# Getting Back To Exercise Without Pain: The Lower Back Part I.

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**Abstract:** Most people today live a sedentary lifestyle. Lack of movement results in the body becoming less equipped to take part in sporting activities, presenting considerable challenges for personal trainers and sports coaches. When the body is expected to perform, a weak musculoskeletal foundation can lead to postural deviations, muscular imbalances and unaligned joints. Physical inactivity increases the risk of musculoskeletal disorders (MSDs) (12,14) and injuries during sport and recreational activities. A common issue in most work environments is inappropriate, repetitive sitting, lifting and standing positions that aggravate low back pain. Tight muscles around the hips like the hip flexor complex, the lumbar erector spinae and underactive muscles like the gluteus maximus or multifidus can result in excessive, unwanted motion of the lumbar spine(14,18). One approach to counter ailments is the NASM Corrective Exercise Continuum (CEx) – which promotes the activation and deactivation of muscles, fascia and the nervous system(2).To accomplish the four stages of the CEx model (Self-Myofascial Release (SMR), stretches, isolated activation and integration of muscles) a good understanding is needed of the healthy musculoskeletal system through different postures; the nature of musculoskeletal diseases; and identifying risk factors for potential musculoskeletal problems. My aim is to discuss how improved muscle strength and flexibility around the hips can help prevent or help improve core strength and decrease lower back hypermobility. In line with the NASM CEx system, I have suggested some easy-to-implement techniques and exercises and drawn attention to preventative body awareness measures. Please refer back to my previous three articles on the description and use of the movement assessments and the CEx.
Keywords: low back pain, lower crossed syndrome, the NASM Corrective Exercise Continuum, neutral spine, sedentary lifestyle

**Questions**

*What are the signs of low back hypermobility and what is considered to be normal alignment from a preventative point of view?*

*Where should we look for stability and is there a short-term solution to prevent lower back pain occurring and reoccurring?*

**Introduction**

Lower back pains are particularly common with both regular gym users and those who reserve their exercise only for the weekend. The issue is more likely to stem from weak hip, core muscles and a lack of mobility at the front of the hip and thoracic spine. I will only talk about acute low back pains that tend to be mechanical in nature and related to the hypermobility of the lumbar spine as this condition responds very well to corrective and specific stabilization exercise (4,6,26). Usually the client comes to see the Personal Trainer when they have already seen a GP or worked with a physiotherapist who has suggested exercise as a solution to prevent this pain from re-occurring (24,26), however with our static and dynamic movement screens we will be able to confirm their findings or we will be able to scan for potential risk factors for low back pain.

In the ten years, that I have been helping people in their training, from those new to the gym to accomplished athletes, many have come to me suffering with an injury. They mistakenly come to the conclusion that their problems such as an exercise-aggravated low back pain are a sign that they should give up their preferred exercise routines. In my opinion, if they were to consider the direct effect of their habitual postures and long hours of inactivity each time when they have an episode arising they would realize the connection between low levels of physical activity for most of the day and niggles and pains arising with exercise.

The deterioration of the condition of muscles, tendons, ligaments, cartilage and even bones appear over time and therefore learning and understanding how to keep these tissues in good condition will help the appropriate use of the musculoskeletal system. So, before hitting the gym or the running track, everyone should incorporate a number of preventative steps into their warm up or even during the session itself which would then keep the injury rates to a minimum or would stop misalignments developing which cause problems during these bouts of exercise. This preventative approach is reflected in the CEx system. In the lower back the muscles are the most common sites of pain, followed by the intervertebral disks as the second most common problem tissues (REF). CEx has enabled my clients to eliminate or greatly improve MSDs such as hypermobility of the lumbar region, muscle weakness related low back pains and prolapsed disk related complaints.

**The Neutral Spine**

The desired neutral position of the spine is described by Panjabi, 1992 as one “in which the overall internal stresses in the spinal column and

muscular effort to hold the posture are minimal" (20) When in a neutral posture (good posture), the body is in its strongest and most balanced and the least strain is placed on supporting muscles, ligaments and other tissues during movement or weight-bearing activities and no abnormal wear and tear will be present. While good or bad posture is the position in which a person holds their body upright against gravity while standing, sitting or lying down. In static posture analysis, the spine is bisected by a so-called plumb line (Figure 2). From the sagittal view the plumb line should bisect the ear, the cervical vertebral bodies, the center of the glenohumeral joint, the lumbar vertebral bodies, the center of the acetabulum, just behind the patella, and through the tarsals of the feet (15). This sagittal line of reference theoretically indicates even distribution of weight between the front and the back of the body.

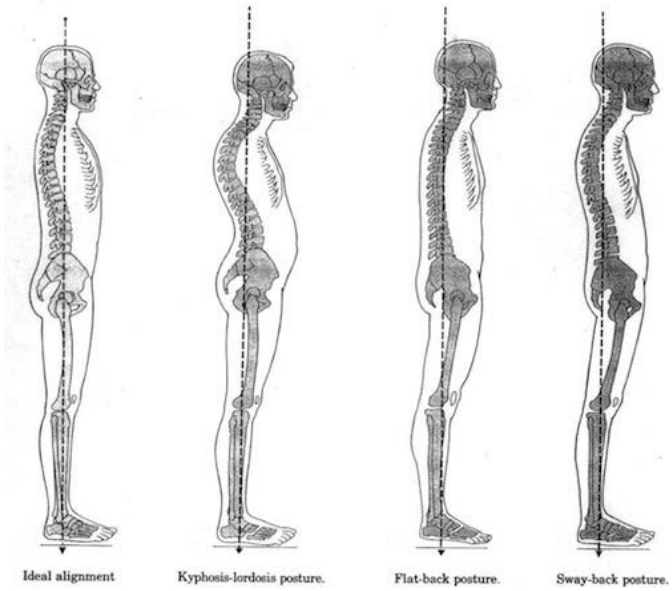


Figure 2. Common postural variations, illustrated with the plum line

The neutral spine described above does not equate to a flat spine, as there are three natural curvatures (Figure 3). The neck, known as the cervical spine, and the lower back, known as the lumbar spine has a natural anterior curve or lordosis. The thoracic spine, or trunk, has an opposite orientation, a posterior curve, which is known as a kyphotic curve. These natural curves give the spine a slight 'S' shape when viewed from the side. Maintaining a neutral spine is a dynamic process that is meant to transition from position to position.

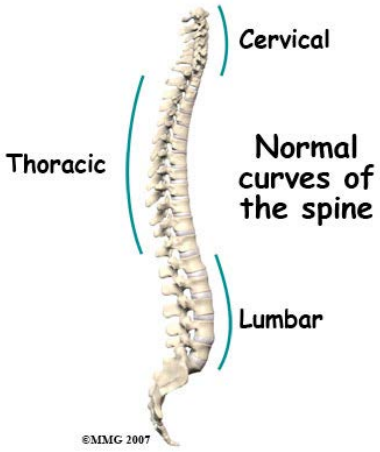


Figure 3. Neutral spine

**The Neutral Zone in spine motion**

The Neutral Zone is part of the normal physiological intervertebral motion, measured from the neutral position of the vertebrae, within which the spinal motion requires less effort and meets minimal resistance. It is the zone of high flexibility or laxity (20). Clinical Instability of the spinal segments will indicate the segments inability to stay within this neutral zone due to a significant decrease in the capacity of the stabilizing system of the spine to maintain the intervertebral neutral zones (19,20). According to Panjabi, 1992 there are three spinal stabilizing systems such as the active system, comprising the muscles, tendons; passive system ligaments, disks, facets, vertebrae; and the nerves' feedback system as part of the central nervous system. These will constantly try to adjust so that the neural zone remains within certain physiological thresholds. Problems start when this cannot be maintained any more due to fatigue and strain of the stabilizing systems. I will discuss the sources of fatigue later in this article. The reasons behind the unwanted range of motion (ROM) increase may be due to injury or to weakness in the muscles, most importantly the multifidus (7, 8, 25) which in turn may lead to not just spinal instability but in the long-term even low back pain. As a protective mechanism, ROM may decrease with time by osteophyte formation and fusion, or in a more desirable way due to active muscle strengthening.

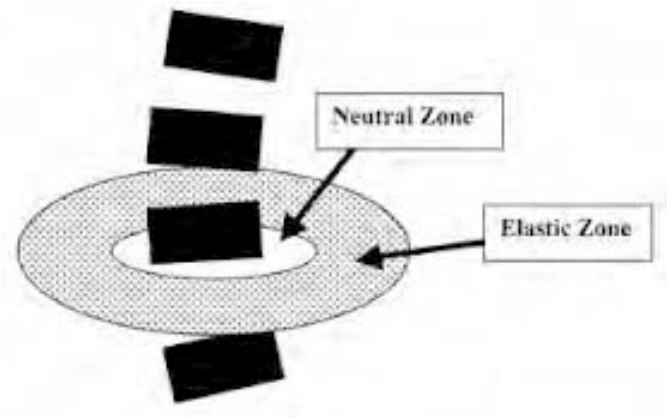


Figure 4. Intervertebral movement: neutral zone and elastic zone (Panjabi, 1992b)

**Different postures different disk loads**

An intervertebral disk links the adjacent vertebrae together and acts as a ligament to hold them together. Their role is in shock absorption and also to allow a small movement of the vertebrae. Load on the disks depends on posture. It has been revealed that the sitting position leads to pressures five times greater than those when lying down and significantly less strain is present when standing compared to different seated postures (Figure 5). If in addition, external weights are lifted this can greatly increase the intradiscal pressure, especially if the weight is held away from the body and with a poor posture.

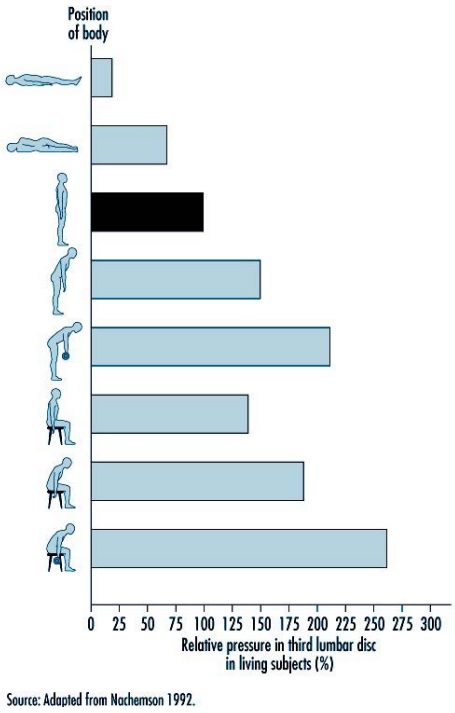


Figure 5. Relative pressures on the disk in different body positions

Bending over, whether it is standing or seated, can double the strain and the pressure on the disks. If this high-pressure state is prolonged and repeated daily the disk will lose its ability to regain its optimal form and shape and the outer fibrous layer wears off gradually and degeneration begins on top of the normal process of aging. The disk then may herniate because of a sudden, traumatic injury or repeated minor injuries, or might rupture completely when the outer layer doesn't hold any more (Figure 6). This can cause great pain. Being overweight or lifting heavy objects, particularly lifting incorrectly even if one lifts one's own weight increases the risk therefore good lifting form is paramount.

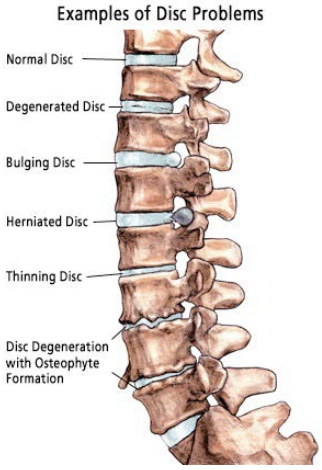


Figure 6: Disk problems

**Lower Crossed Syndrome**

The lower back where most back pain occurs includes five vertebrae, referred to as Lumbar 1-5 (L1-L5). The lower (lumbar) spine connects the chest to the pelvis and legs, providing mobility and supports for much of the weight of the upper body. It also allows sufficient force transfer between the lower and upper body when it is in balance. A typical imbalance linked to this region is the lower cross syndrome documented first by Janda 1987, characterized by the imbalance of tight and short hip flexors like the iliopsoas, lumbar extensors like the erector spinae and inhibited and weakened gluteus maximus and abdominal muscles (14,18). The syndrome promotes an excessive forward tilt of the pelvis and protrusion of the lower abdomen with an increased lumbar lordosis, and a slightly flexed position of the hips (Figure 7).

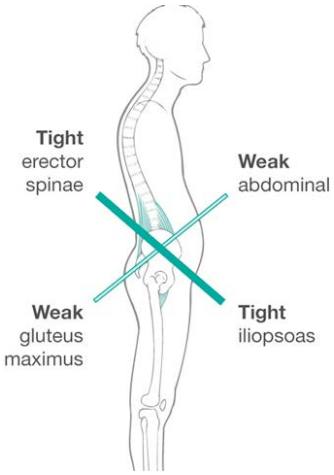


Figure 7. Janda's Lower Crossed Syndrome

Over-activity and tightness of the erector spinae muscle in the presence of inhibited and weakened gluteal muscles will alter the pattern of hip extension, by changing the order in which the muscles get activated. Namely, the lower back erector spinae will fire prior to the glutes. Therefore the lower spine gets overloaded, compressed and hypermobile especially in the L4-L5 and L5-S1 joints. The result of the excessive loading of the lumbar spine and hip joints may lead to stiffness, irritation and inflammation of the joints and surrounding soft tissues such as the disks. Eventually pain occurs, typically affecting the L5-S1 and L4-5 regions. The hypermobility of the lower lumbar spine, that represents itself in an excessive curve is often compensated for by an increased kyphosis of the thoraco-lumbar junction (Figure 8), and an increase of the cervical lordosis develops in efforts to balance the body against gravity.

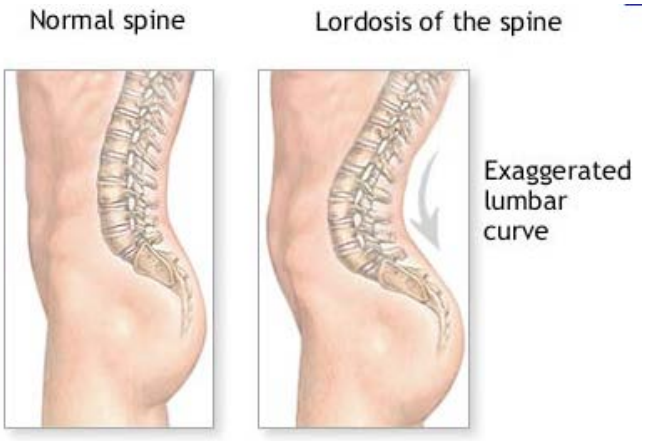


Figure 8. Lordosis and hypermobility of the lumbar spine

**Possible pathogenesis of muscle pain and injury**

It becomes evident that most back pain is caused by disturbances of the muscles, ligaments, and nerve roots pressed by disks around the spine. However, when pain is present, often a single specific cause cannot be identified. Whatever the cause, factors such as physical fatigue, obesity, and lack of exercise can worsen back pain. Most acute low back pain is mechanical in nature; risk factors include repetition, force, static load, posture, and vibration. Work-posture related fatigue caused by insufficient muscle blood flow, nutrients and intramuscular biochemical changes (3) can lead to degenerative processes such as the breakdown of muscle membrane. In general, a tissue must be active to remain capable of living as inactivity causes atrophy (Hides, 2008), therefore those muscles and ligaments that get to be underused decrease in size.

Conversely, physical activity may increase muscle strength and working capacity, through facilitating growth in muscle volume. This translates into an increase in the number of contractile myofibrils and the volume of sarcoplasmatic reticulum and increased metabolic capacity of the tissues as more nutrition gets to the muscles or waste products can be removed efficiently (Edwards, 1988). Interestingly, the muscle fibers that are affected the most by the degeneration process are „slow twitch fibers".

**Stabilizers tend to get weak, mobilizers tend to get tight**

We can categorize the muscles around the hips and pelvis (Lumbo-pelvic-hip-complex) as: stabilizers or "postural muscles" that mostly consist of slow twitch muscle fibers that are mono-articular (one-joint) muscles linking small segments of the spine together for local stability and core support (23), while mobilizers or "task muscles" are mostly fast-twitch muscle fibers, superficial and are often bi-articular (two-joint) muscles for global stability (22). Stabilizer muscles also responsible for the intra-abdominal pressure and to develop a stiffness around the trunk that acts as a 'corset' which needs to be created when one needs to brace the torso before lifting an object or one's own bodyweight for supporting the spine (23) (Figure 9). It is not difficult to see that the atrophy of these local stabilizer muscles can have devastating effect on one's spinal and trunk stability.

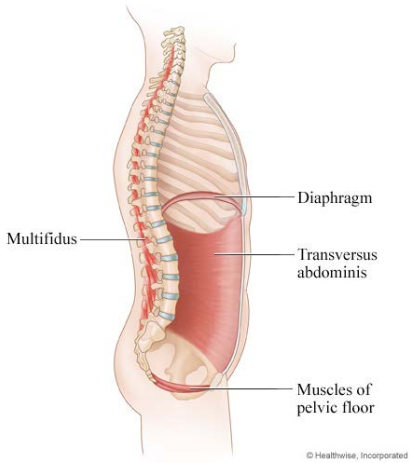


Figure 9. Stabilizers of the trunk also responsible for bracing before lifts

Mobilizers have the tendency to become overactive and tight causing imbalance around the joints, when the muscles on one side of a joint are constantly tight and the opposing muscles are lax, the joint will move out of alignment permanently, pulling the joint toward the tight muscle, changing length-tension relationships around that joint. Also, without the local stabilizers producing the required stiffness of the joints prior to the movement of a limb, the mobilizers won't be able to produce accurate, efficient movement. They won't work optimally but they will try to compensate for it by working harder and overworked tissues on the shortened side of the joint will develop trigger points over time that further shorten the muscle while also making it weaker. It is again easy to see how imbalanced muscles and joints can cause postural deviations. It seems that the most effective way to correct imbalances is to deactivate, roll and stretch the overactive muscles first and to reactivate and strengthen the underactive muscles.

Typically underactive muscles

It seems that, in low back pain as well as in knee and ankle pain, 'gluteal amnesia', the body's inability to fire the glutes on time, can be responsible. A common postural flaw that can lead to gluteal amnesia is the above-mentioned anterior pelvic tilt that is present in the lower crossed syndrome. As the gluteus maximus is constantly in a lengthened position due to this tilt it fails to provide hip extension through the full range which will mean that the other extensors of the hips the less efficient once, such as the hamstrings and lower back erector spinae, have to take over this job. The activation of the primer stabilizer muscles also appears to be delayed (9) most important being the multifidus (7,8,25), asymmetric atrophy between sides can present itself (7,8) causing further problems between left and right sides of the body. Research found that the multifidus in patients with lower back pain had gone through abnormal degenerative changes, was atrophied, fatigued and unstable in concentric action. When this happens, the middle layer stabilizers such as the transverse abdominis (TrA) would take over, however, in lower crossed syndrome where low back pain was present the TrA also has a delayed onset of contraction (5, 11) and a loss of its tonic and pre-adjusting function (9). This motor control deficit is hypothesized to result in the inefficient muscular stabilization of the spine (9,10) and the excessive move of the spinal segments outside of the Neutral Zone.

| STABILIZERS | | MOBILIZERS |
|---|---|---|
| Primary | Secondary | |
| Multifidus | Gluteus maximus | Iliopsoas *<br>Rectus femoris |
| Transversus abdominis | Quadriceps | Hamstrings |
| Internal oblique | Iliopsoas * | Tensor fasciae lata |
| Gluteus medius | Subscapularis | Hip adductors |
| Vastusmedialis | Infraspinatus | Piriformis |
| Serratus anterior | Upper trapezius | Rectus abdominis<br>External oblique<br>Quadratus lumborum * |
| Lower trapezius | Quadratus lumborum * | Erector spinae |
| Deep neck flexors | | Upper trapezius<br>Levator scapulae |
| | | Sternomastoid<br>Scalenes |
| | | Rhomboids<br>Pectoralis minor<br>Pectoralis major |

Table 2. Stabilizer and mobilizer muscles that affect the low back

Figure 10.
Source: Luque-Suárez et al., 2012

***To be continued***

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