CHAPTER 4

MUSCLE MYTHS: STRETCHING SCIENCE DEBUNKED

Physiotherapy is a fast-changing world. Attitudes to stretching have changed radically over the past 50 years and continue to be adapted as new theories emerge year on year. Physios have a professional responsibility to keep abreast of changes, but it is more difficult for club and recreational runners, who may find it is all too easy to pick up out-dated or even ill-founded information. So it seems worthwhile to look at a few of the common truisms of stretching and see how much scientific truth they hold.

MYTH: STRETCHING BEFORE RUNNING REDUCES YOUR PERFORMANCE

There is no evidence that dynamic stretches in a warm-up will affect performance adversely, but it certainly has some positive psychological and physical impact – preparing the mind and body for activity – and some studies have indicated that it may even provide a small boost in power. However, in regards to static stretching, the opposite is true. Static stretching will not aid performance. In fact, it can have a negative effect on muscle strength, power and endurance.

MYTH: YOU DON'T NEED TO STRETCH BEFORE A RUN, ONLY AFTERWARDS

As laid out in the previous chapter, a warm-up of dynamic stretches is advisable before any run. As there is sufficient scientific evidence to suggest it can help in preventing injury as well as getting you 'in the zone', the strongest argument is surely, why not? The misconception is probably founded in the lack of benefit in static stretching before activity. However, post-run, there are some arguments for the effectiveness of both dynamic and static exercises in preventing soreness in joints and muscles.

The gluteus muscles

The gluteus muscles, often called 'the glutes', are a muscle group located in each buttock. They are made up of three individual muscles – the gluteus maximus, the gluteus medius and the gluteus minimus – and play a major role in physical movement and stability. The gluteus maximus is the largest of these muscles and it is the primary muscle responsible for hip extension in running. The other glutes play their part by holding our pelvis level and steady and keeping the lower body aligned.

Strong glutes are essential for athletes aiming to run faster. Not only is strong hip extension the basis of a powerful stride, but these muscles also restrict side-to-side movement, which produces a more efficient running style. Their strength is also fundamental to avoiding injury. Glute weakness is linked to Achilles tendinitis, runner's knee, iliotibial band syndrome (ITBS) and other injuries.

The major problem faced by many runners is that the glutes become inhibited – meaning they don't work to their full potential. This is generally because the gluteal muscles aren't as active as other muscles during daily life, and tight hip flexors resulting from hours spent sitting inhibit and weaken them. Then, when we run, we automatically look to stronger muscle groups – quads, hamstrings, calves – to contribute instead.

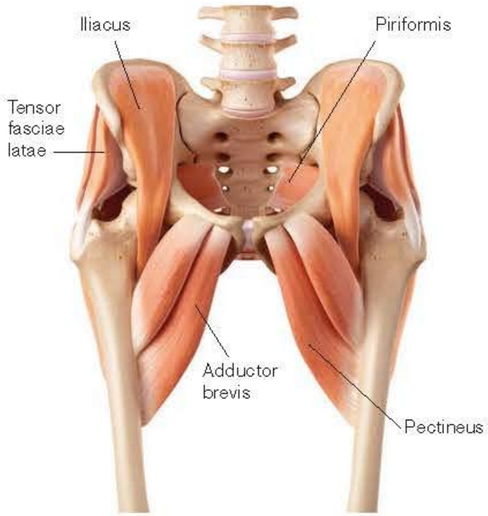
Hip flexors

The hip flexors are a group of seven muscles on each side of the body. They are found in the pelvic area and run from the the lower back via the hips and groin to the top of the femur (the long thigh bone, the strongest in the body). The main function of these muscles is to bring the knee towards the chest and bend the waist. Their strength and increased activity contribute significantly to an increase in speed as they drive the leg through the air to help lengthen the stride.

The principal hip flexors are the inner hip muscles that form the iliopsoas – a joint name for the merged iliacus and the psoas muscles. The psoas major is a deep-set, rope-like muscle that runs diagonally from the spine to the femur. At the hip, it merges with the iliacus, which extends to the thigh. The psoas works especially hard, contracting and lengthening at every stride, while the iliacus flexes and rotates the femur.

Great demand is placed on these muscles in particular, but despite being naturally strong they are often underdeveloped in many runners. So, often it is a stronger muscle that picks up the load. This can be the rectus femoris, one of the quadriceps, which crosses both the hip and knee joints, or the tensor fasciae latae, commonly referred to as TFL.

TFL is a small muscle found on the outside of the hip. It attaches at the top to the pelvis and runs down to connect to the iliotibial (IT) band, which acts as its tendon (albeit a very long, thick tendon). Its primary function is to rotate and stabilise the hip, but it is also called upon to support the small glutes and contribute to hip flexion. The versatility of such a small muscle presents problems; it can easily be overworked, but if inhibited, it can also put stress on other muscles, which rely on its support.



Sitting for long periods of time only serves to shorten and restrict the power the hip flexors are able to generate. Attention to developing all the hip flexor muscles is therefore key to improving both strength and performance.

The sartorius

The longest muscle of the body, the sartorius runs diagonally down the front of the leg, from the outside of the hip to the inside of the knee. Because it spans both the hip and the knee, it is involved in virtually every move you make with your lower body.

The sartorius is not the primary muscle in any action but it is important in providing support in hip flexion, hip adduction (taking a step sidewards), external hip rotation (rotating the leg outwards) and knee flexion (bending the knee). A ribbon-like muscle, it is sometimes referred to as the 'tailor's muscle' – its name derives from the Latin word 'sartor' meaning tailor – perhaps related to the cross-legged position tailors once used to adopt.

Single-leg squat (SLS)

1. The test for a single-leg squat is simple, but difficult to measure accurately. The best way is to do it in front of a full-length mirror. Run a strip of masking tape down one side of the mirror to create a ruler. Use this to measure or mark the depth of your hips on your SLS.
2. Stand a repeatable distance away from the mirror (so you can test 'self against self' with some accuracy) and then, facing the mirror, perform a single-leg squat.
3. The single-leg squat is an art form; it's easy to cheat and lose sight of what you are trying to do. Hips must remain level and the knee needs to sit in a fine line of two axis points. It must not deviate medially or laterally, but remain over the middle toe, while also not extending beyond the end of your foot. The height you can dip down with all three of these parameters in check is the height of your single-leg squat. Choosing to dip lower just compounds faulty technique and will impact your running. As soon as the knee starts to deviate towards the midline, stop. Take a guess as to which line your knee reached on your masking tape scale.
4. Now place a horizontal line of tape at this point, then go back to your mark and retest. It will now be easier to tell if you have the correct height as you will see if your knee reaches the same point. Take your time to get this measurement accurate for left and for right, but do not obsess (yes, I know runners well!) over it. Leave the tape on the left-hand side of your mirror with the height of your left knee depth and do the same for the right. You will use these daily for your exercises, but you'll also need to move them weekly as you progress, so be prepared to leave your set-up there indefinitely, without anyone in your house moving anything.

It is quite normal to find people cannot dip lower than 5cm (2in) at first, so work to a level that is easy for you to achieve and don't try to be a hero with this exercise. Starting at an easier level will allow you faster progression in a few weeks.

DATE	LEFT	RIGHT

SIDE LUNGE

BEGINNER: two sets of 10 with each leg, on alternate days
INTERMEDIATE: three sets of 20 with each leg, on alternate days
ADVANCED: three sets of 30 with each leg, on alternate days

The side lunge is just like a big disco dance move by a drunk uncle at a wedding. You simply step out to the side and as you step you lower your body. There is no need to fix your tie around your head Rambo-style as per the drunk uncle, but it is important to keep control as you land and sink your hips down towards the floor, while maintaining an upright body posture.

Technique/exercise instructions

1. From a standing position, either with your hands on your hips or clasped in front of you, step out to the side.
2. When your foot makes contact with the floor, bend your knee while maintaining a good upright posture with your body. You need to drop low enough to get a 90-degree knee bend, but this may take time to achieve.
3. Start with a less acute knee bend if you cannot maintain the upright body posture and gradually build the exercise through the weeks as you get stronger.
4. Repeat for the specified number of repetitions.

How it should feel The first few repetitions may well feel quite easy although if you have creaky knees, the sound they make may put you off a little. Knee tracking is important, so if you are concerned then see your physiotherapist for an assessment.

Over the repetitions you should start to feel some fatigue in the quadriceps and glute muscles. It is OK to progress to a fairly deep-seated burning feeling, as you would get in the gym, but only continue if you can maintain good form. There is nothing wrong with training hard, but do not sacrifice technique to squeeze out extra repetitions.

Equipment (if required) All you need is an empty space. People performing this exercise are known to let out the odd growling noise towards the end of the set…

Target area This is a strength exercise that will strengthen the quadriceps and glutes primarily, but a lot of ankle flexion also occurs, plus the lower back, core and hamstrings all get a good workout, too.

Did you know? The side lunge is very useful ahead of race day. When you train for running, there are few or no objects or people to get in your way. When running in a mass-participation event, such as a marathon, however, there will be a vast number of drinks bottles on the floor, people in your way and the odd rhino costume to navigate. Without this exercise, you will be hugely underprepared for all the lateral movements you will need to make and many people have suffered during longer races for this exact reason.

⚠ SAFETY ADVICE/CAUTION

You do not want to overdo this exercise initially. It is not a position you find yourself in regularly and so attacking it too vigorously at first will leave you with aching glutes and walking backwards down the stairs. The other risk is to the groin area if you overstretch the lunge, so start slowly and build up gradually.

TFL AND ITB STRETCH

BEGINNER: two 30-second stretches, daily
INTERMEDIATE: three 45-second stretches, daily
ADVANCED: four 60-second stretches, daily

The tensor fasciae latae (TFL) is the contractile component of the iliotibial band (ITB), which is responsible for the stability of the knee joint in motion. The ITB itself has the tensile strength of steel and cannot be stretched, hence the only place for release is the TFL. This muscle is easy to palpate by sliding a finger into the coin pocket on a normal pair of jeans.

Technique/exercise instructions

1. From standing, slide one leg backwards and around the back of the other, until your little toes are parallel with about 30–60cm (1–2ft) between your feet.
2. Take the same arm as the back leg over the head and push the hip out laterally. Lean your body to the side of the standing leg. Place your lower hand on your hip.
3. Repeat for the specified number of repetitions then repeat on the other side.

VARIATION: If you want to increase the stretch, raise your other arm upwards, bend your elbow and slide your hand down between your shoulder blades. Now, try to push the back leg hip forwards and in an arc towards the standing leg (you will experience very little movement, but the stretch will intensify).

How it should feel A mild stretch in the location of the TFL.

Equipment (if required) It may be of benefit to use a fixed surface or chair back to balance on during the stretch.

Target area This stretch targets the tensor fasciae latae (TFL). While it is almost impossible to isolate one muscle during a stretch, this is the target. You will also be stretching to a lesser degree the quadratus lumborum (back side flexor), peroneal longus, biceps femoris, latissimus dorsi and lateral glutes.

Did you know? Many runners spend a long time foam rolling their ITB. The fact is, though, the ITB is no more likely to lengthen under the efforts of a foam roller than it is at the desk at which I am sitting right now. What's more, foam rolling an ITB is incredibly painful: while it has no stretch receptors, it is full of pain sensors. There may be some benefit to the surrounding fascia, but only if you want to endure the pain.

⚠ SAFETY ADVICE/CAUTION
While it is impossible to overstretch by holding this or other stretches for too long, trying to push into the depth of the stretch with too much vigour is inadvisable – a deep but tolerable stretch is more than adequate.

REVERSE LUNGE

BEGINNER: two sets of 15 repetitions with each leg
INTERMEDIATE: three sets of 15 repetitions with each leg
ADVANCED: four sets of 20 repetitions with each leg

The reverse lunge is as simple as doing the lunge backwards in that you simply step backwards instead of forwards. Moving backwards works the muscles in a different way, which is why many technique coaches like athletes to do some backward running to help strengthen the posterior chain. The exercise here is a good compromise and less likely to have you bumping into things and other people.

Technique/exercise instructions

1. From standing, step back and drop your knee to the floor.
2. Step up again and return to standing.
3. Switch legs and repeat for the specified number of repetitions.

How it should feel The emphasis falls to the rear leg, with more work being done with the calf and foot before you load the quads.

Equipment (if required) None.

Target area The glutes, quads, calves and hamstrings.

⚠ **SAFETY ADVICE/CAUTION** Doing this exercise may not be wise for those suffering with plantar fasciitis or ankle sprains as it loads the foot and ankle much more than the forward lunge.

You could combine forward and backward lunges into a nice little mini session for the legs.

DEAD LIFT

BEGINNER: two sets of 10 repetitions
INTERMEDIATE: three sets of 15 repetitions
ADVANCED: three sets of 20 repetitions

The dead lift is one of those age-old exercises that has stood the test of time. Science hasn't found a reason for us all to stop doing it and it seems to bring benefits for the leg and back strength that we so desperately crave.

Technique/exercise instructions

1. Begin by standing with your feet hip-width apart. Soften the knees so they are slightly bent. Hold a 1–2kg kettlebell in your hands.
2. Slowly lower down with a straight back as you slightly bend the knees.
3. Straighten back up again and repeat for the specified number of repetitions.

How it should feel It is hard to keep a straight back, but please try: you want the back extensors to work and also the glutes.

Extra advice Using a kettlebell is great because you can simply aim this between your feet.

Equipment (if required) A weight of some description. This could be a small kettlebell, a large container of water, dumbbells or a barbell (most common).

Target area The dead lift works the hamstrings very well indeed, in addition to the glutes and the lower back.

⚠ **SAFETY ADVICE/CAUTION**
Please do keep your knees soft and slightly bent; the force you otherwise put through your lower back can be damaging.

couple of weeks, you need to revisit the injuries and weaknesses that have piled up over this period and start to address them.

The early period of this training should form a sort of deconstruction of the body – featuring lots of assessment and a review of the year – to tell you what needs most work. For example, ask yourself whether the final third of each race demonstrated a lack of fitness as everyone overtook you, or whether your start was slow and weak and made it much harder for you to get back on terms with the other runners. The answers to these sorts of questions will provide you with the information you need to start to create your new S&C programme for the coming year. Of course, the form this programme takes depends on the type of running you are doing, so let's break it down and assess the different requirements.

TRAINING SET REPETITION		
TRAINING GOAL	**REP**	**WORKING SET**
Endurance	12 or more	two to three
Hypertrophy (muscle size)	six to 12	three to six
Strength	six or fewer	two to six
Power	one to two	three to five

STRENGTH FOR SPRINTING

Sprinters will need maximal muscle contraction and at a high speed of turnover. Strength is therefore paramount, but strength without power is going to leave you in the starting blocks while every other athlete is on their way to the finish line.

Pure strength training is seen as very heavy weights lifted from one to six times in a set and usually comprises four or more sets.

Power training is all about the explosive nature of the movement, but again the weights will be heavy and the repetitions even lower, one to two repetitions at a time. For both strength and power, the rest periods will be quite long to allow for local muscle energy to return in the form of adenosine triphosphate (ATP).

You would add into this programme some plyometric training, which is very explosive. This could include sequential box jumps, whereby, for example, you jump up onto a box, then jump down into the space between that box and another higher box, and with minimal contact time bound up onto the next box, and so on. The boxes are often of varying heights.

STRENGTH FOR MIDDLE DISTANCE

Middle-distance runners will still require strength but also a lot of strength endurance with less power. The middle-distance runner needs to be able to produce a high number of sub-maximal contractions, but these sub-maximal contractions are still at a very high level as they are working in the high-energy zones for the duration of the race.

I would say middle-distance runners need to be good at everything – strength, power and endurance – but most of all they need to be able to work at their anaerobic threshold for extended periods of time. The anaerobic threshold is the point at which the blood is accumulating a lot of lactic acid. If someone goes too far beyond this point, they will end up becoming too fatigued and needing to stop.

The ability to utilise strength and aerobic fitness all at once is the product of a very mixed training regime and does not come from just running alone. Three to six sets of six to 30 repetitions would be the range of this sort of S&C programme.

STRENGTH FOR 5/10K

Similar in training requirements to middle-distance events, the 5km is a distance that requires a high capacity for sustained exertion. Slightly lower muscle contraction is required than for middle distance, but only just, and as such the training will not vary too much. There is a reduced need for high muscle strength for 10km races, although more is required than would be needed for a marathon, for instance. Three sets of 15 to 20 repetitions would be the mainstay of this sort of S&C programme.

STRENGTH FOR HALF-MARATHON OR MARATHON

When running a marathon distance you really need endurance, but to avoid all types of strength training would be detrimental to your ability to withstand the loads of training and also the eventual time it takes you to cross the line.

For endurance, I like to recommend very high repetitions, working over total number of repetitions rather than three sets of 12 for example. A good session is to aim for 100 repetitions on each exercise. This could be as simple as four sets of 25 repetitions or you might consider really going for it and doing a maximal count of 50 repetitions until fatigue, then going again after 30 seconds' rest and maybe doing 20 repetitions, then another rest, before managing 12 repetitions, and so on until you have done all 100 repetitions with short rests. This is brutal but great for endurance.