Functional
Low Back
REHAB

INTRODUCTION

Lower back pain is the leading cause of disability worldwide, affecting around 80% of the population at some point in their life, with approximately 25% of people having ongoing issues.

Many people are given a “diagnosis” of non-specific lower back pain. There is always a reason for low back pain. The world’s foremost spinal researcher, Professor emeritus Dr Stuart McGill, attributes back pain to poor motions, postures and loads, which exceed tissue capacity and cause injury. Similarly, Australian spinal neurosurgeon Dr David Johnson calls back pain a disease of movement dysfunction.

All biological tissue has fatigue and load capacity. Flawed movement patterns, mobility restrictions, muscle weakness and poor motor patterns are all factors which overload the passive structures of the spine - discs, ligaments, cartilage and bone - and cause injury. Rehabilitation focuses on identifying specific impairments and then improving function and capacity through exercise.

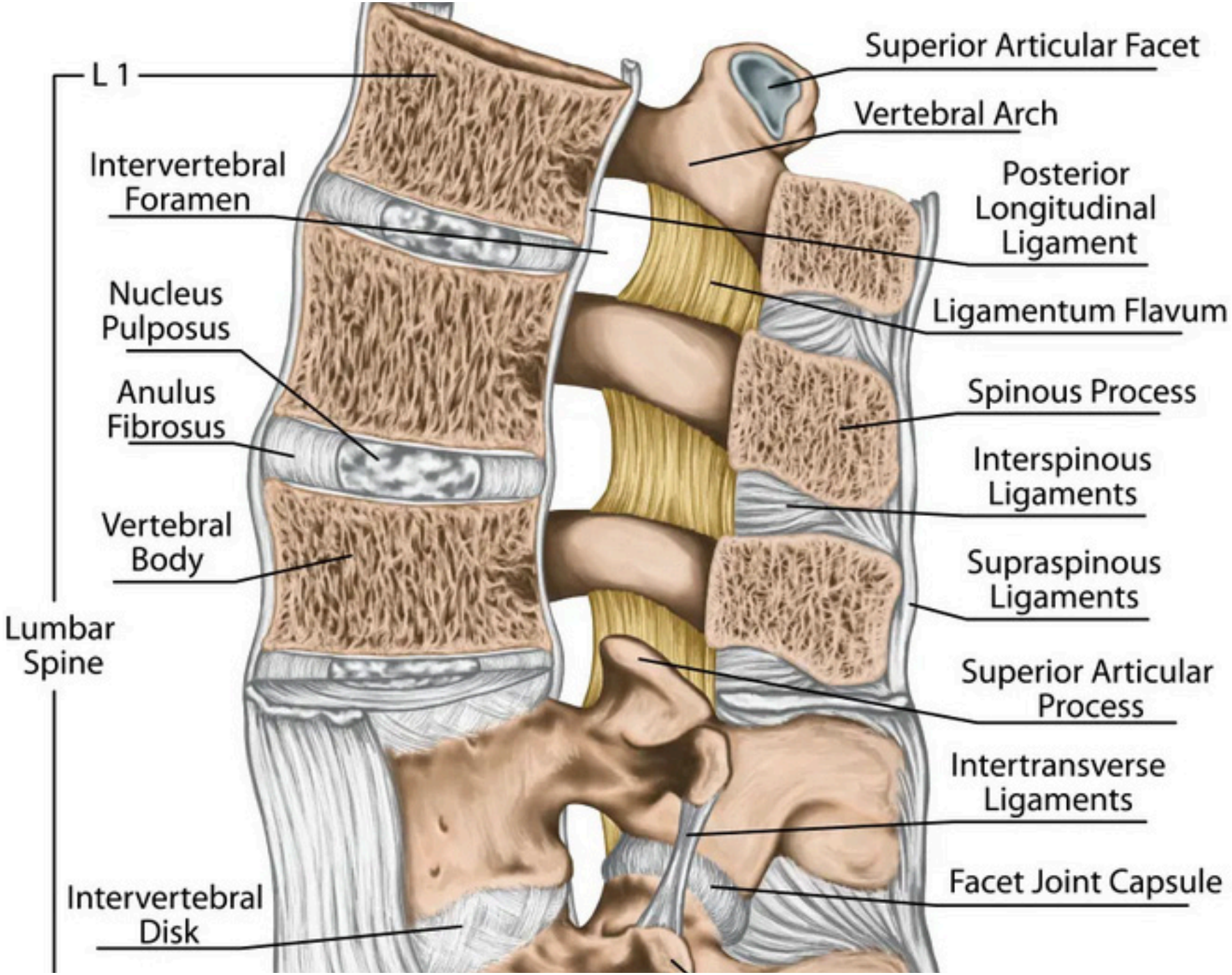
Basic Spinal Anatomy

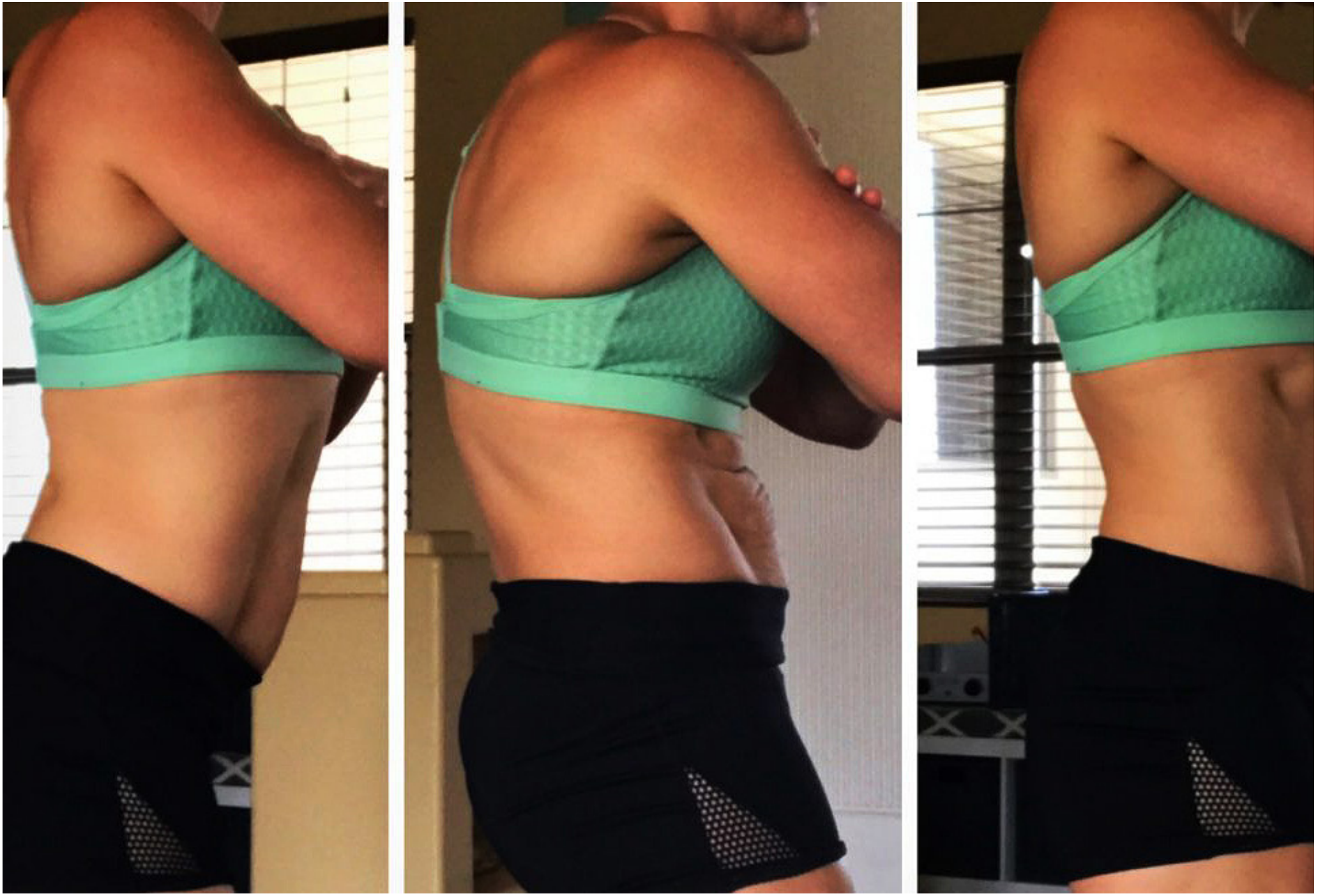
The spine is comprised of individual bones (vertebrae) stacked on top of each other. Between each vertebrae is the disc, which is comprised of circluar rings of collagen, that holds an inner gel-like centre, the nucleus.

Facet joints are the other major structures of the spine that can be responsible for back pain. Facet joints guide and limit motion within the spine.

The spine houses the spinal cord, which has nerve roots that exit at each level of the spine. Damage or interference of the nerves can cause both back pain, as well as referred pain to other tissues such as the foot. Nerves can be irritated a number of ways - mainly through a disc bulge or herniation, or a narrowing of the vertebral canal (stenosis).

There are many - and many layers - of muscles in front of and behind the spine. Their role is to protect and stabilise the spine, so movement can occur at the extremities (shoulders and hips).


L 1
Intervertebral Foramen
Nucleus Pulposus
Anulus Fibrosus
Vertebral Body
Lumbar Spine
Intervertebral Disk
Superior Articular Facet
Vertebral Arch
Posterior Longitudinal Ligament
Ligamentum Flavum
Spinous Process
Interspinous Ligaments
Supraspinous Ligaments
Superior Articular Process
Intertransverse Ligaments
Facet Joint Capsule



Neutral Spine

Neutral spine is when the spine is in its most natural and resilient position. It's the foundation of quality movement - and sitting - patterns. It means that during these tasks, the spine has maintained its natural curves. This position places the least amount of stress on the spine and related tissues. Posture and movement determine how much load, and subsequently, stress, is applied to associated joints and tissues.

Constantly bending forward with poor movement patterns, or sitting and working in positions with a flexed spine, can lead to creep deformation of the posterior tissues, which lowers the threshold at which injury occurs.

Neutral spine is also an important position for recovery from back pain. Sitting with a flat or curved spine exposes the passive structures to stress that prevent them from healing.

Neutral spine is not a single specific point, but a small range.

Injury Mechanisms - Passive, Active and Neural Concept

Back pain doesn't occur from minor incidents. It is the result of cumulative microtrauma from repetetitive sub failure magnitude loading or sustained postures, which decrease tissue capacity, exposing the passive structures to injury.

The passive tissues of the spine work together with the muscular system to provide stability to the spine. The neural component refers to motor patterns, which is the way muscles are recruited, movement patterns, and proprioception, which is the body's ability to sense itself in space.

Correcting flawed movement patterns is one of the major steps in rehabilitating back pain, but increasing the muscles' strength is also a key aspect. Researchers have demonstrated that the passive tissues of the spine can only withstand around 2000 nMetres of compression before injury, yet Olympic weightlifters and elite powerlifters have forces up to 17000 nMetres during their events.

Disc Pathology

Discs are comprised of circular rings of a tough, dense connective tissue called collagen. These rings are tightly bound together, but repeated flexion activities, especially when under load, can lead to delamination and weakening of the collagen, which then allows a disc bulge or herniation to occur.

Disc injuries fall into three different categories. The first is a focused disc bulge, which occurs around the periphery of the disc, and is caused by repeatedly bending the spine in the direction opposite the load. Occupations that involve repeated motions are a common reason for developing this injury, as are people with an asymmetric pattern of hip mobility, which forces motion in one particular direction.

All tissues, including discs, have a fatigue capacity. There are therefore a finite number of times where it is possible to bend before injury occurs. Body type and genetic shape of the discs are two factors governing this capacity, as are movement patterns and load.

The second type of disc bulge is a result of the disc losing height. The disc bulges on all sides, and is commonly referred to as degenerative disc disease, which is an inaccurate term.

This type of disc injury tends to result in spinal instability. Stuart McGill refers to this pattern of disc pathology as similar to letting air out of a car tyre. A car will tend to be more unstable across the road surface like this. Similarly, the instability that presents with this pathology can allow micro-movements to occur through the spine, causing pain.

Pain commonly occurs during seemingly simple tasks such as rolling over in bed, leaning forward to open a wondow or flush the toilet, and similar functions.

The final type of disc bulge is more accurately a tear. Repeated twisting and bending movements gradually lead to delamination of the collagen fibres of the disc. Most people are unaware of how many times a day they twist through the lumbar spine.

Unloading groceries, turning to put something on the nightstand next to the bed, opening doors and numerous activities in the office environment all involve twisting, as may even a seemingly simple task like using a broom or a vaccum cleaner.

Certain sports like golf, tennis and hockey involved repeated spinal twisting. The key to success with these activities is minimising twisting activities through the day, developing hip and thoracic spine mobility so motion occurs in areas designed to move, and increase rotational capacity through movement training at the appropriate time.

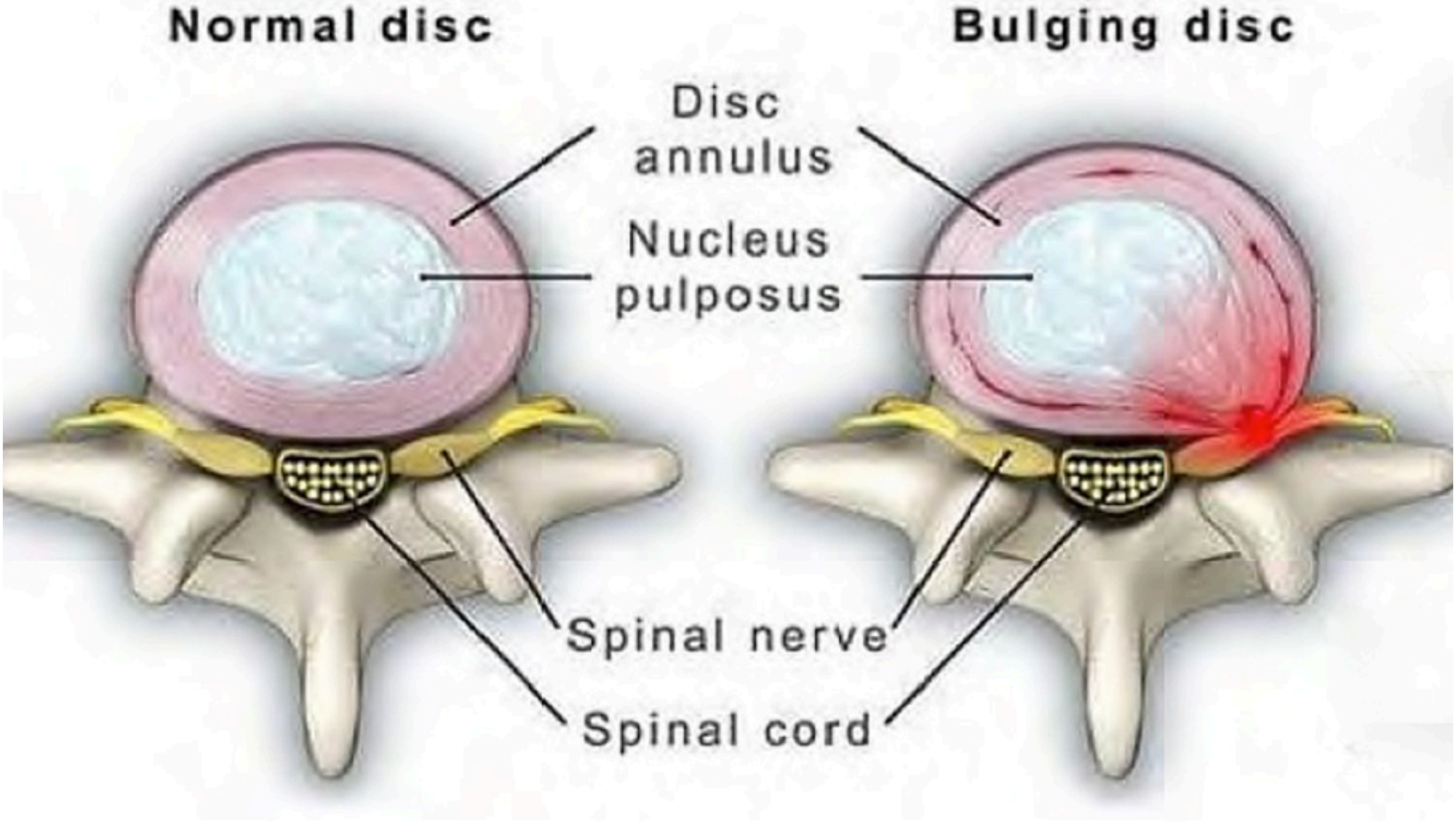
Disc Bulge, Herniated Disc, Slipped Disc?

Disc bulges occur when some degree of delamination has occurred. This allows the nucleus to deform slightly, changing the shape of the disc. These injuries often happen during simple daily tasks such as bending over to pick something up, or leaning across a desk, but such activities are not an injury mechanism. The injury occurs due to poor movement patterns and load in the previous months and years.

A disc herniation results more from trauma than everyday use. In this case, the nucleus enters the rings of the disc themselves.

Both injuries can result in either localised or referred pain (sciatica).

It is important to note that discs cannot slip. Spondyolisthesis occurs when a small fracture in the pars allows the vertebrae to move forward, or, less commonly, backwards, but the mechanism of injury for these conditions is different than for disc injury.


Normal disc
Bulging disc
Disc annulus
Nucleus pulposus
Spinal nerve
Spinal cord

Sciatica

Sciatica refers to pain along the sciatic nerve. It's important to note that "sciatica" as a diagnosis is pointless. There are a number of reasons why the sciatic nerve may give rise to pain - disc pathology, a narrowed vertebral foramen (stenosis), spondylolisthesis, instability or muscular causes. Successful rehab involves identifying the reason for sciatic nerve irritation, and then applying the appropriate interventions.

Stretching makes the issue worse; nerve flossing is the better technique, along with spine hygiene, core stability and avoidance of full range spinal motions. Sitting with a neutral spine is important. A lumbar roll may need to be used during the workday in particular, or in cars and planes if commuting is common.

Disc injuries will heal. It may not seem so if sciatica has been ongoing for a period of time, but this is almost certainly due to the underlying causes not being addressed, and thus irritating the nerve on a daily basis.

Spondylolysis and Spondylolisthesis

Spondylolisthesis is when there is a slippage of one vertebrae on another, usually because one of the bones in the neural arch, (pars), fractures, and allows the slip to happen.

These injuries usually result from excessive bending and twisting, and are generally limited to people who participate in sports such as gymnastics, weightlifting and cricket bowlers. Tennis players who arch excessively when serving, as well as soccer and football players who overextend their spines are also prone to developing the condition.

Spondylolysis is a stress fracture of the pars interarticularis. As above, these injuries tend to occur in specific sports or occupations that involve excessive motion.

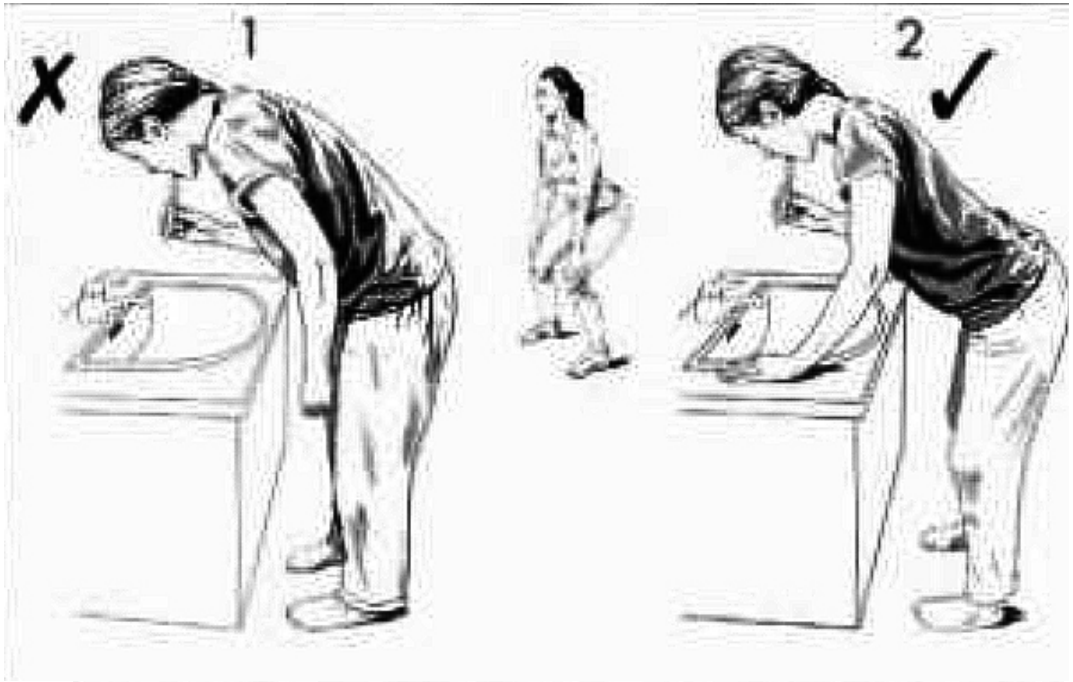
Spine Hygiene

Spine hygiene refers to the practice of moving and performing daily activities in a manner that preserves tissue capacity and winds down pain. This can be anything from the way that you stand, whether in queues at the bank or supermarket, or watching your children and grandchildren play sport.

Many common daily activities are performed poorly, in ways that place excessive stress on the spine and related tissues and reducing its fatigue and load capacity, when there are better ways to perform seemingly simple tasks where bad habits have become ingrained movement patterns.

The way you get out of a chair, bend to put on and tie shoes, sit at home and work, pick things up, even the manner in which you open doors, brush your teeth and put things in the dishwasher, can all be modified to preserve spine capacity for those moments when you do need it.


KBN
Focus



Avoid slouched sitting which stresses the posterior

Stuart McGill, the long time Professor of spinal biomechanics at the University of Waterloo in Ontario, Canada, coined the term spine hygiene, which refers to motions and postures that preserve capacity in the spine.

The aim with lumbar spine rehabilitation is to ascertain which postures, movements and loads are responsible for low back pain, eliminate or modify them, and then build resliience through better movement patterns, core stability and approproriate load gradually increased as tissue capacity increases.

Spine hygiene is an important part of the process to pain free living. The spine is a freestanding pillar designed to bear load, but with minimal movement. The foundation of better movement is maintenance of neutral spine, hip-centric rotation, posterior chain development and movement limited by functional capacity. These factors allow the joints designed to move to bear load, while minimising stress and load on the spine and related tissues.

Core Stability

The muscles of the core and spine are meant to support and stiffen the spine in order for it to successfully bear load. Having great core stability won't prevent back issues if poor movement habits or postures are maintained, but even with excellent movement and postures, core stability is still important.

In the beginning, basic core exercises such as plank, side plank and bird dog exercise may be prescribed, as Stuart McGill's research has shown these exercises develop core stability and help eliminate pain, while avoiding aggravation of symptoms.

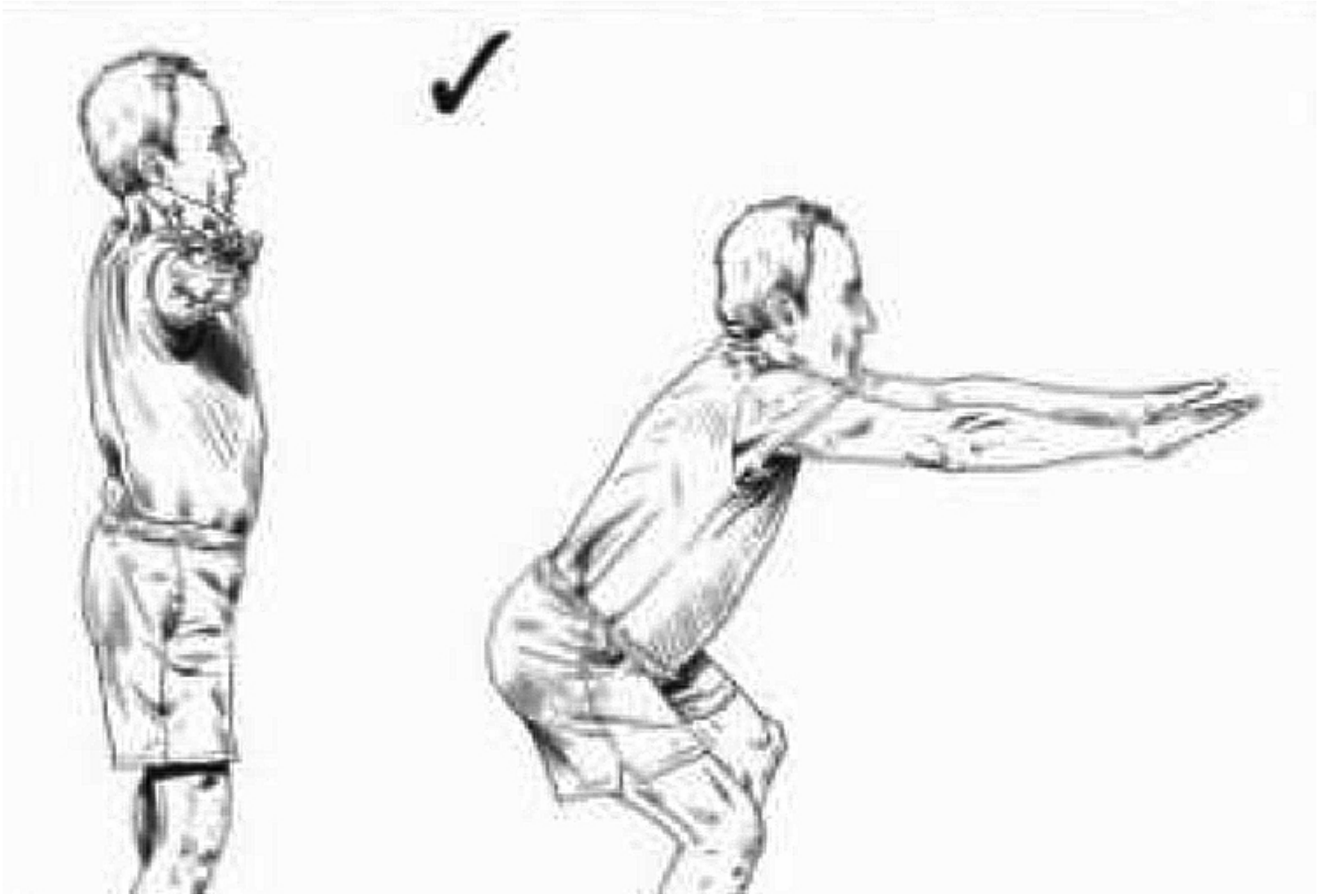
The trick is to prescribe the right amount of exercise at the right time, and then progress to more advanced, functional movements when the requisite core stability has been developed, which minimises further injury and allows for better performance.

Functional Movement

Humans move in fundamental patterns that are essential for improved health and performance. A classic gym exercise like the Romanian deadlift, pictured opposite, belongs to the “hip hinge” or bending moving pattern.

Clearly the spine is in a neutral position, which minimises load, as the hips are used to bend. This movement is the way all manner of daily patterns, such as loading and unloading dishwashers and washing machines, putting clothes away, picking up bags and shopping and even patting animals, should be performed. It is actually the way the body was designed to move, but learned movement patterns that form in childhood lead to poor motor engrams that persist throughout life and may exceed fatigue and load capacity.

Everyone is different, which is why some people can move poorly seemingly without issue. Body shape, disc shape, hip mobility, occupation, sporting activities, repetition and loading all play a role.



The squat, or sit to stand pattern, is the other basic fundamental movement pattern that is often poorly performed. Many people sit down by leaning forward with their spine, and then rising with the same motion, consequently using their spine, instead of their hips, to move.

The correct movement is to sit down by directing the hips first, in a down and back pattern with the neutral spine maintained.

The hips are a ball and socket joint. Their very design means the hips are meant to move through multiple planes of motion. The lumbar spine is a flexible rod that has some ability to move, but driving movement is not its function by design or desire.

Using your hips to move allows pain to wind down, and preserves spine capacity for other functions.

Other fundamental patterns of human movement that enable improved function are classified as carry, push, pull, lunge, rotate and the step-up.

Whilst the squat and hip hinge patterns are generally a motor control issue, the lunge, pictured opposite to pick up a child, can be a simple motor control issue, or a lack of strength in the quads and/or glutes. The lunge is, however, one of the most fundamental and useful patterns of human movement.

Pushing and pulling can relate to opening or closing doors, using a wheelbarrow or vacuum cleaner or moving a trolley at work, or pushing a supermarket trolley. Any bending should take place from the hips or shoulders, with the core appropriately stiffened. Pushing and pulling place shear forces across the spine, which can be a cause of back pain.

In someone who is shear intolerant, certain movements and daily habits will have to be minimised for a period of time,

Stretching

Stretching is often prescribed for back pain, but will actually make the issue worse. People often feel better initially, but this is due to a temporary relaxation in muscle tone.

Stretching and mobility exercises may be necessary depending on limitations. There is evidence that restricted hip mobility, especially a side to side difference, is an indicator of future back pain. It is very difficult to move properly or perform simple daily tasks without sufficient hip and, often, ankle, mobility.

An exercise such as the cat-camel can help mobilise the spine and lessen that stiff feeling. This and the prone cobra are the only back stretches most people should perform.

Mobility exercises for the hips and ankles may be necessary, especially in active people.

The Importance of Glute Strength

Strong glutes are important for healthy spine function. One of the glutes' primary goals is hip extension - the movement that happens every time you walk, when one leg swings behind the body. Getting up from chairs, going up stairs and the hip hinge or bending pattern also require strong glute function.

If the glutes lack strength, then the lumbar spine and hamstrings extend the hip, an action they aren't designed to perform. The single leg glute bridge is a great test of overall glute function that tests stability and activation.

Exercises to develop glute function in the beginning stages might be crab/monster walks and the modified clam, with progression through to the deadlift in various forms.

Return to Activity

Once symptoms have resolved, a return to activity should take a gradual path in order to allow for tissue adaptation.

The return to activity phase is one of the least understood but important components of rehabilitation. No matter how thorough the previous stages of rehabilitation have been, returning to previous activities is a new stress that the body needs to adapt to.

It might take someone 3 months, for instance, to return to playing 18 holes of golf or 5 sets of tennis. Attempting to rush the process is more likely to involve a reccurrence of symptoms.

The information in this booklet is strictly for informational purposes only. It is not intended nor should it be used as a guide to training, exercise or self-assessment and treatment of lower back pain. Anyone using this booklet in this manner is doing so at their own risk.

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