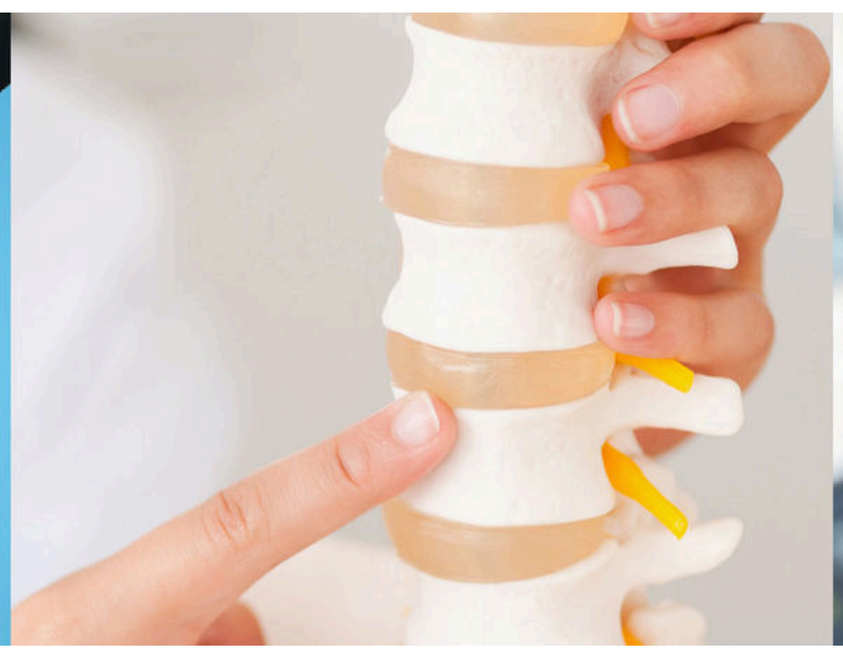
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Our 7 Steps

To Less Back Pain And Better Posture







Includes **FREE** Posture Correction Exercise Videos

Author & Contributors

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Prologue

I have always had a passion in helping people to improve their lives in some way, shape or form. Since obtaining my masters in osteopathy in 2011, I have been fortunate enough to embark on this journey, though it is not yet complete.

It has taken me a while to understand that we (as practitioners) cannot “fix” nor “correct” someone's posture, whatever we do.

I have gradually learned through personal application, that an individual can indeed fix and correct their posture **themselves** by simply being consistently **AWARE** in every environment they have exposed it to, and making the correct environmental and physical changes when and where required.

It is through my acceptance of this and through their diligent application, I am gratefully rewarded every time I see my clients.

In this e-book, we address the effects of posture on the whole body as a unit and we demonstrate how to improve each region of the spine and lower limb for the better.

I have put this free and simplified e-book together using qualified sources and personal tried and tested measures, not for any other reason but to educate and to give to those valuable information that may just make a positive impact in their lives, like it has in mine.

This is for you.

Enjoy!

Yours In Health,

Andrew Siyabalawatte
Director at Back To Health Wellness



Back to Health wellness

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Our 7 Steps
To Better Posture

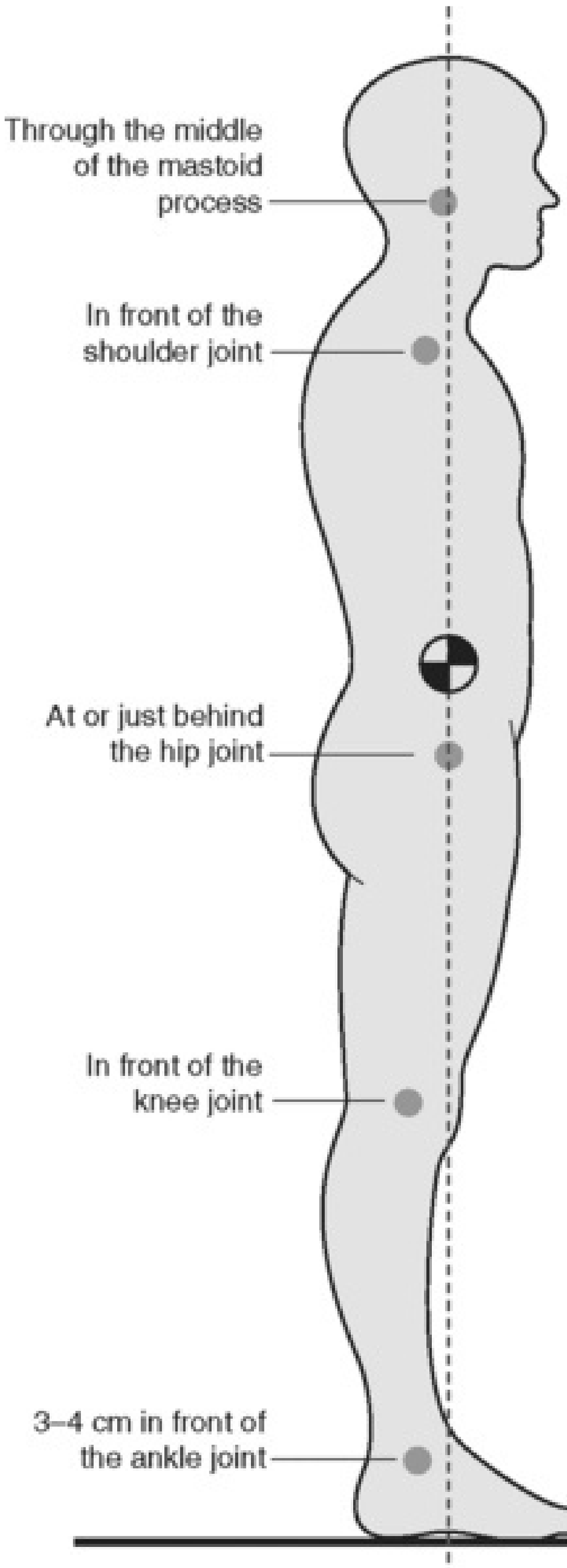


Image and material sourced from a website reproducing this image from Trew & Everett (2005)
(https://musculoskeletalkey.com/good-posture-and-how-it-can-be-achieved/#bib12

WHAT IS GOOD POSTURE?

All the muscles and joints in the body, contribute in some way to maintain a good position. Balance between the muscles and the bones of the body are critical to its protection and its ability to move and function properly.

Good posture is simply the best position within the body that puts the least strain on bones, joints and their supporting structures, irrespective of the environment, be it standing, sitting, lying or moving.

The image to the left, shows the ideal gravity line through particular anatomical parts of the body.

Provided load through the body is distributed through these landmarks, the body will be in the strongest position to manage it.

WHAT IS BAD POSTURE?

Bad posture can be defined as the misuse of joints and associated muscles and ligaments, with progressive and, ultimately, irreversible injurious effects, with associated physical, and possibly painful disability.

Bad Posture results in the following:-

- Muscle imbalance and resulting injuries.
- Less efficient breathing and circulation.
- A sluggish digestive system.
- Lack of coordination and the ability to move with ease.
- An adverse effect on mood and well-being.

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Spinal Stabilisation Exercises For Back Pain

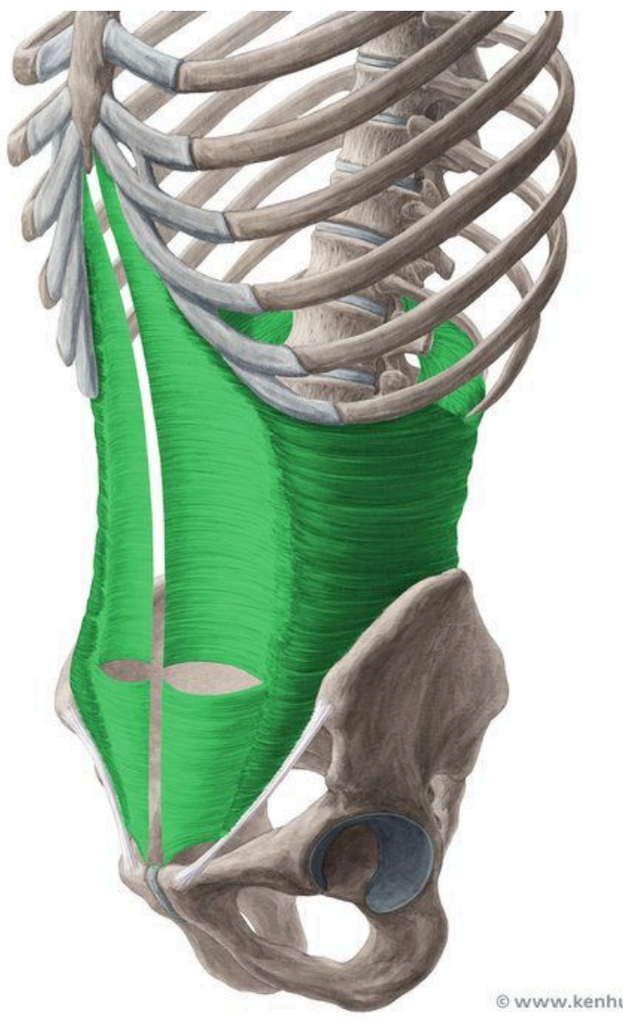
The multifidus muscles work with the transversus abdominis and the pelvic floor muscles to form what is known as the **anatomical girdle**. These deep compartment muscles are most important in providing **essential stability** to the spine.

The transversus abdominis muscle in particular, contracts just after your brain has the initial thought for motion. In the event of when the “back goes”, there is miscommunication between the two stabilisers.

Disc herniations and lower back issues present in those that have poor co-contraction of these muscles.

Therefore, to improve the state of chronic back pain or poor posture, adequate stabilisation work to both muscles are essential before doing more dynamic core stabilisation workouts. We demonstrate the specific stabilisation routines on the following page.

TRANSVERSUS ABDOMINIS



The transverse abdominis muscle is the deepest of the six abdominal muscles. It extends between the ribs and the pelvis, wrapping around the trunk from front to back.

The fibers of the transversus abdominis run horizontally, similar to a **back support belt**.

The FOUR main functions of the transversus abdominis are:-

1.To **maintain** proper placement of abdominal organs and supports the lower back.

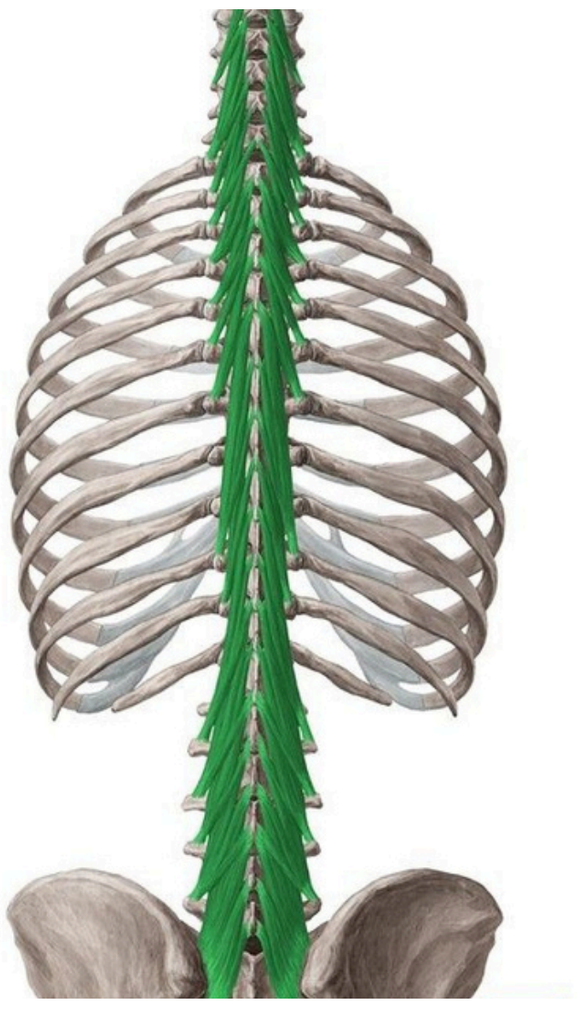
2. To **assist** in forceful expiration, coughing, and defecation by increasing intraabdominal pressure.

3. To **support** the lumbopelvic region during movement.

4. The transverse abdominis **moves the spine** in rotation.

.

MULTIFIDUS



The multifidus spans from the base of the spine up the spine.

It functions by **extending and rotating** the verterbral column.
The multifidus muscle is also an important stabilizer of the lumbar spine. It functions together with transverse abdominis and pelvic floor muscles for spine stability.

Over time, sitting can cause weakening of the multifidus muscle and reduce its ability to stabilise the lower spine as we move.

Multifidus muscle weakness and atrophy is associated with chronic lower back pain.

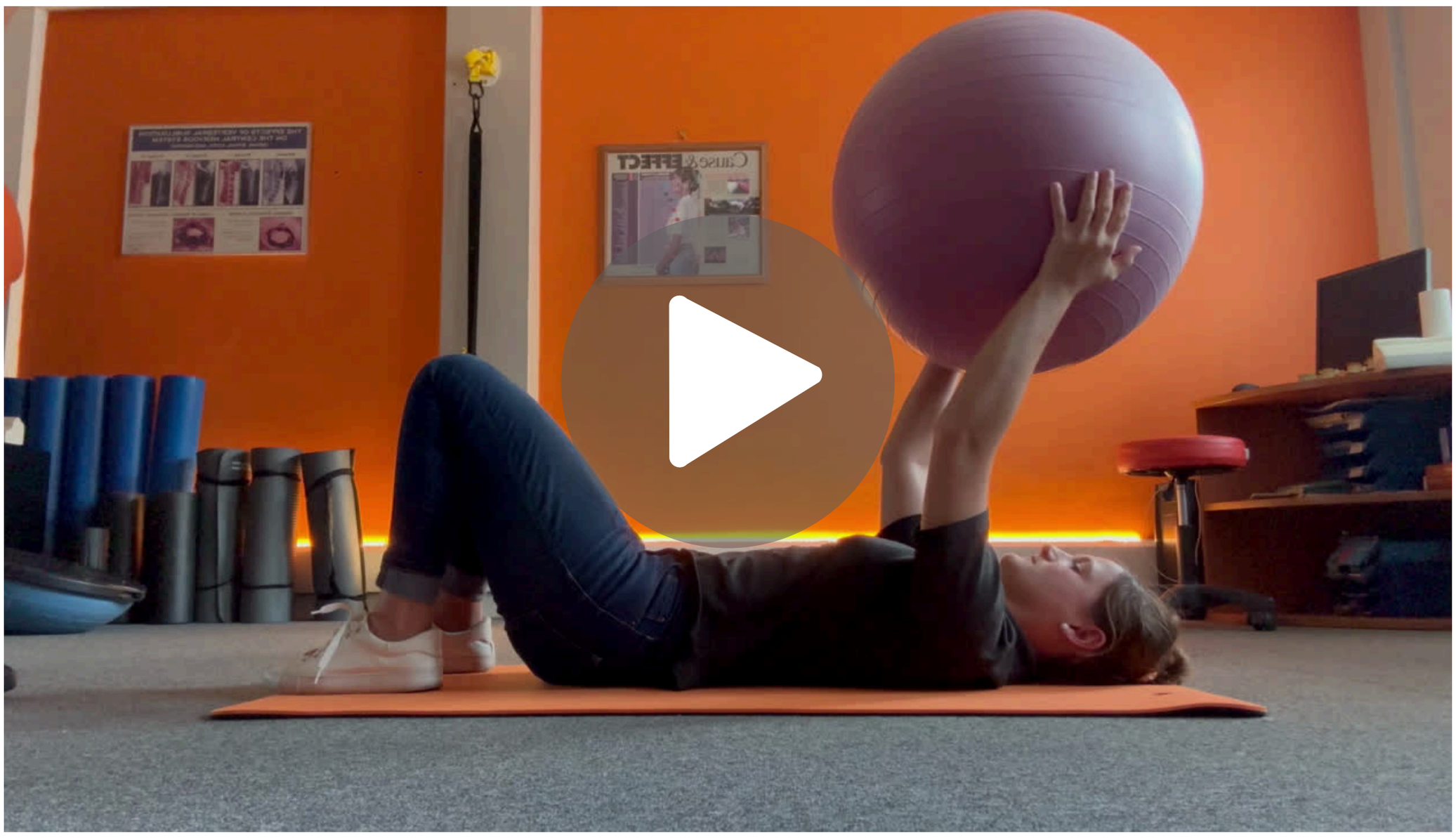
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A) DRAW IN THE BELLY BUTTON (TA ACTIVATION)



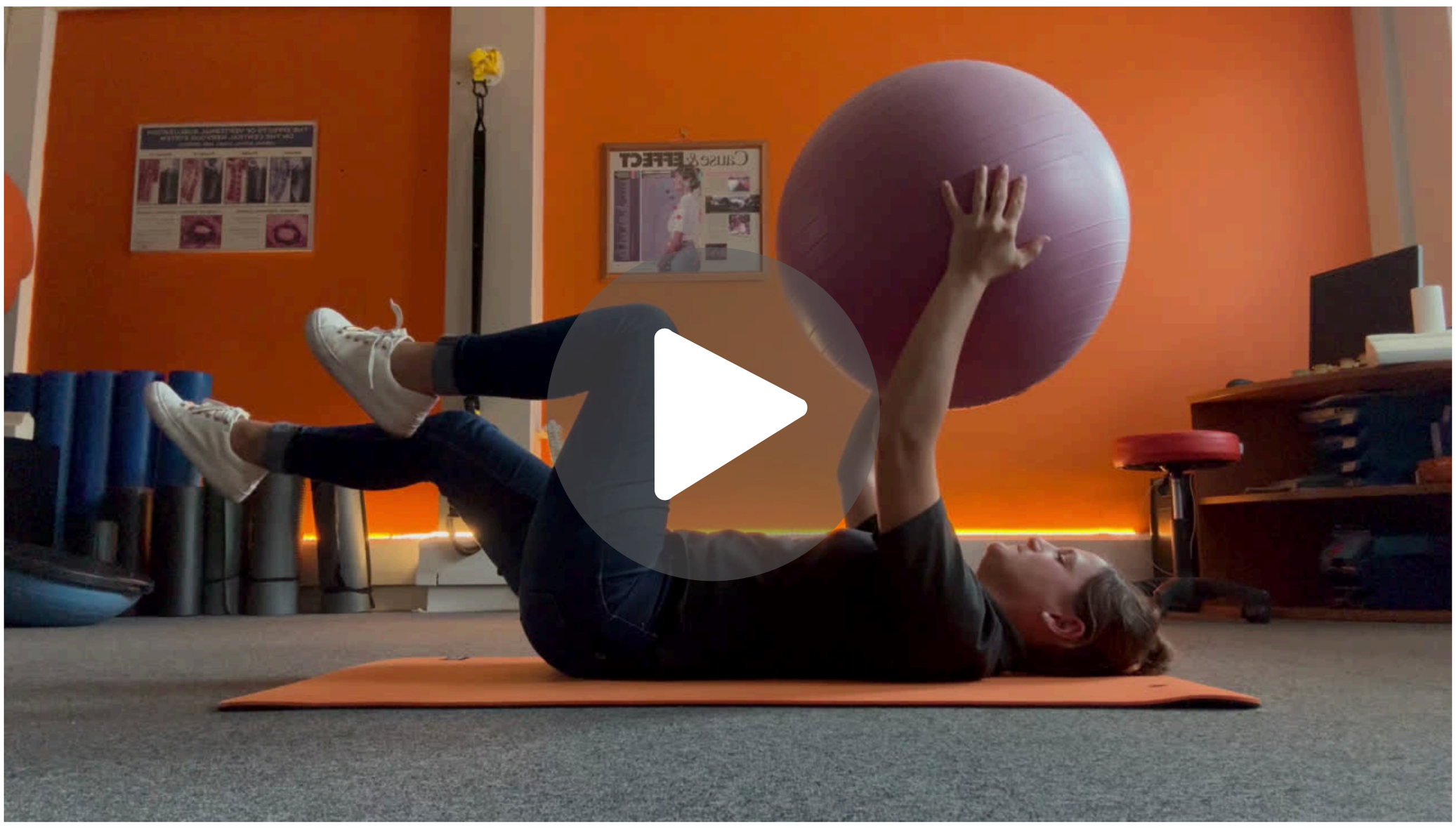
When we draw (or scoop) the bellybutton in towards the spine, the two deepest layers (the transversus abdominis and multifidis are switched on, allowing them to form a strong muscular contraction in the spine. Training in this way has been shown to be very effective in reducing lower back pain and strengthening the abdominal muscles. Using a Swiss ball is a great way to further enhance the gain.

B) TA ACTIVATION + BALL CIRCLES



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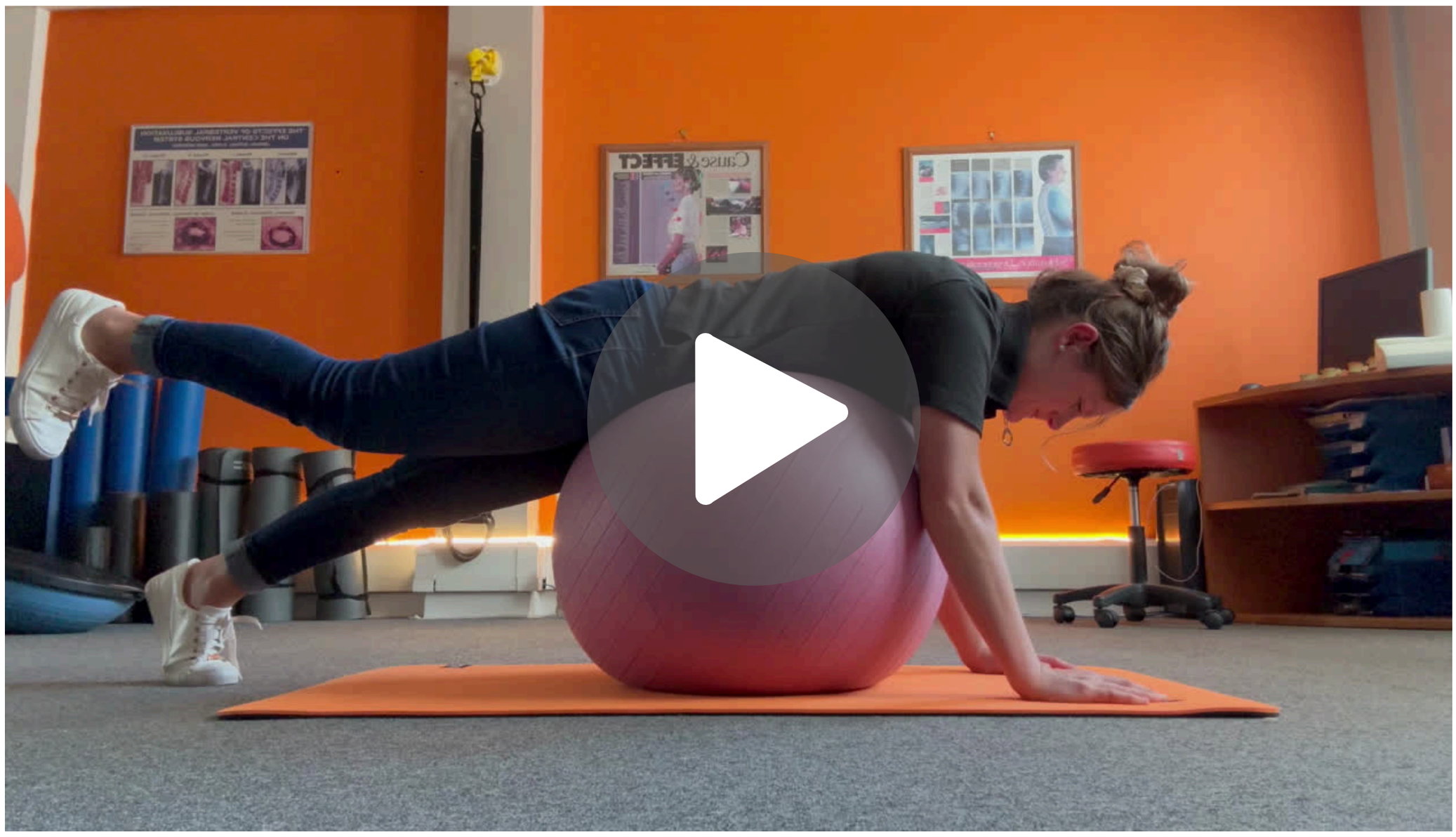
C) TA ACTIVATION + MOUNTAIN CLIMBERS



D) TA ACTIVATION + BRIDGE + GLUTE EXT



E) TA + ALTERNATE LEG RAISES (MULTIFIDUS)



F) TA ACTIVATION + SUPERMAN ADAPTED



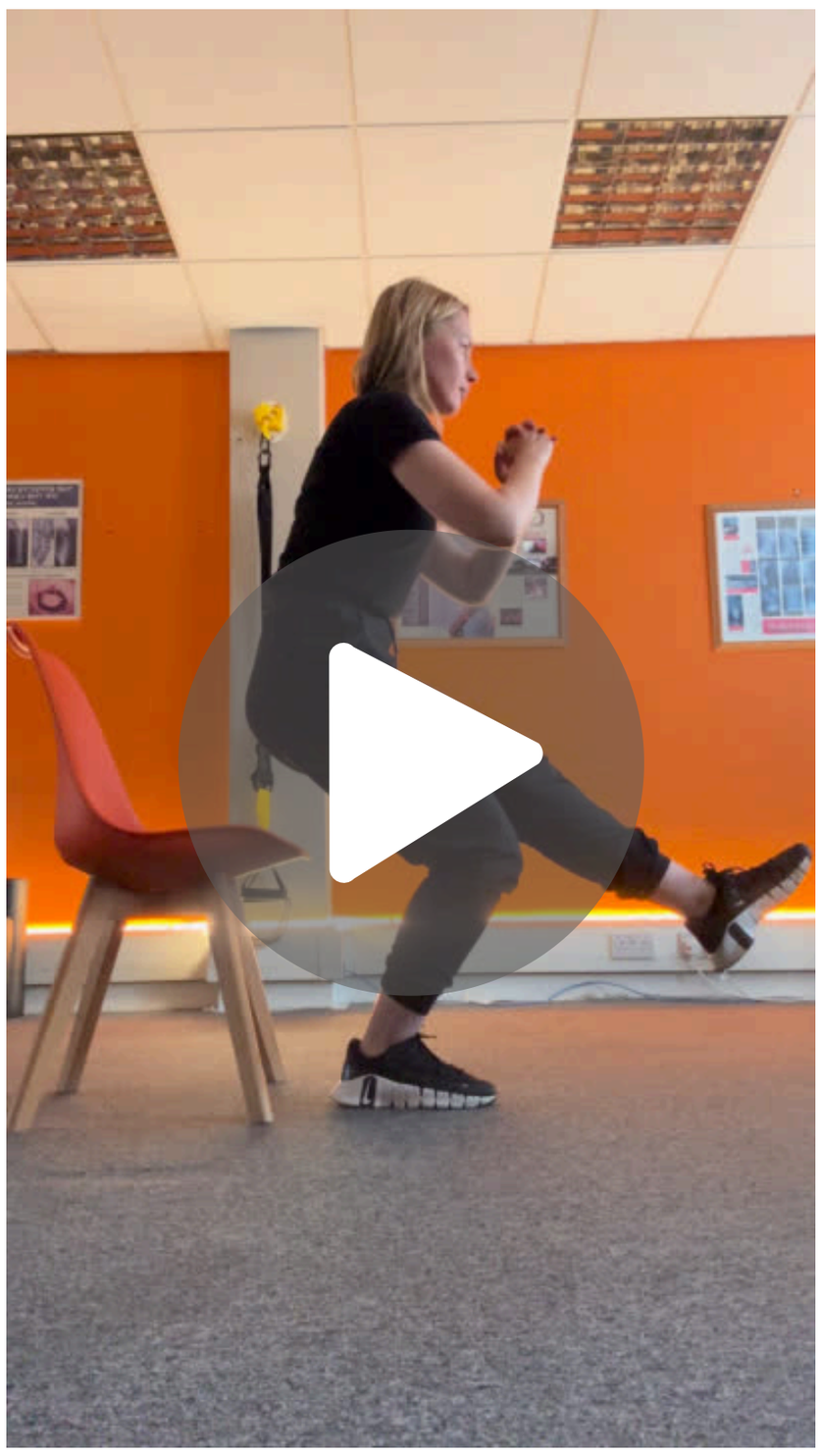
G) DEAD BUG (TA + MF)

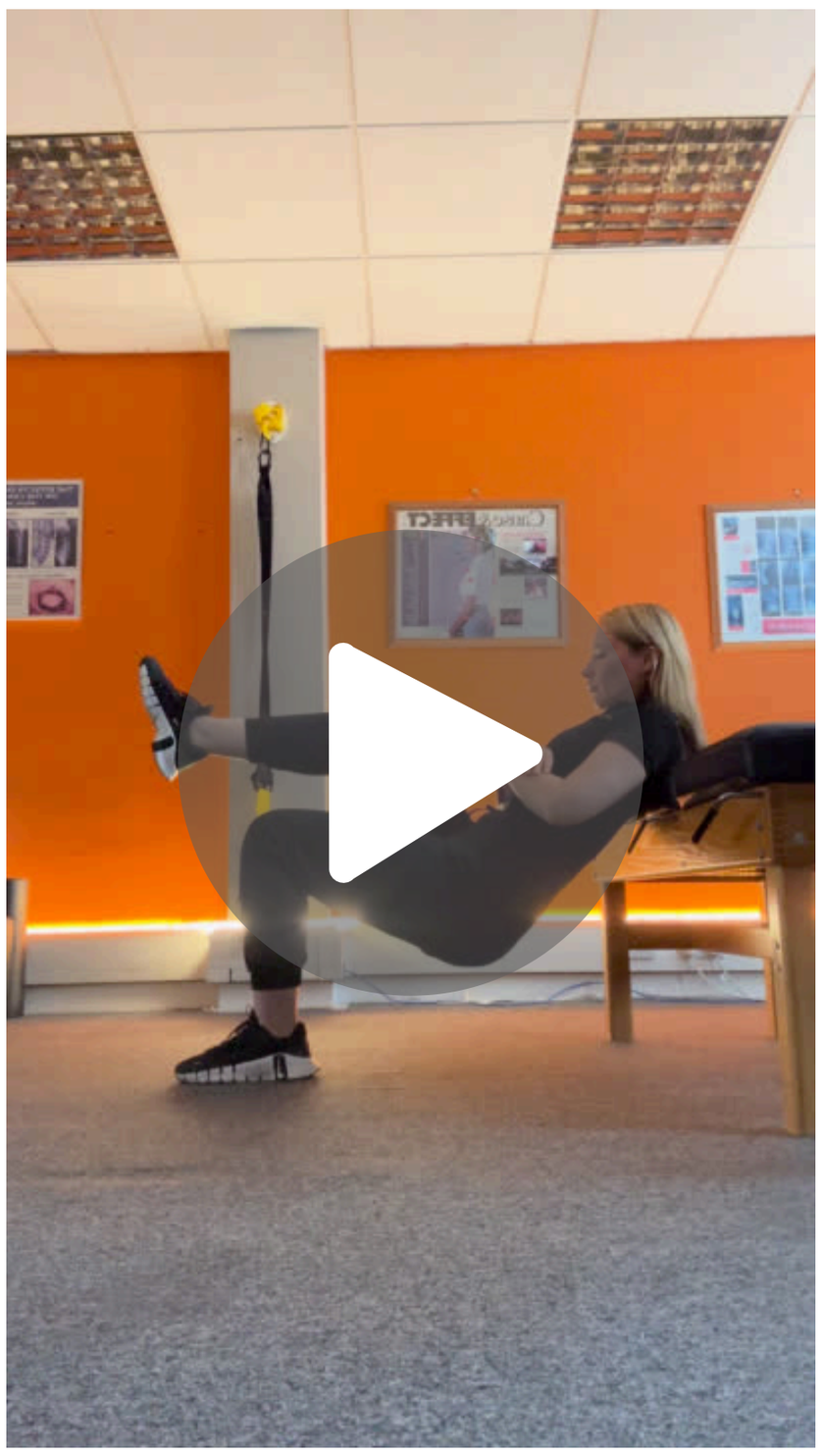


H) BIRD DOG (MF +TA)



I) GLUTE EXERCISES





The principal function of the gluteus maximus is as the chief antigravity muscle during sitting by counteracting and controlling the flexion of the hip.

Examples of activities requiring the gluteus maximus to act as an hip extensor when rising from a seated position, straightening from a bending position, walking upstairs or on a hill, and running.

To externally rotate the hip, the gluteus maximus works synergistically with the iliopsoas (hip flexor), piriformis, and obturator muscles. It also acts on the bony pelvis, supporting it and the trunk, which is vital when standing on one leg.



WHAT IS NORMAL NECK POSTURE?

Normal anatomical alignment of the neck (cervical spine) is to be straight and symmetrical. Remember that posture is the window to the spine. You will know by looking at your posture in the mirror if your neck is straight by drawing a line from the sternal notch to the middle of the top lip. If this is a straight line then your neck (cervical spine) will be straight. If your neck is straight then your eyes will be level, your ears will be level, the dimple in your chin will be facing directly forward, your jaw will be aligned. (1)

THE EPIDEMIOLOGY OF NECK, BACK PAIN AND DISABILITY

You only have to look around and notice that bad posture seems to be becoming an increasingly significant problem. In fact one could argue that we all suffer from bad posture at some time. Think about how much time you spend sitting in front of a computer, laptop, tablet or smart phone and the posture that is often associated with these activities. Research shows that the older we get the more likely it is that we will suffer from bad posture. Neck pain is becoming increasingly common throughout the world. It has considerable impact on individuals and their families, communities, health care systems, and businesses. The estimated yearly incidence of neck pain from available studies report that up to 21.3% of people have neck pain over the course of a year. There is a higher incidence on office and computer workers. Most cases do not fully resolve and run an episodic course over a person's lifetime. Relapses are common. (2)

(1) .[Harrison normal cervical model; CBP Structural Rehabilitation of the Cervical spine; Deed Harrison et al; 2002; page 5] (2) [Best Pract Res ClinRheumatol. 2010 Dec;24(6):783-92. doi: 10.1016/j.berh.2011.01.019.The epidemiology of neck pain. Hoy DG1, Protani M, De R, Buchbinder R.]

WHAT IS THE CAUSE (AETIOLOGY) OF MISALIGNMENT AND BAD POSTURE?

Misalignment patterns and bad posture are the result of many factors

- Inherited patterns of misalignment such as scoliosis running from one generation to the next.
- Acquired patterns of misalignment as a result of the physical stresses of life such as sitting in front of computers, lifting, sports injuries, and abnormal spinal biomechanics.
- Emotional stresses of life. Think about the posture associated with someone who is depressed.
- If you are stressed emotionally we know that this leads to abnormal neck posture and neck tension.
- Prolonged emotional stresses lead to longer terms chaces.
- Age: we know that with increasing age you are more likely to suffer from misalignment.

The reality is that we all do things to create bad posture and misalignments in the spine. *[Chiropractic Management of spine related disorders; Gatterman;M 1990]*

THE EFFECT OF MISALIGNMENTS IN THE SPINE

We know that the when the spine is out of line a number of things will begin to happen:

- We are more likely to develop pressure on the nervous system which will potentially affect the different parts of the nervous system (sensory (pain), motor (posture) and autonomic (bodily functions)
- If the spine is left misaligned for longer periods of time we are more likely to see damage and arthritis around the areas of misalignment.
- Spinal misalignments cause poor posture.

THE DIFFERENT PATTERNS OF MISALIGNMENT

When looking at your neck from the frontal plane misalignment patterns of the neck with respect to the ribcage can be in any one of 6 different directions.

- Right and left lateral shift (translation)
- Right and left lateral flexion
- Right and left rotation

These patterns can be individual patterns of misalignment or they can be in combinations of doubles and triples. This means that there are 26 separate patterns of misalignment that you could potentially fit into.

(3) (4) [Chiropractic Management of spine related disorders; Gatterman;M 1990]

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HOW DO I KNOW WHAT PATTERN I AM?

You will have already got a sense of whether your neck is optimally aligned from the front by looking at your posture in the mirror. However without exception the very best way to obtain an in-depth analysis of your neck (cervical spine) alignment is a standing weight bearing x-ray. For many patients who have already been through the 4 day process they will have had the chance to review there x-rays. If you haven't had a set of x-rays it would be worthwhile discussing this with your practitioner at this point to decide if it would be appropriate for you to do so.

Your practitioner will be able to go through your x-rays with you and show you the following:

- The presence of any translation and the direction and degree of translation.
- The presence of any rotation and the direction and degree of rotation.
- The presence of any lateral flexion and the direction and degree of lateral flexion.
- The presence of any arthritis in your neck.
- Areas of misalignment that might be affecting your nervous system and your general health

IT ALL SOUNDS VERY COMPLEX.

HOW CAN I MAKE THIS SIMPLE TO UNDERSTAND?

- Obviously the spine is a complex structure.
- However by being able to assess your spine your practitioner will now be able to give you a very specific category that accurately describes the misalignment pattern for your spine.
- Clearly as a patient you don't have to remember all pf the different categories.
- The good news is that you only have to remember **ONE** category. That is your category. The good news is that this is all you need to know.

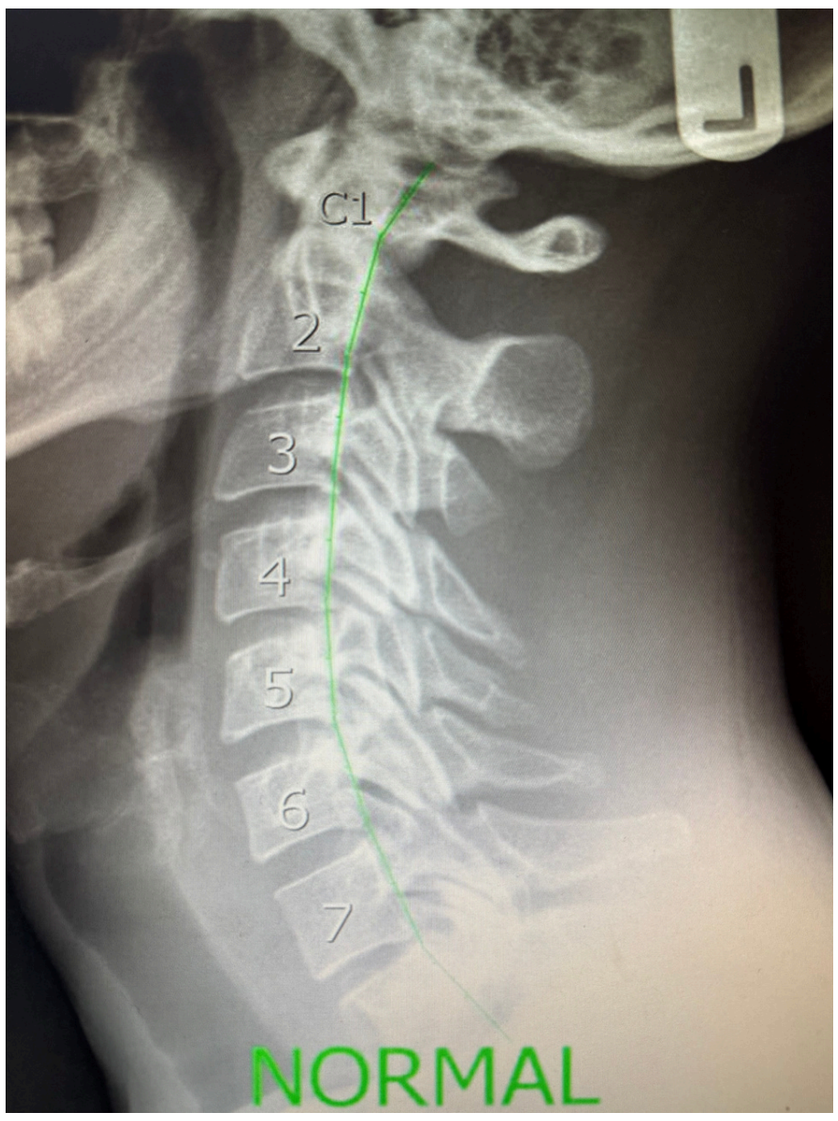
THE DIFFERENT NECK PATTERNS

Pattern	Translation	Axial Rotation	Lateral Flexion
1	Right Cervical Shift	Right Cervical Rotation	Right Cervical Lateral Flexion
2	Left Cervical Shift	Left Cervical Rotation	Left Cervical Lateral Flexion
3	Right Cervical Shift		Left Cervical Lateral Flexion
4	Right Cervical Shift		Right Cervical Lateral Flexion
5	Left Cervical Shift		Right Cervical Lateral Flexion
6	Left Cervical Shift		Left Cervical Lateral Flexion
7	Right Cervical Shift	Right Cervical Rotation	
8	Right Cervical Shift	Left Cervical Rotation	
9	Left Cervical Shift	Left Cervical Rotation	
10	Left Cervical Shift	Right Cervical Rotation	
11		Right Cervical Rotation	
12		Right Cervical Rotation	
13		Left Cervical Rotation	
14		Left Cervical Rotation	
15		Left Cervical Rotation	Right Cervical Lateral Flexion
16		Left Cervical Rotation	Left Cervical Lateral Flexion
17		Right Cervical Rotation	Left Cervical Lateral Flexion
18		Right Cervical Rotation	Right Cervical Lateral Flexion
19	Right Cervical Shift	Left Cervical Rotation	Right Cervical Lateral Flexion
20	Right Cervical Shift	Left Cervical Rotation	Left Cervical Lateral Flexion
21	Right Cervical Shift	Right Cervical Rotation	Right Cervical Lateral Flexion
22	Right Cervical Shift	Right Cervical Rotation	Left Cervical Lateral Flexion
23	Left Cervical Shift		Right Cervical Lateral Flexion
24	Left Cervical Shift		Left Cervical Lateral Flexion
25	Left Cervical Shift		Right Cervical Lateral Flexion
26	Left Cervical Shift		Left Cervical Lateral Flexion

Our posture pictures and xray will provide accurate information regarding what pattern you are.

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WHAT IS NORMAL NECK POSTURE (CERVICAL CURVE /LORDOSIS)?



Normal anatomical alignment of the neck (cervical spine) looking from the side is that the ear (C1) should be directly over the shoulder (T1).

Remember that posture is the window to the spine. You will know by looking at your posture from the side by looking at photos of yourself whether or not your head sits above your shoulders or not.

When we look at the mechanics of the neck the research shows very clearly that the neck should be a circular curve. That means that C1 should be directly over T1, C2 over C7, C3 over C6, and C4 over C5. Because it is a circular curve it means that the neck functions like a spring and it distribute the weight of the head equally over all of the joints in the neck.

[Harrison normal cervical model; CBP Structural Rehabilitation of the Cervical spine; Deed Harrison et al; 2002; page 5]

WHAT ARE THE NORMAL ANGLES OF THE NECK (CERVICAL) SPINE SEEN ON AN XRAY?

Measurement	Average Normal	Ideal Normal
C2 over C7	15mm 24	0mm 29
C1 to horizontal	degrees 24	degrees 29
Total Arc C1 to T1	degrees 24	degrees 63
ARA C2 – C7	degrees 34	degrees 42
RRA C2 –C3	degrees 7.8	degrees 9.4
RRA C3 – C4	degrees 6.6	degrees 8.2
RRA C4 – C5	degrees 7.2	degrees 8.2
RRA C5 – C6	degrees 5.9	degrees 8.2
RRA C6 – C7	degrees 6.6	degrees 8.2

[Table 3 of Structural Rehabilitation of the Cervical Spine Harrison et al page 64]

In a survey of 6000 chronic headache patients Braaf and Rosner *[Trauma of the cervical spine as a cause of chronic headache. J Trauma, 1975, 15:441 – 446]* found that the complete or segmental loss or reversal of neck (cervical) curve is the most consistent characteristic feature and very often it is the only abnormality found. Vernon found a relationship between loss of neck curve and tension headaches and migraines.

Several authors have found that loss of the neck curve or reversal of the neck curve is a cause or is associated with a high incidence degenerative changes in the vertebral disc and the vertebral body

[

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Over the course of this eBook, we will share several postural corrective exercises videos for you to carry out daily in pursuit of achieving posture correction. These everyday simple movements done over time, are some of the most effective and practical exercises to help you achieve your postural goals.

However, before beginning it is suggested if possible you first visit our clinic to gather the necessary understanding of your postural patterns. This will help you gain the maximum benefit from these exercises.

1) RIGHT NECK SHIFT CORRECTIVE EXERCISE



Step 2: Anterior or Posterior Head Carriage



WHAT IS ANTERIOR HEAD CARRIAGE?

Anterior head carriage is in fact forward head carriage of the head with respect to the lower part of the neck. You might suspect anterior head carriage if your ear sits in front of your shoulder when looking gat your posture from the side. When reviewing your x-ray your practitioner will be able to identify and measure precisely how much anterior head carriage you have in fact got.

WHAT IS THE IDEAL SHAPE OF THE NECK ON AN X-RAY?

The neck is in fact normally a circular curve (an arc within a circle). Just as the ear should sit directly above the shoulder when looking from the outside, and the C2 vertebra should be directly above C7 vertebra on the inside. This enables the spine to act like a spring and distribute the forces equally amongst all of the joints in the neck.

[Troyanovich SJ et al: Cervical coupling on AP Radiographs During Lateral Translations of the head creates an s configuration; ClinBiomech 2000; 15 960: 436 – 440]

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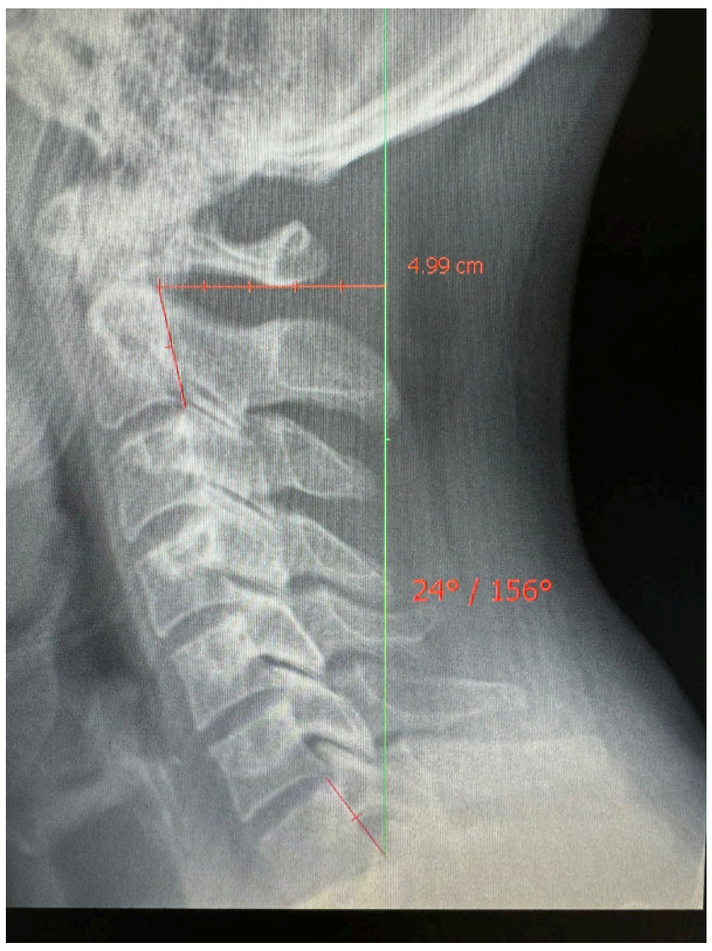
CAN ANTERIOR HEAD CARRIAGE CAUSE LOSS OF LUNG VITAL CAPACITY?

According to Dr. Rene Cailliet, an emeritus professor of Physical Medicine and Rehabilitation at the David Geffen School of Medicine at UCLA and the author of numerous books on musculoskeletal medicine, anterior head carriage can add up to 30 pounds of leverage on your cervical spine, which can pull your spine out of alignment. Dr. Cailliet states that anterior head carriage can lead to the loss of 30 percent of your lung's vital capacity (the total amount of air you can expel from your lungs after a maximum inspiration). Anterior head carriage-related loss of vital capacity is due to your loss of cervical lordosis or neck curvature, which negates the action of your hyoid muscles, especially your inferior hyoid muscle, which is responsible for elevating your first rib during a deep breath in. Postural exercises are an effective way to restore your normal neck curvature and regain your lung vital capacity.

CAN ANTERIOR HEAD CARRIAGE CAUSE NECK PAIN OR DISCOMFORT?

Neck pain or discomfort is a common musculoskeletal complaint by those with mild, moderate or marked anterior head carriage. According to a 2002 study published in the "Journal of Occupational Rehabilitation," there was a significant association between neck pain and anterior head carriage during computer processing. The study, conducted by researchers in the Department of Rehabilitation Sciences at Hong Kong Polytechnic University, found that among those who reported neck pain during computer use, 60.5 percent had a forward head posture. According to Life Chiropractic College West, the tight neck muscles found in those with anterior head carriage are often associated with Upper Cross Syndrome, a condition of your musculoskeletal system in which certain muscles of your upper torso are tight and overactive while others are weak or inhibited. Postural exercises and stretching, along with other practitioner-rendered manual therapies, can help reduce your anterior head carriage-associated neck pain and restore your structural fitness.

WHAT DOES ANTERIOR HEAD CARRIAGE LOOK LIKE ON A XRAY?



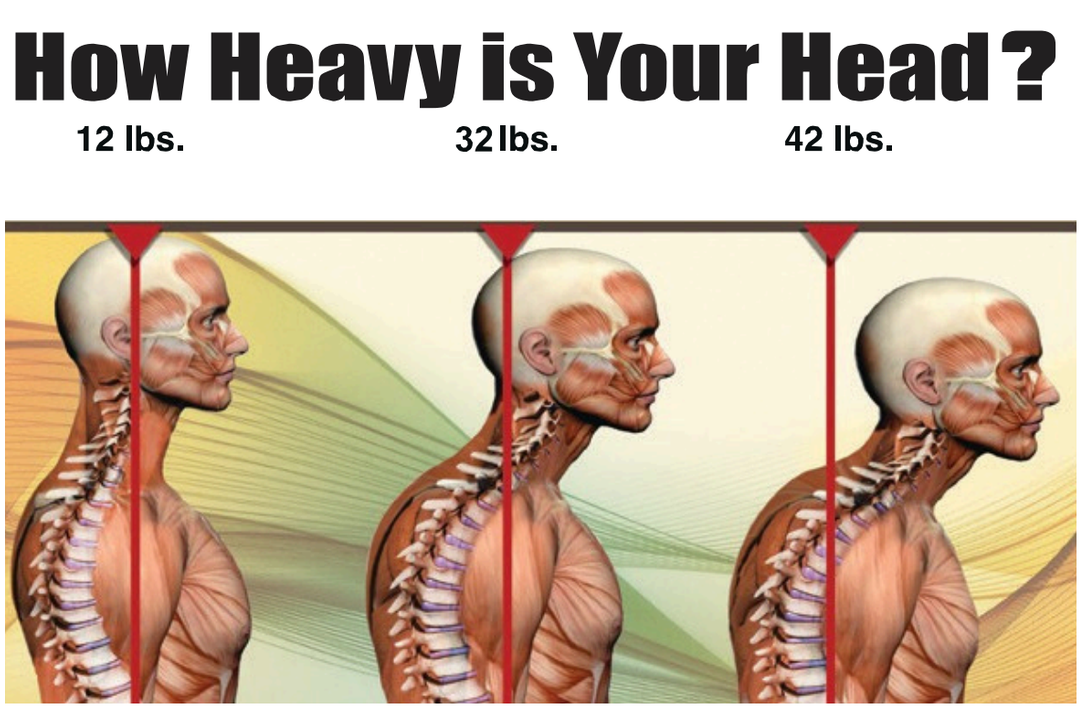
This image shows the skull translating forward from the neck at 4.99cm. This posture is indicative of an imbalance between the flexor and extensors of the neck.

[Harrison normal cervical model; CBP Structural Rehabilitation of the Cervical spine; Deed Harrison et al; 2002; page 5]

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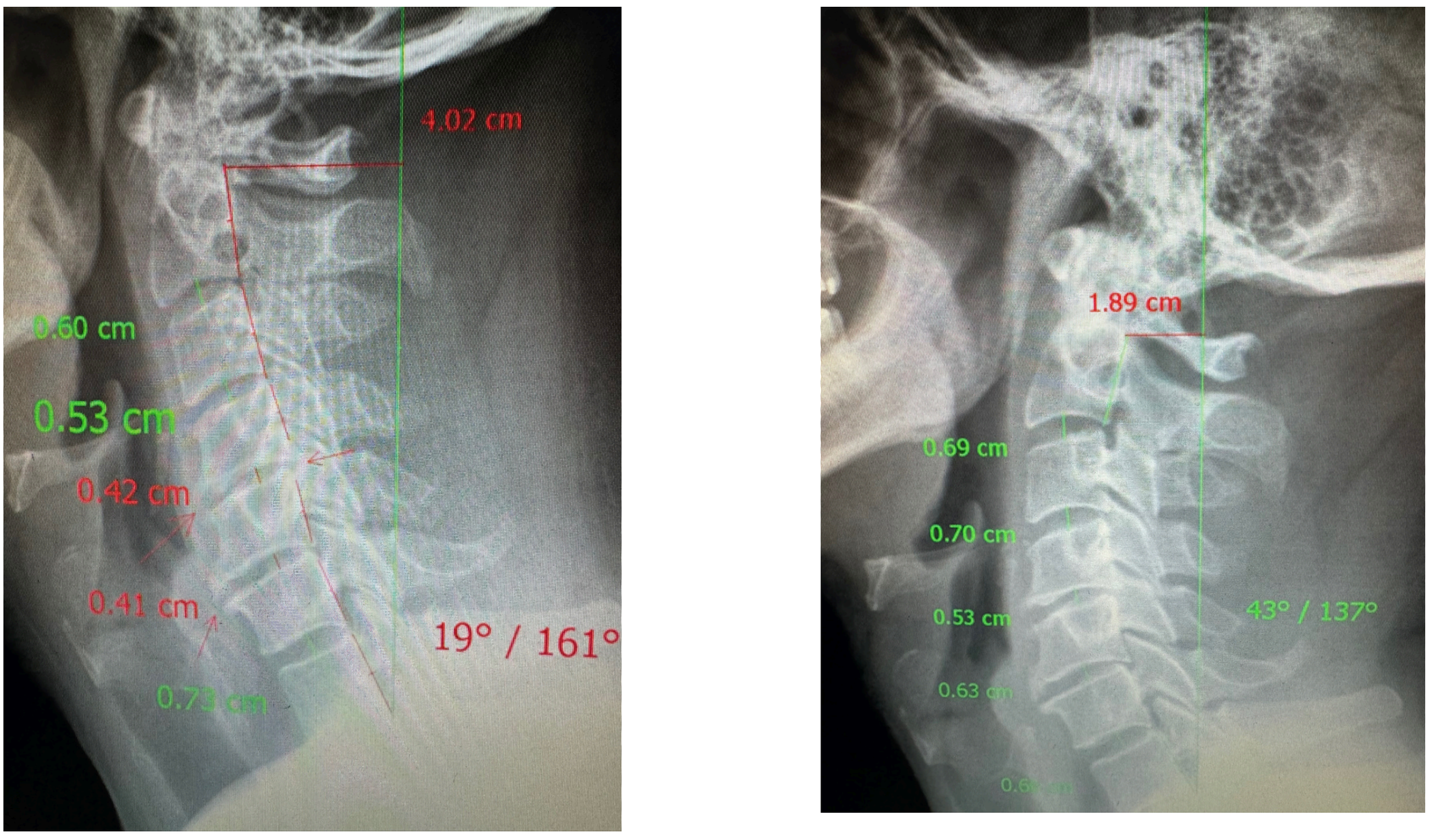
THE CATEGORIES OF HEAD TRANSLATION

Category	C2 Translation Over C7	Atlas Plane Line
1	Anterior Head Translation	Neutral
2	Posterior Head Translation	Neutral
3	No Translation	Head Extension
4	No Translation	Head Flexion
5	Anterior Head Translation	Head Flexion
6	Anterior Head Translation	Head Extension
7	Posterior Head Translation	Head Flexion
8	Posterior Head Translation	Head Extension



In this poster on the left, the first sketch (far left) represents “perfect” head posture. A line dropped from the centre of the external auditory meatus (EAM) would land directly in the centre of the shoulder (the tip of the **acromion process**). The graphic on the right demonstrates the (occasionally

The reality is that we all do things to create bad posture and misalignments in the spine.



Pre and Post Spine Correction pictures from anterior head carriage

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HOW DO I CORRECT MY NECK IF IT IS MISALIGNED?

Symmetry and optimal spinal alignment is the goal of the corrective care programs at Back to Health Wellness. It is important for you're to understand that long term correction of the spine can only happen through a consistent and simultaneous application of the following:

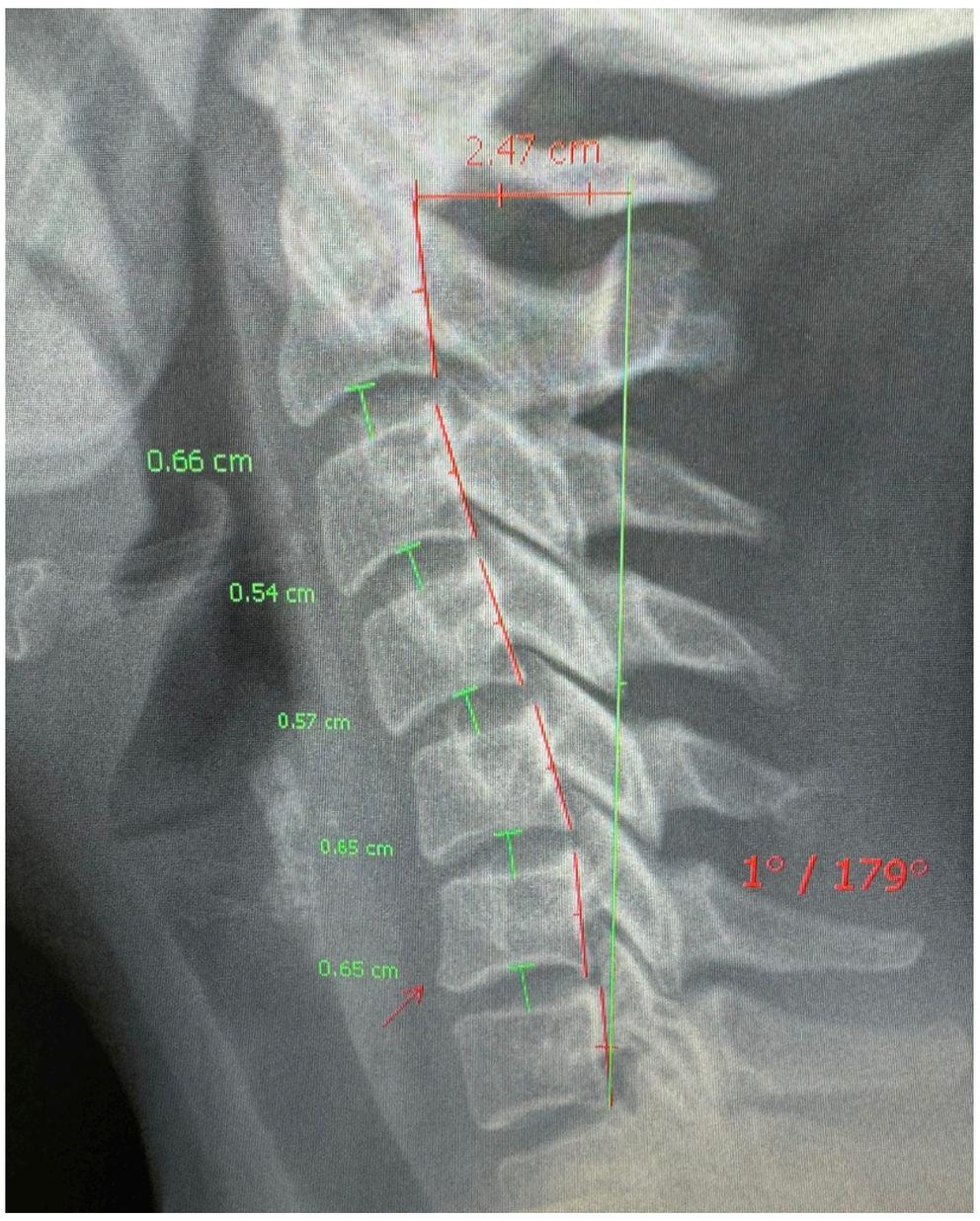
Regular spinal adjustments to *correct the areas of misalignment*, to take pressure off the nervous system and allow the muscles and soft tissues to relax.

Your practitioner will continue the process of adjusting the spine on this visit.

Asymmetrical Mirror Image exercises to help strengthen the *muscles* around the spine. Traction stretches to the spine.

Stretches will be required to help break up the scar tissue in the soft tissues around the spine (*ligaments, tendons, joint capsules*)

WHAT DOES A MISALIGNED NECK LOOK LIKE ON AN XRAY?



This image shows evidence of a slight reverse curve (s-shape) away from the normal c-shape expected in the neck. The red lines at the back of each vertebrae (bone), should follow a slightly lordotic (c-shape) curve, smooth and withot step-offs. Any malalignment should be considered evidence of adverse discal pressure, bony or ligamentous injury.

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WHAT IS THE CAUSE (AETIOLOGY) OF ANTERIOR HEAD CARRIAGE?

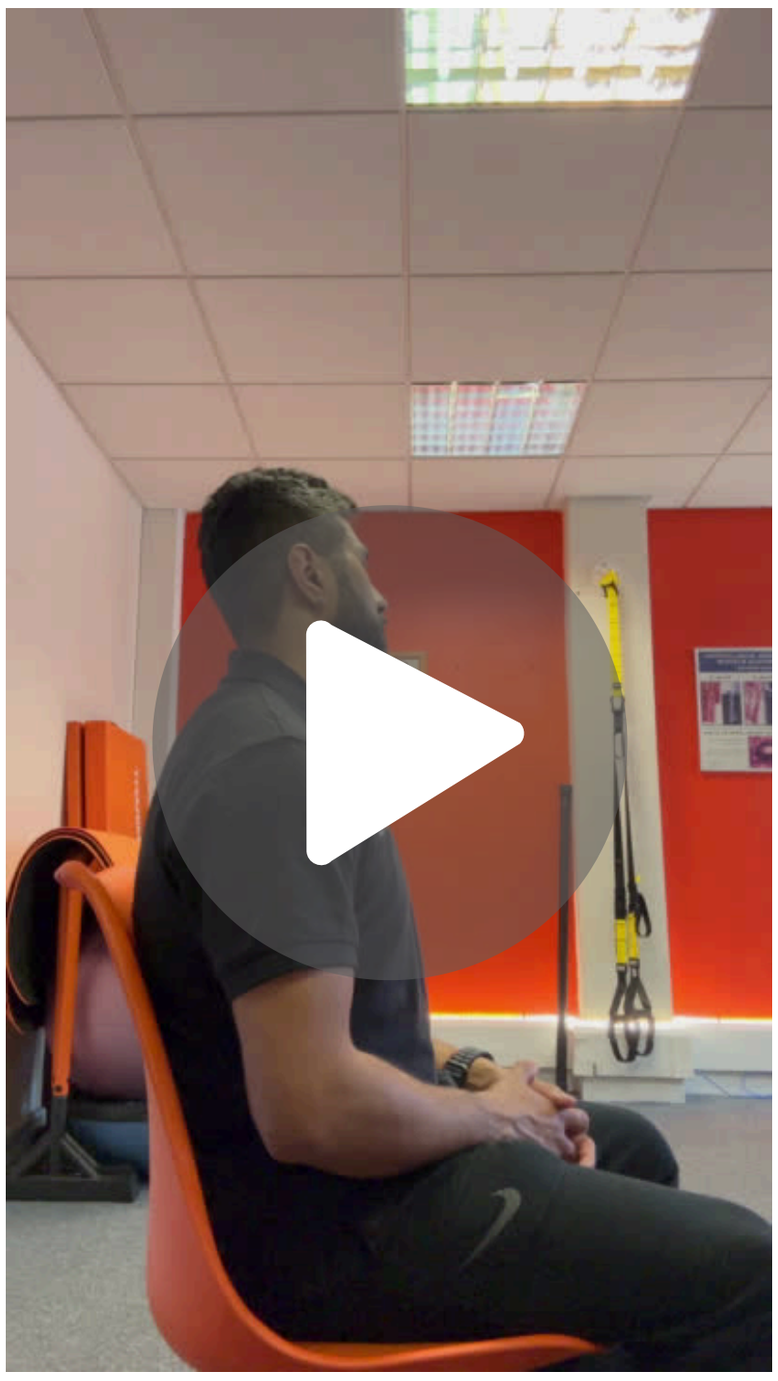
Anterior head carriage is endemic. Take the opportunity today to observe neck posture in your friends and family. It is very likely that you will observe it in others once you have observed it in yourself. The reason is that there are so many factors in our lives today that create the movement of anterior head carriage. Sitting at desks and pouring over computers, working from laptops, playing games on your phone will all create anterior head carriage? The more you do these things the more likely you will suffer from anterior head carriage.

HOW COMMON IS ANTERIOR HEAD CARRIAGE?

Anterior head carriage is present in 99% of patients presenting to Back to Health Wellness. It is very important to understand that anterior Head Carriage may be coming from a problem in the neck or alternatively it may be coming from a problem in the thoracic spine (typically an increase in the thoracic kyphosis). Your practitioner will be able to identify the cause of your anterior head carriage.

[CBP Structural Rehabilitation of the Cervical spine; Deed Harrison et al; 2002;]

2) ANTERIOR HEAD CARRIAGE CORRECTIVE EXERCISE



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WHAT IS POSTERIOR HEAD CARRIAGE?

Posterior head carriage is when the head sits behind the shoulders. On an x-ray the C2 vertebra would be behind a vertical line drawn from C7 vertebrae.

This is a particular unusual presentation but it does occasionally occur in approximately 1/100 cases presenting to Back to Health.

THE EFFECTS OF ANTERIOR HEAD CARRIAGE

When the head is carried anteriorly over the neck it creates an asymmetrical force or load into the neck. The neck can no longer act like a spring.

Asymmetrical loads are created on tissues when your posture is not sound and therefore not biomechanically sound.

These loads create abnormal stresses and strains on the tissues and these stresses and strains can create dysfunctions and pathologies.

The correction of these abnormal spinal configurations is the primary goal of your back to health practitioner.

Balance and symmetry on these tissues enables these tissues to respond to stress from gravity and other forces.

When this symmetry is lost due to abnormal posture the stresses and strains cannot be overcome and degeneration and arthritis ensues in the spine.

Watson and Trott found that headache subjects with anterior head carriage had a decrease in cervical muscle endurance and isometric strength compared to subjects without headaches and anterior head translation.

We know that patients with significant anterior head carriage are more prone to neck pain, headaches, arthritis in the neck.

Research has also shown that one of the very important factors in determining the prognosis of a spinal surgery patient is that of anterior head carriage.

The presence of the loss of neck curve and forward head carriage is an indicator of a poor prognosis.

A study by Chiu of neck pain patients found that among those with neck pain during computer processing, 60.5% had a forward head posture.

[J OccupRehabil. 2002 Jun; 12(2):77-91.A study on the prevalence of and risk factors for neck pain among university academic staff in Hong Kong].

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Step 2: Anterior or Posterior Head Carriage

According to Kapandji (Physiology of the Joints, Volume III), for every inch your head moves forwards, it gains 10 pounds in weight, as far as the muscles in your upper back and neck are concerned, because they have to work that much harder to keep the head (chin) from dropping onto your chest.

This also forces the upper neck (Sub occipital) muscles (they raise the chin) to remain in constant contraction, putting pressure on the 3 upper neck (Sub occipital) nerves. This nerve compression may cause headaches at the base of the skull. Pressure on the upper neck (Sub occipital) nerves can also mimic sinus (frontal) headaches.

Rene Cailliet M.D, famous medical author and former director of the department of physical medicine and rehabilitation at the University of Southern California states: *"Head in forward posture can add up to thirty pounds of abnormal leverage on the cervical spine.*

This can pull the entire spine out of alignment. Forward head posture (FHP) may result in the loss of 30% of vital lung capacity.

These breath- related effects are primarily due to the loss of the cervical lordosis, which blocks the action of the hyoid muscles, especially the inferior hyoid responsible for helping lift the first rib during inhalation." Persistent forward head posture ("hyperkyphotic posture") puts compressive loads upon the upper thoracic vertebra, and is also associated with the development of Upper Thoracic Hump, which can devolve into Dowager Hump when the vertebra develop compression fractures (anterior wedging).

A recent study found this hyperkyphotic posture was associated with a higher rate of mortality in the elderly.

CAN ANTERIOR HEAD CARRIAGE CAUSE MUSCLE TENSION HEADACHES?

In an April 29, 2009 "National Post" article by Rob Williams, a Vancouver, British Columbia-based kinesiologist and posture specialist, he states that tight levator scapulae muscles, which connect your neck to your shoulder blades, frequently contribute to tension headaches. With anterior head carriage, the muscle tone of your levatorscaplae muscles, along with your upper trapezius and suboccipital muscles, increases, and "trigger points" —hyperirritable nodules within a band of muscle—can form and produce local and referred pain. The increased tone of your suboccipital muscles puts pressure on your suboccipital nerves, which can produce headaches originating at the base of your skull. Increased pressure on your suboccipital nerves also can imitate sinus headaches. Muscle tension headaches or tension-type headaches are the most common type of headache disorder, according to the World Health Organization.

[J Am GeriatrSoc 2004 (Oct); 52 (10): 1662–1667]

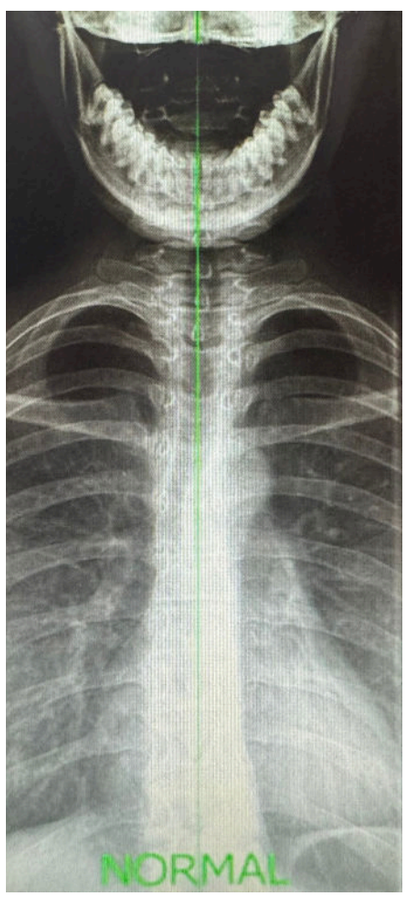
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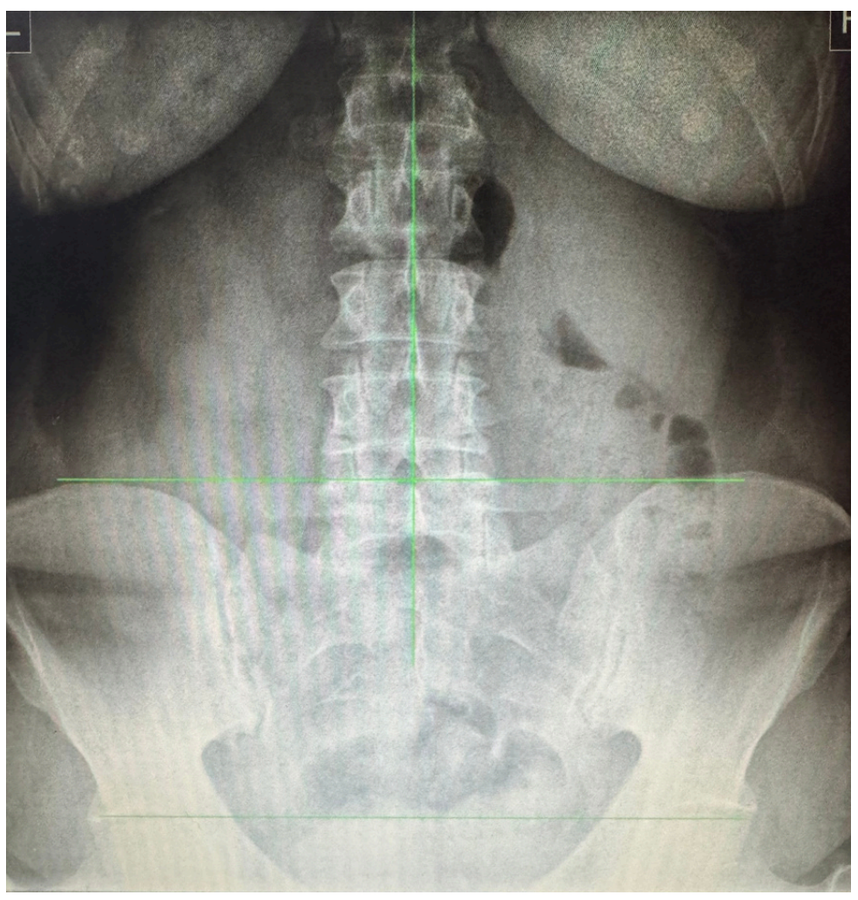


WHAT IS NORMAL MIDDLE AND LOW BACK POSTURE?

Normal anatomical alignment of the middle and low back (Thoracic, Pelvis and Lumbar spine) is to be straight and symmetrical. Remember that posture is the window to the spine. You will know by looking at your posture in the mirror if your low back is straight by drawing a line from the middle of your feet to the belly button and then from the belly button to the sternal notch (the indentation between the 2 collarbones and at the top of the sternum). If this is a straight line then your low back (lumbar spine) will be straight. If your low back is straight then your hips will be level, your weight distribution will be even, your belly button will be facing directly forward, your jaw will be aligned.

[Posture of the thorax and Pelvis: Reliability, Validity and Analysis; Harrison and Harrison; Chapter 2 structural rehabilitation of the lumbar spine 2007]



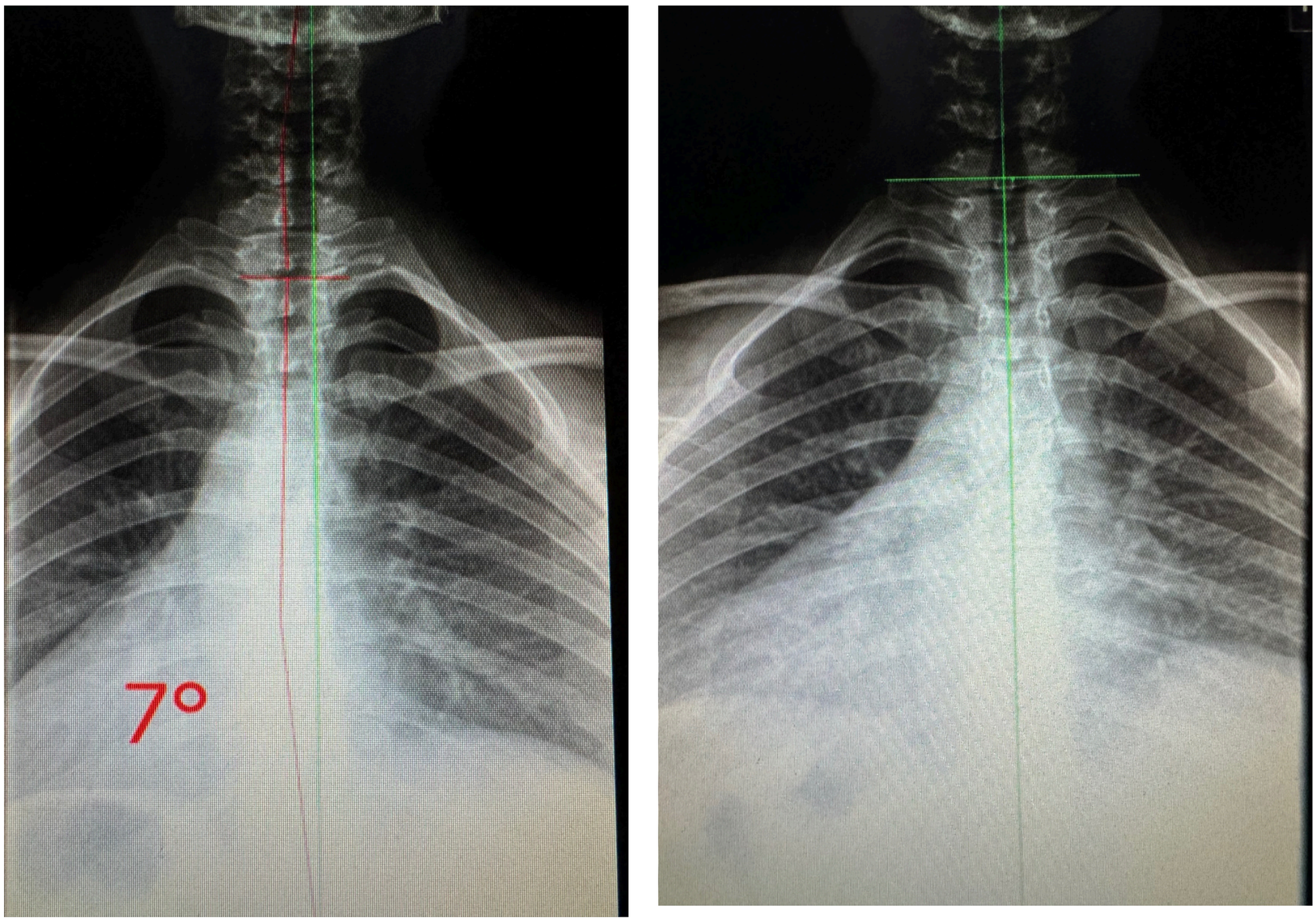


IDEAL ALIGNMENT OF THE SPINE XRAY VIEWS: Left - Xray of the middle spine taken from the front (note position of the heart). Right - Xray of the lower back, pelvis and hips, taken from the back.

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BEFORE AND AFTER

This is the result of Mirror Image® Exercise carried out at home and work + tailored adjustments to the spine, carried out at the clinic over 12 months. Excellent postural and spinal alignment improvements verified with follow up x-ray (see below).



Xray pre and post posture correction (left to right)

MID SPINE TRACTION



Mid spine traction is effectve for anterior head carriage, buffalo hump and increased kyphosis (hunchback)

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THE 26 DIFFERENT PATTERNS OF THE MID SPINE

Protocols for mirror image exercise displacement patterns:

Pattern	Translation	Axial Rotation	Lateral Flexion
1	Right Thoracic Shift	Right Thoracic Rotation	Right Thoracic Lateral Flexion
2	Left Thoracic Shift	Left Thoracic Rotation	Left Thoracic Lateral Flexion
3			Left Thoracic Lateral Flexion
4			Right Thoracic Lateral Flexion
5			Right Thoracic Lateral Flexion
6			Left Thoracic Lateral Flexion
7	Right Thoracic Shift	Right Thoracic Rotation	
8	Right Thoracic Shift	Left Thoracic Rotation	
9	Left Thoracic Shift	Left Thoracic Rotation	
10	Left Thoracic Shift	Right Thoracic Rotation	
11	Right Thoracic Shift	Right Thoracic Rotation	
12	Right Thoracic Shift	Right Thoracic Rotation	
13	Left Thoracic Shift	Left Thoracic Rotation	
14	Left Thoracic Shift	Left Thoracic Rotation	
15		Left Thoracic Rotation	Right Thoracic Lateral Flexion
16		Left Thoracic Rotation	Left Thoracic Lateral Flexion
17		Right Thoracic Rotation	Left Thoracic Lateral Flexion
18		Right Thoracic Rotation	Right Thoracic Lateral Flexion
19	Right Thoracic Shift	Left Thoracic Rotation	Right Thoracic Lateral Flexion
20	Right Thoracic Shift	Left Thoracic Rotation	Left Thoracic Lateral Flexion
21	Right Thoracic Shift	Right Thoracic Rotation	Right Thoracic Lateral Flexion
22	Right Thoracic Shift	Right Thoracic Rotation	Left Thoracic Lateral Flexion
23	Left Thoracic Shift		Right Thoracic Lateral Flexion
24	Left Thoracic Shift		Left Thoracic Lateral Flexion
25	Left Thoracic Shift		Right Thoracic Lateral Flexion
26	Left Thoracic Shift		Left Thoracic Lateral Flexion

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NOTES ON PROTOCOLS FOR EXERCISING THE MIDDLE AND LOWER BACK

1)Begin with the biggest distortion patterns first and foremost. In most cases this will involve lateral translations. Often this will have a significant impact on your posture.

2)As you master your translation exercises (either left or right, front or back) you can begin to introduce the more subtle distortion patterns which are typically the rotations and lateral flexions).

3)Begin with 10 second with isometric (pushing against resistance but not moving) and graduate into concentric strengthening exercises (movement to the end of the range of motion without resistance)

4)As you improve you will be able to tolerate a longer duration to the exercise and your practitioner may increase the exercise up to a duration of 2 minutes. Often with longer duration of the exercise there is a reduction in the frequency of the exercise.

5)Ensure that you communicate with your practitioner and follow their advice. Every patient is different and your practitioner will be in the best position to advise you on how to use these tools to correct your spine as much as possible and get the very best results for you. It is very important that all your questions are answered as quickly as possible but no matter how good your practitioner is no one can read minds. After 20 years of practice we have the answers to all your questions. Remember that no question is too small to ask. There really are no bad questions. Your practitioner will enjoy the fact that you really are interested in talking control of your health by asking questions. So don’t be shy!

6)Some patients with more simple case presentation will be able to quickly increase the frequency and duration of their exercises whilst other patients with more complicated (arthritis) and severe (pain) clinical pictures may take longer. Remember that it is not a race. You really do need to pace yourself. The most important thing is that you are learning and gradually improving. As long as you get there in the end that is what it is all about.

7)Remember to keep your pain scales in mind at all times. If 10/10 is the worst possible pain and 0/10 is no pain. 5/10 is a good stretch, 7/10 is stretch with discomfort and 8/10 is stretch with pain then you need to work at 7/10 or below.

Let your practitioner know where you are with your pain levels on each visit.

If you have any concerns or you think your pain levels are getting over 7/10 then stop immediately and speak to your practitioner.

[Posture of the thorax and Pelvis: Reliability, Validity and Analysis; Harrison and Harrison; Chapter 2 structural rehabilitation of the lumbar spine]

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HOW DO I CORRECT MY BACK IF IT IS MISALIGNED?

Symmetry and optimal spinal alignment is the goal of the corrective care programs at Back to Health. It is important for you're to understand that long term correction of the spine can only happen through a consistent and simultaneous application of the following:

- Regular spinal adjustments to c*orrect the areas of misalignment*, to take pressure off the nervous system and allow the muscles and soft tissues to relax.

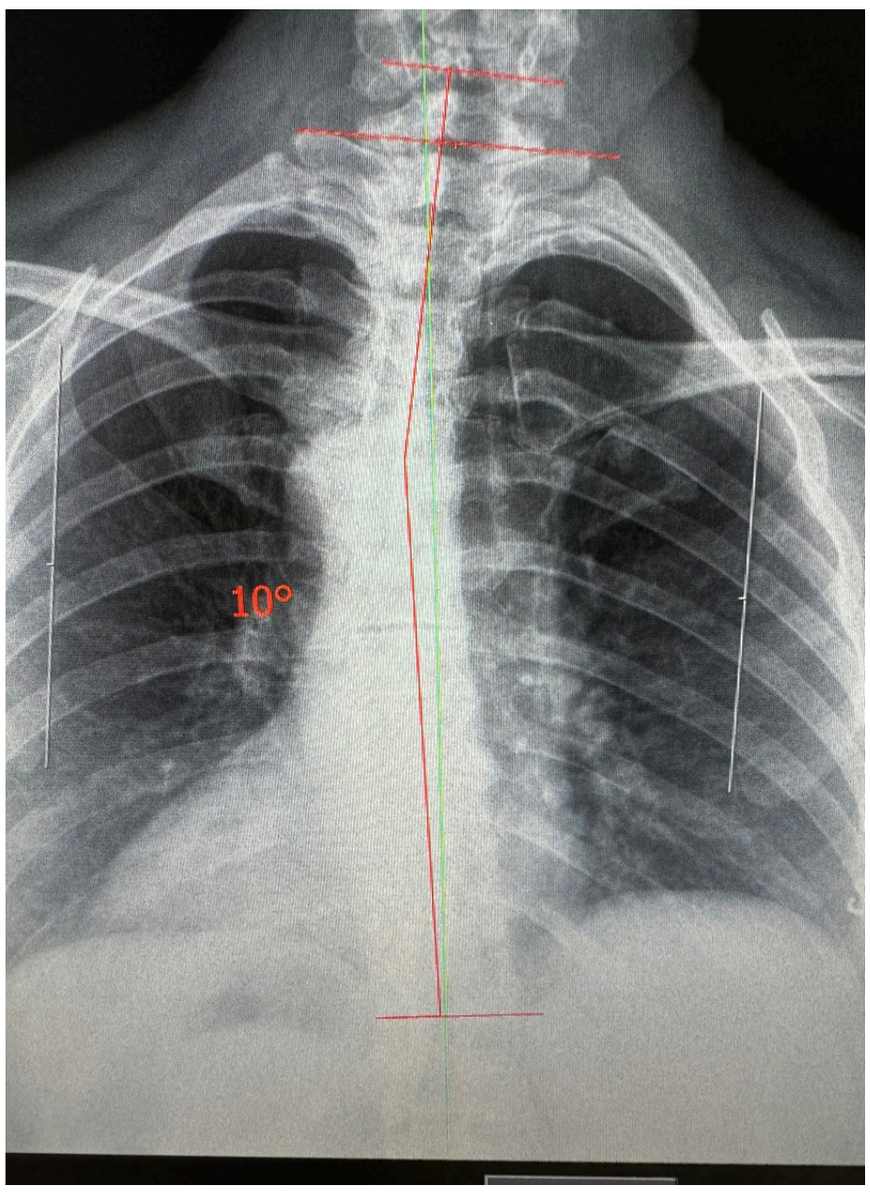
- Your practitioner will continue the process of adjusting the spine on this visit.

- Asymmetrical Mirror Image exercises to help strengthen the *muscles* around the spine Traction stretches to the spine.

- Stretches will be required to help break up the scar tissue in the soft tissues around the spine (*ligaments, tendons, joint capsules*)

[Posture of the thorax and Pelvis: Reliability, Validity and Analysis; Harrison and Harrison; Chapter 2 structural rehabilitation of the lumbar spine 2007].

3) LEFT RIBCAGE SHIFT CORRECTIVE EXERCISE





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Step 4 - How To Correct The Spine



1)Learn about your postural distortion and spinal misalignment patterns through discussion with your practitioner. Discuss and identify your prescribed exercises with your practitioner over the first few weeks of your program of care. Learn how to use the resources that you have been provided with. However avoid exercises in the first 6 to 10 visits with acute injuries, your practitioner will teach you how to do the exercises and when best to employ them.

2)In cases of chronic pain then exercises can begin at the initiation of treatment, research has shown that patients who have combined spinal adjustments and exercises will benefit more from their care. Research also shows that exercise alone in chronic cases can lead to adverse clinical results.

3)Exercise/traction frequency should be a minimum of 3 up to 5 sessions per week.

4)Treatment duration initially should be for a minimum of 2 to 3 months. Treatment will be longer for more complicated case presentations, your practitioner will be able to advise you on the best program.

5)Begin with the largest postural displacement. Your practitioner will be able to identify this area. It is recommended to start on 1 postural movement and then add more postural movements over time.

6)Start with an isometric exercise (contraction against resistance without movement) and then graduate into more active movements always within the pain limits (7/10 or less). For example, one set of 10 repetitions and hold the contraction for 5 to 10 seconds.

7)Re-evaluate your progress with your practitioner every 10 visits with posture analysis, a muscle scan or periodically with the use of X-rays after a minimum of 30 visits (after discussion with your practitioner that this is appropriate for you).

Important note: always consult with your practitioner about the implementation of these protocols. Remember that every patient is different and your practitioner will be best placed to advise you specifically on how best to incorporate these protocols to get the best results for you. Please do not use this exercise program unless you are under the direct supervision of a qualified back to health practitioner who has been appropriately trained.

(6) [CBP Structural Rehabilitation of the spine; Deed Harrison et al; 2002; chapter 5]

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WHAT ABOUT YOGA AND PILATES AND ALEXANDER TECHNIQUE? WON'T THEY CORRECT MY POSTURE?

There is a time and a place for all of these wonderful therapeutic approaches but unfortunately the research does not support long terms structural changes to the spine through Yoga, Pilates or alexander technique. However once a normal posture has been achieved then the more traditional functional rehabilitation and fitness can be performed more effectively with better clinical outcomes and most importantly more safely. Because structure determines function we can exercise more efficiently on top of a stable and correct structure or posture. This is one of the most exciting advances in rehabilitation in the last 25 years.

WHERE DO I START WITH MY EXERCISE PROGRAM?

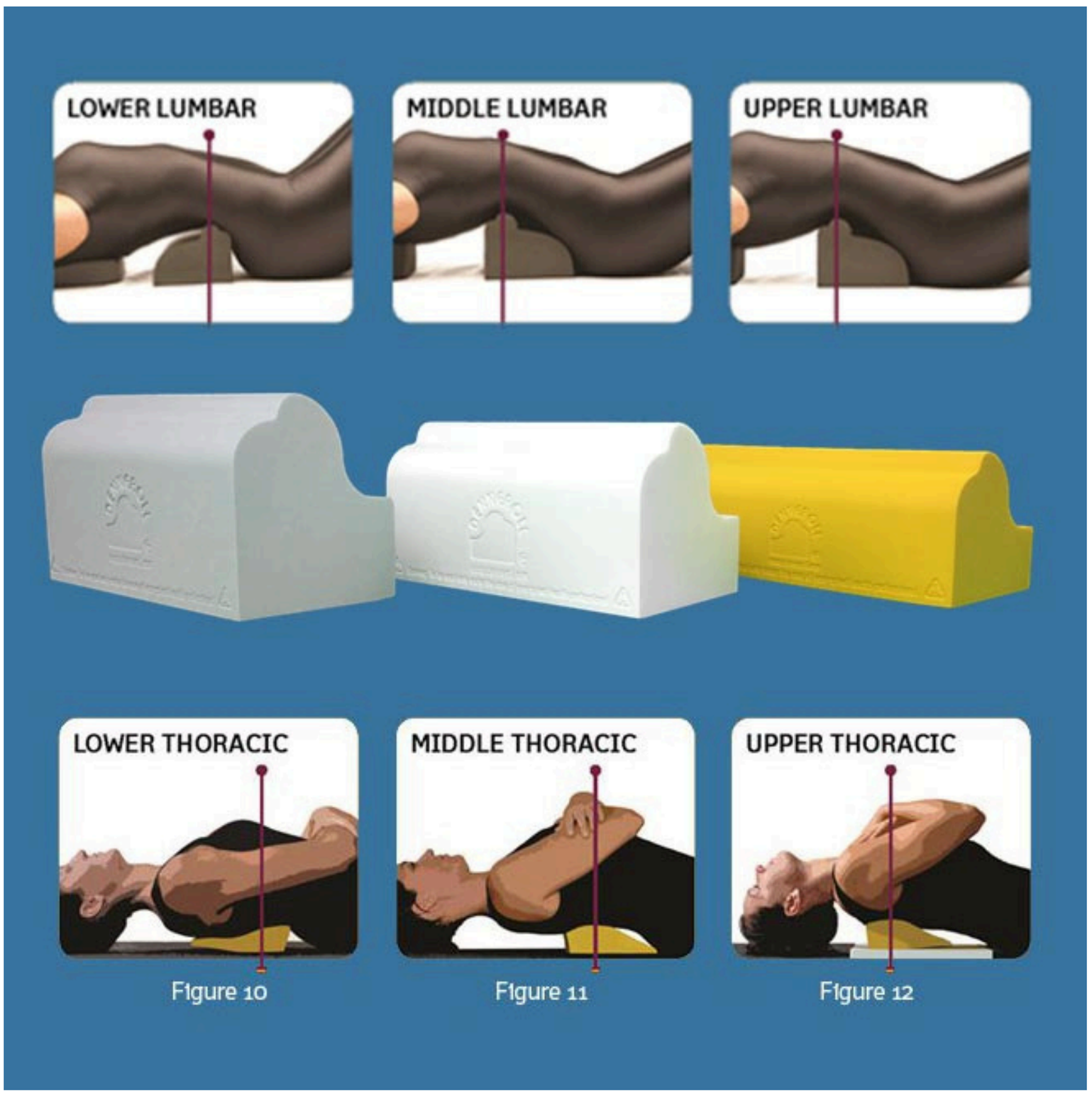
As you become more aware of your posture as a patient it will become clear that there are a nearly infinite number of postural distortion patterns that a patient may exhibit. These patterns may not be readily discernible at the beginning of the rehabilitative process but become clearer as the process unfolds over time. As a patient it is best to start with the most significant global and obvious postural distortion and then work down over time to more specific muscle groups. Your practitioner will advise you on the best place to start.

WHAT ABOUT IF I AM IN PAIN?

Many patients unfortunately wait until there has been a significant amount of damage sustained before seeking help. Often patients present to the practice in a significant amount of pain. When we are in pain with damage to certain muscle groups the body has to adapt and use other muscle groups to achieve the required movement. Therefore if you are in acute pain that has been recently sustained then it is recommended that you work closely with your practitioner to reduce the inflammation before starting your mirror image exercise protocols. Typically most patients are starting to see a reduction in their symptoms within the first 6 to 10 treatments. Spinal Adjustments have been shown to be a very effective way of reducing pain and inflammation. There are caveats to this advice and in particular a disc herniation or protrusion has a natural history of about 3 months to return to pain free state. This is because like ligaments the discs in the spine have a very poor blood supply and don't heal very well.

Because hydration of the soft tissues is important to the long term outcomes then we encourage patients to drink ample amounts of water to get best results. This is especially important in patients who smoke and drink large amounts of caffeine. We also know that tissue temperature is important therefore we encourage patients to either exercise before stretching or to have a hot showers or bath before stretching. Exercise generates tissue heat and the warmer the tissue the quicker it will deform and stretch.

HOW TO CORRECT THE SPINE



[Chiropractic Biophysics Rehabilitation of the cervical spine training module 2. Harrison, D]

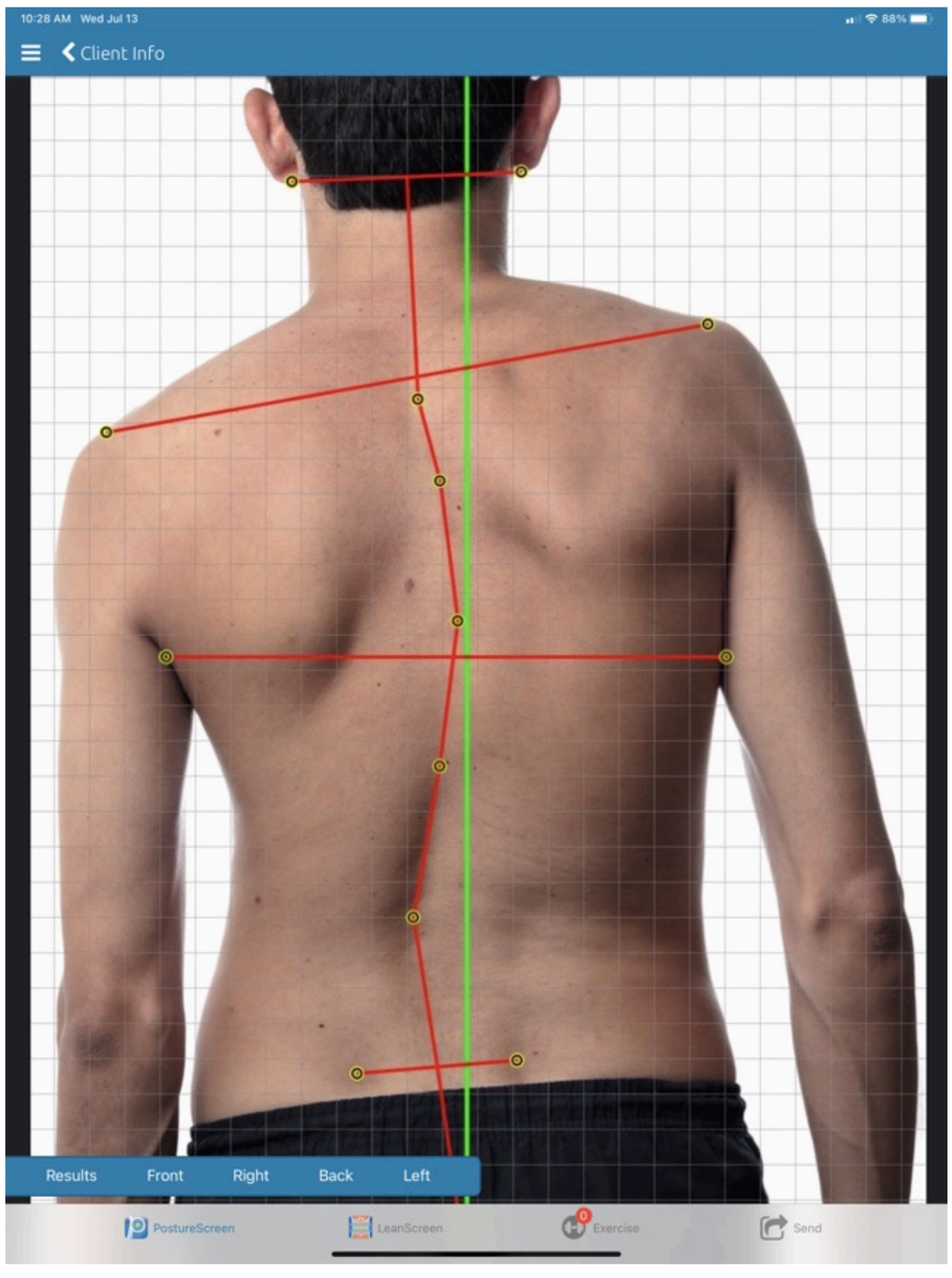
Denneroll spinal remodeling devices are based on tested Chiropractic BioPhysics® techniques and evidence-based, sagittal plane curve models. Denneroll offers four patent-pending designs engineered to enhance treatment of the cervical, thoracic and lumbar spinal regions. Denneroll devices correct improper spinal curvature and enhance your practice's ability to treat conditions like thoracic kyphosis, abnormal cervical and lumbar lordosis, and more.

Denneroll use is dependent on the areas of postural imbalances. Your practitioner will be able to go through your posture pictures and x-rays with you and show you the following:

- The presence of any loss of curve in thr neck or lower back
- The presence of any anterior head carriage or posterior weight bearing (translation)
- The presence of any arthritis in your neck and lower back
- Areas of misalignment that might be affecting your nervous system and your general health.

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YOUR POSTURE IS THE WINDOW INTO YOUR SPINE



Posture analysis shows you detail about your posture that you may not see when you look in the mirror. It helps you to identify your unique posture patterns to understand how you hold your body and what it does as you move.

If you experience pain, posture analysis will also give insight into the defensive mechanisms the body initiates to protect you to manage the pain.

To help you improve your posture for the long term, we need to understand how your spine behaves in your environment to advise on the causative factors keeping it the way it is.

HOW DO WE HELP YOU?

Our spinal adjustments will assist you in correcting the areas of misalignment, by taking pressure off the nervous system and allowing the muscles and soft tissues around the spine to relax. Asymmetrical Mirror Image exercises to help strengthen the muscles around the spine, while traction (with a denneroll) will stretch the spine. Stretches will be required to help break up the scar tissue in the soft tissues around the spine (Ligaments, tendons, joint capsules)

It is the goal of this program to focus on global muscle activities rather than focussing individually on one muscle. Research has shown that training a single muscle is almost impossible to achieve. Conversely when rehabilitation of a group of muscles is attempted all of the muscles in the body will gain a beneficial effect. Therefore the focus of this program is to rehabilitate the entire musculoskeletal skeletal system in the direction of normal posture and normal structure.

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WHAT IS THE DIFFERENCE BETWEEN STRUCTURAL AND FUNCTIONAL REHABILITATION OF THE SPINE?

Typically a rehabilitation program will try and focus on specific muscle groups in order to provide a functional correction. The problem with this approach whilst it makes sense in a laboratory environment the concepts break down under scrutiny in the real world. For example if there is a weakness in lateral flexion in the low back then it would make sense to focus on strengthening the quadratus lumborum muscle which when contracting will bend the trunk over to the side of muscle activity. However in the real world we know that lateral flexion or side bending is the combination of contraction of a large group of muscles including the following Latissimus Dorsi, Internal and External Oblique muscles, Serratus Anterior as well as the aforementioned Quadrants Lumborum. Therefore it is the goal of this program to focus on global muscle activities rather than focussing individually on one muscle. Research has shown that training a single muscle is almost impossible to achieve. Conversely when rehabilitation of a group of muscles is attempted all of the muscles in the body will gain a beneficial effect. Therefore the focus of this program is to rehabilitate the entire musculoskeletal skeletal system in the direction of normal posture and normal structure.

[Harrison normal cervical model; CBP Structural Rehabilitation of the Cervical spine; Deed Harrison et al; 2002;]

TRACTION STRETCHES TO IMPROVE THE STRUCTURE OF THE SPINE

Purpose: Traction is used with purposeful positioning of the patients abnormal posture to restore normal posture and normal spinal curves in the neck, mid back and low back. It is the specific aim that this unique application of forces to the human spine with a precisely defined structural outcome, that is not symptomatically based, but for the true restoration of a more biomechanically stable spine and posture.



Traction of the neck (cervical spine)

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WHAT DOES THIS MEAN FOR YOU?

In the neck the ideal circular curve measured between the 2nd and 7th cervical vertebrae is minus 43 degrees. If their cervical curve is less than minus 30 degrees we know that these patients are at an increased likelihood of developing osteoarthritis in the lower cervical (neck) spine. Anything less than minus 28 degrees and these patients are much more likely to have acute neck pain episode in their lifetime and anything less than minus 26 degrees that these acute neck pain episodes are much more likely to become chronic at some stage. Therefore it may be that your spine might not ever be perfect but our whole clinical goal is not to necessarily be perfect but to at least be safe. In the low back the theoretical ideal curve (elliptical or oval shaped) is minus 40 degrees with the average curve (no pain and no arthritis) being minus 35 degrees. Once again between minus 35 and minus 40 degrees is considered the safe range in the low back

In the low back the ideal elliptical curve measured between the 1st and 5th lumbar vertebrae is minus 40 degrees. If the lumbar curve is less than minus 30 degrees we know that these patients are at an increased likelihood of developing osteoarthritis in the low back (lumbar) spine. Therefore it may be that your spine might not ever be perfect but our whole clinical goal is not to necessarily be perfect but to at least be safe. In the low back the theoretical ideal curve (elliptical or oval shaped) is minus 40 degrees with the average curve (no pain and no arthritis) being minus 35 degrees. Once again between minus 35 and minus 40 degrees is considered the safe range in the low back.

GOALS OF TRACTION STRETCHING

- Structural outcome of normal posture and spinal position
- Less pain
- Less risk of osteoarthritis
- Improvement inpatients activities of daily living.

HOW DOES IT WORK?

Less tension on the spinal cord and nerve roots when the spine is in an optimum position Normalised loads on all spinal structures and the legs / lower extremities Normalised feedback from nerves (mechanoreceptors) into the nervous system from the spinal discs, ligaments and facet joints. Inhibition of pain receptors Improved blood circulation Improved range of motion and flexibility or of the spine by normalising the starting position of the spine

CAN SPINAL ADJUSTMENTS ALONE CORRECT THE CURVES OF THE SPINE?

Spinal adjustments on their own will help reduce pain and inflammation and improve the range of motion of the spine. However on their own they will not correct the curves of the spine.

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CAN EXERCISE ALONE IMPROVE THE CURVE IN MY BACK?

Exercise therapy alone will help with pain but once again will not restore the curves to the spine. There is no evidence that exercise intervention alone can change the radiographic determined spinal curves for better or for worse.

WHAT IS REQUIRED IN ORDER TO CHANGE THE CURVES IN MY SPINE TO A SAFE ZONE?

Non-randomised controlled clinical trials on a combination of spinal adjustments and extension traction protocols were the only ways that her been proven to provide clinically and statistically significant changes in the curves of the spine and reductions in chronic pain intensity in treatment groups when compared to no changes in a control group. Most importantly follow up research at 18 months later showed that the pain and spinal curve improvements were stable and maintained in the treatment group.

THE PHYSIOLOGICAL EFFECTS OF TRACTION AND SPINAL ADJUSTMENTS TO THE SPINE

The connective tissues undergo the following changes:

1) **Elasticity:** The property of a substance that deforms under force but then returns to normal when that force is removed.

2) **Plasticity:** The property of tissue which when a force is applied a critical point must be reached before deformation occurs. This deformation is permanent once reached.

3) **Viscosity:** This is a time dependant property. Increasing a force will not necessarily not increase the actual deformation but it will increase the rate of deformation. Viscous elements show no elastic return once the force is removed. This results in permanent deformation.

4) **Strength:** The force required to reach the point at which molecular bonds break. Traction forces should never exceed the strength of spinal tissues.

Each material (muscles ligaments discs and nerves) contains different combinations of collagen and therefore has a different combination of these 4 properties.

[Harrison normal cervical model; CBP Structural Rehabilitation of the Cervical spine; Deed Harrison et al; 2002;]

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WHAT IS TISSUE CREEP?

With sustained loading such as in spinal traction these tissues experience Creep (nonelastic deformation that will be remembered) and stress relaxation (decreases in internal stresses as a result of the creep) It is well known that the creep deformation of spinal tissue depends on several important variables:

- Magnitude of the force applied.
- Joint position or postural position of the spine when the load is applied.
- Duration of the load application or time Sustained versus cyclic loading
- Loading history of the tissue Hydration of the tissue Temperature of the tissue.

[Harrison normal cervical model; CBP Structural Rehabilitation of the Cervical spine; Deed Harrison et al; 2002;]

HOW LONG SHOULD I STRETCH FOR?

Your practitioner will be perfectly positioned to advise you specifically on your individual protocols but the research gives us good information about the frequency and duration of traction stretches.

Remember that if you are in a lot of pain then you may only be able to tolerate very small durations of traction to begin with. You might be able to do just one or two minutes at a time at the beginning of your care.

Often patients can add an extra minute to their traction stretch every few days however please speak to your practitioner for your individual instructions.

Practically this means for you as a patient that traction stretching for 5 minutes or less will stretch the more elastic components of the soft tissues and that when the stretch is terminated at 5 minutes or less there is not a long term change to the tissues.

Therefore the benefit of the stretch is lost. If spinal ligaments are to be deformed and remodelled into a normal position then 10 minutes of sustained loading is required in order to cause a permanent deformation and remodelling of the more viscous parts of the soft tissues. This stretch will then be remembered by the soft tissues into the long term.

At 10 minutes there is approximately 60% change to the soft tissues and at 20 minutes there is an 80%change to the soft tissues.

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A NORMAL SPINE IS THE GOAL OF CARE

The principle goal of the back to health spinal correction protocols is to apply loads to the spine that will through visco-elastic creep return the spine and the spinal tissues to normal alignment and resting length, the force from traction will produce strain in the tissues which have become pathologically shortened due to abnormal postures maintained for months or years or decades. The main ligament involved is the anterior longitudinal ligament (particularly in areas of the spine where there is a loss of curve) and the intervertebral disc. However all ligaments and muscles must deform in order to correct abnormal posture and alignment of the spine. Due to the visco-elastic properties of the soft tissues a sustained force is necessary to get past the elastic range and into the permanent deformation range of tissues. Ultimately spinal correction should alleviate chronic abnormal mechanical loads and their increased stresses and strains on the central nervous system structures. Because of the normalised stress/strain environment of the neural tissues many chronic neck and low back neurological conditions will benefit from these mirror image traction procedures.

Therefore it is the goal of this program to focus on global muscle activities rather than focussing individually on one muscle. Research has shown that training a single muscle is almost impossible to achieve. Conversely when rehabilitation of a group of muscles is attempted all of the muscles in the body will gain a beneficial effect. Therefore the focus of this program is to rehabilitate the entire musculoskeletal skeletal system in the direction of normal posture and normal structure.

CONTRAINDICATIONS TO TRACTION

These are conditions where applying spinal traction protocols may place the patient at risk. Your practitioner will have thoroughly examined you in order to determine that none of these disease processes are apparent before deciding that traction is suitable for you as an individual. You should not use spinal traction protocols of any of the following disease processes have been diagnosed as part of your comprehensive examination.

- Central or Foraminal stenosis Dizziness Nausea Vertigo Nystagmus or radicular symptoms in the traction.
- Posterior Head translation on the cervical lateral x-ray.
- Thoracic hypo kyphosis on the lateral thoracic radiograph Anterior thoracic translation on the lateral thoracic x-ray.
- Retrolisthesis of any neck (cervical) segment on the lateral x-ray

[Harrison normal cervical model; CBP Structural Rehabilitation of the Cervical spine; Deed Harrison et al; 2002;]

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[CBP Structural Rehabilitation of the Cervical spine; Deed Harrison et al; 2002; Chapter 1]

HOW MUCH PAIN SHOULD I EXPECT DOING MY STRETCHES AND WHEN SHOULD I STOP?

It should be noted as with all interventions the traction stretching protocol will possibly increase a patients discomfort into the painful range. Our recommendation is to give your pain a mark out of 10 with zero being no pain and 10 being the worst.

- 5 would be a good stretch.
- 6 some discomfort and
- 7 discomfort that is bordering on being painful.
- 8 would be painful.

If you fell that you are at a 7 or below then you may continue stretching.

If you feel that your pain levels are at an 8 or above then stop and speak to your practitioner about pain reduction techniques that can be perform such as adjustments, manipulations, stretches and soft tissue therapy or massage.

Important: if you have a chronic condition then research has shown that for best results with respect to pain and functional improvements then aggressive exercise intervention needs to be employed.

This means that in chronic cases your practitioner will need to work with you to encourage you to work through some pain and discomfort (to a level of 7/10 and not beyond).

Most important is to recognise that chronic patients who are unable or unwilling to work through their pain are likely eventual surgical candidates.

If you are unsure about anything then please do not start your traction stretching until you have clarified your questions with your practitioner.

Step 4 - How To Correct The Spine

Category	Cervical and Lumbar Curve	Translation	Traction Type
1	Loss of curve	Anterior head carriage between 15 and 50 mm	Extension and Compression (cervical strapped wedge)
2	Loss of curve	Anterior head carriage less than 15mm	Deneroll
	S shaped neck or lumbar curve	Posterior Translation	Deneroll
3	S shaped neck curve	Significant Anterior	Deneroll
4	Complete reversal of neck curve (kyphotic)	Translation	Extension and Compression (cervical strapped wedge)
5	Normal neck curve and coupling	Significant Anterior Head	Extension and Compression (cervical strapped wedge)
6	Loss of curve (0 to minus 10 degrees)	Translation Significant Anterior Translation	Posterior translation exercise then as pain subsides extension compression traction (cervical strapped wedge)
7 8	Loss of curve (minus 10 to Minus 30 degrees)	Anterior head Translation greater than 50 mm Anterior Head Translation greater than 50mm	1)Thoracic extension traction 2)Extension and Compression (cervical strapped wedge)

[Harrison normal cervical model; CBP Structural Rehabilitation of the Cervical spine; Deed Harrison et al; 2002; page 5]

HOW DO I KNOW WHAT CATEGORY I AM?

You will have already got a sense of whether your neck is optimally aligned from the front by looking at your posture in the mirror.
However without exception the very best way to obtain an in-depth analysis of your neck (cervical spine) alignment is a standing weight bearing x-ray.
For many patients who have already been through the 4 day process they will have had the chance to review there x-rays.
If you haven't had a set of x-rays it would be worthwhile discussing this with your practitioner at this point to decide if it would be appropriate for you to do so.

WE USE RESEARCH TO CORRECT YOUR POSTURE

We utilise a staged process with over two decades of research demonstrating validity and reliability, to help guide you through the process of posture correction.

The tables on the following page detail this research.

OUR THREE STAGES OF CARE

The Initial Stage:

*T*he goal here is to get you feeling better. We use a combination of soft tissue work and spine manipulation to improve nerve function, decrease inflammation and muscle tension.

The Corrective Stage:

1. Improve **Flexibility** – Focused regular stretches to do daily at home or at work.
2. Improve **Strength** – Spine stabilisation exercises.
3. Conditioning of the Spine For The Long Term. This stage includes general body strengthening. Our weekly pilates classes compliments this stage well.

The Maintenance Stage:

Once correction has been achieved, we help you maintain your changes through monthly and quarterly sessions to compliment your new posture and lifestyle.

HOW LONG WILL IT TAKE TO CORRECT MY SPINE?

Our recommendation varies based on the nature of your misalignments, your functional mobility and phase of change within your spine. However, most clients we see within phase 1, achieve 80-90% improvement within 6-18 mths.

The research table shown below guides our recommendation. As you can see, the research is based on achieving changes as quickly and as necessary as possible. Though, it may not be the most practical way to help your acheive your goals, so we tailor a plan to suit you and your circumstances. At Back To Health Wellness, we see posture correction as a slow, but **definite** change.

Study	Minutes of traction per day	Number of Adjustments	Number of weeks	Average Improvement
Cervical (neck)	10	30	12	6.7 degrees
Cervical (neck)	20	35	12	14.2 degrees
Low back (Lumbar)	20	38	12	11.3 degrees

RESOURCES:

- *Harrison DD, Jackson BL, Troyanovich SJ, Robertson GA, DeGeorge D, Barker WF, The Efficacy of Cervical Extension-Compression Traction Combined with Diversified Manipulation and Drop Table Adjustments in the Rehabilitation of Cervical Lordosis.*
- *J Manipulative Physiol Therapy 1994;17(7): 454-464 Harrison DE, Cailliet R, Harrison DD, Janik TJ, Holland B.*
- *New 3-Point Bending Traction Method of Restoring Cervical Lordosis Combined with Cervical Manipulation: Non-randomized Clinical Control Trial, Archives Phys Med Rehabil 2002; 83(4):447-453*
- *Harrison DE, Harrison DD, Cailliet R, Janik TJ,*
- *Holland B. Changes in Sagital Lumbar Configuration with a New Method of Extension Traction and its Clinical Significance. Arch Phys Med Rehab 2002;83(11):1115-1591*

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WHAT IS NORMAL LOW BACK POSTURE (LUMBAR CURVE /LORDOSIS)?

Normal anatomical alignment of the low back (lumbar spine) looking from the side is that the shoulder should be directly over the hips which should be directly over the knee and the ankle. Remember that posture is the window to the spine. You will know by looking at your posture from the side by looking at photos of yourself whether or not your shoulder sits above your hips, knees and feet or not. When we look at the mechanics of the low back the research shows very clearly that the low back should be an elliptical curve. This helps the low back act like a spring and distribute the weight accordingly. Maintaining a more neutral low back curve (lordosis) in the spine while performing tasks such as lifting or sitting will maximize shear support, ensure a high tolerance of the joint to withstand compressive forces, eliminate the risk of ligamentous damage since the ligaments remain unstrained and eliminate the risk of a disc herniation since this is associated with a fully flexed spine

[Posture of the thorax and Pelvis: Reliability, Validity and Analysis; Harrison and Harrison; Chapter 2 structural rehabilitation of the lumbar spine 2007].

THE EPIDEMIOOGY OF BACK PAIN AND DISABILITY

Until recently the majority of low back pain was considered to be an acute injury episode that given a short time would resolve (remiss on its own without treatment. Typically the advice was pain relieving medication, anti-inflammatories and bed rest. In other words low back pain was considered a self-limiting condition. In fact research shows that up to 75% of patients with acute and uncomplicated low back pain will CONTINUE to have problems. At 3 months and 12 month follow ups only 25% of acute low back pain cases will have resolved.

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A 5 year follow up showed that 63% of patients reported recurrences or chronic constant pain. A 28 year follow up showed that 65 – 70% of patients with low back pain and radiations into the lower extremity reported the same problems. Therefore low back pain and lower extremity pain are NOT self-limiting conditions that will resolve over time and the presence of low back pain is a strong risk factor for future pain.

[Posture of the thorax and Pelvis: Reliability, Validity and Analysis; Harrison and Harrison; Chapter 1 structural rehabilitation of the lumbar spine 2007].

HOW DOES MY LOW BACK GET MISALIGNED? WHAT IS THE CAUSE (AETIOLOGY) OF LOW BACK MISALIGNMENT AND BAD POSTURE?

Misalignment patterns and bad posture are the result of one of many factors

- Inherited patterns of misalignment such as scoliosis running from one generation to the next.
- Acquired patterns of misalignment as a result of the physical stresses of life such as sitting in front of computers, lifting, sports injuries, and abnormal spinal biomechanics.
- Emotional stresses of life. Think about the posture associated with someone who is depressed. If you are stressed emotionally we know that this leads to abnormal neck posture and neck tension.
- Prolonged emotional stresses lead to longer terms chances.
- Age: we know that with increasing age you are more likely to suffer from misalignment.

[Chiropractic Management of spine related disorders; Gatterman;M 1990]

The reality is that we all do things to create bad posture and misalignments in the spine.

WHAT IS THE SHORT AND LONG TERM EFFECT IF MY LOW BACK IS OUT OF ALIGNMENT?

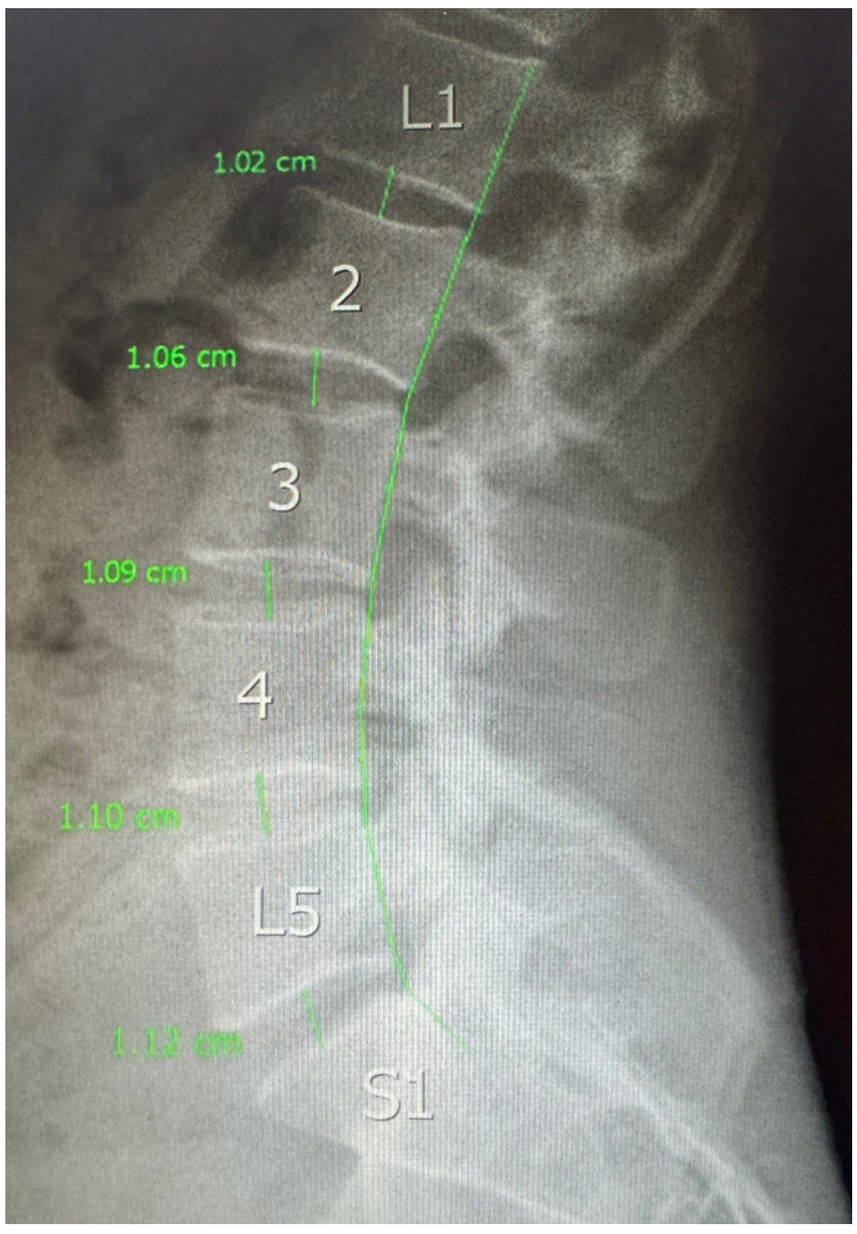
We know that the when the spine is out of line a number of things will begin to happen

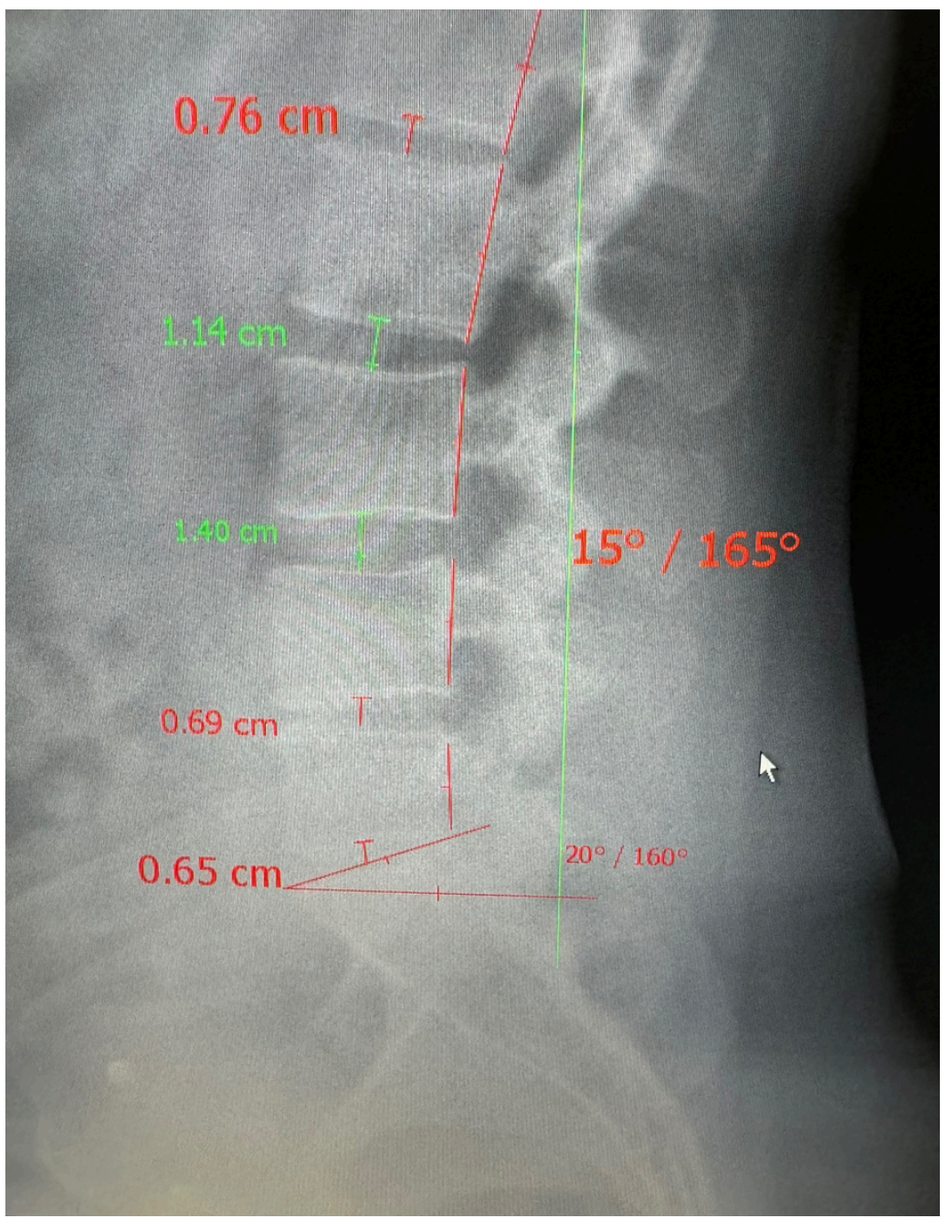
- We are more likely to develop pressure on the nervous system which will potentially affect the different parts of the nervous system (sensory (pain), motor (Posture) and autonomic (Bodily functions).
- If the spine is left misaligned for longer periods of time we are more likely to see damage and arthritis around the areas of misalignment.
- Spinal misalignments are the cause of poor posture.
- Patients with neck and lower back curves of less than minus 30 degrees (lordosis) are more likely to develop osteoarthritis in the neck and lower back.
- Patients with neck and lower back curves of less than minus 28 degrees are more predisposed to having acute neck and lower back pain episodes in their lives.
- Patients with neck and lower back curves less than minus 26 degrees are more likely to suffer from chronic neck and lower back pain in the lives

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WHAT SHOULD THE LOWER BACK (SIDE) LOOK LIKE ON AN XRAY?

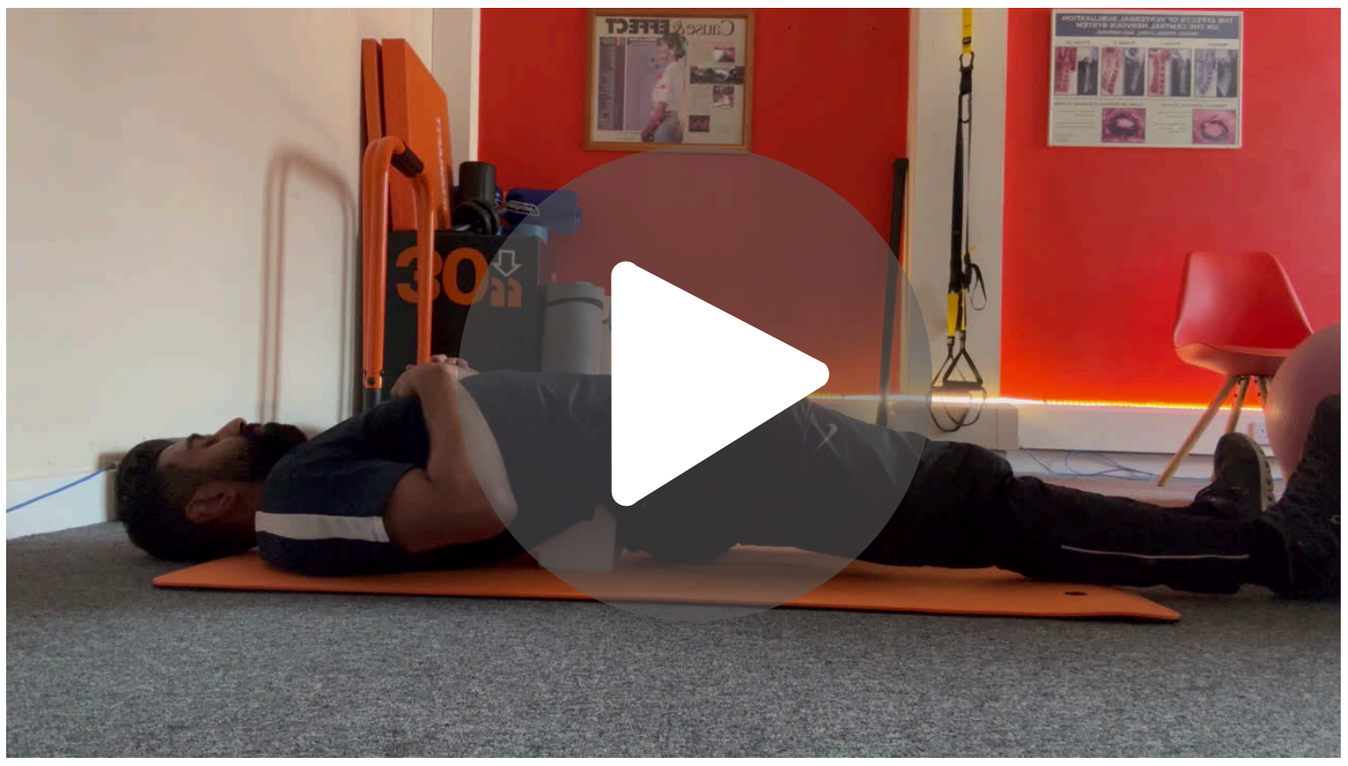
In the low back the ideal elliptical curve measured between the 1st and 5th lumbar vertebrae is minus 40 degrees. If the lumbar curve is less than minus 30 degrees we know that these patients are at an increased likelihood of developing osteoarthritis in the low back (lumbar) spine. Therefore it may be that your spine might not ever be perfect but our whole clinical goal is not to necessarily be perfect but to at least be safe. In the low back the theoretical ideal curve (elliptical or oval shaped) is minus 40 degrees with the average curve (no pain and no arthritis) being minus 35 degrees. Once again between minus 35 and minus 40 degrees is considered the safe range in the low back.





The image on the left shows an ideal lower back curve, a evenly distributed lordosis with adequate disc spaces. The second image on the right shows a reduced lower back curve with uneven spacing between the vertebrae and significantly reduced disc spaces

LUMBAR TRACTION



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Step 5: Optimal Low Back (lumbar) Posture

Category	Lumbar Curve	Sacral Base Angle	T12 over S1
1	Decrease	Reduced	Posterior T12 over S1
2	Normal	Normal /slight increase	Large anterior translation T12 over S1
3	Increase	Increase	Large anterior translation T12 over S1
4	Increase	Increase	No Translation T12 over S1
5	Increase	Normal	No Translation T12 over S1
6	Increase	Increase	Mild Anterior translation T12 over S1
7	Lateral Flexion	Middle T12 Off centre S1	No rotation of spinous process
8	Scoliosis	T12 neutral	Rotation of spinous process
9	Lateral Translation	T12 off centre of S1 vertical	Rotation of spinous process
10	Decrease	Reduced	Large Anterior translation T12
11	Decrease	Normal	Large Anterior translation T12
12	Decrease	Reduced	Slight anterior translation T 12
13	Decrease	Normal	No translation / or slight Ant or Post T12
14	Decrease	Reduced	Large Posterior Translation T12
15	Decrease	Reduced	Mild / moderate posterior Translation Large Posterior
16	Decrease	Normal	Translation Mild / moderate
17	Decrease	Normal	posterior translation

[Posture of the thorax and Pelvis: Reliability, Validity and Analysis; Harrison and Harrison; Structural rehabilitation of the lumbar spine 2007].

HOW DO I KNOW WHAT CATEGORY I AM?

Your practitioner will have already got a sense of whether your low back is optimally aligned from the side by looking at your posture from the side. However without exception the very best way to obtain an in-depth analysis of your low back (lumbar spine) alignment is a standing weight bearing x-ray. For many patients who have already been through the 2-step process they will have had the chance to review their x-rays. If you haven't had a set of x-rays it would be worthwhile discussing this with your practitioner at this point to decide if it would be appropriate for you to do so. Your practitioner will be able to go through your x-rays with you and show you the following:

- The presence of any change of low back curve
- The presence of any pelvic tilt
- The presence of any translation of T12 over S1 Areas of misalignment that might be affecting your nervous system and your general health.

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WHAT ARE THE NORMAL ANGLES OF THE LOW BACK (LUMBAR) SPINE SEEN ON AN XRAY?

Measurement	Average Normal	Ideal Normal
RRA T12 – L1	-0.3 degrees	+0.2 degrees
RRA L1 - L2	-1.0degrees	-4.7 degrees
RRA L2 – L3	-6.8degrees	-8.8 degrees
RRA L3 – L4	-10.9 degrees	-12.4 degrees
RRA L4 – L5	-15.9 degrees	-19.5 degrees
RRA L5 – S1	-31.3 degrees	-40 degrees
Global		
ARA T12 – S1	-66 degrees	-58 degrees
ARA L1 – L5	-34.5 degrees	-40.4 degrees

[Table 3 of Structural Rehabilitation of the Lumbar Spine Harrison et al page 64]

HOW LONG WILL IT TAKE TO CORRECT MY SPINE?

Study	Minutes of traction Number of per day	Adjustments	Number of weeks	Average Improvement
Low back (Lumbar)	20	38	12	11.3 degrees

ABSOLUTE CONTRAINDICATIONS TO TRACTION

These are conditions where applying spinal traction protocols may place the patient at risk. Your practitioner will have thoroughly examined you in order to determine that none of these disease processes are apparent before deciding that traction is suitable for you as an individual. You should not use spinal traction protocols of any of the following disease processes have been diagnosed as part of your comprehensive examination.

- Infectious discitis and spinal cord tumours.
- Abdominal aortic aneurysm
- Abdominal hernias
- Severe osteoporosis or bone diseases.
- Vertebral / spinal fracture

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- Unstable spinal segments under traction loading verified by X-rays
- Multilevel spinal fusions
- Conditions that would be general contraindications to conservative chiropractic or osteopathic care.
- Recent spinal surgery.

RELATIVE CONTRADICTIONS

[Posture of the thorax and Pelvis: Reliability, Validity and Analysis; Harrison and Harrison; Structural rehabilitation of the lumbar spine 2007].

These are conditions which have the possibility of worsening when applying traction procedures. Your practitioner will be able to diagnose these conditions through a comprehensive examination and will be able to advice you on the best way to either modify your traction stretching or terminate your traction stretching in order to get the best results. Presence of any of the following does not absolutely prevent you from using traction but you may need to modify your approach. Your practitioner will be able to advise you of the best way forward for you as an individual.

- Spinal canal stenosis when applying traction
- Anterolisthesis of the spine when applying traction
- Lateral listhesis when applying traction
- Retro listhesis when applying traction
- Single level fusions of the spine Hip replacements
- Mild to moderate osteoporosis
- Lack of food and nutrition and water nun the several hours prior to certain traction methods
- Extreme fatigue or illness
- Kissing spinous or Baastraps disease will inhibit segmental extension form occurring.

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GENERAL INDICATIONS

[Posture of the thorax and Pelvis: Reliability, Validity and Analysis; Harrison and Harrison; Structural rehabilitation of the lumbar spine 2007].

Mirror image spine and posture traction basic rules

- Sagittal plane (from the side) traction to improve curves in the thoracic and lumbar spine.
- Consider the following relative body positions-
- Position of the feet relative to the pelvis (anterior, posterior, flexed or extended)
- Thorax to pelvic posture (anterior, posterior, flexed or extended)
- Is the lumbar (low back) curve increased or decreased in the lower, middle or upper lumbar spine.
- Is the rib cage curvature normal, hyper-kyphotic, hypo-kyphotic and the location.
- Coronal plane traction (from the front) to correct lateral flexion and rotations of the spine.
- Consider the following relative body positions
- Thorax to pelvis posture is it rotated, laterally flexed or laterally translated?
- Pelvic to feet posture: is it rotated or laterally translated?

Step 6: Anatomical Leg Length Inequality



WHAT IS NORMAL LOW BACK AND PELVIC POSTURE FROM THE FRONT?

When observing the posture your low back and pelvis from the front the hips should be level, the belly button should be facing straight ahead, there should be an even weight distribution (within 5 pounds left versus right). If you or your practitioner notice that one hip is higher than the other then you may well have a leg length inequality. There are 2 types of inequality:

- Functional Leg Length inequality (FLLI): One hip is higher and it appears that the legs are unequal in length but in fact there is no anatomical inequality. FLLI may be the result of rotation in the pelvis or low back, or they may be the result of a flat foot (dropped arch).

- Anatomical Leg Length inequality (ALLI): One hip is higher and it appears that the legs are unequal in length and it is the result of a true anatomical inequality. ALLI may be the result of a fractured leg that has healed imperfectly (broken leg) or it may have been present from birth (congenital abnormality)

In all cases of ALLI greater than 5 – 10mm a recognisable postural displacement pattern is present most of the time. The typical pattern that exists is as follows:

- Rib cage (thoracic) lateral translation (shift) to the short leg side
- Rib cage (thoracic) lateral flexion away from the short leg side
- Anterior Pelvic rotation on the short leg side (7-0% of cases)
- Posterior thoracic rotation on the short leg side.

[Posture of the thorax and Pelvis: Reliability, Validity and Analysis; Harrison and Harrison; Chapter 4 structural rehabilitation of the lumbar spine 2007].

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WHAT IS ANATOMICAL LEG LENGTH INEQUALITY (ALLI)?

The assessment of the patient with disturbed postural distortion patterns particularly in the lumbar spine is incomplete without an analysis of the weight bearing radiographic view of the pelvis and lumbar spine including the hips (femoral heads). When thoracic – lumbar – pelvic asymmetry occurs further investigation of the patients structure is needed to accurately assess the cause.

HOW COMMON INEQUALITY? IS ANATOMICAL LEG LENGTH

To begin with at least 90% of the asymptomatic population will have an ALLI of any amount. Regarding children Travell presented data detailing the prevalence of ALLI in 1146 schoolchildren between the ages of 5 and 17 years. In 80% of the sample an ALLI of 1/16th inch was found and 3.4% had an ALLI of ½ inch or more. In reference to the treatment of ALLI with orthotic lift therapy in children Travell stated " uncorrected difference grow larger whilst two studies reported that leg length differences corrected during childhood often become smaller over time"

[Travell et al: Myofascial Pain and Dysfunction; The trigger point manual, Vol 1 and 2. 2nd edition Williams and Wilkins, Baltimore, 1999]

WHAT ARE THE CAUSES OF ANATOMICAL LEG LENGTH INEQUALITY?

ALLI can result from a variety of causes including

- Genetic growth disturbances
- Fractures of the leg Infections Hip and Knee replacement surgeries
- Transitional vertebra in the low back
- Asymmetrical growth of the pelvis and sacrum leading to sacral base tilt.
- Half (hemi) or wedge shaped vertebra in the low back particularly L4 and L5

[Posture of the thorax and Pelvis: Reliability, Validity and Analysis; Harrison and Harrison; Chapter 4 structural rehabilitation of the lumbar spine 2007].

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WHAT ARE THE EFFECTS OF HAVING AN ANATOMICAL LEG LENGTH INEQUALITY?

Research shows that having an Anatomical Leg Length Inequality of 5mm or more is clinically significant and may cause disturbances in function and pain levels. Obviously the more the discrepancy the greater the damage that is done over time to the body. Here is a list of conditions that Anatomical Leg Length Inequality has been found to correlate to:

- Low back (Lumbosacral facet joint)
- Arthritis Lower leg stress fractures
- Knee injuries Hip arthritis
- Various chronic musculoskeletal pains
- Some visceral disorders
- Gait abnormalities with 2cm or more inequality.

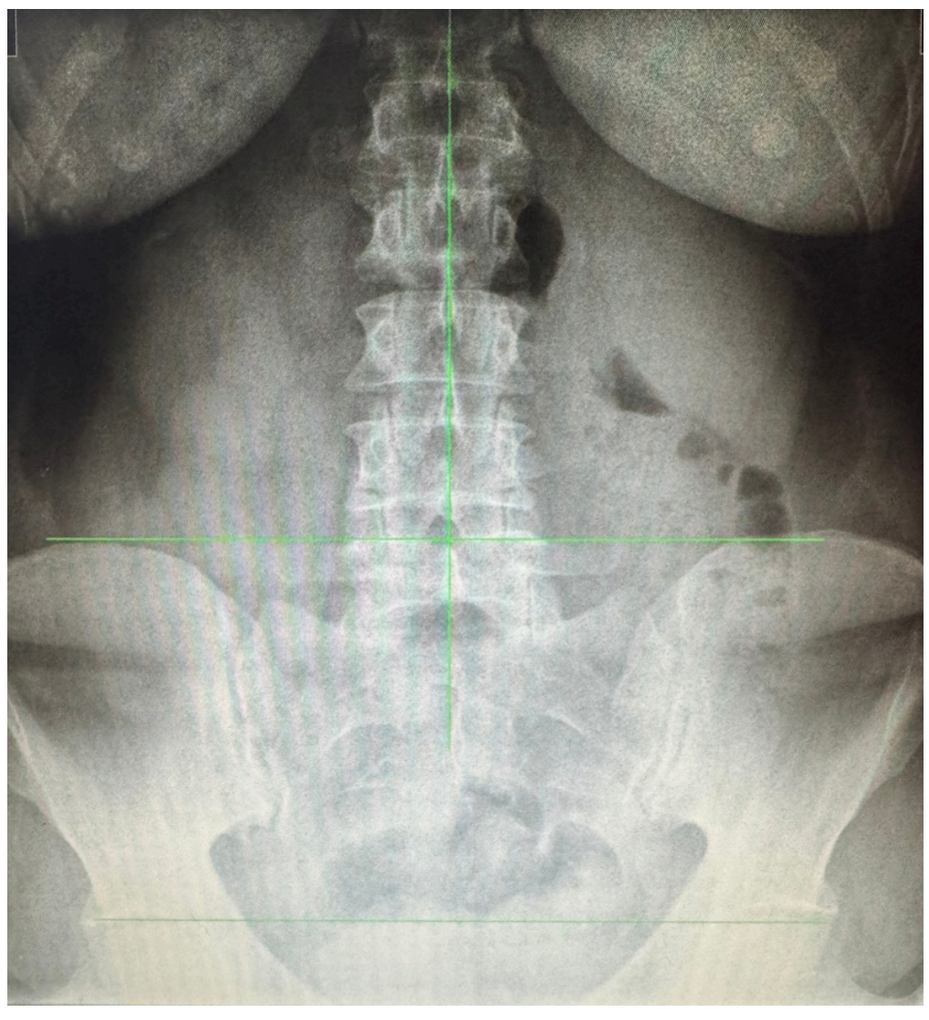
[Posture of the thorax and Pelvis: Reliability, Validity and Analysis; Harrison and Harrison; Chapter 4 structural rehabilitation of the lumbar spine 2007].

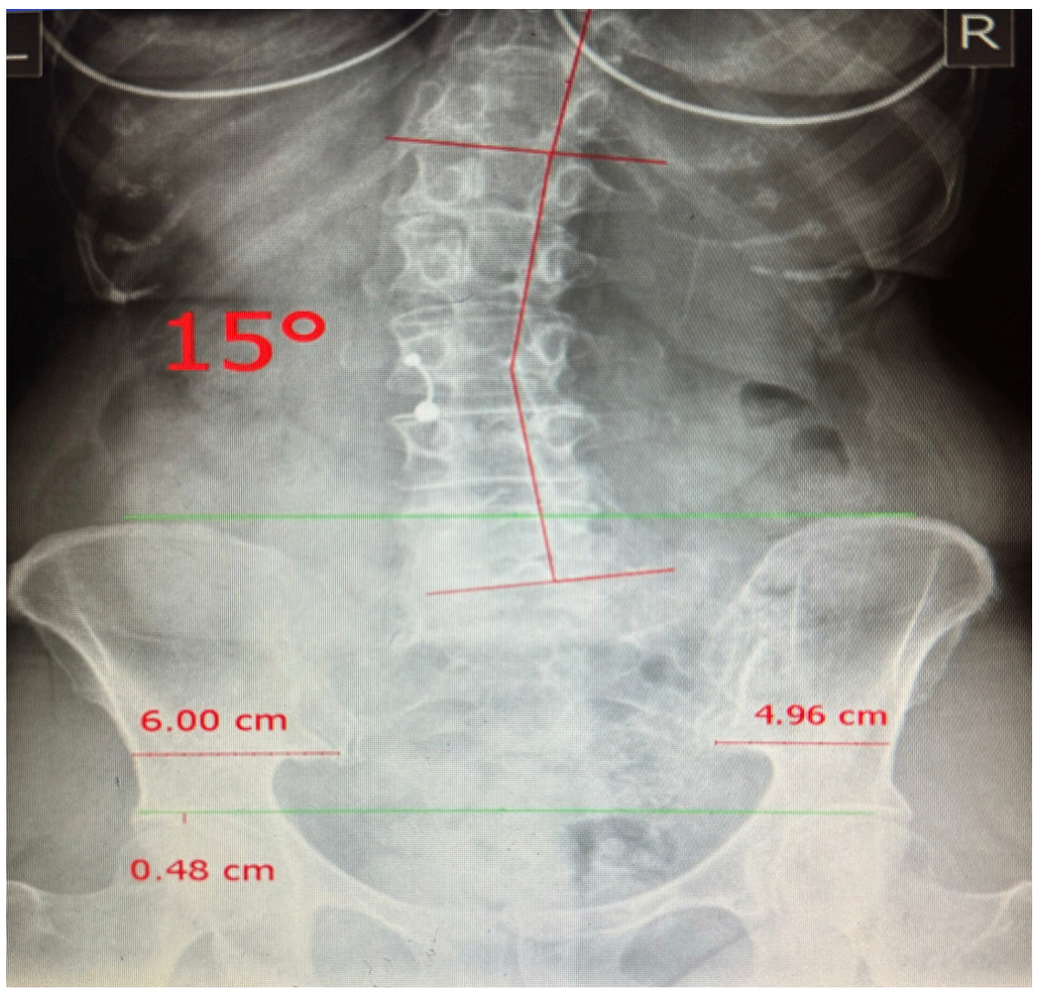
HOW CAN WE LIFT INTERVENTIONS TO CORRECT USE FOR ORTHOTICS AND ANATOMICAL LEG LENGTH INEQUALITY?

Multiple investigations have been performed using shoe lifts to level ALLI in a variety of patient pain and disability conditions. Collectively these studies suggest that lift therapy determined by x-rays demonstrated positive improvements in a variety of patient pain and disability conditions. Prevention of future lumbar degeneration and stress fractures have been suggested as a possible benefit of reduction of ALLI. We recommend that using a lift on an orthotic device any time there is a measured ALLI of greater than 4mm for optimum postural corrections. This is the suggested limit of accuracy of the technique and the tolerance suggested by some of the literature. The orthotic lift should be equivalent to the height needed to reduce the measured ALLI to 4mm or less. A follow up x-ray would ideally be obtained to verify proper correction.

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WHAT SHOULD THE PELVIS AND HIPS LOOK LIKE ON AN XRAY?





If a leg length discrepancy is present, often a pelvic rotation will accompany it. This is an adaptation which will bring about compensatory changes elsewhere in the body, such as in the lower back (see image above right)

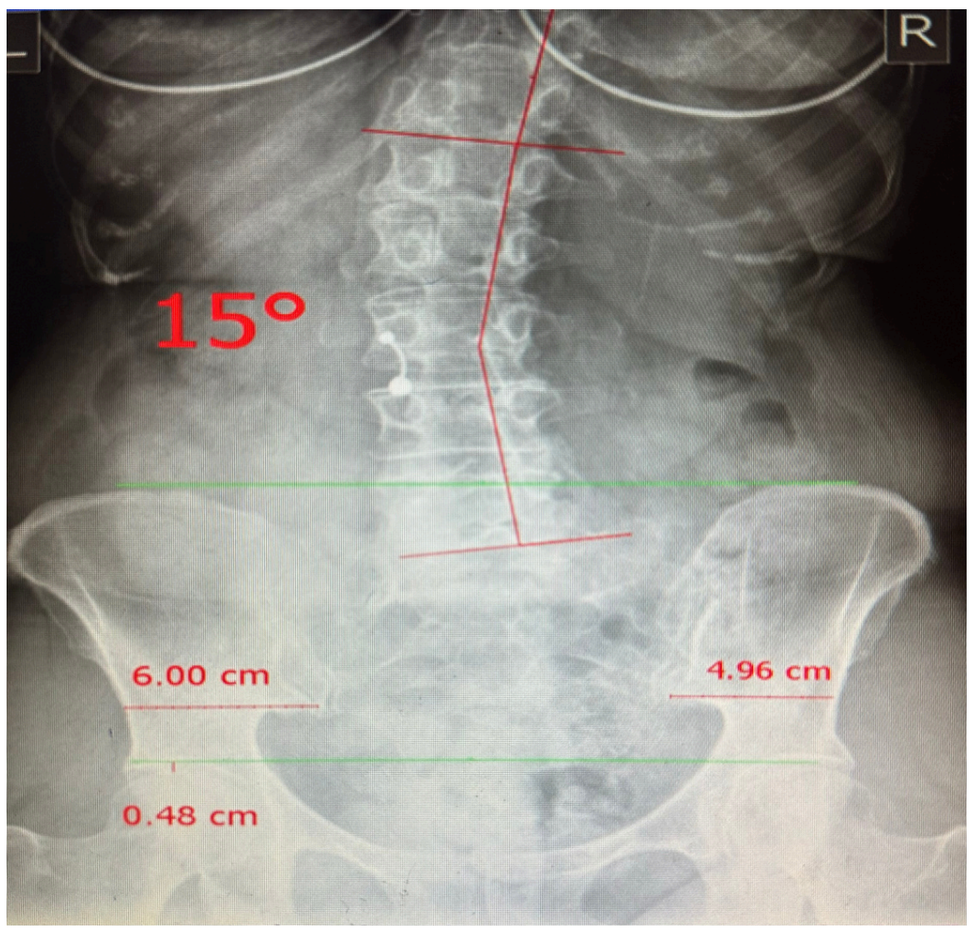
HOW CAN TRACTION HELP A ROTATED PELVIS?

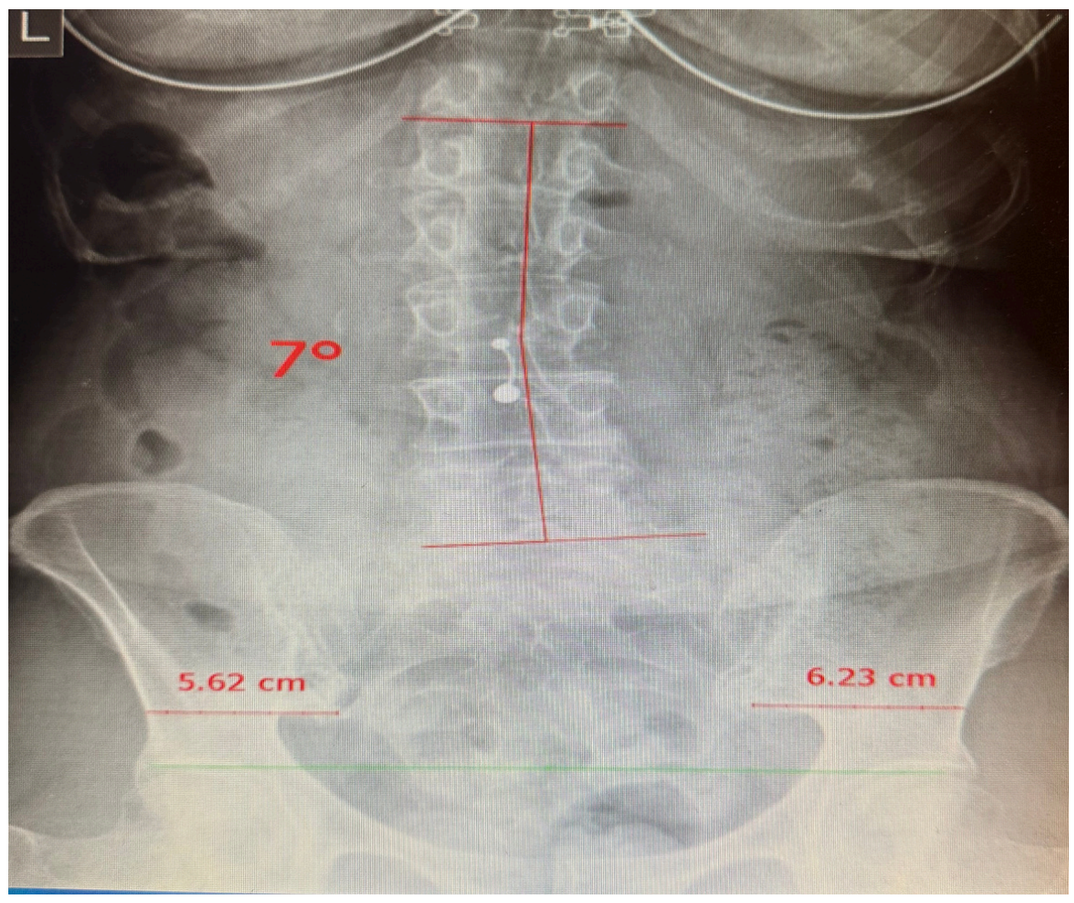


Side traction targets the rotated spine segments to lengthen the shortened muscles on the opposite side (video above).

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PRE & POST CORRECTION COMPARISON





The images above shows the results pre and post correction of a client using the corrective model to retrain their spine position. The improvement (second image) was obtained within a 12 month period. As a result of the correction, the functional leg length discrepancy (shown in the first image on the left) had been corrected naturally without the need for orthotics.

4) PELVIC ROTATION CORRECTIVE EXERCISE



This exercise aims at correcting a spine and pelvic rotation by bringing both knees and feet together, and then altering the hip and pelvis position by moving the feet to mirror the current position.

When moving the feet, the hips and spine will also change position. Alongside traction, this is an effective corrective exercise when done consistently.

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Anomalies (such as congenital malformations as described above) should be handled by your practitioner on a case by case basis. The different types of anomalies need to be checked for the spinal and postural displacement patterns. Certain anomalies will be corrected the full amount as measured whereas others are reduced by only 50% with lift intervention and others may not need lift intervention.

[Posture of the thorax and Pelvis: Reliability, Validity and Analysis; Harrison and Harrison; Chapter 4 structural rehabilitation of the lumbar spine 2007].

WHAT IS AN ORTHOTIC DEVICE?

An orthotic is a device that is placed inside the shoe that modifies the structural and functional characteristics of the neuromusculoskeletal system. In fact shoes are indeed very basic orthotics. They change the way that your foot functions. An orthotic device is used to:

- Control and guide the foot through the gait cycle,
- To restrict movement in a given direction particularly in areas of hypermobility or joint / ligamentous laxity
- To assist walking and standing generally
- To reduce weight bearing forces going through the wrong areas of the foot, akle, knee, hip and low back.
- To aid rehabilitation from fractures after the removal of a cast.
- To otherwise correct the shape and/or function of the foot,
- To provide easier movement capability or reduce pain.

There are many different types of orthotics using different materials ranging from very soft and flexible EVA through to carbon fibre rigid orthotics. There are different sizes of orthotics from full length to ¾ length. Here at Back to Health we use full and ¾ length orthotics that are made of varying densities of EVA (Ethylene Vinyl Acetate).

They are made with the following construction features:

- **100% EVA:**

EVA has a long ‘construction memory’ and can be moulded and adjusted to the patients’ feet or cast, simply by applying heat. The Taibrelle covers resist bacteria, and are easily cleaned in warm water.

- **Closed Cell Construction:**

No air bubbles so the Orthotics will resist compression and distortion.

- **Triangular shaft:**

Is a mid-foot stabiliser which runs longitudinally from the mid foot through to the forefoot and splays out in a triangular shape. The Triangular Shaft allows weight to be dispersed evenly across the bones of the foot through its unique Weight Distribution System (WDS).

- 5” Intrinsic rear foot varus angle:

This is the ideal angle (due to patients having an average 4°- 6° tibial varum) for optimum performance as recommended by industry standards.

- **42” sagittal inclinometer:**

This gives biomechanical control of the subtalar joint during stance and gait, allowing balance, control and coordination.

- **Dual Density:**

Firmer density EVA gives support to the longitudinal arch and rear foot, aiding in mid tarsal joint support, the medium density EVA provides the patient with forefoot comfort during the gait cycle.

ORTHOTIC SELECTION
HOW DO I CHOOSE MY ORTHOTIC?

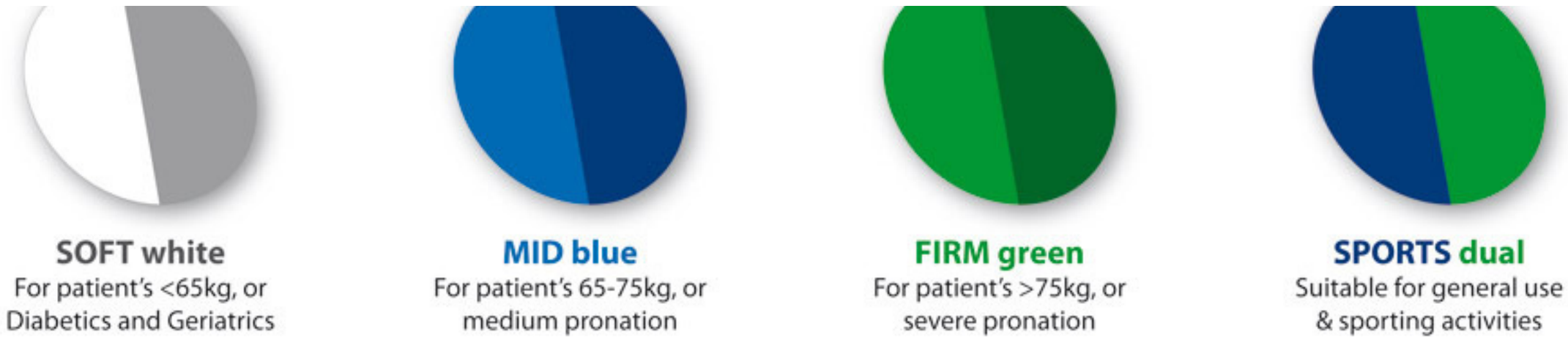
An orthotic is a device that is placed inside the shoe that modifies the structural and functional characteristics of the neuromusculoskeletal system. In fact shoes are indeed very basic orthotics. They change the way that your foot functions. An orthotic device is used to.

There are 3 factors that must be taken into consideration, when selecting the right orthotic for your patient

- Orthotic Density
- Orthotic Style
- Orthotic Size

1.Choosing the Orthotic Density

Factors such as the amount of pronation, the patient's weight and other existing medical conditions (such as diabetes) must be considered when selecting the appropriate density for each patient. Below is a general guide:



2. Selecting the Orthotic Style

The style of footwear which the orthotic will be worn in is also an important consideration.

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Step 6: Anatomical Leg Length Inequality

2/3 Length Orthotics are best used in regular walking shoes and most men’s dress shoes.



Full Length Orthotics are best suited to sports shoes and work boots.



Dress Style Orthotics can be used for patient with very wide feet, as the lateral skive will allow the foot to splay naturally. It is also good for narrow fitting shoes.



High Heel Orthotic is ideal for use in ladies low to high heel court shoes. It is extra thin and can also be fitted to flat shoes with a shallow heel cup or narrow shank.



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3.Orthotics Size

Dual Density Heat Moulding Orthotics are available in an extensive range of sizes: starting from an Infant size, up to an adult's XX Large. Use the shoe sizing chart below as a guide to estimate the required orthotic.

Size	Men UK	Women
	K1 - 3	K1 - 3
K2 - 3.5	K4 -6	K4 -6
K4 -6	K7 - 9	K7 - 9
K7 - 9	K10-12	K10-12
Small Junior	1 - 2.5	1.5 - 3
Junior	3 - 4.5	3.5 - 5
X Small	5 - 6	5.5 - 7
Small	7 - 8.5	7.5 - 9
Medium	9 - 10.5	9.5 - 11
Large	11 - 12	11.5 - 12
X Large	13 - 14.5	12.5 - 14
XX Large		

For greater accuracy place the orthotic under the foot - if the distal edge of the orthotic finishes 5-10mm behind the bisection of the 1st Metatarso phalangeal joint, it is the correct size.

Patient Compliance: Patients should wear the orthotics for 1 hour on the 1st day (or until discomfort occurs), 2 hours on the second day - gradually building up to wearing them full time.

FITTING ORTHOTICS: HOW ARE THEY CUSTOM MADE FOR ME?

It is important that Orthotics be fitted and moulded to the patient's Subtalar Joint Neutral Position, which will assist in correcting and limiting excessive pronation.

To find the subtalar neutral position you can use the Anterior Alignment Method:

- Locate the depression anterior to the medial malleolus by asking the patient to over pronate their foot.
- Mark the depression
- Repeat steps 1 & 2 for the lateral depression.
- Bisect the lateral and medial depressions and mark the bisection.
- Locate and mark the 2nd metatarsal head and join it with the bisection mark made in step 4.
- Locate and mark a dotted line along the tibial crest to meet up with the bisection of the medial and lateral depressions.
- To find subtalar joint neutral, ask the patient to roll their foot outwards - when the dotted line along the tibial crest down to the 2nd metatarsal head is straight, the foot is in the subtalar joint neutral position.



WHAT IS NORMAL FOOT POSTURE?

When observing the feet there are 4 areas that are very important that need to function together in order to maintain a neutral normal foot posture.

1.) The Medial Arch (The longitudinal arch)

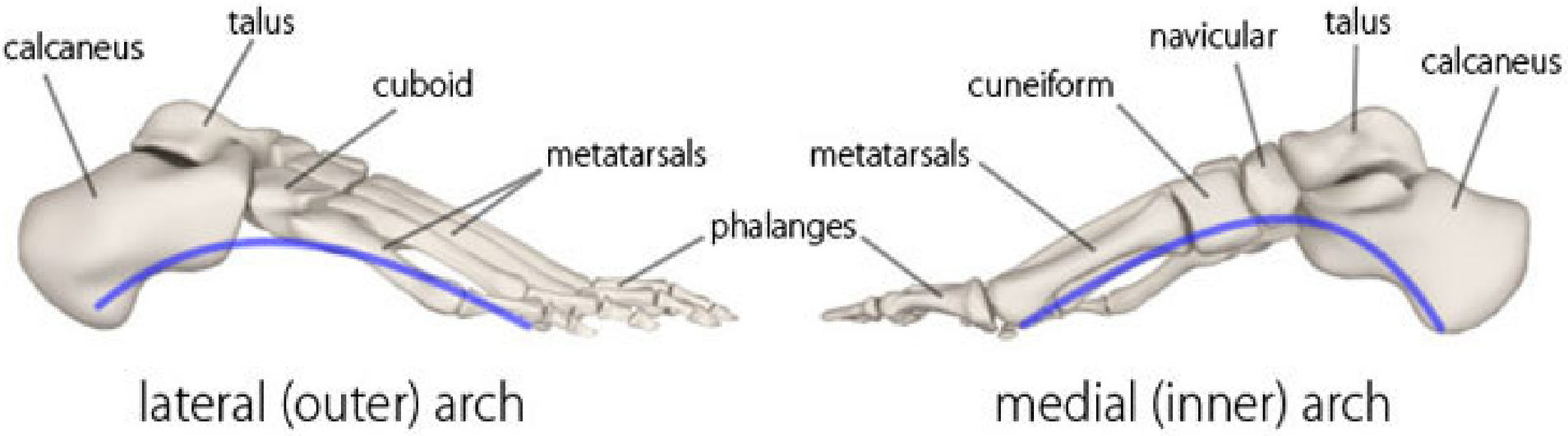
The medial arch is higher than the lateral longitudinal arch. It is made up by the calcaneus, the talus, the navicular, the three cuneiforms, and the first, second, and third metatarsals. Its summit is at the superior articular surface of the talus, and its two extremities or piers, on which it rests in standing, are the tuberosity on the plantar surface of the calcaneus posteriorly and the heads of the first, second, and third metatarsal bones anteriorly. The chief characteristic of this arch is its elasticity, due to its height and to the number of small joints between its component parts. Its weakest part (i.e., the part most liable to yield from overpressure) is the joint between the talus and navicular, but this portion is braced by the plantar calcaneonavicular ligament a.k.a. spring ligament, which is elastic and is thus able to quickly restore the arch to its pristine condition when the disturbing force is removed. The ligament is strengthened medially by blending with the deltoid ligament of the ankle-joint, and is supported inferiorly by the tendon of the Tibialis posterior, which is spread out in a fan shaped insertion and prevents undue tension of the ligament or such an amount of stretching as would permanently elongate it. The arch is further supported by the plantar aponeurosis, by the small muscles in the sole of the foot, by the tendons of the Tibialis anterior and posterior and Peronæus longus, and by the ligaments of all the articulations involved.

[Grays Anatomy 40th edition; The anatomical basis of clinical practice; Gray, H et al 2009]

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2.) The lateral longitudinal arch

- The lateral arch is composed of the calcaneus, the cuboid, and the fourth and fifth metatarsals.
- Two notable features of this arch are its solidity and its slight elevation.
- Two strong ligaments, the long plantar and the plantar calcaneocuboid, together with the Extensor tendons and the short muscles of the little toe,preserve its integrity.



3.) The Transverse Arch

- The transverse arch is at the front of the foot.

- At the posterior part of the metatarsus and the anterior part of the tarsus the arches are complete, but in the middle of the tarsus they present more the characters of half-domes the concavities of which are directed downward and medial ward, so that when the medial borders of the feet are placed in apposition a complete tarsal dome is formed.
- The transverse arch is composed of the three cuneiforms, the cuboid, and the five metatarsal bases.

- The transverse arch is strengthened by the interosseous, plantar, and dorsal ligaments, by the short muscles of the first and fifth toes (especially the transverse head of the Adductor hallucis), and by the Peronæus longus, whose tendon stretches across between the piers of the arches.

[Grays Anatomy 40th edition; The anatomical basis of clinical practice; Gray, H et al 2009]

4.) The Transverse Arch

The subtalar joint, also known as the talocalcaneal joint, is a joint of the foot. It occurs at the meeting point of the talus and the calcaneus
The joint allows inversion and eversion of the foot, but plays no role in dorsiflexion or plantarflexion of the foot.

[Grays Anatomy 40th edition; The anatomical basis of clinical practice; Gray, H et al 2009]

ACHILLES PAIN

Achilles tendonitis (also known as Tenosinovitis or Tendonopathy) is inflammation, irritation and swelling of the Achilles tendon at the attachment to the calcaneus.

There are two types of Achilles tendonitis

Non-insertional: caused predominately by excess pronation

Insertional: caused mainly by supination or a high forefoot valgus deformity

BIOMECHANICAL AETIOLOGY

As shearing and tractional forces are placed on the Achilles tendon, inflammation can occur at the attachment to the calcaneus.

A major underlying cause of Achilles tendonitis is the result of aggravation caused by pronation or supination - or a combination of both.

As the calcaneus inverts at heel lift, the gastrocnemius assists and as the foot accelerates into an excessively pronated (or supinated) position, the calcaneus is everted (or inverted) causing medial/lateral tendo-achilles traction.

This results in transverse shearing of the tendon and sheath, leading to inflammation and pain being experienced.

Lateral Achilles pain is associated with a Pes Cavus (high arch) foot structure or a forefoot valgus >10°

Unilateral Achilles pain can also be associated with a structural or functional leg length discrepancy.

The Achilles tendon fans out at its insertion to the calcaneus and is sandwiched between the superficial achilles bursa and the retro-calcaneal bursa. Sometimes an abnormal prominence of the postero-superior process of the calcaneus, known as Haglund's deformity, may be present, causing irritation of the bursa or tendon. Often many patients with this condition are supinators which causes lateral lower limb pressure whilst making the foot less efficient in energy absorption, transferring this stress to the achilles tendon region. Superficial bursitis may cause tenderness posterior to the tendon.

Retrocalcaneal bursitis usually exhibits tenderness while squeezing the area deep to the tendon.

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SYMPTOMS

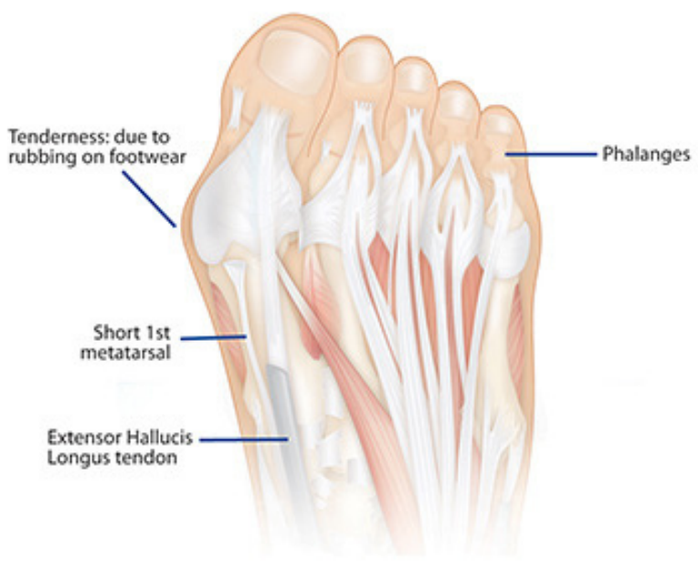
The patient often experiences inflammation, pain and swelling of the Achilles tendon at the attachment to the calcaneus. Pain can be experienced either on the medial or lateral aspects of the Achilles. In extreme cases the Achilles tendon can rupture and detach from the calcaneus, or a compensatory bone spur may develop as the body's natural compensation to prevent the tendon from rupturing. Bilateral medial Achilles pain is often associated with pronation. Bilateral lateral Achilles pain is often associated with pronation and a high forefoot valgus. Whilst unilateral Achilles pain can be associated with a structural or functional leg length discrepancy.

TREATMENT

Orthotics should be prescribed and fitted to assist in controlling pronation (or supination). To help alleviate the tension and inflammation (and resultant pain), a heel lift can be added to both the left and right orthotics. The heel lift should be removed from the orthotics within 2 weeks (or less if the pain and inflammation have subsided). If the heel lifts are worn for a longer period the Achilles tendon may start to shorten.

BUNIONS (HALLUX ABDUCTO VALGUS)

Hallux Abducto Valgus (or 'bunion' is an enlargement of the joint (a lump of bone) at the base of the hallux. Bunions are a valgus deviation of the hallux commonly associated with an exostosis on the 1st metatarsophalangeal joint (MTPJ).



BIOMECHANICAL AETIOLOGY

The main biomechanical factors in the development of a bunion are excess pronation of the subtalar joint, combined with a short 1st metatarsal. As the foot pronates, the centre of gravity moves towards the midline, loading the forces on the medial forefoot area. This action puts excessive weight on the hallux during the toe off phase of gait, increasing the load on the 1st metatarsal shaft in an adductory direction, causing rotation of the shaft, which then causes the hallux to compensate by abducting. The hallux then deviates towards the lesser digits and the joint enlarges to accommodate the addition load. Hallux Abducto Valgus (HAV) is not necessarily an entirely hereditary condition. Bunions can run in a family but it is the biomechanical structure (i.e. short 1st metatarsal and excessive pronation) that is hereditary and passed through the family - not the resultant condition itself. In some cases bunions are caused by arthritis or trauma. Fractures or breaks in the joint may lead to arthritic changes and the development of bunion deformities whilst limiting the range of motion in the joint. Contrary to popular belief footwear is not the common cause of bunions. Although poor footwear in combination with causative biomechanical factors can cause bunions to develop quicker and progress further. Hallux Abducto Valgus may be experienced in 3 stages: primary, secondary and tertiary. These stages refer to the progressive deviation of the hallux towards the midline of the body. Often, bunions in the tertiary stage cause the hallux to overlap or underlap the 2nd toe, usually limiting the patient's mobility and causing pain.

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SYMPTOMS

Pain may be felt in the 1st MTPJ, and a protruding lump on the medial side of the hallux, which enlarges with age. The skin and tissue around the bunion may also be swollen or inflamed, very painful or in some cases patients exhibit no pain at all. If left untreated the hallux will increasingly deviate until it reaches the tertiary stage, in which the big toe either overlaps or underlaps the 2nd toe. As a result, pain, discomfort and difficulty wearing shoes may be experienced due to the bunion deformity. Arthritis and stiffness in the joint can also develop. The lesser toes can also be affected - pressure from the hallux pushing inward toward the lesser toes can cause toe nails to begin to grow into the sides of the nail bed or the smaller toes can develop corns. A ‘hammer toe’ may also develop in the 2nd toe due the deviation of the hallux.

TREATMENT

Primary and secondary stage bunions can be successfully treated with correctly fitted orthotics to realign and control the feet. Orthotics moulded to the patient’s subtalar joint neutral position will assist in limiting excessive pronation, which in turn re-distributes the body weight away from the 1st metatarsophalangeal joint during toe off reducing abduction of the hallux - ultimately preventing further development of the bunion. Orthotics control excess pronation reducing the load on the medial forefoot area and reducing valgus deviation of the hallux. Orthotics re- establish proper weight distribution and lower limb biomechanics which may prevent or reduce gradual growth of a bunion. If HAV is identified and treated with corrective orthotic devices, in the primary or secondary stages, this can assist in preventing further development of the bunion. Adding a Mortons Extension in the primary and secondary stages can assist in supporting the short 1st metatarsal and assist in the toe off phase of gait. To create a Mortons Extension a forefoot addition can be attached to the distal edge, with the medial edge being trimmed slightly to ensure an easy fit into the patient’s footwear.

PLANTAR FASCIITIS

Plantar Fasciitis is inflammation caused by excessive stretching of the plantar fascia. The plantar fascia is a broad band of fibrous tissue that runs along the the plantar (bottom) surface of the foot. The plantar fascia is attached to the calcaneus (heel) and supports the arch by acting like a bow string. When the plantar fascia is stretched excessively (often due to excessive pronation), it can cause the fascia to start to tear away from the calcaneal attachment resulting in inflammation and pain. If left untreated, a secondary compensation of plantar fasciitis is the development of a heel spur. A heel spur develops as a bony growth on the anterior aspect of the calcaneus (front of the heel bone). It is the body’s natural response to prevent the fascia from detaching at the calcaneus. Generally a heel spur grows as a rate of approximately 1mm per year, if the stress on the plantar fascia is not relieved.

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BIOMECHANICAL AETIOLOGY

Plantar fasciitis is generally the result of faulty biomechanics. Excessive pronation, or a high strike angle supinated foot structure, can cause the plantar fascia to elongate and tear at the attachment to tuberosity of the calcaneus. Excess subtalar joint pronation lowers the arch structure and as the foot elongates, a traction force is placed on the plantar fascia. These tractional forces can result, over time, in inflammation of the fascia and surrounding tissues, thus causing pain in the arch and heel. If chronic traction of the plantar fascia from the calcaneal tuberosity occurs, then this may lead to the development of a bony growth on the calcaneal tuberosity. The resultant projection or bone growth may be called a ‘spur’ - referred to as a ‘heel spur’ - which can be visible on X rays. Plantar fasciitis is generally a precursor to a heel spur. Restriction of dorsiflexion of the foot through the presence of tight calf muscles can often add to plantar fascial pain due to restriction in dorsiflexion of the foot during the propulsive phase of gait. When these factors are combined with excess pronation, this results in the foot dorsiflexing at the midtarsal joint which in turn places an extra strain on the plantar fascia.

SYMPTOMS

Sharp pain, stiffness and aching are very common with this ailment. Patients often present with a dull to sharp pain occurring about the plantar calcaneal area when getting out of bed of a morning. The plantar fascia is more inflexible at those times or when arising from a seated position and continuing during the initial periods of weight bearing. Usually the pain subsides within a few minutes, but may re-occur once this sequence is re-established. The pain is often described by patients as a ‘stone bruise’ Pain can be located at the inferior aspect of the heel either medially, laterally or centrally. Plantar Fasciitis is more common in overweight patients, pregnant women, people who have recently increased their level of activity.

TREATMENT

Plantar fasciitis is most successfully treated by realigning the biomechanical structure. To do so, Orthotics should be prescribed and fitted to the patient as they are designed to control excessive subtalar joint pronation which will assist in preventing over-stretching of the plantar fascia, thus relieving pain and discomfort, and preventing the condition from deteriorating and causing a heel spur to develop.

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SHIN SPLINTS

Shin splints is often associated with highly active and sporting people. Shin splints is an over-use strain injury that can be directly attributed to excessive pronation or supination as the underlying causative factor. Shin pain can be experienced medially, laterally or anteriorly.

BIOMECHANICAL AETIOLOGY

Medial Shin Splints: the Tibialis Posterior tendon may be tight and slip over the medial malleolar due to a weak retinaculum. This is generally associated with repetitive excessive subtalar joint pronation, causing the Tibialis Posterior tendon to elongate as the foot collapses medially, hence causing medial shin pain. The continual elongation of the Tibialis Posterior tendon can cause minut tears and scaring in the muscle belly whilst the pulling away from the tibia can cause inflammation and pain.

Lateral Shin Splints: The biomechanical characteristics of the foot may exhibit a high forefoot valgus or fixed plantarflexed 1st ray, both of which may cause a supinatory effect in the patient's gait.When the foot is supinated it causes extreme stress on the peroneals and may cause elongation of the muscles and tendons. The peroneals may may slip off the lateral melleolar anteriorly causing irritation of the tendon. This is associated with a weak retinaculum and tight peroneals trying to elongate to compensate for the forefoot valgus deformity - meaning that as the forefoot tries to make contact with the ground the foot is forced into supination, tearing or straining the peroneal muscles.

Anterior Shin Splints: There is evidence to suggest that anterior shin splints may be related to supination at heel strike, followed by pronation at the midstance to toe-off stage of gait. During the gait cycle the tibialis anterior muscle inverts the foot for ground clearance at the late swing phase. If there is a forefoot valgus < 10° the foot will supinate at heel strike and the ground reaction force on the lateral side will then throw the foot into pronation at midstance to toe-off. In this circrumstance the tibialis anterior will elongate and cause tearing at the muscle belly on the lateral tibial crest and may cause adhesion.

SYMPTOMS

Medial Shin Splints: Often occur when walking for extended periods of time or running uphill. Pain is experienced along the tibialis posterior muscle and tendon. Sometimes it can be felt close to the inferior medial collateral ligament attachment, all the way down to the navicular area. *Lateral Shin Splints:* Pain may be experienced when walking or running long distances, especially when doing so downhill. Being that most sufferers exhibit a forefoot valgus deformity, causing the foot supinate during the midstance phase of gait, the peroneal muscles can tear causing inflammation and tenderness to touch - in addition to pain being experienced when walking or running.

Anterior Shin Splints: Anterior shin pain is often experienced after running or walking on inclines and declines.

TREATMENT

Being that shin splints, medial, lateral and anterior, are linked to biomechanical dysfunction of the lower limb, long-term treatment (and pain relief) of shin splints will primarily involve prescribing orthotics to control excessive pronation and or supination, and the resultant effects on the lower limb. Other techniques can be incorporated into the treatment regime to assist in short-term pain relief, however orthotics should be worn to ensure a ongoing long-term result.

FITTING ORTHOTICS
HOW ARE THEY CUSTOM MADE FOR ME?

It is important that Orthotics be fitted and moulded to the patient's Subtalar Joint Neutral Position, which will assist in correcting and limiting excessive pronation. To find the subtalar neutral position you can use the ICB

Anterior Alignment Method:

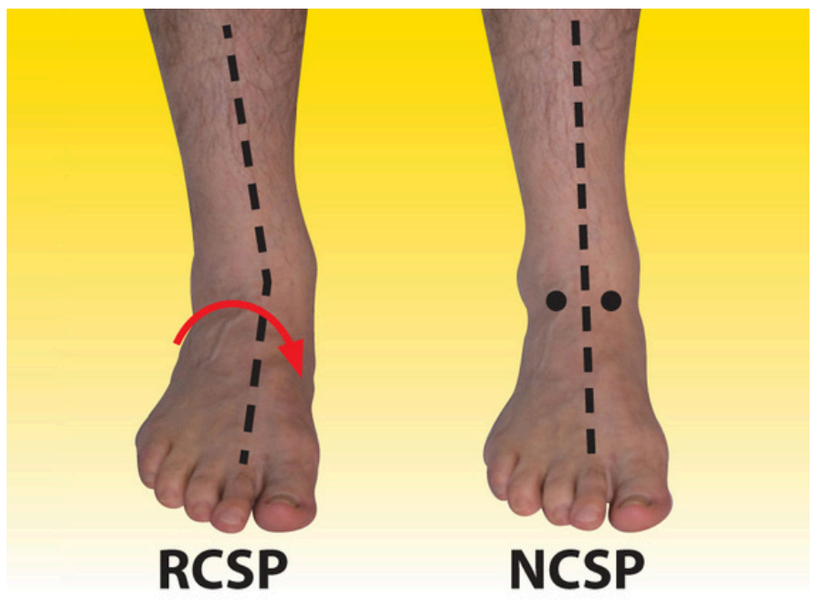
Locate the depression anterior to the medial malleolus by asking the patient to over pronate their foot.

Mark the depression

Repeat steps 1 & 2 for the lateral depression. Bisect the lateral and medial depressions and mark the bisection.
Locate and mark the 2nd metatarsal head and join it with the bisection mark made in step 4.

Locate and mark a dotted line along the tibial crest to meet up with the bisection of the medial and lateral depressions.

To find subtalar joint neutral, ask the patient to roll their foot outwards - when the dotted line along the tibial crest down to the 2nd metatarsal head is straight, the foot is in the subtalar joint neutral position.



ICB Anterior Alignment Method

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HEAT MOULDING ORTHOTICS

Before fitting the orthotic device ensure the patient's shoes are in good condition. If they are badly worn, they should be replaced and any lining or insoles removed Dual Density Heat Moulding orthotics are highly versatile in their application. Orthotics can be custom fitted to the individuals' foot contours:

- Attach any forefoot or rear foot additions (if required) prior to heat moulding.
- With the patient seated, remove 1 of the orthotics from the footwear (the other orthotic must remain in the shoe and be worn also during the moulding process), and using a heat gun, apply heat to the device.
- It is best to hold the orthotic at the distal edge, and concentrate the heat on the plantar surface of the arch.
- Heat for 10- 15 seconds, distributing the heat by making circular motions with the heat gun, until the words 'left' and 'right' appear to fade.
- Insert the heated orthotic into the shoe and tie up any laces or fasteners on the shoe.
- With the patient still seated locate the subtalar joint, and ask the patient to stand - with equal weight bearing.
- Place the foot into the subtalar neutral position (if you have used the ICB Anterior Alignment Method markings as a visual guide).
- With your other hand apply pressure to the medial arch and rearfoot to ensure correct moulding. Hold this position for 30-40 seconds. Ask the patient to sit down (whilst still maintaining your hand positions).
- Remove the moulded device and allow to cool for approximately 2 minutes (or until it is cool enough to touch).
- Then place the moulded orthotic back into the shoe, and repeat the process for the other foot.
- Attach any required heel lifts, metatarsal domes, medial arch infills, flanges or inversion/eversion ramps, after heat moulding.

FITTING ORTHOTICS INTO SHOE

Almost every shoe size, style and design varies slightly.

To accommodate for these differences Full Length Orthotics can be trimmed to ensure a good fit.

Before trimming, remove the manufacturer insoles and use them as a template to trim around the distal edges of the orthotic with scissors.

It is not recommended to trim any other area of the orthotic, as this may affect the comfort and effectiveness of the orthotic.

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NOTES ON ORTHOTIC USE

Remember that there are many types of orthotics and it is an important discussion between patient and practitioner to choose the right orthotic.

If your orthotics are too uncomfortable then take them out and wait to speak to your practitioner.

Often it will take time for you to get used to wearing your orthotics.

Some patients find it helpful to use the orthotics for an hour a day to start with and then take them out.

Then over time you can increase the time with which you are wearing the orthotic device.

You may wipe your orthotics down with a damp cloth to clean them.

Do not put them in the washing machine and do not use hot water.

The orthotics are heat mouldable and therefore the use of heat will potentially change the shape of the orthotics.

Orthotic devices work best in shoes with a heel counter.

Remember to be patient it may take some time to get just the prescription for your orthotics.

Be patient and persistent. If you have any questions please speak to your practitioner.

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