intensive interval run. Gordon Pirie tells me he saw Kuts running 6 x 3/4 in 3:15 each, with a 50-60 yard jog after each, and on other days a series of 880 yards in 2:00 with the same 50-60 yard jog after each!⁵⁸

The type of recovery interval can also vary from jogging, walking, sitting, or lying on the ground. Most

⁵⁷Ibid., p. 46.

⁵⁸Fred Wilt, How They Train, (Los Altos, California: Track & Field News, 1959), p. 85.

modern day proponents of Interval running seem to agree that the most beneficial interval is spent either jogging or walking, with jogging being considered better as this movement forces the body to break contact with the ground and thereby using more energy.⁵⁹

Tom Courtney, 1956 Olympic 800 meter champion, reported seeing the great trio of Hungarian world record holders, Istvan Roszavolgyi, Sandor Iharos, and Laszlo Tabori workout in 1955.

Their workout consisted of a long warm-up followed by 5 x 400 meters in 55 seconds with a 400 meter recovery interval between each one. This was followed by the same 5 x 400 meters in 55 seconds with a 200 meter jog interval, and another 5 x 400 meters in 55 seconds with only a 100 meter jog interval. As the amount of fatigue increased the rest interval was decreased!⁶⁰

Interval running then, by its very nature of repeated timed runs, provides maximum incentive for continued practice and development. Other values are: (1) it permits the athlete to plan ahead of time a definite program, (2) allows the athlete to measure his progression, (3) permits training in pace judgment, (4) gives the athlete an attainable goal

⁵⁹J. Kenneth Doherty, Modern Training for Running, (New Jersey: Prentice-Hall, 1964), p. 96.

⁶⁰Ibid., p. 95.

to reach every day, and (5) is flexible in that duration of fast runs and rest intervals can be varied according to fitness, conditions, and goals one hopes to attain.⁶¹

III. THE LYDIARD SYSTEM OF TRAINING

The successes of New Zealanders Peter Snell, Murray Halberg, John Davies, Barry Magee, Bill Baillie and many others, caused many coaches to investigate their training program. They found that they were all trained by Arthur Lydiard, one of the outstanding athletic coaches of all time. He produced three Olympic medal winners in the Rome games, Snell and Halberg winning gold medals and Magee winning a bronze medal. These same athletes were to later break six world distance running records.⁶²

The basis for Lydiard's success seems to be the development of a marathon training program that involves running 100 miles a week for a four month period. This training is undertaken by all his athletes, whether they intend to run the 880 yard dash or run the marathon as a competitive event.

The typical Lydiard weekly schedule would look something like this:

⁶¹J. Kenneth Doherty, Modern Track & Field, (New Jersey: Prentice-Hall, Inc., 1963), p. 177.

⁶²Arthur Lydiard, Run to the Top, (London: Herbert Jenkins, 1962), p. 13.

Monday: 10 miles over hills and along roads or cross country at 1/2 effort.

Tuesday: 15 miles at 1/4 effort over hills and roads.

Wednesday: 12 miles fartlek (speed play).

Thursday: 18 miles at 1/4 effort.

Friday: 10 miles, 3/4 effort on the road.

Saturday: 20 miles, 1/4 effort.

Sunday: 15 miles, 1/4 effort.⁶³

Lydiard's training schedules are all based on his own personal experiences as an athlete and New Zealand marathon champion. He found that marathon training enabled him to run faster on the track and over the shorter distances. His training consisted of running distances of up to thirty miles through the Waitakere Ranges which border the north-western side of Auckland. He was so determined to find just what the human body would stand without actually cracking that he frequently exhausted himself completely and had to walk the last few miles home.⁶⁴

In early 1953 two young Auckland junior runners came to Lydiard for advice. They were Murray Halberg, a skinny nineteen year old with a withered left arm, and Barry Magee. Lydiard immediately introduced them to his marathon training with startling results. At the end of their first season

⁶³Ibid., pp. 25-26.

⁶⁴Ibid.

they were both running near New Zealand record times, Halberg at the one and two mile distances, and Magee at three and six miles.⁶⁵

The marathon-type training advocated by Lydiard involves running one hundred miles a week for ten weeks for a total of 1,000 miles.⁶⁶ Snell, in his build-up for the 1964 Olympic Games could never run more than three consecutive weeks of one hundred miles, but managed to run 1,012 miles in this same period of time.⁶⁷

This ten week period is followed by six weeks of hill training, running about sixty miles a week. The marathon-type training has enabled the athlete to run long distances with ease; the hill training is to give him the sharp edge to run at a fast pace. For this purpose a hill about half a mile long is found. It should have an approximate quarter mile flat section at the bottom and also at the top. Lydiard's athletes spring up the hill on their toes using an exaggerated knee lift but making sure the upper body is completely relaxed. The emphasis should be more on the springing action than on the speed.

When the top of the hill is reached he jogs very easily for about half a mile to recover before starting the

⁶⁵Ibid., p. 29.

⁶⁶Ibid., p. 60.

⁶⁷Peter Snell, No Bugles, No Drums, (Auckland: Minerva Limited, 1965), pp. 168-169.

second phase, which is running back down the hill, striding out fully relaxed with both arms swinging straight through.

Back on the bottom of the hill he runs a series of short, sharp sprints, something in the nature of 3 x 220 yards or 6 x 50 yards, alternating the 220's and the 50's at the completion of each hill run. The hill is covered both ways four times in each session.

According to Lydiard, the value of the hill running is twofold. Firstly, the springing uphill teaches relaxation, better balance, and forces the legs to work a lot harder than they do in any other form of training. It puts spring into a normal stride without necessarily lengthening the stride. Secondly, the downhill running forces the athlete to extend his stride right out and exercises the stomach muscles.⁶⁸

At the completion of this sixteen week period the athlete is ready to begin a twelve week period of track training in which the weekly mileage is increased to about seventy miles a week. The first six weeks of this track training primarily primes the athlete for the track races ahead in the next six weeks. It includes repetition fifty yard sprints in which the athlete marks the track out in alternate fifty and sixty yard sections. He then proceeds to sprint, flat out, over the fifty yard section and floats the sixty yard section to the next fifty yard start.

⁶⁸Lydiard, op. cit., pp. 76-77.

The short sprint work is mixed in with repetition runs over distances of 220, 440, and 880 yards, and steady runs over two to six miles.

The second six week period consolidates the previous work and includes time trials, races under and over the proposed racing distance, and preparing for major competition.⁶⁹

Lydiard's training schedule for a miler during the first of this twelve weeks track training period would be:

- Monday: Run two miles at 1/4 effort.
- Tuesday: Run 4 x 880 yards at 1/4 effort.
- Wednesday: Stride out over 300 yards and repeat twelve times; run 880 yards at 1/2 effort.
- Thursday: Run six miles at 1/4 effort.
- Friday: Run 6 x 220 yards at 1/4 effort.
- Saturday: Run one mile at 1/4 effort and one mile at 1/2 effort.
- Sunday: Go for a long run of, say twenty miles.⁷⁰

The ninth weeks training has progressed to more shorter distance speed work, but the long twenty mile run is still present.

- Monday: Run fifty-yard dashes for three miles.
- Tuesday: Run a time trial over three quarters of a mile.
- Wednesday: Run 6 x 440 yards at 3/4 effort.

⁶⁹Ibid., p. 80.

⁷⁰Ibid., p. 96.

Thursday: Run three miles at $3/4$ effort.

Friday: Run 3 x 220 yards at full effort.

Saturday: Compete in an 880 yard race.

Sunday: Go for a long run of, say twenty miles.⁷¹

This is the training program that Snell followed in the months prior to his world records over 800 meters, 880 yards, and one mile in early 1962. Between April and December of 1961 Snell completed Lydiard's full marathon training and the strenuous hill-training. In early December he competed in a twenty-six mile marathon race, and actually was with the leaders until he eased down with four miles to go.

On January 1, 1962, with only two and one half weeks of actual speed-work on the track, he ran a mile in 4:01.3. During the following five weeks he recorded times of 1:48.3 and 1:47.3 for 880 yards, 1:46.2 for 800 meters, and then world records of 3:54.4 for the mile and 1:45.1 and 1:44.3 for the 880 yards and 800 meters.⁷²

The first mile in 4:01.3 was run after Snell had galloped through a ten mile run the previous morning, run 10 x 880 yards in 2:10.0 that same evening, and on the morning of the race he ran another ten miles!⁷³

⁷¹Ibid., p. 98.

⁷²J. Kenneth Doherty, Modern Training for Running, (New Jersey: Prentice-Hall, Inc., 1964), p. 211.

⁷³Snell, op. cit., pp. 84-85.

Although Snell is not a particularly fast athlete, his best 220 is only 22.4; his tremendous strength enables him to maintain a speed close to his maximum for a greater length of time. Snell explains his world record 880 yard performance this way:

I was able to run the first quarter of this race as men like Mal Whitfield and Tom Courtney had done before me--within a few seconds of the best I could manage for a quarter--but where they weakened badly in the second quarter, my stamina, built up through marathon type training, was able to combat the dreaded oxygen debt and chip in another quarter with comparatively little speed loss.⁷⁴

Lydiard, in addressing a group of South African athletes and coaches, made the following statements:

Firstly, my aim with you is to get you basically fit and healthy, to gain sufficient stamina to maintain the necessary speed over the distance trained for.

Take a 1:50.0 880 yards for instance. It is only two 55.0 second quarter miles. Most South African half milers can run 50-52 seconds for 440 yards, proving that they have the speed but not the stamina to maintain the speed. These same athletes persist in training for more speed each year instead of stamina, consequently they don't achieve their ambition. It is not easy to acquire this necessary stamina, and many hours of running over distances is required to develop the organs and condition the body for the hard racing ahead. Athletes I train do a great deal of long running. They also do more speed work than most other athletes, which they could never do without the distance work.⁷⁵

⁷⁴Ibid., p. 99.

⁷⁵Arthur Lydiard, Running Training Schedules, (Los Altos, California: Track & Field News, 1965), p. 6.

The Olympic 800 meter final in Rome was a very good example of how increased stamina will help maintain basic speed over a longer period of time. Snell and Roger Moens of Belgium were the slowest 220 men in the final yet they finished first and second respectively. George Kerr of the British West Indies had run both the 220 and 440 considerably faster than the other two but could not match their finishing drive because he lacked the stamina to keep up the fast running all the way without exhausting his reserves.⁷⁶

The 1964 Olympic Games in Tokyo gave further evidence of Snell's tremendous stamina. In a period of seven days he won six races, including the final of both the 800 and 1,500 meters, against the best opposition in the world. His times of 1:49.0, 1:46.9, and 1:45.1 for 800 meters and 3:46.8, 3:38.8, and 3:38.1 for 1,500 meters were among the best in the world for that year. His finishing speed for the 1,500 meters was the most awesome yet witnessed--52.6 for the last 400 meters and 25.4 seconds for the last 200 meters.⁷⁷

The Lydiard system is one that is built on marathon training, sharpened on hill running and honed to a fine edge on speed work practiced on the track. The key to success,

⁷⁶Arthur Lydiard, Run to the Top, (London: Herbert Jenkins Ltd., 1962), pp. 52-53.

⁷⁷Melvyn Watman, "Tokyo Olympic Report," Athletics Weekly, Vol. 18, No. 45, (November 7, 1964), p. 29.

though, lies in the marathon training for without this background the system cannot work.

Kenneth Doherty believes that American coaches and athletes would do well to follow the Lydiard system and that adoption of this system of training would help to improve the standard of American distance running.⁷⁸

⁷⁸J. Kenneth Doherty, Modern Training for Running, (New Jersey: Prentice-Hall, Inc., 1964), p. 120.

CHAPTER III

A TRAINING PROGRAM FOR HIGH SCHOOL

DISTANCE RUNNERS

From the evidence presented it would appear that the application of any of the training programs discussed would bring about similar results. This has caused many high school coaches to select a certain system of training and directly apply it to athletes under their supervision.

However, instant success does not come from directly applying Stampfl's training schedules or running up 80 foot sand hills. There are many factors to be considered before setting up a training program for the high school athlete.

A thorough medical examination should be required of all participants in the program. Providing this examination shows no physical defects, other factors should be taken into consideration. Is he hopelessly out of shape? Does he need to drastically lose weight? Is his running form a definite handicap? Does he have the right mental attitude? Is his sole objective an award or letter or does he genuinely desire to improve himself? These are questions the coach must be able to answer.

After appraising his personnel for the distance running program, the coach should set realistic and attainable goals for each member of the squad. These should be goals

that the coach feels the athlete is capable of reaching provided he works hard and diligently. For some squad members this goal might be a five minute mile; for others it might be a six minute mile.

Equipment should be issued to the athletes at the beginning of school in September. For the distance runner the main equipment is shoes. These must be a well made, proper fitting track warm-up shoe such as manufactured by Adidas, Puma or Tiger. The cheaper, canvas track shoes tend to force the toes up in the air and let the heels fall too much resulting in sore or strained calf muscles and sometimes a severely strained Achilles tendon. Comfortable shorts and cotton tee shirts should be worn during the workout. Sweat suits are an unnecessary burden and should not be worn unless the temperature gets into the low 40°'s. Too many boys feel that they are athletes as soon as they put on a school sweat suit and are content to jog around a track in 80° weather achieving nothing more than a good sweat.

A group of suitable training areas, free from hazards, should be mapped out. These could be the track, football field, park, road, beach, golf course, or any place where it is possible to run. The more varied the training courses, the less likelihood there will be of the athlete getting bored and quitting.

The first workout should be on a track or grassed area where the coach can fully supervise the running form of

all the athletes. Correct form should be demonstrated, but no effort should be made to change a boy's natural running style unless it is definitely going to hold back improvement. The main thing here to be concerned with is foot placement. The athlete should land on the ball of his foot, rock back slightly onto the heel, move onto the ball again, and then push off with the toes. The toes should point straight ahead and the foot should be placed down on the track directly below the knee and not out in front of it. Overstriding is a common fault among many young distance running hopefuls. A short stride is more economical and less tiring than a long stride.

The actual training program should begin as soon as possible after taking care of all preliminary matters. It is never too soon to start training. Ideally, top class runners will train the year round and even top class high school runners today train twice a day.⁷⁹

The actual training program that follows takes into consideration two factors that most books on the subject do not consider. First, the weather in the Texas Gulf Coast area in September makes hard, long sustained workouts very unwise. Excessive loss of body fluids and subsequent heat exhaustion limit the duration of the workouts. Secondly, it

⁷⁹Fred Wilt, Run, Run, Run, (Los Altos, California: Track & Field News, 1964), p. 1.

is assumed that the athletes are in rather poor physical condition for running and, therefore, need to start off rather slowly.

Bearing these factors in mind, the following training program is suggested for the month of September:

September, first week:

- Monday: Run very easy for about 2 miles.
- Tuesday: Run very easy for 1 mile.
Run 6 x 110 yards in about 20.0 seconds each.
Walk 110 yards after each one.
Run very easy for 1 mile.
- Wednesday: Run very easy for about 3 miles.
- Thursday: Run 1 mile in 7:00.0 to 8:00.0 minutes.
Walk 440 yards.
Run 5 x 110 yards in 20.0 seconds each.
Walk 110 yards after each one.
Walk for 5:00.0 minutes.
Run 1 mile in 7:00.0 to 8:00.0 minutes.
Walk 440 yards.
Run 5 x 110 yards in 20.0 seconds each.
Walk 110 yards after each one.
- Friday: Run 1 mile in 7:00.0 to 8:00.0 minutes.
Stride through 880 yards in 3:00.0 minutes.
Run 1 mile in 7:00.0 to 8:00.0 minutes.
Stride through 880 yards in 3:00.0 minutes.
- Saturday: Run 2 miles in 14:00.0 to 15:00.0 minutes.
Walk for 880 yards.
Run 4 x 110 yards in 20.0 seconds each.
Walk 110 yards after each one.
- Sunday: Rest.

It will be noted that in this first week of training the total distance run never exceeded three miles and that

the fastest pace attempted was only at an eighty second 440 yard pace. Most athletes would probably find this schedule rather easy, but it should be stressed most emphatically that nothing can be gained by starting out too ambitiously. The times specified should be strictly adhered to and the athletes should be warned about trying to run any faster than the schedule calls for. The same thing, of course, applies about running too slow. The total time for the workout should not exceed one hour. In fact, this is another point that should be stressed and that is that valuable time should not be wasted during workout periods. All of the above workouts can easily be completed during a fifty minute Physical Education class. The second weeks schedule would be as follows:

September, second week:

- Monday: Run 1 mile in 7:30.0 minutes.
Walk for 5:00.0 minutes.
Run 6 x 110 yards in 19.0 seconds each.
Walk 110 yards after each one.
Walk for 5:00.0 minutes.
Run 1 mile in 7:30.0 minutes.
- Tuesday: Run 4 x 110 yards in 19.0 seconds each.
Walk 110 yards after each one.
Run 6 x 220 yards in 40.0 seconds each.
Jog 220 yards after each one.
Run 4 x 110 yards in 19.0 seconds each.
Walk 110 yards after each one.
- Wednesday: Run 3 to 5 miles at a speed no slower than 8:00.0 minutes per mile and no faster than 7:00.0 minutes per mile.
- Thursday: Run 4 x 220 yards in 40.0 seconds.
Jog 220 yards after each one.
Run 4 x 440 yards in 80.0 seconds.

Jog 220 yards after each one.
 Run 4 x 220 yards in 40.0 seconds.
 Jog 220 yards after each one.

Friday: Run 2 miles over a cross country course or around a suitable grassed area in a speed of about 6:30.0 to 7:30.0 minutes per mile.
 Walk or rest for 5:00.0 to 10:00.0 minutes.
 Run 5 laps of sprint-jogs.

A sprint-jog means walk 55 yards, jog 55 yards, stride 55 yards, and sprint 55 yards. This is then repeated with the athlete running two of these each lap of a 440 yard track. The acceleration from jogging to striding and then to sprinting should be done smoothly and without any great noticeable sudden change in running action. This type of running is excellent conditioning if practiced correctly. It has to be fairly well controlled to make sure the runner does not jog, stride, or sprint the whole distance. It is good practice to finish the sprint at the usual finish line of a race so that the athlete gets the feel of accelerating toward the end of a race.

Saturday: A fairly long run of from 4 to 7 miles should be attempted with no effort made to run for time or a certain pace.

The object of this run is to build in strength and stamina by continuous running and to break through the "fatigue barrier" that the athlete will probably experience after about 3 miles. The whole workout is wasted if the athlete starts to walk or stops at any time. The time it takes to complete the run is of no consequence just as long

as the athlete maintains a pace faster than a jog. It can be as slow as 9:00.0 to 10:00.0 minutes per mile or as fast as 6:00.0 to 7:00.0 minutes per mile. However, the importance of maintaining a constant pace should be stressed.

Sunday: Rest.

September, third week:

Monday: Run 10 x 220 yards in 38.0 to 40.0 seconds.
Jog 220 yards after each one.
Jog for 2:00.0 minutes after each one.

Tuesday: Run 4 x 880 yards in 3:00.0 minutes.
Jog for 5:00.0 minutes after each one.

Wednesday: Run 2 miles no faster than 13:00.0 minutes and no slower than 14:00.0 minutes.
Walk for 10:00.0 minutes.
Run 4 laps of sprint-jogs.

Thursday: Run 4 x 220 yards in 38.0 to 40.0 seconds.
Jog 220 yards after each one.
Run 6 x 440 yards in 80.0 seconds.
Jog 220 yards after each one.
Run 4 x 220 yards in 38.0 to 40.0 seconds.
Jog 220 yards after each one.

Friday: Run 5 x 660 yards in 2:00.0 minutes.
Walk 220 yards after each one.

Saturday: A fairly long run of from 5 to 8 miles bearing in mind the same instructions as were given for the run last Saturday.

Sunday: Rest.

September, fourth week:

Monday: 10 x 440 yards in 78.0 seconds.
Jog a very slow 220 yards in no more than 2:30.0 minutes after each one.

Tuesday: Run 8 x 110 yards in 17.0 to 18.0 seconds.
Walk 110 yards after each one.
Run 2 x 880 yards in 2:40.0 minutes.

Jog for 5:00.0 minutes after each one.
 Run 8 x 110 yards in 17.0 to 18.0 seconds.
 Walk for 110 yards after each one.

- Wednesday: Run 1 mile in 7:00.0 minutes.
 Jog very slowly for 10:00.0 minutes.
 Run 1 mile in 6:30.0 minutes.
 Jog very slowly for 10:00.0 minutes.
 Run 1 mile in 6:00.0 minutes.
 Jog very slowly for 10:00.0 minutes.
 Run 4 laps of sprint-jogs.
- Thursday: Run 3 x 880 yards in 2:40.0 minutes.
 Jog for 5:00.0 minutes after each one.
 Run 6 laps of sprint-jogs.
- Friday: Very easy light run from 2 to 4 miles.
- Saturday: Competition or time trial over one and one-half miles.

If no cross country races are being held, then arrange a one and one-half mile time trial over an accurately measured cross country course. If possible the course should be accurately marked at each half mile and the times of the runners carefully recorded at these points. The athletes should endeavor to maintain as even a pace as possible. There should not be more than a five second variation in time from the fastest to the slowest half mile section.

This time trial or race should give the coach and athlete a guide as to how the training program is progressing. Each athlete's final time and intermediate half mile times should be carefully analyzed, together with his condition at the end of the race. From this the coach can decide whether the athlete needs to spend more of his time on long steady runs developing more strength and stamina or on sprint-jogs

and shorter Interval work to build in speed. The training program over the next few months will be based mainly on the results of this race and subsequent time trials and races.

No rigid program is suggested for the next few months as the needs of each individual athlete will vary considerably according to their rate of development and progress. The coach must be constantly on the lookout for signs of extreme fatigue, boredom, lack of interest, and enthusiasm. The athlete must be kept enthused all the time if he is to experience any degree of success.

Probably the best way to keep an athlete enthused is to vary his training program, avoid monotony, continually encourage him, and give him a chance to succeed or show improvement in his races or time trials. Do not make them workout over the same course or on the same track day after day. Change the venue every now and then and introduce new ideas to avoid monotony.

Running up the side of a hill at a good fast pace can be substituted for the 110 or 220 yard Interval workouts. The woods, golf course, or beach are a refreshing change to the athlete who has spent many hours running around a cinder track. Training should be fun and not drudgery. No athlete can succeed if he does not enjoy the workouts and does not experience a feeling of accomplishment at the conclusion of each workout.

If the athlete's workout consists of running 10 x 440 yards, he should be accurately timed over each 440 yard repetition. These times should be carefully recorded and averaged at the conclusion of each workout. Training diaries should be kept by both coach and athlete and every workout carefully written down together with comments about the weather, running conditions, and degree of fatigue experienced. This way improvement can be studied and the relative effectiveness of different workouts compared.

Further fall workouts would consist basically of strength work (Interval running over 440 yards, 880 yards, 1,320 yards, etc.), speed work (sprint-jogs and fast strides over 110 and 220 yards), and stamina work (long, slow runs over distances of from 5 to 15 or 20 miles).

Bob Timmons, Jim Ryun's high school coach, calculated that Ryun ran over 4,380 miles his junior year in high school for an average of 12 miles per day every day of the year!⁸⁰

The main emphasis in the fall and winter should be on strength and stamina work. As the season progresses more emphasis should be placed on strength and speed and less on stamina until by the latter part of the season the workouts consist mainly of fast strides, pace work, and sprint-jogs

⁸⁰Cordner Nelson, The Jim Ryun Story, (Los Altos, California: Track & Field News, 1967), p. 71.

with only occasional long runs. The speed work is best done on a grassed area such as a football field to prevent muscle soreness from running on the hard tracks.

The following training program could be followed in the early part of the track season:

Monday:	<u>Milers</u>	10 x 440 yards at a pace 2.0 seconds faster than that which the athlete expects to maintain in a race. Jog 440 yards in 3:00.0 minutes after each one.
	<u>Half-milers</u>	8 x 220 yards at a pace 1.0 second faster than racing speed. Jog 220 yards in 2:00.0 minutes after each one.
Tuesday:	<u>Milers</u>	3-4 x 880 yards at racing speed. Walk and jog 5:00.0 minutes after each one.
	<u>Half-milers</u>	4 x 440 yards at a pace 2.0 seconds faster than racing speed. Jog 440 yards in about 3:00.0 minutes after each one.
Wednesday:	<u>Milers</u>	30 x 110 yards in 16.0 to 17.0 seconds. Jog 110 yards after each one.
	<u>Half-milers</u>	20 x 110 yards in 14.0 to 16.0 seconds. Jog 110 yards after each one.
Thursday:	<u>Milers and half-milers</u>	5 to 8 miles Fartlek type running with the milers putting more emphasis on striding distances of from 200 to 700 yards and the

half-milers concentrating on bursts of a shorter distance and faster speed.

Friday: Very easy running or rest completely.

Saturday: Competition.

Sunday: Milers A long slow run of from 7 to 10 miles.

Half-milers A long slow run of from 5 to 7 miles.

Toward the latter part of the season the training program would be along the following lines:

Monday: Milers 8 x 440 yards in a speed 2.0 to 3.0 seconds faster than racing pace.
Jog 220 yards in 2:00.0 to 3:00.0 minutes after each one.
6 laps of sprint-jogs.

Half-milers 8 x 220 yards in a speed 2.0 seconds faster than racing pace.
Jog 220 yards in 2:00.0 to 2:30.0 minutes after each one.
6 laps of sprint-jogs.

Tuesday: Milers 12 x 220 yards at a speed 4.0 to 5.0 seconds faster than the athlete hopes to maintain in a race.
Jog 220 yards in 2:00.0 minutes after each one.

Half-milers 12 x 110 yards fast sprints at a speed 1.0 to 2.0 seconds faster than race pace.
Walk-jog 110 yards after each one.

Wednesday: Milers 2 to 3 x 880 yards at race pace.
Jog 5:00.0 minutes after each one.
4 laps of sprint-jogs.

in the school swimming pool.⁸¹

However, it should be emphasized that these are supplemental training aids and should never take the place of running. Any recreational activity such as tennis, swimming, soccer, etc., should also be encouraged as a means of active relaxation from the rigorous daily training.

⁸¹Ibid., p. 35.

CHAPTER IV

SUMMARY AND CONCLUSIONS

Summary

It was the purpose of this paper to investigate the various techniques used in training distance runners and from this investigation develop a program for training high school distance runners.

The first method of training investigated was the Fartlek system. This system, originated by Swedish coach Gosta Holmer, is one of unregimented freedom in which the athlete runs as he feels over varied terrain.

Gundar Haegg, Swedish multi-world record breaker, used this system of training by running long distances through snow covered forests and training on forest paths at varying tempos of pace. Haegg's successes were followed by a series of record performances by Swedish athletes that gave that country the lead in the distance running events until the early 1950's.

The dominance of the Swedish runners was followed by a succession of great performances by Australian athletes led by Olympic champion Herb Elliott. Most of these athletes were trained by Percy Cerutty, a small wiry man, who at the age of seventy, would run with his athletes over the rugged Victorian coast line near his beach home.

Cerutti's training methods included running many miles over sand hills, beaches, mountain paths, lifting heavy weights, and anything of a strenuous, taxing nature. Cerutti believed that an athlete's training should be enjoyed, and not a demanding task that must be undertaken every day.

The Fartlek system of running contrasts somewhat to the second system investigated; namely, the Interval system of running made popular by Franz Stampfl.

The Interval system involves running repeated distances on a track at a predetermined pace. Each fast run is followed by a slow run or recovery interval. The value of this system lies in its adaptability to individual needs or coaching situations. Training schedules can be set far in advance and specific goals can be set and worked toward while individual progress can be noted.

The third system is a combination of both Fartlek and Interval running with the addition of long slow marathon-type running. Called the Lydiard system, after New Zealand coach Arthur Lydiard, it involves running about 100 miles a week at a relatively slow pace. The distance is then gradually shortened and the pace increased as the competitive season approaches. Lydiard stresses the importance of long runs of up to 25 miles but also requires his athletes to run short sprints of from 50 to 300 yards.

From these three systems a training program for high school athletes was developed. This program involved Interval running with occasional long runs in the fall and progressed to more Interval running at faster speeds and Fartlek running in the competitive season.

Conclusions

On the basis of evidence revealed in this investigation and other related studies, it appears that the following conclusions can be assumed:

1. All three systems of training have a definite place in the conditioning of athletes.
2. The Fartlek system would be more suitable to an older, more mature athlete because of its freedom.
3. The Interval system would be better suited to high school and college coaches because of its adaptability and ease of supervision.
4. The Lydiard system has its definite advantages but would be of more benefit to long distance runners than to high school athletes.
5. The program presented for high school runners is best suited to the climatic conditions encountered by Gulf Coast area high school athletes.

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