Realizing Tri-Planer Performance Through the Respiratory Diaphragm

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& Board of Certification

Postural Restoration Institute®

The Historic
Boston Garden

The Even More Historic
Boston Arena
(Matthews Arena)

"The"
Big Three

Challenge to the Eastern Conference Dynasty

1987 Detroit Pistons

Respect the
Nervous System

The
Respiratory System
dictating

Movement Patterns & Human Performance

Autonomics
and the
Posterior Mediastinum

Respiratory Diaphragm

The one muscle in the human body that holds the ability to unlock motion in all three planes for unrestricted athletic performance.

Unique positioning and central arrangement gives it the uncommon ability to influence available motion across both the upper and lower halves of the body on both the right and left sides.

Brachial Chain (BC)

Anterior-Lateral Intercostals, Deltoid-Pectoral Muscle, Sibson's Fascia, Triangularis Sterni, Sternocleidomastoid, Scaleni, Diaphragm

Anterior Interior Chain (AIC)

Diaphragm, Iliacus, Psoas, TFL, Vastus Lateralis, Biceps Femoris

Respiration

The respiratory system is an asymmetrical system with asymmetrical form and asymmetrical function.

The diaphragm muscle is uniquely positioned to directly influence every aspect of the musculoskeletal postural core.

The diaphragm dictates body position at rest and with movement.

Therefore, respiration affects the position and function of all other body systems.

The diaphragm influences neuromuscular tone because of its position relative to the axial skeleton.

Our asymmetrical pattern of breathing regulates:

- The position and function of three keystone type bones: sternum, sacrum and sphenoid.
- The stability of these bones in a non-neutral position.

Requirements for Balanced Respiration

- Preserve the shape of the diaphragm on both sides
- Preserve the position of diaphragm on both sides
- Preserve the function of diaphragm on both sides

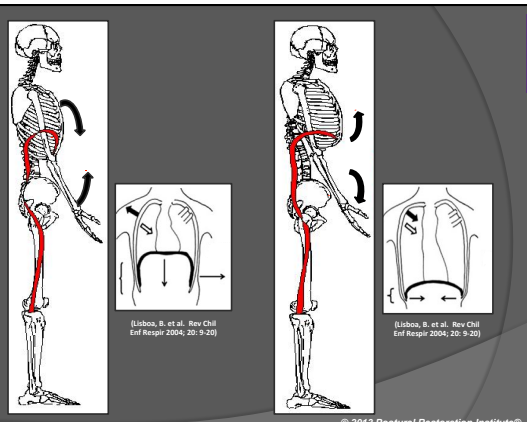
This can only occur when the diaphragm is able to move into a domed shape, with the distal borders drawn down and in, during exhalation.

Due to the human being's inherent asymmetry, acquiring sufficient rib internal rotation during exhalation is often more of a challenge on the left side.

Zone of Apposition (ZOA)

The portion of the diaphragm that is directly apposed to the inner aspect of the lower rib cage.

The abdominal muscles oppose the descending diaphragm by holding the lower rib cage down and in during inhalation.



(Lisboa, B. et al. Rev Chil Enf Respir 2004; 20: 9-20)

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Attain and Maintain a ZOA

- ATTAIN: Fully drawing the ribs down and in during exhalation using concentric abdominal activity.
- MAINTAIN: Keeping the ribs down and in during inhalation, using eccentric abdominal activity.

If not properly positioned and supported, the inherent differences between the two sides of the diaphragm can lead to:

- Abdominal muscle position imbalances
- Rib cage position imbalances
- Spine positional imbalances
- Overall body system imbalances

The asymmetrical form must be respected in order to keep the human body in proper balance.

If these differences are not appreciated and understood the diaphragm's asymmetrical form can lead neuro-muscular-skeletal dysfunction and pathological patterns.

Right Hemi-Diaphragm

has the following characteristics:

- Larger diameter
- Thicker central tendon
- Larger central tendon
- Higher central dome
- Better able to maintain its domed shape (placement over domed liver)
- More crura fibers and fascia
- Has crura that attach lower on the lumbar vertebral bodies (1 to 1½ lumbar levels lower)
- Better abdominal eccentric opposition
- Concentrically effective for respiration

Right Hemi-Diaphragm is powerfully positioned to serve as a respiratory muscle.

It inherently centers our core of stabilization and neurological control laterally over to the right.

This lateralization creates chronically over worked and hypertonic muscles that feel tight to the patient.

This includes lack of flexibility when attempting to:

- Side bend the trunk to the left
- Rotate the thorax to the right

But the reality is that these right sided muscles are neurologically overused and require muscle inhibition techniques rather than traditional stretches.

Left Hemi-Diaphragm

has the following characteristics:

- Smaller diameter
- Thinner central tendon
- Smaller central tendon
- Lower central dome
- Less able to maintain its domed shape (placement under the heart)
- Less crura fibers and fascia
- Has crura that attach higher on the lumbar vertebral bodies (1 to 1½ lumbar levels higher)
- Poorer abdominal eccentric opposition
- Concentrically effective for left thoracic rotation and extension

Left Hemi-Diaphragm is not positioned to serve as a respiratory muscle, because the left hemi-diaphragm is more challenged in attaining ZOA activity.

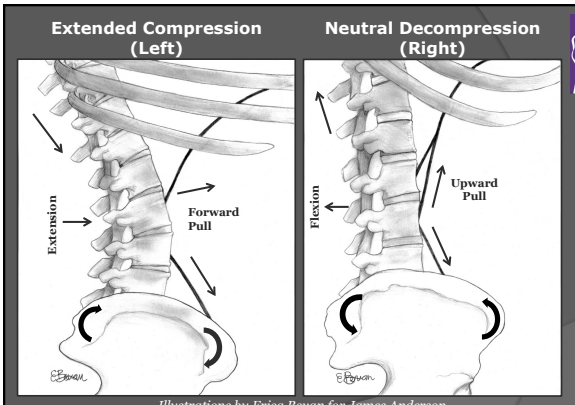
The flatter left diaphragm becomes more of a postural stabilizer.

It tends to become agonistic with the spinal extensors, and can direct the entire body into a state of extension.

The flatter position of the left hemi-diaphragm makes it toned and overactive.

Unfortunately this over-activity is ineffectual, since it is not properly supported and opposed by the abdominal muscles. In other words, its cannot maintain a ZOA.

The muscles across the left side need neuromuscular repositioning and retraining to properly position all the muscles associated with the left pelvis and trunk.



Illustrations by Erica Bevan for James Anderson

Lateralized Ventilation

Right dominant mechanical ventilation is complemented by key exhalation muscles and differences in lung lobular design.

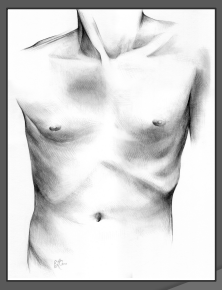
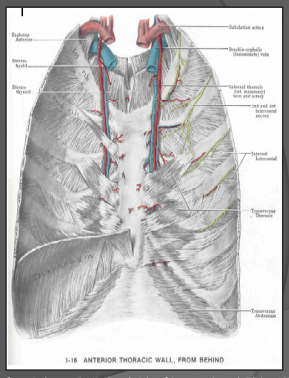


Illustration by Elizabeth Noble for the Postural Restoration Institute®

The tendency for the left side to hyper-inflate is offset by a more effective exhalation muscle on the inside of the chest wall on the left side called the Triangularis Sterni or Transverse Thoracus.



Taken from: Anderson J.E. MD. Grant's Atlas of Anatomy. Seventh Edition. 1978.

Triangularis Sterni Muscle

Fibers on the left side extend up to the second rib, which is one full rib level higher than on the right.

The placement and development of this powerful exhalation muscle offsets the more common exhalation restriction pattern on the left and supports the more common inhalation restriction pattern on the right side.

Pulmonary Concepts and Anatomy

- Pressure and Volume have an inverse relationship. More space = low pressure, so less alveoli are required.
- There are 3 lobes of the right lung in the smaller right chest wall to maximize alveolar air exchange.
- The left lung has 2 lobes because the larger left chest wall can more easily achieve a favorable pressure gradient to draw air in.
- Air flow into the left chest is assisted by the right side's liver, domed diaphragm position and shorter abdominals.

The Left AIC Pattern

There are 2 gait performance chains across the core and lower half that need to synchronize timing and intensity of muscle activation with timing and intensity of muscle inhibition on the other side for non-compensatory gait to occur.

They are the Right AIC and the Left AIC. We identify and treat the Left AIC because it is the chain that commonly pulls into a state of unopposed overactivity.

The development of the left AIC pattern is primarily influenced by the asymmetrical design of the respiratory system. Specifically, the dominant pull of the diaphragm's right crura rotates or orients the lumbar spine to the right.

The right-oriented spine position causes:
- The sacrum and pelvis to rotate to the right
- The left half of the pelvis tilts forward, which tends to activate the left hip flexors...

Which facilitates the left psoas major to further orient the spine to the right.

Posterior Abdominal Wall

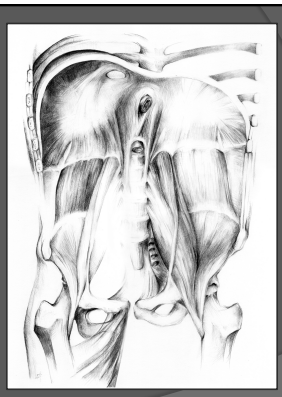


Illustration by Elizabeth Noble for the Postural Restoration Institute®

The left diaphragm is overactive because of its inability to get into a domed shape for full relaxation.

It does not have the mechanical advantage to rotate the lumbar spine back towards the left.

Limited influence of the left crura, lack left ZOA and lack of left abdominal opposition, all complement right lumbar orientation.

The left half of the pelvis is anteriorly tilted and forwardly rotated.

This promotes overutilization of the left swing phase muscles (hip flexors, abductors and external rotators).

This destabilizes the left lower extremity during single leg activity.

Anteriorly Tilted, Forwardly Rotated Left Hemi-Pelvis

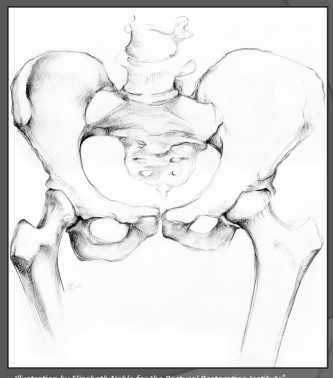


Illustration by Elizabeth Noble for the Postural Restoration Institute®

The right half of the pelvis is posteriorly tilted and backwardly rotated.

This causes overutilization of the right stance phase muscles (hamstrings, adductors and hip internal rotators).

Hence, respiration drives gait mechanics and vice versa.

Anteriorly Tilted, Forwardly Rotated Left Hemi-Pelvis

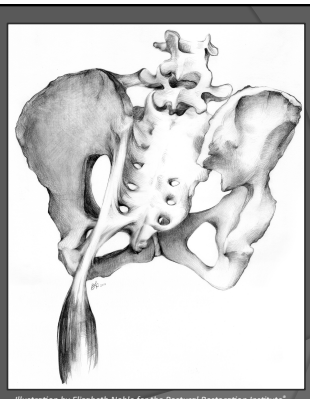


Illustration by Elizabeth Noble for the Postural Restoration Institute®

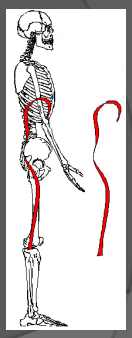
The left diaphragm, hip flexors and the lateral thigh muscles make up the L AIC:

Anterior (in front of the spine)

Interior (most of the chain is located inside the abdominal cavity)

Chain of Muscles

This chain crosses multiple joints as it runs from the inside of the lowest ribs and to the proximal end of the tibia.

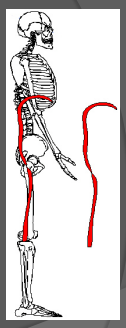


Optimal AIC

Left AIC polyarticular muscle chain

- Left diaphragm
- Left psoas major
- Left iliacus
- Left tensor fascia latae
- Left vastus lateralis
- Left biceps femoris

These left hip flexors and outer thigh muscles become overactive to stabilize the left pelvis that is biased towards hip flexion and external rotation.

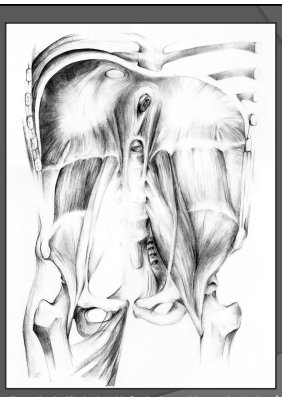


Sub-Optimal AIC

The left diaphragm becomes overactive because it is working without an optimal ZOA.

This left AIC does not pull the pelvis toward the left, but instead is a primary contributor to the right oriented pattern herein described.

Posterior Abdominal Wall View of the Left AIC Pattern



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The difference between the left AIC and right AIC is that when the right AIC works, it is able to stay within a normal range of movement upon excitation (activation) and rest (inhibition).

But on the left side, these muscles are in a constant state of activation due to the high functional demand continually placed upon them in that position.

To maintain upright posture, this left chain has to compensate with constant muscle activity in an attempt to stabilize single leg function.

Since the left AIC is constantly trying to stabilize a side that is not in the proper position, normal reciprocal use of excitation and inhibition is lost.

The tendency to have an overactive left AIC is inherent in our anatomical and neurological design.

It directs the body into a predictable right side dominant pattern.

Thus the center of gravity is shifted over toward the right, is pulled back on the right and is turned toward the right leg into the right stance phase of the gait cycle.

This right dominant pattern exists underneath all other patterns that develop in our lives.

It needs to be understood to fully appreciate the underlying mechanics of human movement dysfunction.

This over active chain of muscles can be addressed with exercise techniques, breathing techniques, and positioning to inhibit the left AIC. By doing so, we minimize compensatory strategies used to negotiate this right dominant pattern and we regain neutrality.

The Postural Restoration Institute® offers programs and strategies on how to properly inhibit this overactive chain of muscle on the left side using muscle isolation, inhibition, and integration

This properly positions all the muscles associated with these core muscle chains on both sides of the body.

Once balance has been restored, the muscles on the left side of the body that inhibit and oppose the left AIC must be properly retrained.

This opposition training allows these chains to attain balanced integration on both sides of the body.

The focus of PRI treatment is on repositioning, retraining and restoring function through inhibition using non-manual and manual techniques.

PRI Goal

Goal is to balance respiratory dynamics, stabilize corrected pelvic and rib cage position, and to retrain properly sequenced neuromotor patterns.

Overview
Anterior Interior Chain (AIC)

Anterior Interior Chain (AIC) Muscles

- Diaphragm
- Psoas
- Iliacus
- TFL
- Vastus Lateralis
- Biceps Femoris

The Anterior Interior Chain (AIC)

1) The diaphragm pulls the thoracic spine up and forward (extension).
2) The psoas pulls the lumbar spine and pelvis down and forward (extension).
3) These two forces increase lumbar spine lordosis, anterior pelvic tilt, and activate lumbar extensor muscles.

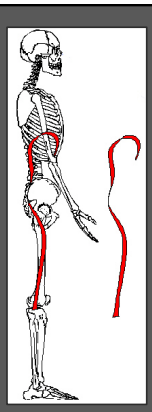
The Anterior Interior Chain (AIC)

4) Biomechanically, the diaphragm becomes positioned to bring the rib cage "up" and decreases respiratory effectiveness.
5) Right chest expansion is usually restricted because of the sub-optimal influence of contralateral diaphragm.

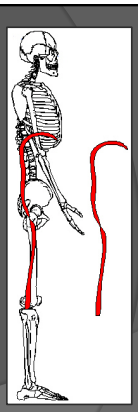
The Anterior Interior Chain (AIC)

6) As a result of anterior rotated ilium, the femur is oriented inward. Therefore, the torsional demands increase on the:
   - Psoas as an ineffective femoral external rotator
   - Vastus Lateralis and Biceps Femoris as antagonistic hip stabilizers

Optimal AIC



Sub-Optimal AIC



Primary Opposition Muscles of the Left AIC:

- Left Hamstrings
- Left Ischiocondylar Adductor Magnus
- Right Gluteus Maximus
- Left Anterior Gluteus Medius
- Right Posterior Gluteus Medius
- Left Internal Obliques and Transverse Abdominis

Primary Opposition Muscles of the Left AIC:

Inlet:

- Left Proximal Iliacus
- Right Sartorius
- Right Rectus Femoris
- Left Internal Obliques and Transverse Abdominis

Outlet:

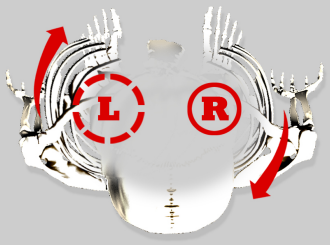
- Left Pubococcugeus and Puborectalis
- Left Obturator Internus
- Left Iliococcygeus
- Right Piriformis
- Right Coccygeus
- Right Gluteus Maximus

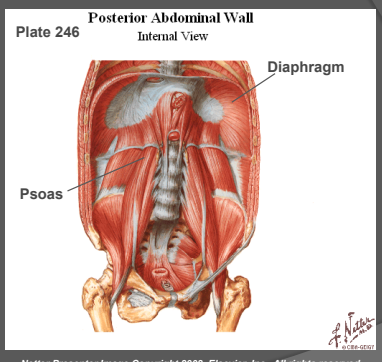
The Right BC Pattern

The L AIC orients the diaphragm, lumbar spine, and pelvis to the right in the transverse plane.

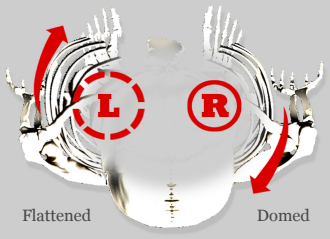
Remember that the lumbar spine and diaphragm relationship usually ensures that they are positioned in the same direction.

Right Lumbar & Diaphragm Orientation





Transverse Diaphragm



ORIENTED RIGHT

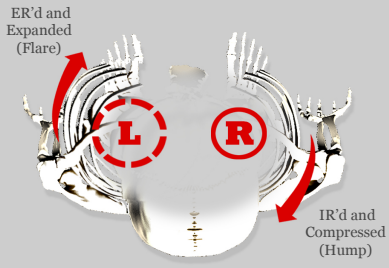
The Right Brachial Chain must counter-rotate the thorax back to the left, at and above the level of the diaphragm (T8).

A dominant right chest wall (R BC) pattern can develop because of the left upper thoracic rotation that occurs in response to the right oriented pelvis and lumbar spine position with the left AIC pattern.

Left rotation of the trunk has a direct influence on rib rotation and airflow into the rib cage on both sides of the thorax.

- Ribs on the Left side Externally Rotate.
  (This allows air to be drawn in more easily into the left anterior chest.)
- Ribs on the Right side Internally Rotate.
  (This shrinks the right side and makes it more challenging to draw air in to the right anterior and lateral chest.)

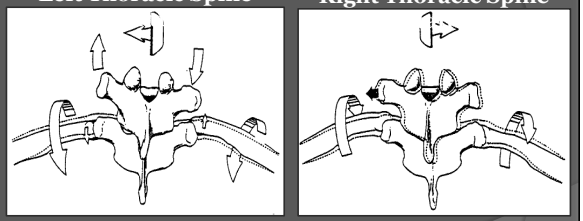
Transverse Ribs



STERNUM ORIENTED RIGHT

Rib Kinematics with Thoracic Spine Motion

Left Thoracic Spine | **Right Thoracic Spine**



Images used with permission from Diane G. Lee Pysiotherapist Corporation Copyright. Biomechanics of the thorax: A clinical model of in vivo function. Journal of Manual and Manipulative Therapy 1993;1:19

Right chest muscles become overactive because the right rib cage is chronically internally rotated and contracted together.

These muscles assist with left upper thoracic rotation which contributes to a restriction of airflow into the right rib cage.

The brachial chain also includes muscles that extend up into the right anterior neck. These neck muscles are forced to work as inspiratory muscles due to the inhalation restriction across the right rib cage.

Right Brachial Chain Polyarticular Muscle Chain:

- Right Anterior-lateral Intercostals
- Right Deltoid and Pectorals
- Right Sibson's Fascia
- Right Triangularis Sterni
- Right Sternocleidomastoid
- Right Scalenes
- Right Diaphragm

The one muscle in the right BC that becomes active, but still retains the ability to fully relax between contractions is the right diaphragm.

This is because of the right diaphragm has its established ZOA and support from the properly positioned right abdominal muscles in the left AIC pattern.

However, the rest of the muscles remain hypertonic as they are forced to continue in compensatory left thoracic rotation as a result of left AIC directing the pelvis and lumbar spine right.

Right BC muscle works together in a pattern that facilitates right rib internal rotation and thoracic spine rotation to the left.

The tendency to rotate to the left promotes a hyper-inflated left side. The left ribs are in a state of ER resulting in the left side of the thorax becoming exhale-restricted.

This same tendency promotes a hypo-inflated right side. The right ribs being in a state of IR results in the right side of the thorax becoming inhale-restricted.

A pattern of limited reciprocal respiration is thus perpetuated.

Rib Cage Positioning in Left Thoracic Rotation

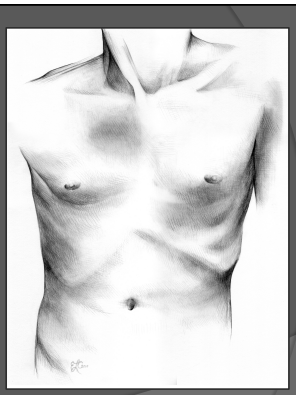


Illustration by Elizabeth Noble for the Postural Restoration Institute®

All of these issues would not be *an issue* if the patient demonstrated the ability to reciprocally shift their pelvis into a left posterior lateral position and rotate their upper thorax to the right during the left mid-stance phase of alternating reciprocal gait.

In other words, they would not be in a pattern and would be in a neutral state.

One of the greatest challenges is learning how to inhibit patterned muscle.

Learning how to stay "repositioned" requires isolated inhibitory integration.

Acquisition of the right AIC pattern is needed to (re)create a pattern that will enable reciprocal and alternating function.

PRI concepts that describe the body's normal mechanics during this desirable left "stance" phase of reciprocal gait are:

- Left AF IR (acetabular-femoral internal rotation)
- Left ZOA
- Right upper thoracic rotation

The propensity to over-shift into right stance with left upper trunk rotation is called the left AIC/right BC pattern.

The left AIC/right BC pattern causes a clear pattern in terms of airflow, rib rotation, and spine dynamics.

A patient can develop a patterned position with the thorax essentially getting "stuck" in left upper thoracic rotation.

The pelvis, hips, and lumbar spine are constantly being "directed" into the predictable right "stance" position.

The thorax becomes patterned into the expanded left chest wall and the compressed right chest wall.

More importantly, if the right BC does not disengage, the left BC will not be able to direct the upper thorax into right rotation.

The overactive right BC is driven by the dominant ability of the right diaphragm and the limited left diaphragm.

A patient with the left AIC/right BC pattern has three key rehabilitation objectives to restore the upper thorax to a balanced alternating reciprocal pattern of motion:

They need to get their thorax back into a left stance phase position by:

1. Extending, adducting and internally rotating the left pelvis on femur position (restoring full left AF IR)
2. Restoring a left ZOA
3. Restoring right upper thorax rotation above the diaphragm to the right

The restoration of the left ZOA includes improving left "exhalation" (ribs move into IR) and right "inhalation" (ribs move into ER) with the left ribs staying in a state of exhalation.

Restoration of the left ZOA balances airflow and allows for alternating reciprocal rotation on the contralateral sides.

Individuals who meet each of these three objectives are then trained to maintain gait mechanics with proper breathing, while maintaining balanced brachial chain muscle activity.

The newly positioned left ZOA with left abdominal wall activation combines with the right lower trapezius and right triceps to oppose the right BC.

Once achieved, feed-forward activity of these opposition muscles allows continued maintenance of the left ZOA and thoracic neutrality.

These are requirements for alternating reciprocating function across both the upper and lower halves of the body during gait.

Overview
Brachial Chain
(BC)

Brachial Chain

- Anterior – Lateral Intercostals
- Deltoid – Pectoral Muscle
- Sibson's Fascia
- Triangularis Sterni
- Sternocleidomastoid
- Scaleni
- Diaphragm

Brachial Chain (BC)

1) Extends from sternum to rotator cuff, to the chin to the ZOA
2) Enhances chest wall concavity
3) Reduces lymphatic drainage through thoracic duct
4) Restricts anterior upper lobe expansion (usually unilateral and on the right) & promotes "belly breathing"

Brachial Chain (BC)

5) Usually associated with contralateral AIC / PEC tightness
6) Limits trunk rotation to ipsilateral direction or lower half to contralateral direction
7) Limits ER of upper ribs (promoting accessory respiratory muscle activity) & IR of lower ribs (initiating increased abdominal activity)

Optimal BC

Sub-Optimal BC

Primary Opposition Muscles for the Right BC:

- Left Diaphragm
- Right Triceps and Lower Trapezius
- Left Triangularis Sterni
- Right Serratus Anterior
- Left Internal Obliques and Transverse Abdominis

Tri-Planer Sequencing

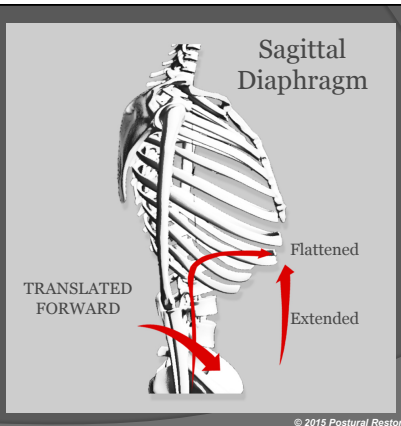
- All muscles have the ability to act in more than one plane and serve as either agonists or antagonists to tri-planar movement across the lower extremities, pelvis and trunk.
- The potential of each muscle to generate force in a given plane of motion depends upon the position, length and leverage of each agonist and antagonist involved.

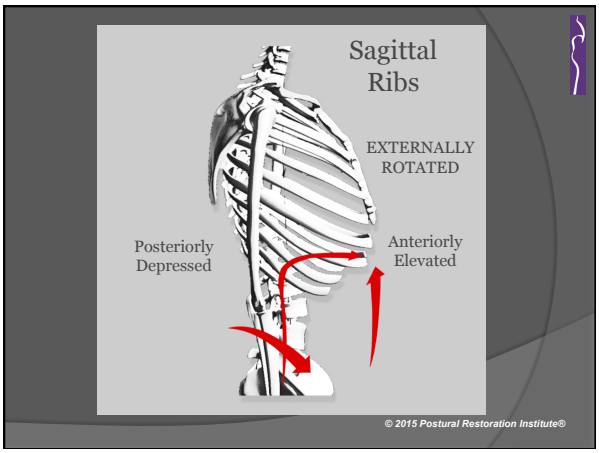
- The muscles have biased leverage in their respective planes of motion on one side compared to the other by virtue of bone, joint and muscle position when in the left AIC pattern.

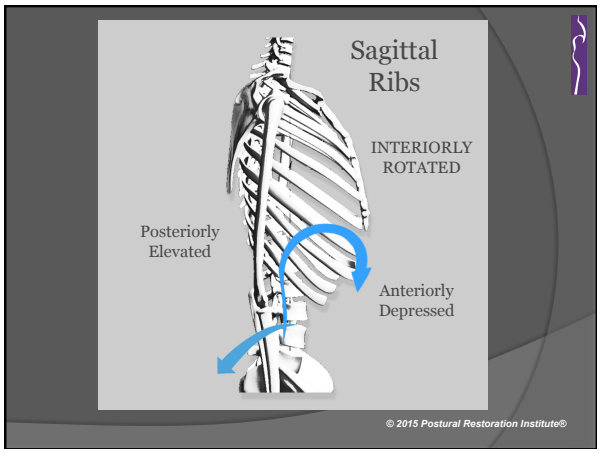
Sagittal Plane

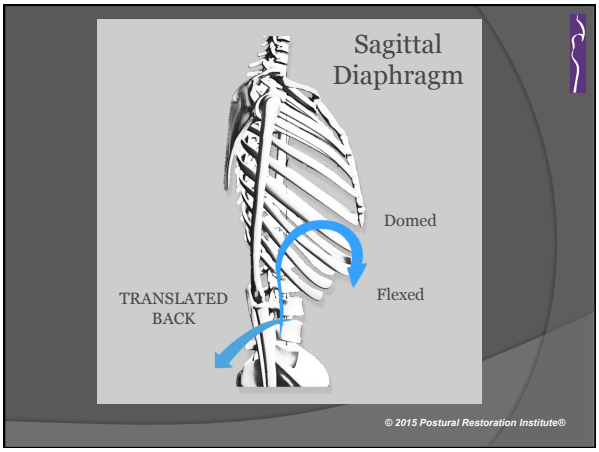
Sagittal anti-gravitational movement and control is better provided by the extended right hip than the more flexed left hip. Repositioning in the sagittal plane on the left side should be addressed before either of the two other planes can be properly trained.

Sagittal plane position and function for both the diaphragm and the rib cage must be considered.





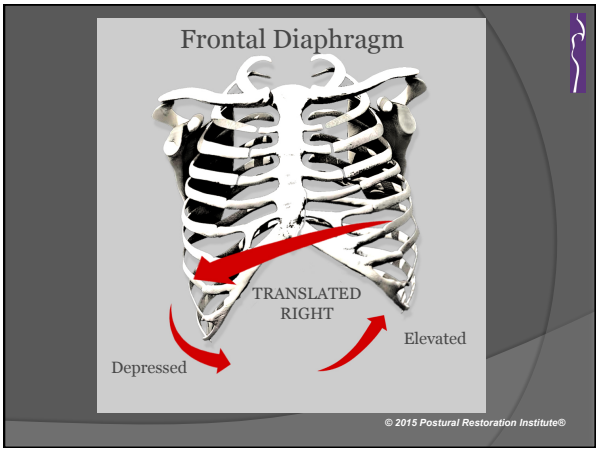


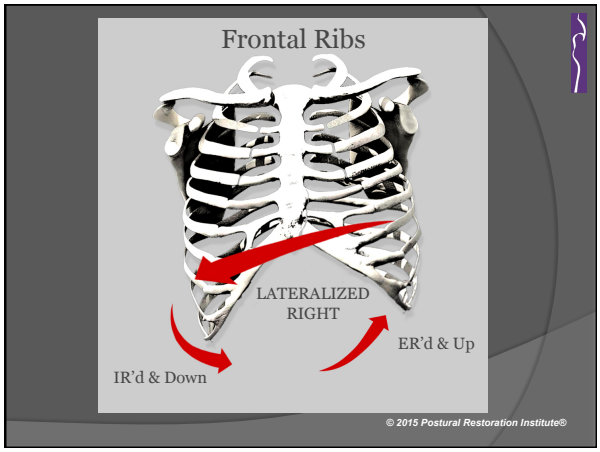


Frontal Plane

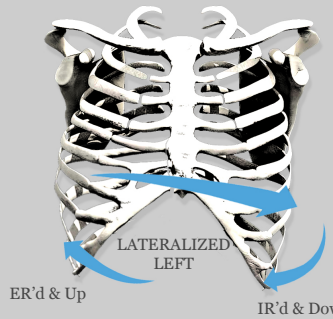
The frontal plane is the second plane that should be addressed. The integration of hip adduction on the abducted left side and hip abduction on the adducted right side is an essential element of stability that should be addressed prior to attempting any transverse plane activity.

Frontal plane position and function for both the diaphragm and the rib cage must be considered.

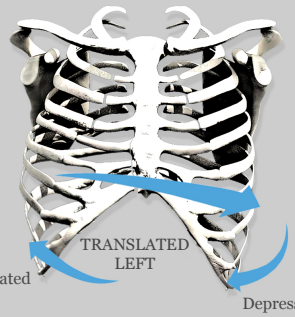




Frontal Ribs



Frontal Diaphragm

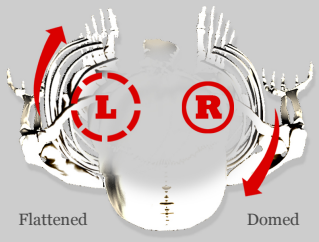


Transverse Plane

Transverse plane activity is the final plane in the tri-planar sequence of movement for gait and related tri-planar activities. Hip rotation is able to occur without compensatory activity when both the sagittal plane and the frontal plane have first been properly positioned and stabilized.

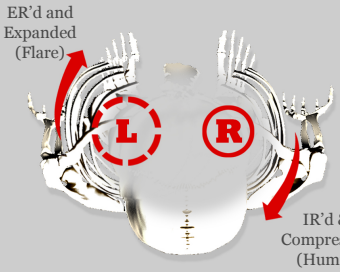
Transverse plane position and function for both the diaphragm and the rib cage must be considered.

Transverse Diaphragm



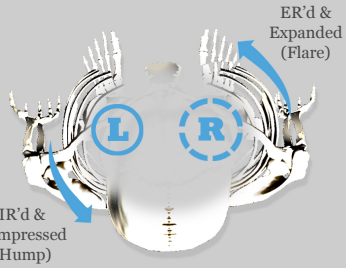
ORIENTED RIGHT

Transverse Ribs



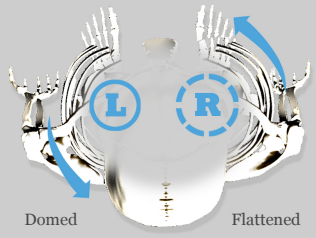
STERNUM ORIENTED RIGHT

Transverse Ribs



STERNUM ORIENTED LEFT

Transverse Diaphragm



Domed Flattened

ORIENTED LEFT

Alternating Reciprocal Gait

The human body is designed to alternate between the right and left sides of the body in alternating reciprocating fashion to coordinate balanced gait.

This can only be accomplished if the respiratory diaphragm can alternate between the right and left sides of the body in alternating reciprocal fashion.

- Reciprocal reflects going through full range of available motion in both directions (for example full flexion followed by full extension is a reciprocal activity).
- Alternating reflects movement toward one side followed by movement toward the opposite side (for example performing the activity for three breaths on the left side followed by three breaths on the right side is an alternating activity).
- Alternating reciprocal activity refers to activity that moves through the full range of motion in both directions on both sides of the body (gait is one of the best examples of alternating reciprocal activity).

A given muscle on one side of the body could have a different level of strength, tone and endurance compared to the same muscle on the other side of the body because of differences in bone, joint and muscle position and alignment during non-symmetrical functional activities.

The ideal pelvic position, hip joint position and trunk position on one side of the body, during the gait cycle, would be the opposite pelvic position, hip joint position and trunk position on the other side of the body.

Each side of the pelvis is capable of acetabular movement on top of the femoral head as each half of the pelvis reciprocates into each of the three planes of motion. Acetabular-femoral (AF) motion refers to acetabular movement on the femur.

- When one hip is moving into AF flexion the other hip would hopefully be moving into AF extension
- When one hip is moving into AF abduction the other hip would hopefully be moving into AF adduction
- When one hip is moving into AF internal rotation the other hip would hopefully be moving into AF external rotation.

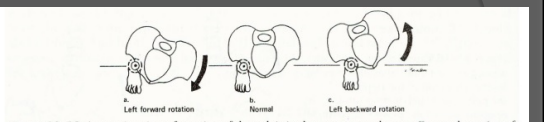


Figure 10–18. A superior view of rotation of the pelvis in the transverse plane. a. Forward rotation of the pelvis around the right hip joint results in medial rotation of the right hip joint. b. Neutral position of the pelvis and the right hip joint. c. Backward rotation of the pelvis around the right hip joint results in lateral rotation of the right hip joint.

Norkin, C and Levangie, P: Joint Structure and Function: A Comprehensive Analysis, Ed 2, FA Davis, Philadelphia, p 314, pending permission.

The pattern of hip movement for the swing phase is a combination of flexion, abduction and external rotation (FAbER).

The pattern of hip movement for the stance phase is a combination of extension, adduction and internal rotation (EAdIR).

When these three activities are able to move through full available ranges of motion in opposite directions on each side in an alternating fashion, alternating reciprocal tri-planar gait is possible.

Neutrality

The concept of PRI neutrality differs from the traditional view of neutrality.

Instead of viewing neutrality as one specific place or position, it is viewed as a transitional zone an individual moves into between both ends of a given range of motion.

It's important that our patients can get into this transitional zone of neutrality when the individual stops moving.

This neutral state is critically important for static activities like sitting, standing and sleeping, because it allows rest without excessive tone.

If neutrality is present at rest, that individual is more likely to be able to move into and out of neutrality during dynamic activities, such as during gait.

Neutrality is dynamic because reciprocal motion involves dynamic movement across the full spectrum of the available range of motion.

Getting a patient neutral when they are moving involves balancing the dynamic transitions.

The ability to decrease this tri-planar bias for both sides of the body allows movement into the mid-zone in each of the three planes. This is neutrality.

If tri-planar chains of muscle are overactive, then muscle inhibition must occur to allow movement into neutrality.

Balancing respiration and establishing a left ZOA becomes important for attaining neutrality, so the individual can reciprocally move toward the other end of the range of motion.

The ability to inhibit the left AIC/right BC pattern is an essential ingredient for alternating reciprocal activity, such as gait, across both the right and left sides of the pelvis and the thorax.

The Influence of Diaphragm Position on Tri-Planer Body Motion

Sagittal Tests at the Pelvic Girdle:

- SLR
- Extension Drop (Thomas Test)

Sagittal Tests at the Shoulder Girdle:

- Shoulder Flexion
- Apical Expansion

Frontal Tests at the Pelvic Girdle:

- Adduction Drop Test (Ober Test)
- Abduction Raise

Frontal Tests at the Shoulder Girdle:

- Shoulder Abduction
- Apical Expansion

Transverse Tests at the Pelvic Girdle:

- Hip IR/ER
- Trunk Rotation Test

Transverse Tests at the Shoulder Girdle:

- Shoulder IR/ER
- Horizontal Shoulder Abduction

Evidence Based Practice and PRI

Integration of the best research evidence with clinical expertise and patient values.

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