



Australian Mountain Running Association

Uphill running by John Harding

Running in mountain and other uphill races can be made much easier and performance greatly improved by specific training. Running uphill involves vigorous employment of all of the limbs of the body and of the cardiovascular system. The elite uphill performer has the following physiological characteristics:

- high aerobic capacity
- strong ankles
- very strong quadricep, hip and gluteal muscles
- well toned stomach muscles
- arms that can maintain a vigorous action for long periods without tiring and losing 'form'.

The first objective for the serious mountain runner aiming to improve uphill performance is to develop these characteristics through an appropriate package of training measures. A secondary objective is to avoid short term injury and long term over-use problems. The latter is very important and implies care needs to be taken in the timing, intensity and duration of a focused hill training program. The downside of, for example, very strong quad, hip and gluteal muscles is that if the hamstrings and stomach muscles are weaker in comparison, then the muscle imbalance may lead to injury.

The best male mountain runner in Australia during the last decade has been Des Woods who used to train very specifically for mountain running only in the last 2 months before a major championship; the rest of the year he trained for road and cross country running. The best female mountain runner has been Louise Fairfax whose focus throughout the year shifts from mountain running to triathlon to orienteering, depending on which season she is in. This changing focus through the year means that she maintains a very high level of aerobic fitness at all times but is putting different muscle groups through different volumes and intensities as she gears her training for the major events she contests in each sport. This has given her both longevity and levels of performance that have surpassed all other elite mountain runners during the last decade.

Arthur Lydiard, the great New Zealand coach, includes a one month period of focused hill training in all of his roughly six month track, cross country and marathon training periodised training programs. Two sessions a week for a month tend to develop enough of the flexibility and power needed to make a smooth transition to anaerobic track training. For the mountain runner the additional power in the legs from a further two to four weeks of Lydiard workouts tend to optimise the physiological development required, provided that the hill training has been preceded by a substantial endurance buildup over two to three months, including hilly courses on trails for many of the long runs. This suggests that for an aspiring Australian representative in 1999 the annual cycle would include an endurance

build-up in January, February, and March, concentrated hill training in April and May to peak for the Australian championship early in June, more endurance running in June and July, and a further concentrated period of hill training in August and September before the World Championship on 19 September, followed by an active rest for some weeks afterwards, and a resumption of training in October.

There are two packages of workouts which will improve hill running performance:

- Activities that can be done all year round (excluding the active rest period) which will improve hill running fitness but have a low risk of causing over-use injury in the long term.
- Specific hill training workouts which can be concentrated into a two month period but have a risk of injury if continued for much longer periods.

Year round activities to improve uphill running

1. A high training volume

The first and most important pre-requisite for uphill running is high aerobic capacity. If you huff and puff and feel tired as soon as you start running up a moderate slope, you are going to be in big trouble if the slope continues for very long. To run up a mountain, you must have very good endurance so that the legs and arms do not tire too soon, and you must have very good aerobic capacity so that the aerobic threshold is high enough to avoid anaerobic wastes clogging the muscles until nearing the finish.

Despite being in their 40s, Louise Fairfax and Belinda Soszyn are world class mountain runners in open company, and world class triathletes in their age groups, while Belinda is currently the number one female stair runner in the world and Louise is an elite orienteer. Both train all year round from 15 to 25 hours per week doing a mix of running, cycling, swimming and gym work. This high year round volume of work gives both a very high aerobic capacity and very high muscular endurance.

2. Overload and recovery workouts

Endurance levels are increased by overload and recovery workouts so that muscles are heavily fatigued and glycogen levels greatly depleted followed by easier days in which repair, replenishment and strengthening occurs. For the mountain runner, regular long runs and long bike rides throughout the year are the best options for optimum results, although long mountain hikes are also both pleasurable and effective, especially in events such as 12 hour and 24 hour rogaines through rugged country.

Overload workouts are also among the best forms of psychological preparation for mountain running because the mind is then trained to tolerate long periods of tiredness. Hence the runner finds it much easier to cope with relatively short periods of intense fatigue up steep sections in mountain races, and to keep going in ultra distance mountain runs such as the Six Foot Track and Brindabella Classic.

3. Cycling

Over eighty per cent of elite mountain runners in Australia do a significant amount of cycling as part of their training. Cycling greatly strengthens the quadriceps and stomach muscles, while avoiding the foot strike pounding of running. The quadriceps muscles in the front of the upper leg are the engine room muscles for both cycling and running uphill.

4. Upper body work

Strong but not overly muscled arms greatly assist uphill running performance and keep the muscles in balance, and a couple of short weight training sessions a week throughout the year using moderate (not heavy) weights achieve this goal of adequate upper body

strength. Weights should not be used on the legs for mountain and cross country runners who live in hilly environments such as the A.C.T. Such weight training overloads legs which are already doing plenty of work in hilly terrain.

A useful form of upper body work is swimming which has the added benefit of extra aerobic conditioning. A mix of fast and slow laps tends to be more beneficial than steady continuous swimming. The cold water from a pool or river or beach also tends to speed up recovery from hard workouts.

5. Stomach strengthening

Stomach strengthening exercises include sit-ups and doing cycling motions with the legs while the back is flat on the floor. Strong stomach muscles keep the spine well supported, assist good running form and help avoid lower back, hip and pelvic overuse injuries.

6. Stretching

Both uphill and downhill running fully extend the muscles in the front and the back of the legs. Hence a high level of flexibility is needed both to maximise speed and to avoid injury. This means maintaining a good stretching program as a routine throughout the year, and before racing having a good warmup and stretching regime.

The concentrated phase of uphill running training

1. The Lydiard hill training workout

Running as fast as possible to the top of a hill and then jogging back down tends to be counter-productive. They are physically exhausting and make the muscles sore.

A much better method involves bouncing up a hill, with high knee lift and vigorous arm movement that best looks like sprinting in slow motion. The hill can be short and quite steep or longer (300 metres or more) and much more moderate in gradient. In *Run The Lydiard Way*, Arthur Lydiard describes uphill bouncing as:

'springing up, on your toes, not running up, but bouncing.....drive upwards with a high knee lift.....drive hard, pushing upwards with your toes, flexing your ankles as far as possible and landing on the forepart of your foot, with the heel coming down below the level of the toe.....your actions must be relaxed, with the head up and looking ahead, the hips slightly forward, the legs driving down forcefully.....your progression up the hill won't be fast but slow.'

The benefits of such repetitions are immense:

- the pulse rises to a very high level but the muscles are fatigued, not made sore
- the quadriceps are fatigued and become stronger
- the full extension of the calf muscle applies resistance which thoroughly stretches and exercises the muscle fibre, so that flexibility and power are added simultaneously. The extension also prevents achilles problems
- this increased flexibility and power improve coordination of arms and legs, in turn improving running action and speed
- the arms are also fatigued from the vigorous uphill driving, providing a total body workout

How many repetitions to do? Stop as soon as you start feeling really fatigued. How many workouts of this type a week? Two is the ideal. Are there other features of the workout? If

training for up and down racing, then the best hill involves a triangular circuit with, say, a one in three uphill for hill bouncing, a one in six or eight downhill on grass or a dirt surface for striding out downhill, and a flat 100 metres or so at the bottom for a leg speed strideout.

The greatest benefit from this training is achieved when it is combined in a week's training with two or three long runs (only one of which should be hilly), racing is avoided and there are a couple of light days to absorb the work.

2. Psychological training

Athletics Australia head coach Chris Wardlaw, a dual Olympian, and coach of Steve Moneghetti and many of Australia's best distance runners, once said that running at the elite level was 50% physical and 50% mental. In mountain racing, pace judgement plays an enormous part in determining outcome. Doing the first third of the race too fast reaps a harvest of fatigue at the business end of the race, the last third. Going out too slow on the other hand may mean getting trapped by slower runners on narrow sections of the course, or not being able to make up ground on very steep sections where everyone is forced to walk.

Clearly practising pace judgement in races is the best form of psychological training for race day, and would be a major factor in the successes of Louise Fairfax at the international level during the 1990s. She has considerable international racing experience in Europe in both mountain running and orienteering, and does lead up races in Europe prior to each world championship. European mountain racing courses, because of the height of the mountains, are quite different from those in Australia, and pace judgement is critical to performance.

The second critical contributor to pace judgement is an intimate knowledge of the course to be used on race day. Course profiles should be studied carefully and then checked out carefully on foot. Mentally a mountain course seems three times as long the first time you traverse it than it does on subsequent occasions. If able to recover in time, a harder run over the course can yield a great deal of useful information. A further advantage of checking out the course on foot before race day is that footwear will change depending on how much of the route is grassy, rocky, slippery or muddy. Having confidence in the right footwear being worn is a psychological advantage on the starting line.

3. Altitude training

My best ever performances in mountain running races were achieved after periods of altitude training on mountain trails where one can easily manage long runs, steep uphill, quick running in bursts downhill, and plenty of rest in between workouts to maximise recovery and adaptation to a heavy training workload.

4. Cycling

As part of his mountain running and stair running training, 1996 Australian mountain running champion David Osmond includes a weekly session of on road repetitions on a bicycle up a mountain in Canberra. There are four urban mountains suitable for this in Canberra: Mt Stromlo, Black Mountain, Mt Ainslie and Mt Majura. The principal advantage of such workouts is the absence of jarring of the legs in the downhill between each repetition. The great New Zealand Olympic medallist Rod Dixon had a hill running workout where he ran up a long hill and got his wife to drive him down for his next uphill repetition. Most of us are not in a position to use such help!

5. Long repetitions

In addition to hill bouncing workouts, an excellent session for improving cardiovascular fitness in both the lead-up to and during the concentrated training phase is to do repetitions of a kilometre or more at slightly faster than 10km race pace over flat or undulating dirt trails. Such repetitions also help mental preparation.

6. Stair running

1996 Australian mountain running champions David Osmond and Belinda Soszyn both include a weekly or fortnightly session of repetitions of the stairs in a building of 12 or more storeys. Both are among the top few stair runners in the world and are physically and temperamentally suited to this kind of running. One needs to exercise caution with such workouts: have shoes with good cushioning and do not sprint up the stairs and make yourself sore, defeating the purpose of the training. The same principles apply as in the hill bouncing workouts.

7. Flat running

The primary goals of the concentrated hill training phase before a major mountain running event are to improve the physical attributes needed to run better on hills, and to become mentally tough and wise in pace judgement. Maximising physical development will only occur if the body can absorb the stresses of the uphill training overload workouts. A guiding principle should be that a heavy hill bouncing workout must be followed the next day by either light training or a long run on the flat. A heavy hill bouncing workout can be undertaken the day after a relaxed long run on a mountain course, but it will then be imperative to have a light day to absorb the two heavy ones.

8. Biofeedback

Competitive runners are generally more likely to over-train than under-train. In many respects, a concentrated two months of hill specific training before a major mountain running event is a risky strategy because if an injury or illness is suffered through over-enthusiasm, the runner may not even get to the start line on race day. Hence personal biofeedback monitoring to avoid illness and injury has to be a high priority and a daily training diary should be kept up-to-date. The Australian Coaching Council has some very good guides to assisting recovery. There are some simple monitoring procedures that any runner can use. Firstly, take the resting pulse first thing in the morning. If 5 to 9 beats a minute higher than normal, back off in training that day and be careful. If more than 9 beats a minutes above normal, either take the day off training or do some light activity such as walking.

Secondly, monitor body weight. If down significantly, chances are the body is low on glycogen and may be dehydrated. Have an easy day. Thirdly, if sleep is significantly less than normal or the body is feeling tired for more than a couple of days, back off the training for at least a day to let the body recharge the batteries. Fourthly, if there are other stresses such as cold coming on, leg soreness or mental stress from say a traumatic experience, it is also wise to take things easy rather than train hard.

There is a strong correlation between the physical attributes required for mountain running, stair running and orienteering. The principles discussed in this article, I think, apply just as well to the physical preparation for major stair running and orienteering events.