Should I stretch before Sprinting?

For a long time the traditional approach to warming up before sprint training or a race is to jog 2-3 laps of the track to warm the muscles up, then to perform 10-15mins of static stretching followed, (more recently), by sprint drills and strides. However, recent research has suggested that static stretching may in fact be detrimental to sprint times.
Should we then ditch those static stretches or is there more to consider before we throw the baby out with the bathwater?

Stretching & Injury Prevention

The first thing to consider is why stretch in the first place. Well, the long held belief is that stretching helps to prevent injury i.e. a tight muscle stretched rapidly during sprinting without being prior warmed up is more likely to tear than if the muscle is warmed up and stretched first. But how often do you see a world-class athlete on TV pull a muscle in a race? Do you really think they would turn up at a major competition and not warm up & stretch thoroughly? Me neither, yet they still get injured. And we've all come across athletes, who just turn up to training or a race, maybe warm up nothing more than their jaw muscles and never seem to get injured. Think also about animals in the wild. I'm sure the wilder beast doesn't politely ask the lion to wait while it stretches its hamstrings before being chased???
So maybe there's more to injury prevention than just stretching.
Let's take a closer look at probably the sprinters most common ailment – "hamstring injury"
I get quite a lot of requests from my athletes to "just stretch my hamstrings for me, they feel really tight" and of course if they are in fact tight I assist accordingly. However when an athlete feels tightness in the hamstrings we need to know weather this tightness is indeed caused by a short tight muscle or weather the source of the discomfort lays elsewhere. Is the muscle necessarily tight? A simple way to check this is to ask the athlete to lie down on the floor on their back, with both legs straight. Place one hand on their left thigh to prevent it from moving, then slowly raise their right leg without bending the knee, until you feel a resistance barrier; the athletes knee starts to bend; or the athlete feels any pain. Repeat with the other leg. A 'normal' range of movement should be approx 80-90° see fig 1.

If the athlete is unable to raise the straight leg to 90° then a flexibility protocol should be initiated. However if the athlete does achieve the normal range of movement, then the sense of 'tightness' may well be caused by something else.
To shed some light on this we need to take a closer look at what the hamstring muscles actually do.

There are three muscles in the hamstring group: the ***semitendiosus***, the ***semimembranosus*** and the ***biceps femoris***. These three muscles flex (or bend) the knee (for example; moving your heel towards your bottom), but they also assist in ***hip extension***

Hip extension is when the thigh moves behind your torso as in the toe-off position during running. See fig 2.

Hip extension is created primarily by the ***gluteus maximus*** (buttocks), but is assisted by the ***hamstrings***, ***adductors*** (groin) and the ***erector spinae*** muscles (lower back). If the gluteals become inhibited, then the other muscles that normally assist in creating the movement (***synergists***) have to, increase their workload to make up for the reduced efficiency of the glutes. The problem with this being that the hamstrings, adductors and erector muscles don't have the proper characteristics to sustain this increased workload, which increases the amount of stress applied to these muscles, eventually leading to pain & injury.

So how do the glutes become inhibited in the first place?

It is through a principle known as ***reciprocal inhibition*** whereby a tight muscle will cause decreased neural input to its functional antagonist and the ***length tension relationship*** between opposing muscles. A What? I hear you ask.

Think of the action of bending your arm at the elbow as in performing a bicep curl. As you bend the arm the bicep muscles on the front of the upper arm shorten. To allow this movement to take place, the triceps muscles at the rear of the upper arm have to simultaneously lengthen. Thus whenever the bicep contracts it reciprocally inhibits the triceps to allow movement to happen. If it didn't you wouldn't be able to bend your arm, or anything else for that matter.

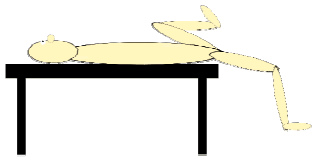
So when a muscle is tight it has an impact on its ***functional antagonist*** on the opposite side of the joint. In the case of the glutes the ***iliopsoas*** is the culprit. The iliopsoas attaches the thigh to the spine and raises the thigh towards the waist (see front leg in fig 2.).

This muscle becomes tight through sustained or repetitive movements involving hip flexion, such as cycling, running, squatting or prolonged periods sitting, for example working in an office, driving a car or spending long periods of time computing.

When the iliopsoas becomes short and tight it reduces the neural input to the gluteals therefore calling upon other muscles to work harder, which eventually leads to reduced performance and/or injury.

So if your hamstrings feel tight but you have passed the hamstring length test the next step would be to test the length of the hip flexor muscles.

Ask the athlete to sit on the edge of a table with their bottom just off the end. They should then be instructed to bring both knees towards their chest as they roll back so that they are laying face up on the table. Then release one leg so that it is hanging off the end of the table whilst holding the opposite thigh close to the chest as in fig 3.



If there's adequate length in the hip flexors the upper thigh should be approx 20 degrees below horizontal with the knee bent at approx 90°. If either do not meet this criteria then hip flexor stretches should be carried out.

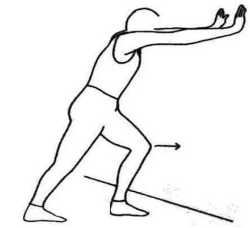
Going back to the theory that stretching prevents injury, well it may well do however, it appears it is more so about maintaining correct posture and the proper relationship between groups of muscles, than through a simple bout of acute stretching prior to dynamic activity.

Stretching & Performance

A recent study published in the Journal of Sports Sciences May 2005 looked to clarify previous research that had suggested that static stretching could reduce peak force output thus impairing performance in dynamic activities. The study looked specifically at sprint performance.
Sixteen members (11 male & 5 female) of a Division 1 NCAA track athletics team performed electronically timed 20m sprints with and without prior stretching of the legs.
The study was performed over four weeks with a different stretch protocol applied each week. The four stretch protocols were: No stretch of either leg (NS), both legs stretched (BS), forwards leg in starting position stretched (FS) and rear leg in starting position stretched (RS). Three stretching exercises were used for the stretch protocols; hamstring stretch, quadriceps stretch and calf stretch. Each stretch was performed four times and the stretch held for 30sec. The BS, FS and RS protocols induced a statistically significant increase (~0.04sec) in the 20m times and although the research does prompt further questions it maybe highlight a need to rethink the validity of our traditional warm up methods.

The Stretches

Static – is the process of passively taking a muscle to the point of tension using an external force (gravity/partner) and holding the stretch for 20-30sec. An example of a static stretch is the standing calf stretch.



Standing calf stretch

This is the type of stretching that the research has called into question. However it is still important for those with muscle length imbalances. It is best applied either after a workout/race to restore muscles to their original length or at home to promote improved flexibility.

Active – uses agonists and synergists to move a limb through a range of motion. For example the straight leg raise we used for the hamstring length test (fig.1) would become an active stretch if the athlete used his/her quadriceps and hip flexor muscles to raise the leg rather than the partner moving the leg.
The stretch is held for 2-4sec and is repeated for 8-12 repetitions.

The repeated repetitions utilized by this method increases blood flow, oxygen and nutrition to the muscle tissue so in effect active stretching becomes a warm up in itself.
This type of stretching may be more appropriate before dynamic activity as the short duration of the hold may not have the same detrimental effect on the muscle as the static stretch.

Functional/Dynamic – uses the force production of a muscle and the body's own momentum to take a joint through the full available range of motion. Leg swings are an example of controlled dynamic stretching.

Self Myofascial Release (SMR) – is a way of breaking down knots or trigger points in a muscle by applying pressure with a biofoam roller. The dense foam roller is moved along the target muscle until a knot or 'hot spot' is felt. The pressure is then maintained on this area for 20-30sec or until the tension diminishes by 75%.
SMR can be performed without first warming the muscles up because there is no lengthening of the muscles.

<u>Putting it all together</u>

The following sequence could provide an effective pre-race warm up for sprinting.

1. **SMR**
2. **Jogging – 2-3 laps to raise muscle temperature.**
3. **Static Stretches –** *Only if muscle imbalances are present and only stretch the muscles that have been identified as short/tight. If no imbalances present go straight to 4.*
4. **Active stretches**
5. **Dynamic stretches**
6. **Strides/practice starts**
7. **Rest**
8. **Race**
9. **Light jog**
10. **Static Stretch**

Please note: the above guidelines are for information only and are not intended to replace advice/examination from your GP or other medical professional.