ARTHUR LYDIARD I GARTH GILMOUR

RUNNING WITH LYDIARD

GREATEST RUNNING COACH OF ALL TIME

FOREWORD BY TERRY CRAWFORD
DIRECTOR OF COACHING, USATF

MEYER & MEYER SPORT

Running With Lydiard

ARTHUR LYDIARD I GARTH GILMOUR

RUNNING WITH LYDIARD

GREATEST RUNNING COACH OF ALL TIME

Meyer & Meyer Sport

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

Running with Lydiard
2nd revised edition 2017
Maidenhead: Meyer & Meyer Sport (UK) Ltd., 2017

Aachen, Auckland, Beirut, Budapest, Cairo, Cape Town, Dubai, Hägendorf,
Indianapolis, Maidenhead, Singapore, Sydney, Tehran, Vienna


Member of the World Sport Publishers' Association (WSPA)
www.w-s-p-a.org
ISBN: 978-1-78255-784-5
E-Mail: info@m-m-sports.com
www.m-m-sports.com

Contents

Foreword

When I began my coaching career more than four decades ago, I had just retired from competitive running and was an eager young coach who wanted to provide my athletes with the best opportunity to reach the same goals I had aspired to as an athlete. At this time, there were no formal coaching education programs nor a plethora of digital information available to increase one's knowledge; there was only the written word of highly respected coaches whose work centered around the success of the athletes they coached. Arthur Lydiard was first made famous by the huge success of legendary runners like Peter Snell and Murray Halberg, 1960 Olympic medalists from New Zealand. Like the rest of the athletic world, I was eager to learn the methods and training philosophy of their mentor and coach. So I began researching and collecting publications about Arthur Lydiard's coaching philosophy. As lifelong learners, coaches must continue to add to their library of knowledge to have a sound coaching philosophy.

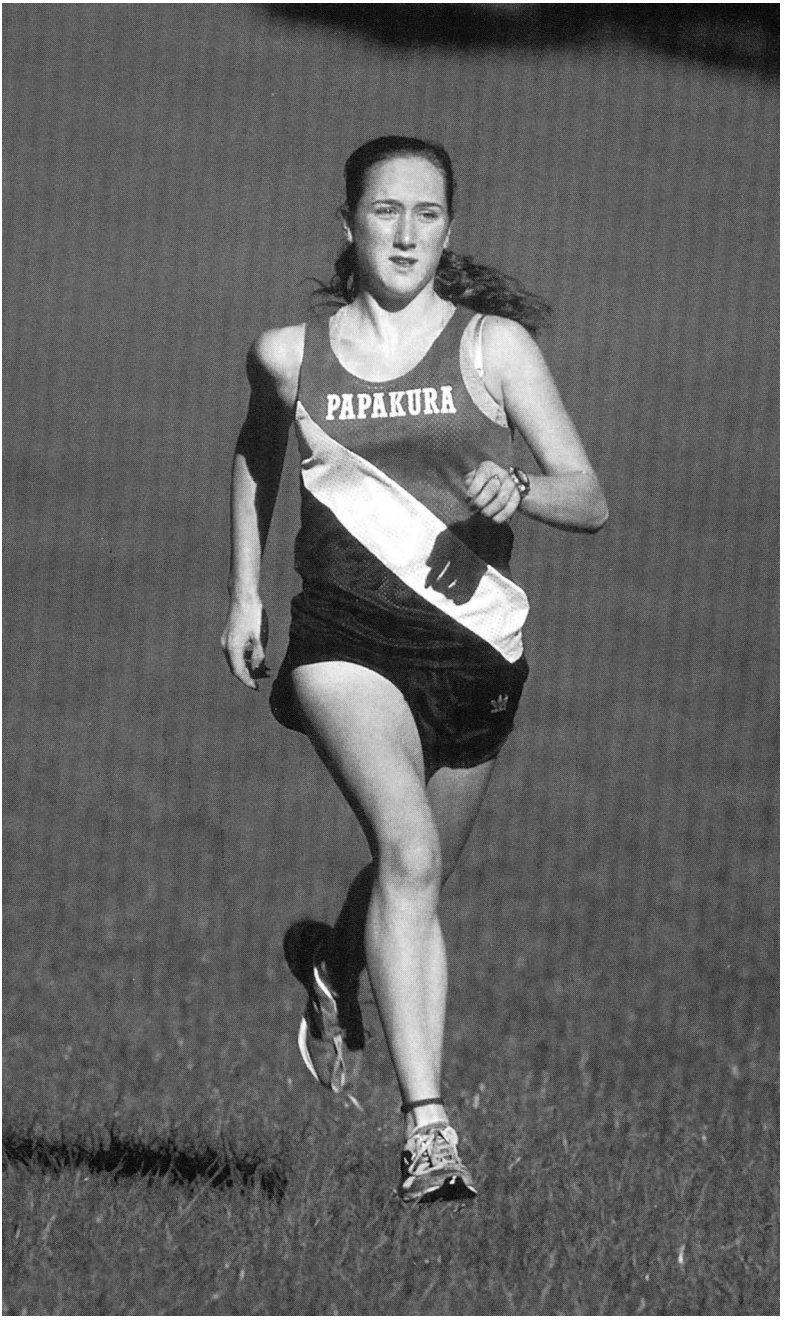
Arthur Lydiard's books have provided the applied science knowledge to coaching that allows every coach—regardless of academic background—to understand "why I do the things I do as a coach." The uniqueness of the human body makes it necessary for every coach to understand the physiology of human performance. Arthur Lydiard not only applies that evidenced-based knowledge to his training programs, but he also relates it in terms that can be understood by the average runner or aspiring coach or even the veteran coach who is looking for an affirmation of his training regimen.

How fortunate for 21st century coaches to have a new edition of Lydiard's wisdom and practical knowledge to add to their library! The work of legends is best validated by the test of time. This new edition of *Running With Lydiard* contains the Lydiard methodology and training regimens from which every coach or endurance runner

will be inspired to follow in this 21st century of wellness and running, be it for leisure and health or for breaking records. Whether into the coaching profession two or twenty years, this is a must-read for every coach!

Terry Crawford

Director of Coaching, USA Track & Field


PAPAKURA

Introduction

In 1961, in the foreword to *Running to the Top*, the first book Arthur Lydiard and I wrote together, I said he was one of the most outstanding athletic coaches of all time.

Twenty-one years later, when we produced *Running with Lydiard*, an updated sequel, I wrote that it was now doubtful if there would ever be another coach who would even equal the impact Lydiard had made on physical conditioning as a prerequisite to sporting achievement in any field and as a way of life for millions of happy joggers and fun runners.

Now, fifty-six years later, there is no room for doubt. Lydiard's training and conditioning methods have not been bettered. They have not been equalled. They have become, in one form or another, the training basis of virtually every successful athlete – the variation being that the more complete the adoption of the Lydiard way, the higher the degree of success is likely to have been.

Arthur Lydiard, who was unknown when his athletes astounded the world by winning three medals at the 1960 Olympic Games in Rome – Murray Halberg (5,000 metre gold), Peter Snell (800 metre gold) and Barry Magee (marathon bronze) – is an international athletic and physical fitness icon without peer.

Lydiard had the magical combination of conditioning savvy, peaking expertise and psychological understanding and encouragement that enabled him to take any average athlete and, with that athlete's faith and full co-operation, produce an outstanding sports achiever.

Lydiard's methods are freely available to anyone who wants to use them, and his system has been applied, with success, to the conditioning of football players, cyclists, canoeists and kayakers, squash players, gridiron footballers, triathletes and duathletes, pentathletes, tennis players ... the list goes on. It has a place in every sporting activity because its fundamental aim is to build a high level of basic fitness on which the specific skills of any sport can be balanced.

The millions who were caught in the world-wide flood of interest in jogging, which Lydiard and friends launched in New Zealand in 1962, could testify that the same fitness basis has contributed to improved work performance, to better sleep patterns, to greater interest in everyday activities and, if not to longer life, then to greatly enhanced enjoyment of the later years when, in the past, people began looking downhill all the way to the cemetery.

The story of how Lydiard evolved his revolutionary training method has been told many times, but its bare bones bear repeating because they explain how thorough was his research into perfecting it. At the outset, he did not plan to become a champion; he had no intention of producing champions; he had no idea of changing the way the running world approached training methods. He was merely concerned, in 1945, that he was not as fit as he thought he should be as a football player and was only an occasional and sometimes successful runner. He worried about what he might be like in another decade or two if he did not change his casual and haphazard training, if he continued to kid himself he was fit when he knew he was not.

His experiment to raise his own level of fitness lasted for ten years. He returned to active athletics to measure his progress and, at an age when everyone else was convinced they were too old, became a scratch runner over three miles, a provincial cross-country representative and a contender for national titles. His early competition results revealed flaws in his training so he continued flogging himself through slowly-

evolving patterns of exercise until, gradually, the final basic theory emerged – that long, even-paced running at a strong speed produced increasing strength and endurance, even when it was continued close to the point of collapse, and that it was beneficial, not harmful, to regular competition because it enabled the easy absorption of intense speed and strength training later.

Compulsion drove him to further refinements. He battered himself over steep country runs up to 50 km, determined to find the limits of human endurance and, within it, the formula for successful competitive running. He was growing older, but he was growing fitter, so he turned to the marathon and found that by training for marathons he could run even faster on the track. The key was in his hand.

Along the way, he had caught the attention and then the faithful dedication of a number of young runners who lived in his neighbourhood. They shared his enthusiasm and were inspired by his intensity and convictions and, when one of those early pupils, after trailing Lydiard on his runs for two years, whipped a provincial championship field by 80 metres – a gap he established in the first lap – Lydiard was established as a coach. The lad, Lawrie King, went on to be a New Zealand cross-country champion, a six-mile record-holder and a 1954 Commonwealth and Empire Games representative.

Lydiard was by then his country's top marathon runner, and more people were taking notice of the sophistication and challenge he was bringing to a race long regarded as the occupation of mental deficients.

When, in 1957, he finally retired from competitive running, one of his motley following of youngsters was Murray Halberg. Lydiard had predicted in 1953 that he would become the finest middle-distance runner New Zealand had known, Jack Lovelock included, and, although few then believed him and quite a lot laughed at him, he was right. Seven years after Lydiard made the claim, Halberg thrashed the

world in the Olympic 5,000 metres and went on to become a sub-four-minute miler and world record breaker. He, Snell and Magee raced themselves to fame and their coach to immortality.

From then on, Lydiard was in demand all over the world and he was still, in his eighties, a key figure at coaching seminars and as a motivator and mentor of men, women and children in all kinds of sporting activity. He no longer chose to coach athletes but could not resist when youngsters with signs of promise approached him for help; he even scored national and international success with many of them.

So we come back to what I said earlier. The past has established, without question, that Arthur Lydiard remains the best distance coach the world has ever known, never, I believe, to be eclipsed.

Garth Gilmour
Auckland 2017

1. The Physiology of Exercise

When we wrote *Running to the Top*, the world of running was comparatively small. Jogging, the exercise form which has since turned millions into runners, was about to take off. I had not then delved deeply into physiology as it applied to athletic performance; nor, in fact, was the significance of it as an explanation of, and a guide to, athletic effort widely understood or even under investigation.

Since then, I have been able to add several years of lay study of physiology in conjunction with physiologists and sports medicine institutes to my 48 years' practical experience as an athlete and coach. It is still impossible to be explicit or exact about the physiological reactions of hard training because, whoever and however many we study, every athlete is a distinct individual with subtly different reactions. But what we have learnt, and are still learning every day, is enough to enable us to lay down, with considerable accuracy, training parameters or guidelines which will help to bring you to maximum efficiency as an athlete.

Fundamentally, my training system is based on a balanced combination of aerobic and anaerobic running. Aerobic running means within your capacity to use oxygen – everyone, according to his or her physical condition, is able to use a limited amount of oxygen each minute. The limit is raised by the proper exercise.

We call the limit the maximum steady state; the level at which you are working to the limit of your ability to breathe in, transport and use oxygen. When you exercise beyond that maximum steady state, your running becomes anaerobic. Chemical changes occur in your body's metabolism to supply the oxygen you need to supplement what you

can breathe in, transport and use. It is a reconversion process with strict limits – again extendable to a known maximum by balanced exercise – so the body is always limited in its anaerobic capacity.

The reaction that takes place to sustain anaerobic running is called 'oxygen debt'. It can be incurred quickly and is accompanied by the accumulation of lactic acid and other waste products which lead directly to neuromuscular breakdown or, simply, tired muscles that refuse to continue to work as you want them to. That absolute limit when you are exercising anaerobically is an oxygen debt of 15 to 18 litres a minute; but that is a level that the average athlete will not reach until he or she has exercised properly and for long enough.

One feature of the oxygen debt is that, as you run into it, it doubles, squares and cubes. As the speed of running is raised, the oxygen requirement increases with dramatic speed.

Morehouse and Miller's *The Physiology of Exercise* records these figures to show the effect:

Yards a second		Litres a minute	
5.56 to 6.45	An increase of .89 yards a second	5.08 to 8.75	An increase in oxygen requirement of 3.67
9.10 to 9.23	An increase of .13 yards a second	28.46 to 33.96	An increase in oxygen requirement of 5.5

Morehouse and Miller have also shown that aerobic exercise is 19 times more economical than anaerobic. The more intense the exercise becomes, the faster and less economically the body's fuel is used and the faster the lactic acid forms.

Having established the basic fundamental of my training system, let us look more closely at the running body. It is not just a matter of working muscles; exercise requires continuing adjustments in respiration, chemical reactions, circulation, temperature-regulating mechanisms, kidney functions and so on. The entire body is involved and affected when you run – one of the reasons why running is such a fine general conditioner.

The effect of lactic acid in the bloodstream is to alter the blood pH – the measure of the blood's degree of alkalinity or acidity. The neutral point between these two conditions is 7.0 and normal blood pH is between 7.46 and 7.48, or slightly alkaline. Under severe physical tests and hard anaerobic exercise, however, the increase in acidity can lower the level, in extreme cases, to 6.8 or 6.9 and, if it stays at that level, the nutritive system is upset, which destroys or neutralises the benefits of food vitamins and slows general development. The pH range within which vitamins function is small, so any prolonged lowering of the level can be damaging. Enzyme functions are adversely affected, so recovery from training is poor and subsequent training becomes more difficult. A continued lowered pH level can also affect the central nervous system, causing loss of sleep and irritability and, consequently, a lessening of interest in training and competing. This is a physiological reaction which can become seriously psychological. Blood platelets are reduced in number, and the athlete is more susceptible to injury and illness because immunity is weakened.

Your general efficiency and ultimate results in running depend basically on your ability to absorb oxygen from the air, transport it to various muscles and organs and then use it. Most people take into their lungs

far more oxygen than they can use because they lack the necessary blood tone and blood flow from the heart to the lungs to assimilate it. Their deficiency, normally, is in haemoglobin, the pigment in the blood's red cells which combines with oxygen to transport it.

The aerobic section of my training system is directed towards improving the efficiency of these factors. Through aerobic conditioning, the heart, which is just another muscle, becomes bigger and improves its ability: it pumps more blood with each contraction and is also able to pump faster. During rest, your heart pumps about four litres of blood a minute but it can increase its capacity eight or ten times, according to your condition. An athlete who runs daily for long periods maintains a reasonably high pressure on the blood circulatory system and steadily develops better circulation and the ability to transport greater volumes of blood to various parts of the body.

This steady work and continued pressure progressively improve pulmonary ventilation – the periodic renewal of air in the lungs. The lungs are thus more efficient, with increased pulmonary capillary bed activity which enables the better-toned blood flowing through the system to absorb more oxygen more easily and faster. In conjunction with this lung development, the generally raised pressure of the blood flow is expanding the arterial and general circulatory system. Muscles have been scientifically photographed to show that in athletes and manual workers, the arterial network is clearly defined with many well-developed channels for blood circulation; in sedentary workers, particularly those who take little exercise, the development is limited and fast; thorough blood circulation is impossible.

Continued use of muscles for long periods actually develops new capillaries within the muscles, all of which increases the efficiency with which oxygen can be distributed to working muscles and used and waste products can be eliminated. All these factors lead to the fine state of endurance we are seeking through aerobic exercise.

One consequence of the general improvement is that the heart begins to do its work more easily, which is reflected by a progressive decrease in the basic pulse rate. This rate is influenced by many factors – posture, emotion, body temperature, exercise and stress – so it is difficult to use it as an exact guide to fitness, and it is misleading to compare rates between athletes because the normal at-rest heart rate can vary from 50 to 90 beats a minute.

However, whatever your normal pulse rate may be, you will observe that, if it is taken at rest under similar conditions from time to time, there is a steady drop in the beats a minute. The rate eventually can decrease as much as 25 beats a minute.

The youngsters of 15, 14 and even younger who regularly achieve new swimming records these days are a perfect example of how this aerobic endurance theory works. They can outswim mature people to these marks because they can do a great deal of long, slow aerobic swimming in training, their light bodies combining with water buoyancy to make them almost weightless. They use their muscles only to propel themselves along; if they had also to lift their body weight against gravity, they would not do so well. They are also able to use oxygen more efficiently than adults in comparison with their body weight. They do not become strong in the sense that they could lift heavy weights, but they can continue swimming at comparatively fast speeds for long periods without experiencing muscle fatigue.

I learnt years ago when I was averaging 24 kilometres a day in training that if I shifted the daily balance to 32 kilometres one day and 16 kilometres the next, I got better reactions without altering my total running distance. Simply, the longer runs developed that greater muscular endurance; the shorter ones provided recovery and consolidation.

At Cologne University in West Germany, physiologists experimenting with endurance athletes proved that if muscle groups are exercised continually for long periods – particularly for periods of two hours or more – fine muscular endurance is attained. They established that this was directly due to the expansion of neglected capillary beds and the formation of entirely new ones to improve oxygen transportation and use.

Runners with a two-hour programme for the day often ask if it is all right to split the two hours into two one-hour sessions. My answer always is that continued exercise is the key, so two short periods will not be nearly as effective as one long one.

This is an argument often used by LSD (long slow distance) runners to support their style of training. I agree that they will gain from their system of long slow runs lasting several hours, but they will not get the best results – the aerobic pressure must be kept up to near the maximum steady state and, with increasing fitness, that level rises so the exercise must increase in pressure with it. A level of aerobic effort between 70 and 100 percent in training is most effective for the time spent running, and the LSD system does not reach that.

Now, while aerobic exercise in volume will develop fine general cardiac efficiency, or a higher maximum steady state, it is also necessary to develop the capacity to exercise anaerobically, to increase the body's ability to withstand maximum oxygen debts. This means that, as part of your training, you have to create fatigue levels that will stimulate your body metabolism to react against them.

This metabolic activity can compensate for lack of oxygen up to a limit, as we have stated, of 15 to 18 litres a minute. At this level, neuromuscular breakdown – or complete exhaustion of the muscle – can be withheld until the lactic acid concentration is as high as 200 mg to 100 ml of blood.

For example, if a runner has a steady state of three litres a minute, can sustain a 15-litre debt and the workload he or she is performing requires four litres a minute, the effort can be maintained for 15 minutes – using one litre of debt capacity each minute. If the workload is increased to five litres a minute, the runner will maintain the effort for only 7.5 minutes because the rate at which the debt capacity is used is doubled to two litres a minute. Every runner knows that if he or she sprints at full effort, no great distance is achieved compared with what can be run if the effort and speed are lowered. This is determined by aerobic capacity.

The critical factors are the extent, intensity and regularity with which you subject yourself to fatigue levels in training. Many training programmes are based on this broad principle, but many coaches and athletes go to extremes to create oxygen debts in the hope that, by doing so, the body's metabolism will be overstimulated into developing more general efficiency against fatigue. They try to hurry and concentrate the process, forgetting that anaerobic exercise is always uneconomic and that, when fatigue rates are created, the body must be allowed conditions in which to recover before further fatiguing effort is applied.

When the maximum steady state, the upper level of aerobic exercise, is low, you can be running anaerobically at a comparatively low speed; as the maximum steady state is pushed upwards, the slower anaerobic speeds become aerobic (and economical). And, if training progresses on this principle – that aerobic exercise is 19 times more economical than anaerobic – then the possibilities of running farther and faster aerobically (and with economy) must increase.

The daily programme of sustained aerobic running is absolutely essential to achieve the correct respiratory and circulatory development, and the longer the periods of running, the better the results will be. The anaerobic section of your preparation should be tackled only after

you have developed aerobic capacity and maximum steady state to the highest possible level; then it must be fairly extreme for a defined period to develop a matching high anaerobic capacity. At this point, you will be aiming to create a big oxygen debt and lower your pH level so that your metabolism is stimulated to build buffers against fatigue. Once you have built those buffers to maximum efficiency, it is pointless and even risky to go on with this fatiguing training.

Four to five weeks is usually enough. You may need less. Those weeks will involve going hard for, say, three days to lower the pH, lightly training for a day to let it come up again to near normal and then pulling it down again with anaerobic effort the next day. Let it come up, pull it down again. Keep it fluctuating. If you keep it low you upset the entire system.

My most frequent admonition to athletes and coaches is: **Train, Don't Strain**. Bill Bowerman quoted this phrase to support his LSD training theories but, as far as I am concerned, it applies more accurately to running at faster aerobic speeds than are implied by LSD. East German physiologists have proved my contention that it is better to do the long aerobic running at between 70 and 100 percent of your maximum steady state. Lower aerobic effort, while it may be fine for joggers and fun runners, does not exert the desirable pressures on the cardiac and respiratory systems that an athlete needs.

Bowerman has also maintained that overtraining can result in staleness and loss of interest and, though he has not exactly defined staleness, suggests that the ideal solution is regular competition. I see staleness as a physiological reaction, caused by excessive anaerobic work, which becomes psychological through the effects of the continual low pH levels on the central nervous system. Regular competitive racing will not cure that.

I have not seen loss of interest in athletes who train aerobically over varied courses. It is not usual for them to experience problems in maintaining 160 kilometres a week of steady state aerobic running throughout the conditioning period. And when they move into the anaerobic phase, when the physiological problems could again be encountered, they are at such a level of cardiac efficiency they can handle the constant lowering and raising of the pH level without that side-effect of staleness.

As a practical example, assume we have conditioned runner A to use three litres of oxygen a minute and runner B to use five litres. We then give them the same volume and intensity of anaerobic training. Because his or her maximum state is lower, runner A will level off and begin to lose form, fighting a progressively larger oxygen debt effect; runner B will continue to hold the best form. He or she can use oxygen more effectively and for longer periods.

Given that example, it is easy to see how the physiological effect on A can become a psychological problem – he or she is never going to beat B and knows it without going back to basics and building the maximum steady state higher.

If we set these two off the same mark in a 1,500-metre race, they will be together at the end of the first lap and neither will be feeling any strain because neither is yet running anaerobically. But, by the time they are into the third lap, because of the simple mathematical fact that A's capacity to use oxygen is only three-fifths that of B, A will be feeling the pace – building an oxygen debt rapidly to keep up with B. Lactic acid is accumulating, neuromuscular breakdown is on the way. When B fires in a finishing burst up the last straight, A will not be there.

Now, if A's physiological inferiority has also become a psychological one, he or she is in real trouble before even starting. Which of the two do you want to be?

One of the greatest difficulties I have had in persuading coaches and athletes to accept my system is that the majority have been chained to the principles of interval training, which emphasise anaerobic interval training or repetition work as the MOST important phase of a training programme. As far as I am concerned, it is the LEAST important.

Anaerobic capacity can be developed to its maximum very easily with various types of work which do not need to be rigidly controlled; it is simply a matter of the athletes tiring themselves with anaerobic exercise and stopping when they feel they have had enough. If they sprinted as fast as possible, they would probably not cover more than 135 metres before their bodies were forced to compensate; if they sprinted a little slower, they could go a farther distance because the rate of increase of the oxygen debt slows in proportion to the reduction in the workload imposed by the running speed. Either way, they achieve the same end result.

No one can be specific about this type of training. If we work hard enough, intensively enough and long enough, the pH level will come down and it does not need the regimented programme of specific numbers of repetition runs over specific distances in specific times with specific intervals in between. The difference is whether you control your training or your training controls you.

I defy any coach to say exactly what any one athlete should do for his or her anaerobic training. Training conditions vary constantly, the state of the athlete must vary almost from day to day. So you must use repetitions without anyone being concerned about the interval, as long as it is roughly equidistant; or the number to be run; or what times they should be run in. You can do ‘ups and downs’ – from 100 metres to 400 metres and back again – but this tends to be predetermined and regimented and I prefer to avoid them.

I like to keep my athletes away from the track as much as possible. I would rather find a forest trail or an area with a pleasant environment, warm them up and then run them to a tree or some kind of natural marker and jog them back. Then I let them continue until either I or they think they have had enough. We may use fartlek, employing hard sprints here and there with a series of repetitions. Anything is better than a systematic grind on a closed track. Different athletes using different methods in the same group can all come in tired from their workouts, all with a lowered pH level; each, in his or her own way, will have been developing an anaerobic capacity towards its maximum. The exercise does not matter; what is important is that athletes should understand the physiological reactions they are trying to achieve and should know when they feel they have had enough and why they feel that way. An athlete is less likely to overdo training and invite blackouts or vomiting because he or she has dragged the pH level excessively low and disrupted the central nervous system. However, it is important when developing an anaerobic capacity to exercise to run distances of 200 metres or more for a longish period to get the pH blood level low. Short, sharp sprints will not do this. It requires volume of work as well as intensity.

Talking to coaches in Abilene, Texas, during an eightmonth tour of the United States in 1970, I mentioned that only twice in a year had I used 20 x 400-metre repetitions and then only because we were on a track which happened to be that size and they were useful in helping to develop pace judgement. At the end of my lecture, a high school coach told me he was training a bunch of young milers, the best of whom could run 4:17 and the others around 4:24. He was giving them 25 x 400-metre repetitions every Monday morning as well as their other anaerobic training and racing. Mostly, they ran the repetitions in 68-69 seconds.