STRETCHING

Stretching has traditionally been performed to prepare for exercise or competition and to reduce the chance of injury. There is much debate in the literature regarding its efficacy in these factors: is it beneficial? does it improve my recovery or even my performance? And will it reduce my risk of injury? Let's explore this further.

Traditional stretching exercises have involved holding a muscle and joint at a new and further range and holding it there sometimes for up to 30 seconds. However, this seems contradictory to the activation of muscles in preparation for performance and recent research has suggested that stretching a muscle prior to activity may actually reduce muscle performance and also increase demands upon the muscle itself due to increased joint mobility – two factors that could lead to injury! This makes good sense, because a stretched muscle like an elastic band becomes weaker and has a reduced capacity to stabilize a joint, absorb energy and generate new forces.

When we hold stretches for a prolonged period with the aim of increasing joint mobility, we often feel a tightness or burning sensation deep within the area being stretched. This is the nervous tissues protective mechanism responding to the stretch in order to prevent you from stretching outside of your safe parameters and possibly injuring the muscle further. With this in mind, further stretching may lead to an increased burning sensation (that you thought was a good stretch on the muscle!) resulting in increased sensitivity of the protective mechanism and not an effective improvement in joint range of movement.

What happens when we stretch?

Within our muscle tissue we have specialized receptors called 'muscle spindles' (fig. 16). These detect the amount of stretch in a muscle. This is very important in maintaining good posture as these spindles relay the level of stretch within a muscle to our central nervous system – (the control centre) which makes continuous adjustments to keep us upright. This is called a *stretch reflex*.

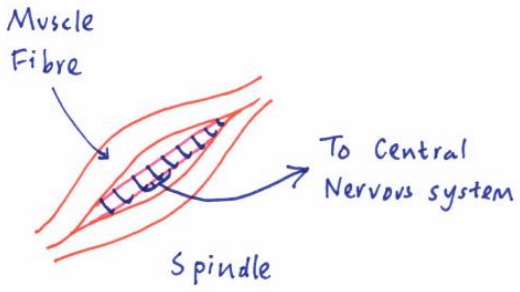


Fig 19: A muscle spindle

When we stretch a muscle, the muscle spindle detects the stretch and sends an electrical message along the nerve to the control centre which in turn activates the same muscles to contract thereby reducing the ability to stretch it. Regular stretching over time will desensitize the muscle spindles increasing the threshold at which it detects stretch (therefore greater stretch is required to activate it). This is called 'Habituation'.

In addition to the muscle spindles, another receptor called the Golgi Tendon Organ also registers the stretch and amount of tension within a muscle. If the stretch is maintained for a period longer than 6

seconds, the GTO will over-ride the stretch reflex and activate a deeper relaxation of the muscle – a protective mechanism to allow increased muscle stretch and avoid injury.

These specialized receptors within muscle tissue are very important in athletic performance and functional activities. However, desensitization of these receptors may have a negative effect on our performance or even the ability to maintain optimal posture. Poor sitting posture (for example) may provide a continuous feedback of muscle stretching of the erector spinae (muscles either side of the spine keeping us upright). This prolonged stretched position will influence the control centre which may then recognize a bad posture as "normal". This can also be associated with tightening of the opposite group of muscles and ultimately lead to pain or injury.

Regular stretching is very important in the maintenance of optimal movement and athletic performance. From the evidence, it is clear that holding a stretch before activity does not make sense! However, we still want to expose our muscles to the range of movement that they will be expected to perform during the subsequent activity whilst maintaining good joint stability and muscle activation. There are several ways in which we can stretch muscle tissue. Let's have a look at some of these.

STRETCHING TECHNIQUES

1. **Static stretching**

This involves stretching a muscle to a point of discomfort for a period. As the stretch is maintained, you will feel a relaxation of the muscle (activation of the GTO) and you will be able to take the stretch further. Holding this stretch for 30 seconds and repeating 4 – 5 times should be performed.

However, this form of stretching has no bearing on functional movements and limited carryover into athletic or functional performance. Care should be taken if you have a muscle injury as you risk aggravating muscle fibres.

2. **Ballistic stretching**

This involves adding repetitive bouncing movements at the end of a muscles available range. Caution should be exercised here as there is risk of uncontrolled stretching and induced injury. This type of stretching should be conducted with a professional and as a progression to static stretching. Progressions should be with caution in terms of range of movement and speed of stretch.

3. **Active stretching**

Performing ACTIVE STRETCHING techniques has shown to improve performance and also reduce injury rates therefore should be included in a warmup prior to activity. This involves actively contracting the muscles opposite the ones to be stretched to move a joint into its end of range (fig 17). For example, to stretch the hamstring muscles (large muscles at the back of your thigh) you would activate your quadriceps (large muscles on the front of your thigh), which allows the hamstrings to relax and facilitate a stretch.

Performing mobility drills through a progressive range of movement using movements that will be performed in the activity later will combine joint stability and control contributing to better performance. By slowly bringing muscle and joint stretches on through active movements, the nervous system will become conditioned to the movements and allow you to reach new ranges of movement without the burning (protective) sensation thereby improving joint and muscle flexibility in the longer term.

Active stretching has several benefits over static stretching:

1. The stretch is acquired whist performing functional (or every day) activities which has a carry over to performance.
2. It facilitates muscle contractions (strengthening of the opposite muscle) and therefore contributes to muscle balance (recall the poor sitting posture scenario earlier).
3. It gives you control over the joint range and therefore very useful in the early stages of rehabilitation.
4. It can be progressed dynamically meaning a greater carry over towards sports and daily activities.

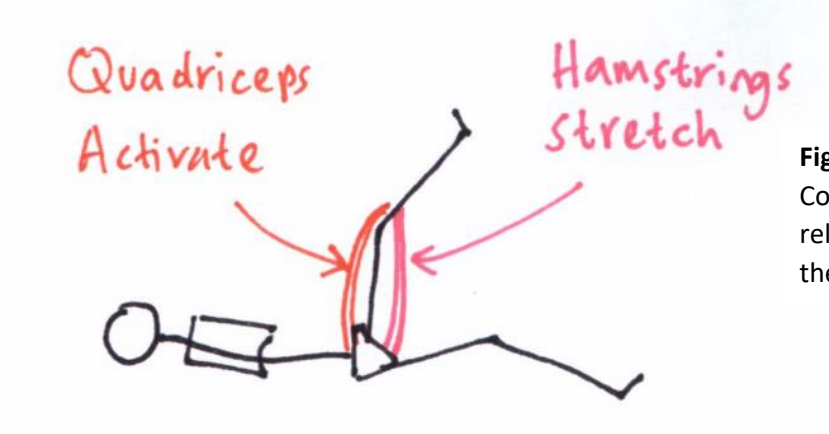


Fig 20: Active stretching: Contracting the quadriceps to gain relaxation and further stretching of the hamstrings.

LONG TERM ADAPTATIONS TO STRETCHING

So far, we have discussed how to stretch a muscle and how to train the nervous system in order to increase joint range of movement whilst maintaining stability and activation of the joints. You can see that this is far superior and safer than stretching and holding this position in order to increase range of movement. But this doesn't answer the question on how we can physically increase the length of a muscle. *So now we get all physiological!!* Like an elastic band, when you release a stretch on the muscle, it returns to its original length, so in order to gain a training adaptation in terms of muscle length, we need to expose the muscle to **load**. Muscle tissue is made up from many muscle fibres and these fibres are made up from sarcomeres which are arranged in series (see picture 18). In order to increase the length of the muscle tissue, we need to increase the number of sarcomeres which will make the muscle longer. The opposite also applies. For example, when we immobilize a joint after injury, the joint and muscle tissue is not exposed to load and therefore sarcomeres are lost resulting in a physically shortened muscle that needs rehabilitation. So how do we load muscle to encourage sarcomere growth?

An increase in the number of sarcomeres in series can be stimulated by the exposure to eccentric muscle contractions. This is the negative phase of a movement for example lowering your heels

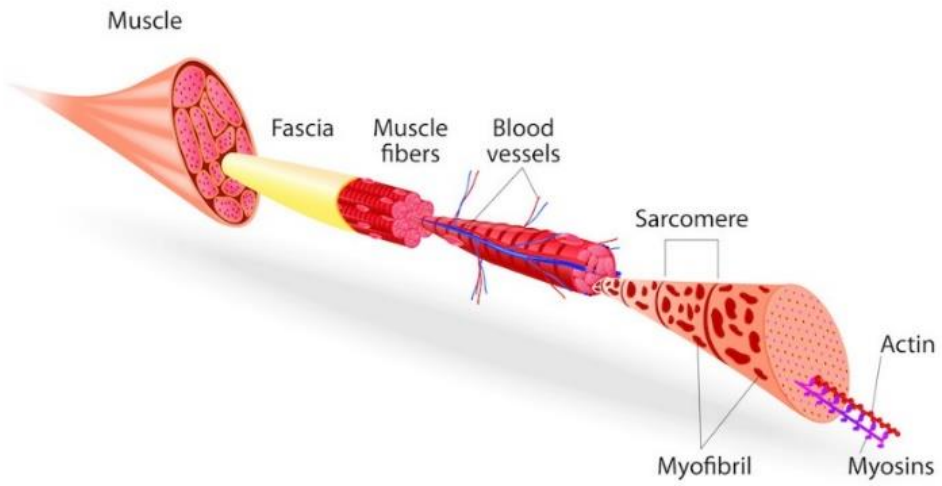


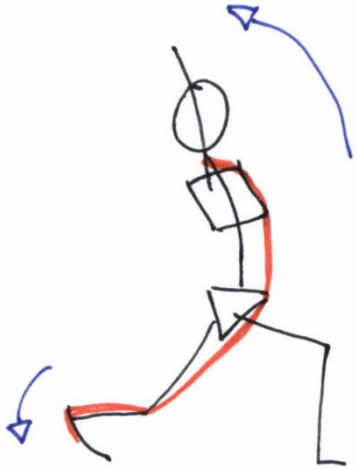
Fig 21: The makeup of muscle tissue showing the sarcomeres

when returning from tip toes for the calf muscles or lowering the bar to your chest when performing bench press for the pectoral muscles. These movements are controlled by the muscle lengthening under tension and is the part of the movement that causes soreness in a muscle after training (commonly referred to as delayed onset muscle soreness or DOMS). So, for an adaptive lengthening of the hamstring muscles, the lowering phase of the stiff leg deadlift would focus an eccentric load on the muscle tissue and stimulate muscle lengthening if performed regularly over a period of time. It must also be noted that in order to gain adaptations, the appropriate load must be applied; eccentric contractions are able to generate much greater force than concentric contractions (the opposite part of the movement when you would be shortening a muscle under tension (i.e. raising onto tip toes for the calf or pushing the bar away during a bench press for the pectorals). So, for the eccentric contraction to be effective a heavy load must be applied, and the movement must be strict and controlled throughout the available range of movement.

WHOLE BODY MYOFASCIAL MOBILITY

Although it is important to focus upon areas of stiffness, it is also a good idea to maintain whole body mobility on a regular basis. This will maintain optimal joint range of movements that will allow muscles to work effectively over the kinetic chain. Often, an injury in one body part can be as a result of stiffness or dysfunction at a point distal from the injury. Compensatory movement patterns as a result of this stiffness can lead to overload of other tissues that subsequently result in pain. To help you get on your way, start with these simple myofascial mobility exercises. Slowly move into the position, and then release and repeat several times rather than hold the posture. These exercises also form the ACTIVATE and MOBILIZE phase of the RAMP warmup.

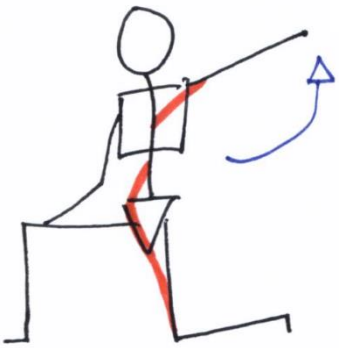
Ease into the position and then gently control your way out. Perform 20 seconds.

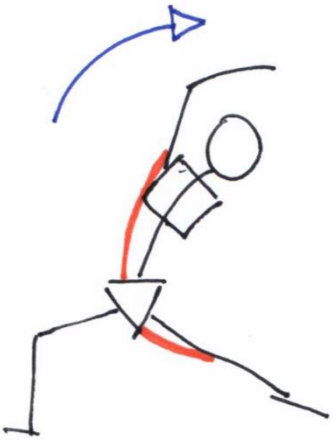


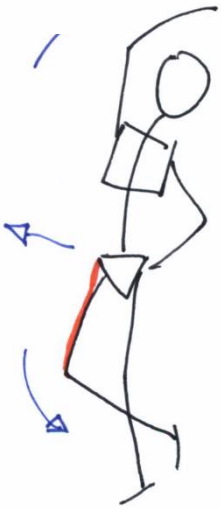
ANTERIOR OBLIQUE SLING (AOS)

- Pectorals,
- latissimus Dorsi
- Rectus abdominis
- Psoas
- Rectus Femoris
- Calf

KNEELING AOS

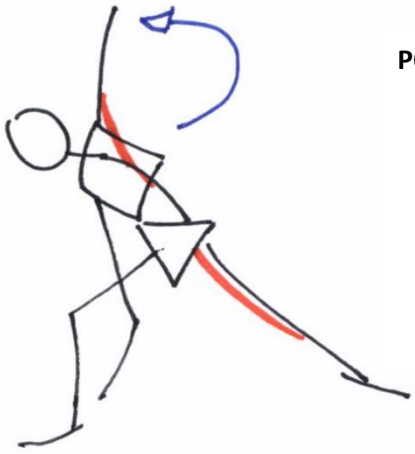






LATERAL SLING

- Pectorals,
- latissimus Dorsi
- Rectus abdominis
- Psoas
- Adductor



POSTERIOR OBLIQUE SLING

- Pectorals,
- latissimus Dorsi
- Rectus abdominis
- Hamstrings
- Adductors
- Calf

TENSOR FASCIAL LATA

GLUTEAL STRETCH