

# MUSCLE IMBALANCE

This section will introduce the concepts of how muscles operate as stabilizers and mobilizers through activity and how they become dysfunctional in injury. We will look at the importance of the core, and mobility training to restore optimal mobility, stability and control.

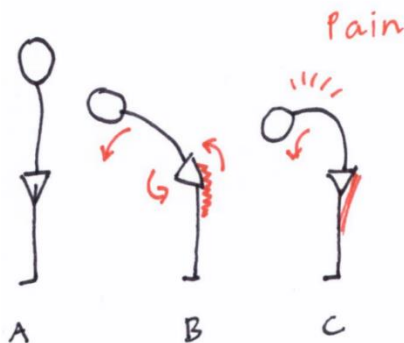
Muscles within our body can be categorized as either stability muscles or mobilizers. Each of these has specific characteristics that enable it to carry out its function.

The stabilizing muscles typically span over one joint and can be further divided into primary and secondary stabilizing muscles. The primary stabilizers have deep attachments and include the transversus abdominis and multifidus (spinal stabilizers). They are smaller and weaker muscles but have the ability to offset fatigue meaning that they can work for long periods of time without tiring. These muscles are ideally suited to maintain posture and stability at a joint ensuring optimal joint congruity. The secondary stabilizing muscles are the main torque producers and are very powerful. They are concerned with the control of movement and absorption of forces as we move.

The mobilizer muscles are larger muscles often spanning several joints. They are less powerful than the secondary stabilizers but situated to facilitate large ranges of movement.

Musculoskeletal injury often leads to muscle weakening or tightening. However, we must also consider that altered movements because of muscle weakness or tightness can lead to musculoskeletal injury and pain. Changes in muscle strength or length because of poor posture, specific sporting activities or repetitive movements often occur in patterns. Mobilizer muscles tend to become tighter and stabilizer muscles tend to weaken leading to a muscle imbalance. This leads to altered length-tension at a joint and can pull a joint out of alignment and lead to poor movement control ultimately leading to injury.

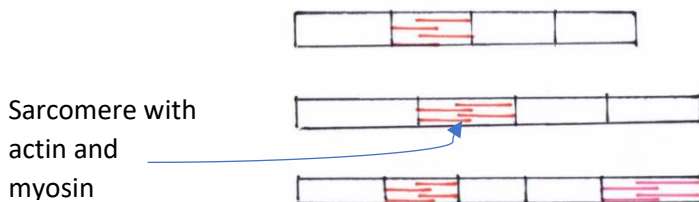
A good example of this is seen in the toe touching exercise: when we bend forwards to touch our toes, movement should occur through a combination of hamstring lengthening and lumbar spine flexion. However, our body prefers to take the line of least resistance and if we have tight hamstring muscles and looser lumbar musculature because of prolonged sitting posture, greater movement and therefore greater tissue strain will always occur at the lumbar spine. Excessive motion at the lumbar spine can lead to pain and injury (Fig 2).



**Fig 10: Relative stiffness in the body**

- (A) Tight hamstrings, lax spinal tissue
- (B) Forward flexion should combine hamstring lengthening and lumbar spine mobility equally
- (C) Tight hamstrings limit pelvic movement and increase stress in the lumbar spine. Ultimately leading to pain.

Stabilizing muscles held in prolonged lengthened positions will over a period, give way to the pull of gravity and 'sag'. This leads to a 'stretch weakness'. The muscle will be able to exert less force as a result of its contractile elements (actin and myosin) being pulled further apart. This may lead to long term adaptations where the muscle, in attempts to move the contractile elements closer, grows longer by adding more sarcomeres (the smallest unit of muscle tissue) to its length (see figure 11) resulting in permanently increased muscle length, further contributing to poor joint alignment and altered movement patterns.

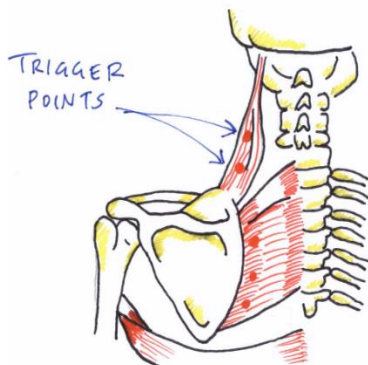


**Fig 11: Muscle length adaptation**

- (A) Normal muscle length
- (B) Stretched muscle – actin and myosin move apart, and muscle loses tension
- (C) Adaptation by increase in sarcomere number

### Trigger points

The mobilizing muscles tend to become tighter with misuse and therefore unable to exert their force through a full range of movement. Tight muscles often inhibit their opposite muscles (antagonists) which can lead to the development of trigger points (see fig 4).



**Fig. 12: Trigger points**

A trigger point (TrP) is a sensitive spot within a taut band of muscle. They are tender on palpation and often lead to tightness or ache in the surrounding muscle.

TrP are commonly experienced in the upper back where there is tightness in the front of the shoulders.

### Restoration of muscle imbalance

To restore muscle balance and therefore optimal movement patterns, three elements must be considered:

1. Correction of muscle length
2. Core/joint stability
3. Segmental control

It is apparent from the example using the toe touching exercise, that simply stretching may be ineffective as a hamstring stretch unless we stabilize the trunk muscles first.

Eccentric exercises (i.e., when the muscle is contracting under a lengthening force (such as stiff-leg deadlifts for the hamstrings or the lowering phase of a bench press for the pectoral muscles) may stimulate an increase in serial sarcomere number and therefore restore mobilizer muscle length. The

key point here is to ensure full range of movement through loading in order to stimulate adaptation in muscle lengthening. A thorough assessment by a physiotherapist is very important to identify the reason why you are experiencing pain and establish a course of treatment to address factors contributing to any dysfunction, pain or injury.