

Acknowledgements:

Many thanks to Gordon Donnachie for the cover photograph which shows Derek Fish giving it 100% at a race earlier this year. Derek is a good friend who inspired me to write this booklet through his personal ambition to be the best he can at distance running.

Besides my own thoughts and views this document draws upon hints & tip from the following sources:

UKA Coach in Running Fitness manuals; Lore of Running; Chi Marathon Running; Runners World; Strength Running Techniques; Kinetic Revolution; Balanced Running Techniques; Ultimate Marathon Guide.

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Introduction

With over 44-years experience of running with many highs and lows along the way, I really do understand how running efficiency and finding the optimum weekly mileage for best race performance can seem like you're on a hunt for the holy grail. This is especially true for those just beginning to ramp up their weekly miles in preparation for their first event. And then there's the dark art of injury prevention and running technique, a mine field for the unsuspecting.

Like any group of enthusiasts, we all pass on hints and tips to our fellow runners from time to time and having obtained my UKA Coach in Running Fitness licence I now feel qualified to join in with some of my thoughts on the subject. These have been drawn from my own experiences together with several hints & tips gleaned from the experts I've studied to gain my coaching qualification.



If after wading through the advice you decide to try one or two of the suggestions, please remember and I know it might come as a shock to some – we're all different! Each of us has developed our own running styles with all the good and bad habits thrown into the mix.

To properly review your running efficiency and style you should get one to one advice from a qualified running coach or trainer.

Together you will develop a personalised training package suited to your individual running needs and style.

Running Efficiency

When we started to run as a child nobody taught us, we just ran. Leant forward and off we went, two speeds: Stop & Go. No pacing skills or race strategies, just bags of energy and natural style.

However, as adults we seem to loose all that natural ability as we grow and as our joints start to show the wear & tear of life. We adapt & change our running to counter ailments and little by little bad habits creep into our running. Tensing our shoulders, clenching our fists, bending at the waist, over striding, heel striking, leaning back on hills and so the list grows, especially on the longer runs as we get tired. Wouldn't it be great if we could turn the clock back and run like we did as a youngster?

To show what I mean, here's 3 photos of junior runners and then overleaf 3 photos from adult races. Spot any differences?





I do believe it is possible to re-learn how to run as a youngster. Not straight away maybe, as the bad habits have been there for many years in some of us, including me. To really benefit from changes to a more efficient running style it will require constantly focusing on our techniques as we run, especially in the initial stages until it's embedded in our muscle memory. It will also require going back to basics with some of our running drills.

It will be worth it in the long run if we can refine our running technique to be more efficient. Wouldn't that be just great if we could save energy during a long endurance race and still have enough energy to pass others on that final push to cross the finish line and still enjoy the whole experience.

Run Like a Child

Let's look at the principles from head to toe:

Head

The average adult human head weighs approximately 5kgs and so dropping your chin down onto your chest to look at the ground by your feet means moving that 5kgs off the body's centre mass line and placing additional pressures on the neck and shoulders, which becomes tiring after a while. Secondly, try turning your head from side to side or even up & down with your chin tucked into your chest as you look at your feet. Doesn't work does it? It is my opinion that by the time we reach adult hood a person should know where their feet are when they're running so no need to look down at them. Look around by all means but keep your forehead up and look straight ahead which will ensure the 5kgs stays over the centre mass line making it easier to carry. Think of your head as being attached to a helium balloon which is suspended over your head pulling it upwards and lift your forehead so you can focus your eyes about 15 to 20 feet ahead.

Try it! Sit in a chair and make sure you're away from the back so you're perched on the front edge of the chair and sit up tall (without getting rigid, please!). Then initiate a forward lean by moving your face forward in space. If you're at all confused about this movement, imagine you're reaching your face forward to kiss someone across a table. You can even pucker up to encourage your neck to perform this movement. Now keeping your face

oriented forward, shake your head no. Do it slowly and see how far you can turn your head in each direction without feeling any restriction or moving the rest of your body.

Now, whilst maintaining your forward lean, pull your chin in to your chest. (This kind of movement may make you look like you have a double chin and therefore another reason not to do it). Still avoid moving the rest of your body and now try shaking your head “no” and see how far you can turn your head each direction without feeling any tension or restriction. It’s pretty hard to turn your head more than a little side-to-side with your head retracted, isn’t it? Whereas with your face reaching forwards as if to give a kiss you can easily turn it about ninety degrees each direction.

Even when running on very uneven ground there is no need to look down at the area around your feet or tuck your chin in (which would stiffen the spine and make it impossible to be so quick and agile) but instead keep your face looking forward. If you’re concerned about the safety of the terrain (either worried about falling or sharp stones underfoot) the only kind of looking down that’s of any use is looking down a little distance in front of you. Retracting your head and looking down just in front of your feet, as if you were looking through reading glasses, tells you about the ground when it’s nearly too late to change course! It also sends your feet out in front of you, creating excessive braking forces we commonly call “over striding.” And furthermore, in stiffening your whole spine, it makes you less responsive to the terrain and in fact more likely to fall.

Looking down with a mobile head and a forward lean allows you to choose a path farther in advance as well as to scrutinize the ground just before your feet when necessary. It also makes you agile and able to shift your weight in response to the terrain so you’re less likely to fall.

Shoulders

These should **be relaxed and not tense**. Holding tension in the upper body is one of the most common problems runners have. When your shoulders inch up toward your ears, it prevents your arms from swinging freely forward and back. Your arms take a less natural side-to-side motion, which is a waste of energy and can cause unnecessary fatigue.

Here’s a simple exercise to check if you’re relaxed or not:

Stand in front of a mirror with your feet hip width apart and staggered, with one foot in front of the other. Shift your weight more to your front leg and start swinging your arms. Now watch to see if you're lifting your shoulders with each swing. If you are, you're a candidate for sore shoulders. So, try this exercise: Place one of your hands on your opposite shoulder and swing the arm of the shoulder that is being held down. This will help you feel what it's like to swing your arm without moving your shoulder. Practice this on both sides for a few minutes. Relaxation doesn't come naturally to some of us, so we have to train ourselves to relax.

Try to always keep your shoulders low and just let your arms swing freely like pendulums. Don't hold your arms away from your sides or you'll be unnecessarily engaging some of your shoulder and neck muscles.

This takes a fair bit of thinking about as you run because the natural reaction as you try to push your pace is to tense up and drive your arms like pistons. Watch any professional endurance athlete and their necks and shoulders are totally relaxed throughout the whole race. So, when out pounding the highways and byways keep reminding yourself to keep the shoulders relaxed all the time.

Arms

An important aspect of arm swing is that the movement of your upper body helps to balance out the work done by your lower body. If you only used your pelvis and legs to run, and your upper body was motionless, you would experience a lot more effort and work. This is because the lack of movement "upstairs" creates inertia (a slowing-down movement) for the motion of the lower body.

Having a relaxed and efficient arm swing can have a huge effect on the smoothness of your gait which translates into increasing your economy of motion which will reduce the workload of your legs. What I mean by efficiency is that you can either run faster, or farther, or require less recovery time...with a lower perceived effort level during your runs and you can feel all this with a more effective arm swing.

Here are some tips on how to make the best use of your arms and hands and what to watch out for.

Create Balance

For efficient running all of your movement should be balanced: front-to-back, side-to-side and top-to-bottom. So to comfortably maintain balance with your body moving forward requires you to create a counterbalance in the opposite direction so that you're not "holding" yourself in a forward position with your muscles. That's where your arms come into the picture. Swinging your arms to the rear as you run ... not forward creates the right amount of counterbalance to your forward motion.

Swinging your arms forward can cause you to over-stride which will create a heel strike, increase your impact and reduce your efficiency.

Begin each arm swing with your elbows at your ribs and pull your hands back towards your ribs. Don't let your elbows swing in front of your ribs as they come forward.

Bend your arms

Your arms are two pendulums. And, the law of the pendulum says that if you want a pendulum to swing faster it needs to be shorter. If you run with your arms swinging too low at your sides, you'll be slowing down your cadence which creates more work for your legs. So, for the most efficient arm swing, keep your arms bent at 90° no matter what speed you're running. Don't pump your arms or you'll be using more energy than you need to. A good check-in tool is to just be sure that your hands never fall below your waistline as you run.

Don't cross your centre-line

One of the basic rules of good energy-efficient running is not have any side-to-side motion in your body. If you swing your arms across your midline it can distract from your forward momentum and also possibly add more impact to your IT bands, hips and lower back.

To find the right angle of arm swing, pretend you're holding a volleyball in your hands and let your arms swing at that angle.

Hands

I see many people clenching their fists when they run. This falls into the category of unnecessary muscle usage placing tension in your body and overtime reducing an efficient running style. Hold your hands with your fingers curled in slightly, like you're holding a crisp between your thumb and forefinger or maybe you've just caught a butterfly

and you don't want to crush it. Be sure to hold your hands with your thumbs on top, not with your palms facing down. Holding your hands facing down will engage the entire muscle chain running from your elbow to your ear. Again, it's unnecessary muscle usage that doesn't contribute to your performance.

Hips

Elite distance athletes seem to do something different from the rest of us when it comes to running. They float around the track, hardly seeming to touch it. They accelerate smoothly and effortlessly. Their legs seem to spin beneath weightless bodies. We try to run like them, but too often we feel like we're muscling our bodies along, pounding the ground and working for each forward push.

I outline the theory of lifting instead of pushing in the “Legs” section of this paper but what else makes such a difference? Our hips and glutes are where the stride begins, so if you can keep your posture in check and keep your hip drive up, you're going to run really, really well.

So, what is it we want our hips to do? The key elements are balance and drive. Our torsos balance on our hips, and the hips are the fulcrums of the leg levers driving our bodies forward. If they are not working properly, the legs are unable to provide optimal power and speed. And many of us have trouble using them properly, resulting in all sorts of inefficiencies. The most common is over striding: reaching forward and landing in front of the torso.

Much is made of core workouts, but heading to the gym might build good core strength but it often doesn't correct the problem. Strengthening exercises will do little good without changing how we actually move and use our muscles. So it all starts with proper posture “running tall” and this is what makes some athletes look graceful and light on their feet, balanced and agile. Whatever we call it, learning it takes more than trying not to slouch or sucking in our stomachs.

If you think of your pelvis as a bowl, hinged at the hip bones and controlled by the muscles in front and in back, your goal is to keep the bowl neutral and not “spill” either way. (Most of us spill out the front – sticking our bottoms out and bending at the waist.) The image helps keep the pelvis aligned so you can ride better above it.. When you are able to keep the bowl from spilling--even while working hard on a run--you begin to feel the connected power as your leg drive pushes your body forward, rather than twisting your hips forward, arching your back and losing efficiency.

Hours of sitting for long periods as many of us do, shorten and tighten our hip flexors on the front of the pelvis and turn off our glutes on the backside. When we stand up, we never fully open up, retaining some of a sitting posture in our hips. Running optimally, however, like elite track stars, involves driving the leg back from the hip, requiring a full hip extension. The faster we want to run, the more important this is. To have a hip drive like the elites requires not only mobility, but also strong, active glutes. Experts agree that glutes are the most powerful, efficient movers for running, and failing to use them creates serious problems with our other muscles compensating until they fail and we pick up injuries.

Legs

To lift or push, that is the question. Just take a moment to analyse what you do when you run. Do you push off with your feet thereby using all the muscle groups in your lower legs

or do you lift your knees using your much larger muscles in your thighs and glutes? Using the larger muscle groups is more efficient especially as we're focusing on endurance running. Some of you will say that you do a bit of both but is it more lifting than pushing or the other way round. At the end of a long run or even the day after a long run do your calves ache and/or knees ache? If yes, you push!

Ankles

Don't run with flexed ankles. Let all the tension go when the foot is in the air.

Feet

How do your feet fall when you run? Toes forward with every step or do your feet turn in or out as your foot strikes the ground? Your feet should point in the direction of travel which is forward to ensure the most efficient foot fall and to reduce possible injuries.

You can assess your foot placement by picking a white line preferably on a running track but if not on a road with no traffic. Stand with one foot on either side of the white line and run. Each foot should fall on either side of the white line if not on it with toes pointing forward. I appreciate this totally contradicts my previous comment re head position to see your feet but needs must to check this action and to ensure how your double chin is shaping up too.

Which part of the foot strikes the ground will depend on your personal technique. However, at touchdown point, you want your foot directly below your centre of gravity. Also, don't clench your toes inside your shoes while running, nor deliberately spring off the toes as your foot leaves the ground

Pulling It All Together

Let's now focus on the actual action of running taking into account everything I've just outlined.

First of all, stand with feet slightly apart and feet facing straight forward. Stand tall with your head looking forward chin sticking out slightly as this ensures a high forehead.

Relax the shoulders and ensure your elbows are at 90° angle and currently beside your hips. Hands with a relaxed grip holding those crisps!

Hips high, knees slightly bent not tense.

Now slowly lean forward from the ankles, keeping the above form. Imagine a ski jumper leaning from the ankles. Gravity will start to take over and to stop yourself from falling onto your front you WILL need to lift one of your knees followed rapidly by the other knee and place each foot back down on the ground. You will have moved forward with no effort from your lower leg muscles. Repeat this process and you'll keep moving forward at a steady rate.

As you lift your knee, move your opposite arm backwards to counterbalance your forward movement and repeat for the other knee & arm. A good rule to remember whilst you're trying this method is: "Nose before toes".

You're running!

Running uphill

There are exceptions to every rule and here it's running uphill as it requires your legs to work harder and one way to increase your efficiency on the up-hills is to swing your arms forward as you head up so that your arms can take some of that extra workload off the legs.

When running uphill, swing your arms with your hands held closer into your chest. This gives your arm swing a more upward motion and will help you to lift your legs more easily. You can also use this same arm motion when sprinting.

Your upper body is just as important to your running as your lower body. And, as you can see, there's a lot more to having a good arm swing than you probably imagined. With a little practice and consistency, you'll find yourself running more smoothly and efficiently across the ground, and you'll come back from your runs energized and relaxed.

Breathing

Unfortunately for those runners who don't consider breathing to be something they need to pay attention to, they're overlooking a key performance factor. Breathing is the process of taking in oxygen to fuel your activity, and there are right and wrong ways to do it. If you're currently breathing inefficiently during your runs, you could be holding yourself back.

It's important to learn a good breathing regime and make it a natural action that you don't think about. Breathing properly while running helps improve your efficiency & performance. There are several different breathing strategies that can help your body get plenty of oxygen while running.

Try 2:1 Strides Per Breath Ratio

While there is no set technique that fits all runners, many runners prefer a 2:1 stride/breath ratio. Basically this means taking two running steps for each breath they take during workouts. However, while this is often the preferred strategy of many successful runners, you don't have to adopt this breathing method to be an effective runner.

Find Your Own Rhythm

Not everyone is comfortable using a 2:1 stride/breath ratio, so finding what works best for you is what actually counts. Finding your own breathing rhythm based on experience and fitness level will help you maximize your running performance. For some runners, not using a stride/breath ratio at all helps them relax. It's a very individual element to our running.

Use the Talk Test Strategy

If you find it difficult or distracting to time your breaths with running strides, a simple talk test will help determine if your running intensity matches your training goals. If you can comfortably talk during your running workouts, but not sing, you're performing at a moderate intensity, which is often appropriate for longer endurance runs. If you can't say more than a few words without pausing to breathe, your running intensity is vigorous, which is appropriate if you're running at a rapid pace for shorter periods of time or sprinting during interval workouts.

Check Your Heart Rate

To ensure your body gets plenty of oxygen and you don't overdo it, check your heart rate during and after exercise. If you're having a hard time catching your breath during or immediately after your runs, your workout intensity may be too high. Your body's maximum heart rate is about 220 minus your age. Moderate intensity exercise is when

you work out at 50 to 69 percent of your maximum heart rate, and vigorous intensity exercise boosts your heart rate up to 70 to 90 percent of your maximum heart rate.

For example, if you're 20 years old your maximum heart rate is about 200 beats per minute. Fifty percent of your maximum heart rate is 100 beats per minute, and 90 percent of your maximum heart rate is 180 beats per minute.

Nose or Mouth: Which is Best?

Mouth breathing is by far the best way to breathe while running, largely because it brings in more oxygen than breathing through the nose. But there are other benefits too - Forcing air through the nostrils can tighten the jaw and other facial muscles, and tension is never good for running. Mouth breathing, meanwhile, relaxes the jaw and can have a similar effect on the rest of the body. However, some runners do breathe through both the mouth and nose to maximize air intake.

Stride Rate

Your stride rate is simply the number of steps you take in a minute. To find it, count the number of strides on one foot for one minute and double it. The goal is to have a stride rate of around 180, or 90 per foot. If it's much less (170) than that, it likely means you're creating more vertical energy, projecting more upward motion than forward, and you guessed it, wasting energy. It also means you're employing braking forces with every stride rather than rolling quickly over the ground. The key is to practice patience while increasing your stride rate and decreasing the time you spend on the ground.

To improve your stride rate, you can run to a music mix at 180 bpm, invest in a metronome, or add the following drill to the beginning or end of your runs (it makes a great active warmup). Although this drill (and running with a faster cadence) may feel awkward at first, that just means you're creating new neuromuscular patterns that will soon start to feel more natural. It's important to note that when running to music or a metronome, it's best to focus on taking shorter strides and increasing the cadence gradually. If your stride rate is 170, for example, you could set it to 174 and progress slowly from there.

Striders: On a flat piece of pavement or running track, start running with short, quick strides. Gradually increase the length of your stride while maintaining a quick cadence for 30 seconds. Slow down gradually, walk back to the start, and repeat a total of four to six times.

Running Efficiency Deadly Sins

1. Over striding

Over striding puts the muscles in an inefficient lengthened position, and causes the foot to land in front of the knee, which creates a braking effect. You will feel as if you are landing very heavily, with your foot striking the ground way out in front of your knee.

2. Wasteful movement

Too much up-and-down movement is a waste of energy. The likeliest cause is lifting the knees too high in front and pushing off the toes. A very short stride can also be to blame. You may feel as if you are running on the spot rather than moving forwards and could be opening yourself up to calf tightness or injury problems. Arms going across the torso, hampering forward motion, is another example of wasted movement.

3. Overpronation

Pronation - when the arch of the foot flattens to help dissipate the impact of landing - is normal. It's when the foot overpronates that there's a problem, because the foot attempts to push off while the arch is still collapsed. This puts extra stress on the muscles supporting the arch, which in turn pull on their attachments to the inside of the shin bone. The knee then rolls in (a good visual indicator of overpronation) and becomes tight. The glutes (buttocks) are put in an inefficient position by the inward rotation of the knees, causing tightness in the hip flexors (front of hip) and back and a pelvic tilt.

4. Sitting in the bucket (or sitting on the hips)

In this posture, the pelvis is tilted forwards and the hips pushed back (often accompanied by a forward lean from the waist). This reduces the power of the hamstrings and glutes and is often a result of weak muscles in the core, poor pelvic alignment and tight hip flexors, though it can set in as a result of fatigue during a run. This posture is responsible for a lot of back and hip problems.

5. Excessive supination

Far less common than overpronation is oversupination, when, instead of rolling in too far, the foot doesn't roll in enough and remains on the outside edge. This reduces the foot's ability to absorb the shock of impact and increase outside edge of the foot and the shin.

6. Poor hip drive

Relying too much on the quads (front of thighs) and hip flexors rather than using the hamstrings (back of thigh) and glutes reduces the power and length of your stride. Stand side on to a wall to hold for balance and swing one leg freely, forwards and backwards, keeping it straight and relaxed. There should be a good back swing as well as forward. You may have poor hip drive if the pelvis feels "jammed", or if the leg splays outwards on the back swing or the back appears to arch a lot (your body is trying to get extra range by cheating). Work on stretching the quads and hip flexors, which will improve pelvic stability and mobility.

Weekly Mileage & Race Day Performance

I've often been asked what is the optimum weekly mileage to ensure a good race performance and avoid over-training.

Bearing in mind my comment above that we're all different, the single biggest predictor of race day performance – behind pacing strategy – is the number of miles you run per week. For example, you want to run a good marathon and enjoy the experience? Well, 25 miles a week isn't going to be enough. Likewise, if you are training for a race of a much shorter distance, you probably don't need a training programme full of 20-mile long runs to achieve your best 5K or 10K. So how do you determine how much mileage is right for you? The answer depends on what race you are training for and how experienced a runner you are.

So, start by sitting down and plan your weekly mileage around the type of races you have coming up. It's very useful to map out when the race or races are and ensure you have sufficient time to train properly. If your race is a marathon, it's advisable to do 2 to 4 20-plus mile long runs during a typical 16-week training programme. Note, these 20-milers come at the end of the peak weeks of training not from week 1 and also we can't rest for six days and then run a 20-miler on the seventh. We therefore need a good base of runs

during the week to prepare us for our 20-miler – or whatever the long run for that week is and there is a general rule of thumb for this:

Your long run should be no more than 30 to 35 percent of your total weekly mileage and the lower that percentage, the better.

So if you are running 40 miles a week, your long run should probably be no more than 14 miles. To get in a 20-miler during marathon training, your weekly mileage total needs to climb into the high 50s. (Just to be clear: I don't mean that you need to run in the high 50s before your long run. In these calculations, your total mileage includes your long run.) In this scenario, someone training for a marathon would ideally have weeks that range from 40 to 60 miles.

The more miles you run injury free, the better a race performance you are likely to have. But you can't go from running 15 miles a week to 70 miles a week overnight because you'll just set yourself up for injuries.

Most experts agree that you should not increase your weekly mileage by more than 10 percent. So, if you are at 30 miles a week, your next week shouldn't be much more than 33 to 35 miles. During this increase in mileage, you should hold at that figure for two weeks to let your body adapt, then maybe cut your mileage by 25 percent before increasing another 10 percent.

For example, you are running 25 miles a week. You increase 10 percent to 28 miles (rounded up from 27.5) and stay at 28 miles for two weeks, then you can cut back one week to 20 miles to give your body a rest and let it make the adaptations before increasing another 10 percent to 31 miles a week. And whatever you do, do not increase your speed during the same time you are increasing your weekly mileage. Doing this just invites disaster in the form of injuries or sore bones and muscles. The key is to listen to your body and if you need a rest day, by all means, take one, or even two.