back to basics

In order to become a better runner, you need to become a better and more complete athlete. Aerobic and strength conditioning are vital factors to consider when beginning any training regime. Together they form a foundation from which you will be able to progress. The importance of these background basics cannot be stressed enough.

Aerobic Conditioning - Supply and Demand

In order to undertake continuous exercise muscles require oxygen, and the harder they work the more they need. This is the reason why breathing becomes heavier, in an effort to increase the oxygen uptake. Exercise with oxygen is aerobic. The aerobic capacity of an individual is the measure by which oxygen can be taken in, distributed and utilized. The limit beyond which the body cannot absorb and use oxygen to perfonn the exercise is known as the V02 max (or maximum aerobic capacity). When the demands of the muscles are not being met by oxygen intake they begin to work without it i.e. anaerobically. This produces lactic acid which the body will then try to remove. There will come a point, during maximal exertion, when lactic acid is produced faster than it can be removed and lactate will increase dramatically. This point is known as the anaerobic or lactate threshold.


Exercises: press-ups, chinnies and treadmill

The period of time a runner can work anaerobically will always be a limiting factor. An athlete's aerobic capacity can be continually improved and it is therefore vital to do so in order to enhance performance. Developing the lactate threshold is key to increasing the duration of intensive running sessions. In order to understand how an athlete can improve both VO2 Max and lactate threshold, it is necessary to look at the relationship between heart rate and training intensity.

Using a Heart Rate Monitor

The heart rate is easy to track and increases in correlation to oxygen intake and exercise intensity. Using a heart rate monitor is therefore an effective way to measure intensity of aerobic training.

Some benefits are:-

- direct and immediate feedback
- training within different zones can help maximize physiological benefits
- gives exact measure of intensity
- can highlight overtraining (e.g. if heart rate higher than it should be on an 'easy' session)
- may show early signs of illness before physical symptoms become evident (e.g. if resting heart rate higher than usual)
- motivational tool – as fitness improves heart rate lowers

Training within different heart rate zones can bring about specific physiological effects. The chart above is a rough guide to these percentage zones and their benefits. It is used in conjunction with an individual's maximum heart rate (MHR) and resting heart rate (RHR).

60%-70%	recovery zone	very slow running; burns fat
70%-80%	aerobic zone	slow steady easy runs; burns fat; will boost aerobic capacity
80%-90%	mixture of aerobic and anaerobic zone	lactate threshold training
90%-100%	anaerobic	very intensive and therefore limited sessions

There are different ways to calculate the heart rate at which an individual should be training in conjunction with the chart above. One example is the Karvonen Formula:-

1. calculate MHR i.e. 220 – age = MHR
2. determine RHR by measuring the heart rate first thing in the morning when the body is very relaxed
3. use the chart above to decide upon the required training zone, then alter the percentages to decimals (e.g. aerobic zone 70% to 80% will become 0.7 and 0.8)
4. put the information into the formula below:-

(MHR – RHR) x zone in decimals +RHR = desired range

e.g. man aged 35 (i.e. MHR 220 – 35 = 185) with resting heart rate of 60 who wants to train aerobically

185 – 60 =125

(125 x 0.7) + 60 = 147.5

(125 x 0.8) + 60 = 160

It can therefore be estimated that if his heart rate measured between 148 and 160 beats per minute during training, he will be in an aerobic zone.

The Polar RS200 is a heart rate monitor designed for runners. I tried it out and found it extremely easy to use. It can record and store detailed information throughout an interval session and features a fitness test which can predict VO2max. It also has Polar OwnZone® which determines an individual exercise zone specific to fitness levels. This is a watch that can be used by both a beginner and experienced runner. In addition distance can be measured by purchasing the footpod. **www.polarelectro.co.uk**

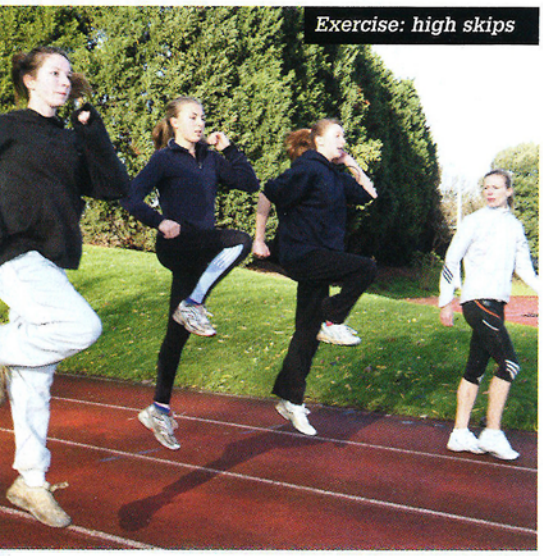
VO2 Max

This is the maximum amount of oxygen in millilitres which can be used in one minute per kilogram of body weight. There are a variety of ways to test V02 max but one of the easiest is the Balke test. Using a 400m track, run for 15minutes and attempt to go as far as possible. The distance covered is then put into the formula[ii] below:-

(Total distance covered ÷ 15) - 133) x 0.172) + 33.3

First and foremost VO2 max can be improved by simply increasing mileage at low intensity.

Further to this specific interval sessions should be incorporated into training, the duration being between three to five minutes at a 3k to 5k pace (corresponding to up to 95% of MHR.)



Exercise: high skips

Lactate Threshold

There are a number of simple (but expensive) lactate testing kits which can provide analysis of blood lactate in a matter of seconds. By using these results throughout a graded track session the threshold can be determined. Another alternative is to undergo a laboratory test which would normally provide all the key performance indicators, including VO2max. The Conconi Test[iii] can also be used. This is based on the correlation between heart rate and intensity, though its accuracy has been questioned. As it is widely acknowledged that lactate starts to accumulate in muscles at 80% to 90% MHR, a simple and popular way would be to assume that the lactate threshold lies in this zone.

When the VO2 max is boosted by increasing base mileage it is likely that the lactate threshold will also be elevated. There are also other ways to do this:-

- try to run for 20 – 25 minutes at 80% to 90% MHR. This should feel like an uncomfortable 'hard' but sustainable run
- run long intervals of 10 minutes with jog recovery within this zone e.g. 3x10m(2m)
- the training period could be broken down further into shorter intervals

Working in the lower end of the zone will produce less lactic than the higher end. Lactate threshold training should be performed having achieved a solid aerobic base, otherwise there will be a higher risk of injury. Running in this intensity range will also facilitate the efficiency of lactate removal and lactic acid tolerance.

It is both important and encouraging to note that when improvement to VO2 max is limited (this may be determined by genetics), it is still possible to reach excellent levels of performance. In these cases improving lactate threshold should be of even higher priority.

Strength Conditioning – circuits and drills

A period of strength conditioning should be incorporated into the start of any training regime. This will:-

- help to increase core stability
- help to strengthen and therefore stabilise the body
- help to reduce chance of injury
- prepare for weight lifting

Both circuits and plyometric drills are effective ways to gain overall conditioning as they can increase strength and power through a full range of movement.

Body weight circuits are simple, effective and time efficient. They are easy to schedule into training and can be performed in a very small space. There are many variations and one example is listed below. I would suggest 3 sets with 30 seconds on each exercise and 15 seconds to move to the next position (total workout time being 15 ½ minutes).

Exercise	Body part worked	How to perform
Press-ups	**chest, arms, stomach**	lie facing ground holding body up on straight arms; lower body down and push up; experiment with widening arms if too difficult
Squat thrusts	**hip flexors, legs, stomach**	start in press-up position with feet together; jump both knees to outside of elbows; return to starting position; if this is too difficult begin with hips higher
Hip raises	**hamstrings**	lie on back, arms across chest, legs together, toes turned up; press heels into ground, push hips up, lower
Chinnies	**stomach**	lie on back, hands on side of head, legs outstretched, toes up; raise body; once body has started lifting draw in left knee, touch right elbow to left knee; repeat other side
Treadmill	**hip flexors, stomach**	hands on floor, shoulders over hands, hips high, (body looks like upside-down 'v'); jump right knee into chest without putting foot on ground; alternate
Squats	**quadriceps, hamstrings, glutes, stomach, hip flexors**	stand, feet hip width apart and slightly turned out, arms held in front at shoulder level; drop down into squat position, stick bottom out, keep back flat, chest up, stomach tight and heels on ground; push hips through to original position, return to standing
Shoulder raises or hyperextension	**lower back**	lie on front, nose to ground, hands on glutes; push hands down back of legs and raise shoulders; keep looking down so spine straight

Technical drills

These form part of strength conditioning and can be both physically and aerobically demanding. These are specific plyometric (or dynamic) exercises which, if performed correctly, can serve a multitude of useful functions including improved performance and injury prevention. Drills can help:-

- develop a more efficient running style
- increase power
- improve the speed and reactivity of foot strike ('touches') – the quicker an athlete can transfer their own body weight, the quicker they will run
- strengthen - in particular the muscles of the feet, calves and hips. This will greatly improve stabilisation and thus be a major contributory factor in injury reduction
- improve hip flexor strength and flexibility which will lead to higher knee lift and therefore increased range of stride (for an endurance athlete this is very significant)

Exercise: high knees

Below is an overview of 2 simple drills with teaching points applicable to each.

1) **High Knees** - quick and exaggerated running action
2) **High Skips** – step on left foot, push off ground and hop high in air (right leg lifting); try to have short contact time and to stay in air for as long as possible; alternate

Summary of basic teaching points:-

- toes flexed (turned up) at all times
- contact on ball of foot - avoid heel striking ground
- knee always in front of heel
- quick change over (the action ball of foot striking ground and the other heel drawing up)
- quick arm movements particularly when tiring
- arms relaxed - controlled 90 degree movement from shoulders
- front hand no higher than eye level
- stay tall, tight stomach, don't lean back opposite arm to leg
- don't hold breath

Try 3 sets of each drill for 30 metres prior to a running session (not afterwards due to physical and neurological fatigue); use a slow walk back as recovery.

Correct technical input is absolutely vital when learning how to perform drills as they are the foundation for good running technique.

Update of Case Study Shân Hughes (Age - 51)

	Initial	After 6 weeks
weight	110.2kg	110.2kg
% fat	47.5%	46%

For weight loss long slow steady runs (60% to 80% MHR) are ideal as they train the body to rely on fat as fuel rather than glycogen (glucose stored in muscles).

For those who wish to lose a large amount of body fat, it may be some time before fitness has improved sufficiently for them to be able to run continuously in the 'fat-burning' zone. It can take real effort to remain motivated when outward physical changes do not appear to be happening as quickly as one would wish.

Shân's reduction in body fat is a sign that her body is beginning to adapt. Whilst her training is key to improving her fitness, she is also making great efforts to eat more regularly as well as more healthily (reducing saturated fat intake). To combine exercise with a better eating regime will help to ensure optimal results in both fat loss and athletic performance.

There are always going to be limiting factors with which to contend i.e. training time available and being restricted by a low fitness level. This is where a heart rate monitor can not only be functional but also encouraging. When body shape does not change as quickly as one would hope, it can often be noted that the heart rate is lower in both exercise and recovery periods (in interval sessions). This is an indication that fitness is improving and the body beginning to work more efficiently. Shân is training with the Polar F4 and says, *'Getting immediate results is helpful as I can tell how hard I'm working. I'm already noticing that in the recoveries my heart rate is lowering to below 100 much quicker.'* **UF**

You can read about Shân's progress and follow her weekly programme at **www.ninaanderson.com**

References

i *Karvonen, J., T. Vuorimaa Heart rate and exercise intensity during sports activities. Practical application. Sports Medicine. 1988, May;5(5):303-11*

ii *Horwill, F Obsession for Running (1994) Colin Davies Printers/British Milers' Club*

iii *Conconi, F., M. Ferrari, P. G. Ziglio, P. Droghetti, and L. Codeca. Determination of the anaerobic threshold by a noninvasive field test in runners. J. Appl. Physiol. 1982, 52: 862-873*

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Nina has a passion for athletics and fitness. She started jogging at the relatively late age of 25, and only stepped on to the track for the first time four years later. Now, at the age of 35, she is a competitive athlete (400m and 800m). As an athletics coach she specialises in technical drills, strength and conditioning, and designing individual running programmes. Together with this, Nina works as a Fitness Mentor with a very wide range of clients.
www.ninaanderson.com

Next issue

In the next issue Nina Anderson explains the importance of weight training for runners and gives a comprehensive guide to the key exercises.