CORE STABILITY

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Core Stability is a buzz-word at the moment. However there seems to be a lot of confusion of what it actually mans. When most people are asked they will be able to come up with “It’s got something to do with Abs” or “It’s what you do on Swiss balls”. Whilst both of these descriptions have an element of truth, they don’t describe core stability or why you, as a therapist, should pay any attention to it.

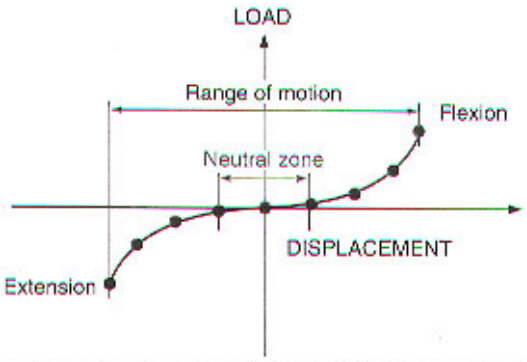

Figure 1: Schematic representation of the load-deformation behaviour of the spinal segment highlighting the region known as the neutral zone

In order to gain an understanding of core stability we need to look at the anatomy of the spine and the muscles that act upon it. The spine is made up of individual vertebra. The passive structures such as the ligaments of the spine, the thoracolumbar fascia, joint capsules of the zygapophysial joints and the annulus fibrosis of the disks all hold the vertebra in place but still allow them to move against each other. After all, they need to move if we are to bend over or twist. However if your vertebra were to move against each other as far as these structures allowed all the time, there would be considerable wear on all the structures. Ligaments and fascia are able to lengthen, so if your vertebra move a lot, over time they will be able to move more and more. The more repetitive excessive movement there is at a joint, the greater the stresses placed upon the disks. If this continues over any length of time you stand to risk a disk injury in addition to injury to your spinal ligaments and muscles.

The vertebra will move against each other during normal daily activities, even ones which you may not initially think placed much load on the spine, such as walking or sitting at a table. However, this movement increases as soon as any load is placed on the body. Things like carrying your shopping home, cleaning the floor and gardening can increase the load on your spine as much as sporting activities. When your vertebra move outside the neutral zone, all the injuries described above become more likely.

It should be stressed at this point that most of these injuries build up over years. You may happily go through life without pain and one day as you lift the shopping into the back of the car one of your lumbar disks prolapses. This is not usually due to the shopping that you just lifted, that was just the last stimulus. But since your spine has been unstable for so many years it only needed a small load for it to fail.

So what can we do to improve the stability of the spinal column and decrease the chance of these injuries happening? The answer is to improve the client's posture to reduce the stresses on the spine and to strengthen the core stabilisers.

Think of the body like a ship. It has a mast in the middle and big guide ropes that control the mast. The guide ropes help keep the mast upright and distribute any stresses placed upon it through the rest of your body. In this analogy the mast is your spine and the guide ropes are your outer unit muscles, such as Rectus Abdominis, Internal and External Obliques, Erector Spinae and Latissimus Dorsi. However, unlike the ship, your spine is not a single solid object. It has joints all the way up. If we only had the guide ropes our mast would buckle. Instead, we need muscles to hold the intervertebral joint in line and prevent too much movement at each of these. This job falls to the inner unit muscles, such as Interspinales, Intertransversarii, Multifidus, Transversus Abdominis and others. The amount of clinical studies examining the role of Interspinales and Intertransversarii in the stability of the spine is limited, so we shall focus on Multifidus and Transversus Abdominis here and their role in promoting the stability of the lumbar spine.

The function of the core stabilisers or ‘inner unit’ muscles is to restrict the movement of the vertebra against each other to within the safe region of the neutral zone. The more load is applied to the spine, causing increased segmental movement, the more the stabilisers need to act to prevent injury. Clinical studies have shown that the stabiliser muscles contract before the body performs any movement. The strength of the contraction is proportional to the amount of load that is about to be placed on the body. However, in clients with low back pain the action of the stabilisers was either delayed or not present at all, meaning that their spine was not protected from the sheer forces placed upon it. This means that clients with low back pain, in addition to being uncomfortable now, are placing themselves at greater risk for long-term damage the longer their back pain continues. This same thing may be happening in clients who do not currently experience back pain. If their segmental stabilisers are not functioning, they are more at risk of developing problems in the future.

The body tries to do everything it can to protect itself. If it feels pain in an area it will restrict the action of any muscles that could make the pain worse, and it tries to compensate by recruiting other muscles to do the same job. Multifidus and Transversus Abdominis are segmentally innervated. They have a nerve supply from each level of the spine they cross. This means they are able to contract very specifically to stabilise a particular segment. However, it also means that they can be very specifically shut off through pain inhibition, should there be any pain in the area that segmental nerve supplies. This is the case in patients with back pain, but it can also affect patients with abdominal pain, such as indigestion, menstrual cramps or organ pain. Since the body can’t use the inner unit muscles to stabilise the spine, it tries to do the best it can with

the outer unit muscles. You will often find that clients with back pain have very tight outer unit back muscles. Massage can be very effective in releasing the spasm in these and this will feel great to the client, but you must be aware that by releasing these muscles you let your client walk out of your clinic with an unprotected spine.

So how does recruiting Multifidus and Transversus Abdominis help to stabilise the spine? Lumbar Multifidus consists of a group of five separate fascicles. The shortest of these fascicles connects the lamina of one vertebra with the mamilliary process of the vertebra two segments caudad. The longer fibres arise from the spinous processes of the vertebra and attach to the mamilliary processes of the vertebra three, four or five levels caudad. Contraction increases the stiffness of the lumbar spine by contracting whenever the segment may move beyond the neutral zone. Since the muscle is segmentally innervated it is able to provide this control at exactly the level that requires it.

Transversus Abdominis on the other hand does not attach directly into the lumbar spine. It attaches to the thoracolumbar fascia. When Transversus Abdominis contracts it draws the abdomen in. This places tension in the thoracolumbar fascia. Due to the oblique arrangement for the fibres within the thoracolumbar fascia, tension in this increases the tension between the vertebra it attaches to and so increases the stiffness in the lumbar spine.

The inner unit muscles are closely linked neurologically. When contracting Transversus Abdominis, most people will also contract Multifidus, as well as their pelvic floor and diaphragm. Training these muscles is unlike the type of work usually carried out in the gym, making it ideal for therapists to do with their clients. When training muscles most people think about lifting weights, i.e. training the prime movers in their body.

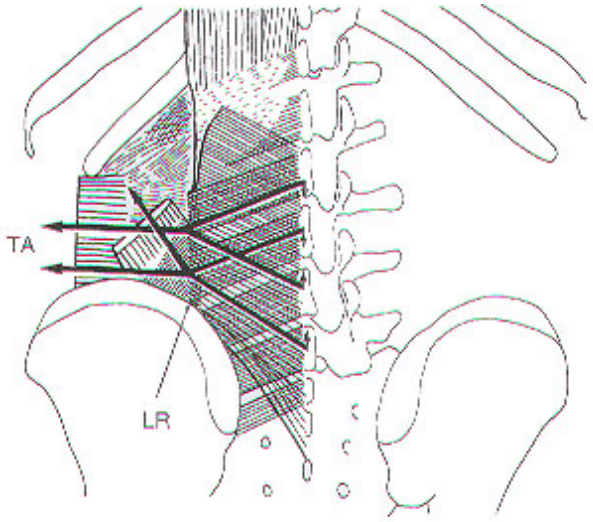

Figure 2: The mechanics of the thoracolumbar fascia. From any point in the lateral raphe (LR), lateral tension in the posterior layer of thoracolumbar fascia is transmitted upwards through the deep lamina of the posterior layer, and downwards through the superficial layer. Because of the obliquity of these lines of tension, a small downward vector is generated at the midline attachment of the deep lamina, and a small upward vector is generated at the midline attachment of the superficial lamina. These mutually opposite vectors tend to approximate or oppose the separation of the L2 and L4, and L3 and L5 spinous processes. Lateral tension on the fascia can be exerted by the transversus abdominis (TA), and to a lesser extent by the few fibres of the internal oblique muscle when they attach to the lateral raphe.

However, the core stability muscles are there to prevent movement, not generate it. To train these we need to work on control and increase the proprioception a client has over their muscles. This is where Swiss Balls can come in. These provide an unstable environment, as anyone who has tried to sit on one will be able to testify. They put the body into a position where it needs to stabilise itself if it wants to stay upright and is therefore more likely to use the core stability muscles.

However, a word of warning here. Swiss balls only help a client work their core stabilisers if these are functional. If you place a client who is not able to recruit these muscles on a Swiss ball, or into any other environment where their spinal stability is challenged, you could do more damage to the spine. Core stability training needs to be carried out after having assessed the level of activation a client can produce and having taught them how to voluntarily contract the relevant muscles. It is these techniques that will be covered in the Core Stability workshop being held by Alan & Corina Lunn.

References:

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Corina Lunn is a Sports & Remedial Therapist and CHEK Exercise Coach. She works from home doing Remedial massage and personal training. She uses core stability training and corrective exercise to help clients recover from injury and improve their posture. Contact her on 0131 662 1896.

Alan and Corina Lunn intend to run a CPD workshop on "Core Stability" for SMTO members from 9am – 5pm on Saturday 30th October 2004. The workshop fee includes your very own "Swiss Ball". Contact us on 01224 822960 if you are interested in attending, or get your booking form into us.