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- Email customerservice@PhysicalTherapy.com

Cultivating a Sustainable Core, Part II.

Therapeutic interventions from yoga, physical therapy and sports medicine in rehabilitation.

by Liz Gillem Duncanson
PT ATC CSCS PYT ERYT C-IAYT

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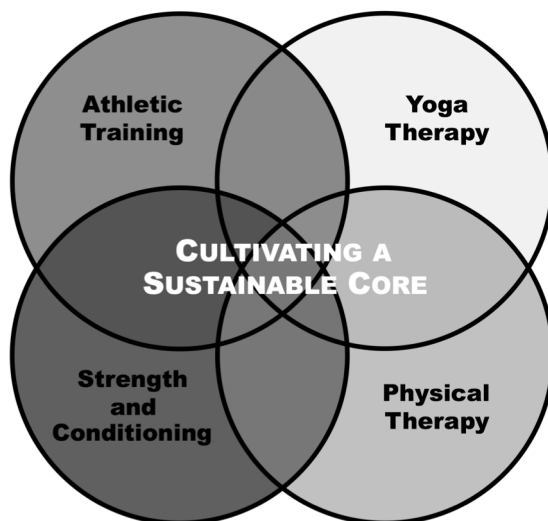
Learning Outcomes

After this course, the participant will be able to:

- Describe at least three ways to assess and treat core muscle dysfunctions with therapeutic exercises.
- Describe at least three differences between normal core muscle recruitment patterns and altered neuro-motor patterns.
- Describe three ways to identify inefficient breathing mechanics versus sustainable breathing patterns.
- Outline at least three appropriate therapeutic interventions for altered core muscle and breathing mechanics.

2

Where the lenses overlap



3

Review of Part I

Bony Core
Muscular Core
Breathing Core



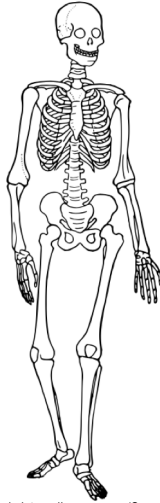
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continued

Cultivating a Sustainable Core, Part II.

Bony Core



By Human_skeleton_diagram.png: (Source: Collier's New Encyclopedia, VIII (New York: P.F. Collier & Son Company, 1921), p. 446.derivative work: GregorDS (talk) 09:18, 21 December 2011 (UTC) (Human_skeleton_diagram.png) [Public domain or Public domain], via Wikimedia Commons



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continued

Cultivating a Sustainable Core, Part II.

Bony Core

3 Dimensional canister

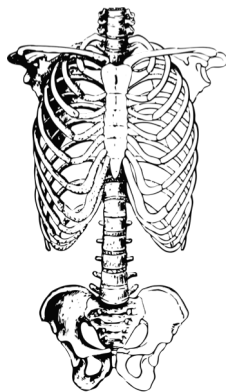


Image: Skeleton Ribs by b0red CC0
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continued

continued

Cultivating a Sustainable Core, Part II.

Neutral Spine

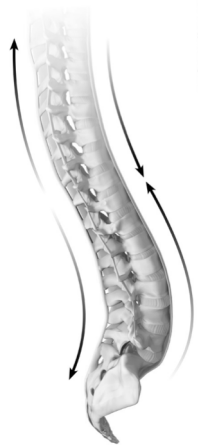


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continued

Cultivating a Sustainable Core, Part II.

Neutral Spine



8

continued

Bony Core

Bony alignment affects muscle recruitment patterns



**Alignment
Matters**

Image: Public Domain CDC/ Debora Cartagena, Courtesy: Public Health Image Library http://www.publicdomainfiles.com/show_file.php?id=13546392022375

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Pelvic Floor Muscles

Recruited best in *neutral* lumbar sitting position



10

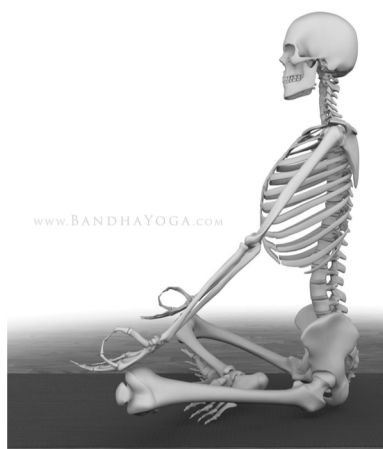


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Spinal Position Affects:

- Core Muscle Recruitment
- Intra-Abdominal Pressure (IAP)
- Pelvic Organ Position
- Intervertebral Disc pressure
- Lumbar Loads (facet compression force)

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Muscular Core

All muscles attached to the Bony Core Cylinder

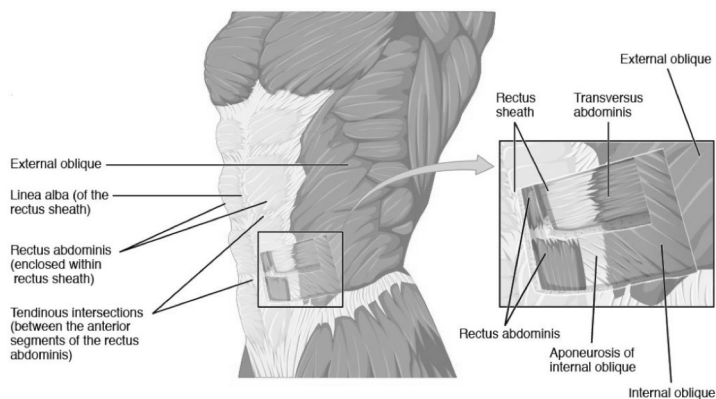


Image: https://commons.wikimedia.org/wiki/File:1112_Muscles_of_the_Abdomen.jpg OpenStax [CC BY 4.0] (<https://creativecommons.org/licenses/by/4.0/>)

12

Anticipatory Muscular Core

Movement presupposes stability



EMG activity of PFMs, TVA, and Serratus Anterior are observed in low load tasks prior to initiation of extremity movement

[https://commons.wikimedia.org/wiki/File:The_diagnosis_of_diseases_of_women_\(1905\)_\(\(14763286455\)\).jpg](https://commons.wikimedia.org/wiki/File:The_diagnosis_of_diseases_of_women_(1905)_((14763286455)).jpg)

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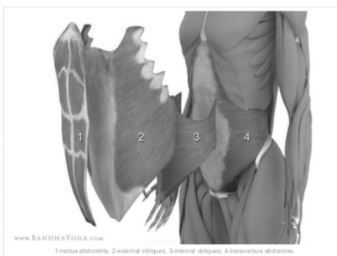
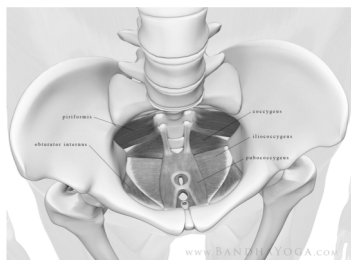
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Sustainable Core Muscles

Pelvic Floor

Deep Abdominals

Serratus Anterior and Lower Trapezius



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The fifth spinal movement: axial extension

Defined as a simultaneous reduction of both the primary and secondary curves of the spine

- Requires neutral alignment
- Decompresses the spine - helps reduce lumbar and disc loads
- Gives us access to the 3 diaphragms (*bandhas*)
- “great seal” *maha bandha*

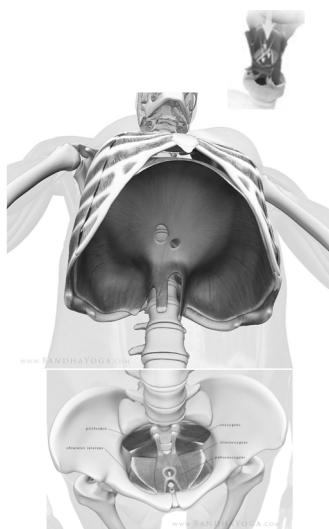


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Three diaphragms

vocal
respiratory
pelvic



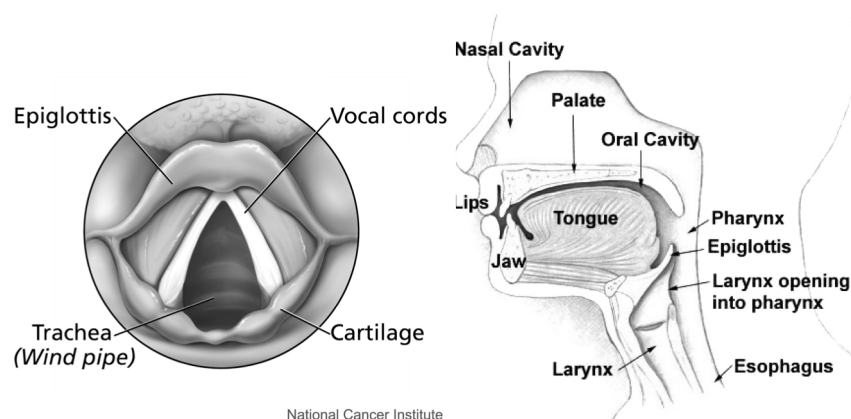
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Recruited best in neutral alignment.

Always moving (dynamic)

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3rd Diaphragm (Vocal Folds)



National Cancer Institute

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National Cancer Institute

By Arcadian - <http://training.seer.cancer.gov/head-neck/anatomy/overview.html>, Public Domain,
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barriers to sustainable recruitment

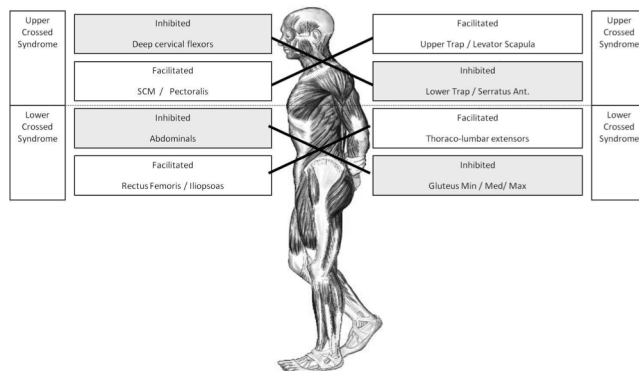


- chronic poor posture
- unmanaged intra-abdominal pressure (IAP)
- chronic pain/stress

Image: CC0 baukegel-2694486_1920.png pixabay kalhh

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Chronic poor posture leads to:
facilitated UT, SCM, Pecs, Iliopsoas Muscles



while the abdominals, LT, and SA are **INHIBITED**

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Unmanaged habitual increase in IAP can be a factor in
hernia, prolapse, stroke, and Diastasis Recti.

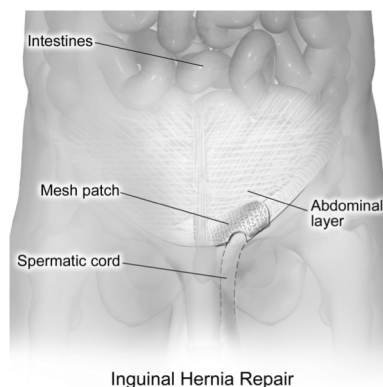


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20

The core is an *interdependent* pressure system.
Goal: manage intra-abdominal pressure IAP

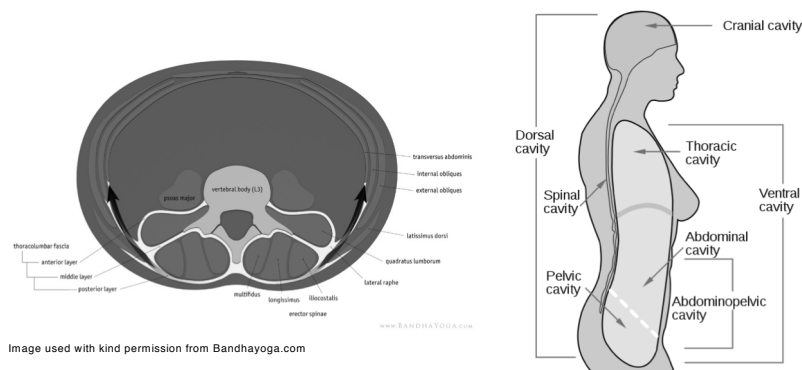


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Image CC0: File:Body cavities.svg
https://en.wikipedia.org/wiki/Abdominal_cavity#/media/File:Scheme_body_cavities-en.svg

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Chronic poor posture and altered IAP is
correlated with faulty breathing patterns →
over-recruitment of accessory breathing Mm

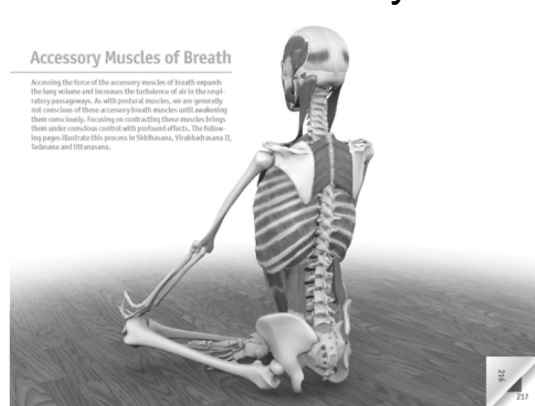


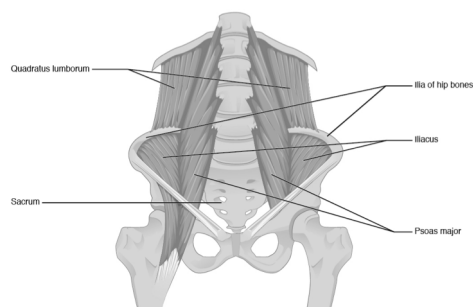
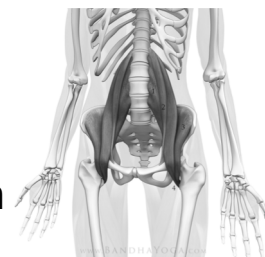
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Accessory “Exhale-ators”

Ilio-Psoas

Quadratus Lumborum



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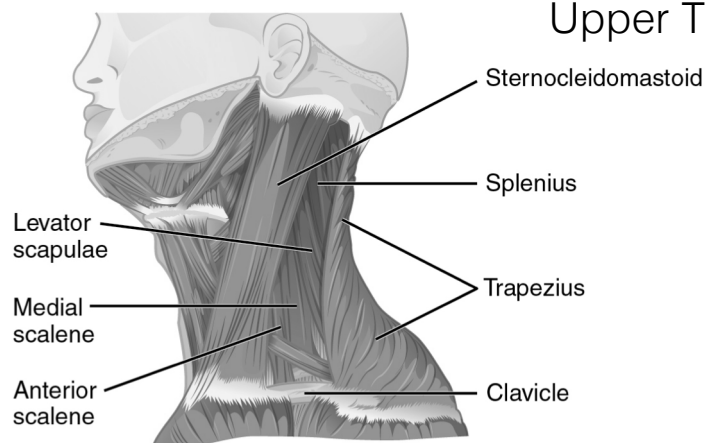
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Accessory “Inhale-ators”

SCM

Scalenes

Upper Traps



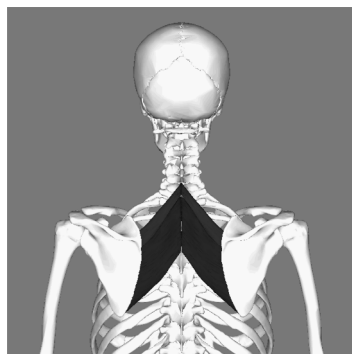
https://commons.wikimedia.org/wiki/File:1117_Muscles_of_the_Neck_Left_Lateral.png

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Accessory “Inhale-ators” (continued)

Rhomboids

Pectoralis Minor



https://commons.wikimedia.org/wiki/File:Rhomboid_muscles_animation.gif



https://commons.wikimedia.org/wiki/File:Pectoralis_minor_muscle_animation_small.gif

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Sustainable Core Muscles



Pelvic Floor

Deep Abdominals

Serratus Anterior

Lower Trapezius

Vocal Folds / Larynx

Image CC BY 2.0 <https://www.flickr.com/photos/44313045@N08/6101415124>

Emergency Core Muscles

Ilio-Psoas

Quadratus Lumborum

SCM

Scalenes

Upper Traps

Rhomboids

Pectoralis Minor



Image: https://commons.wikimedia.org/wiki/File:PublicInformationSymbol_EmergencyExit.svg

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Emergency Core Muscles

Over-recruited in chronic stress (Fight, Flight, Freeze)



We can down-regulate them through Diaphragmatic Breathing (polyvagal Theory).

The Respiratory Diaphragm Muscle is the switch between the sustainable and emergency core.

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Image CC0 <https://pixabay.com/en/human-jogging-marathon-person-1296750/>

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Conscious Competence Learning Model

attributed to Noel Burch, which starts with the unconscious incompetent (novice) and progresses through four stages to unconsciously competent (expert):



- Unconscious Incompetence
- Conscience Incompetence
- Conscious Competence
- Unconscious Competence

Image: CC0 <https://pxhere.com/en/photo/1458231>

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Musical Instrument analogy

Neuro-motor patterning

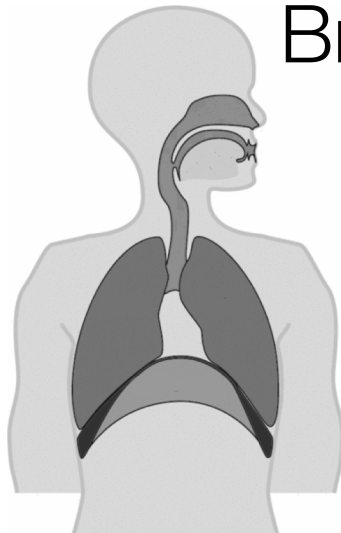


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Breathing Core

Dynamic

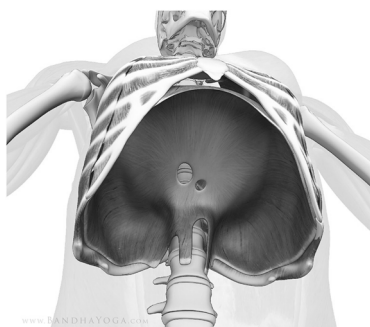
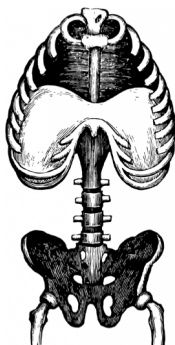


“Except in cases of paralysis, the **respiratory diaphragm** muscle is always used for breathing.

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Respiratory Diaphragm Muscle

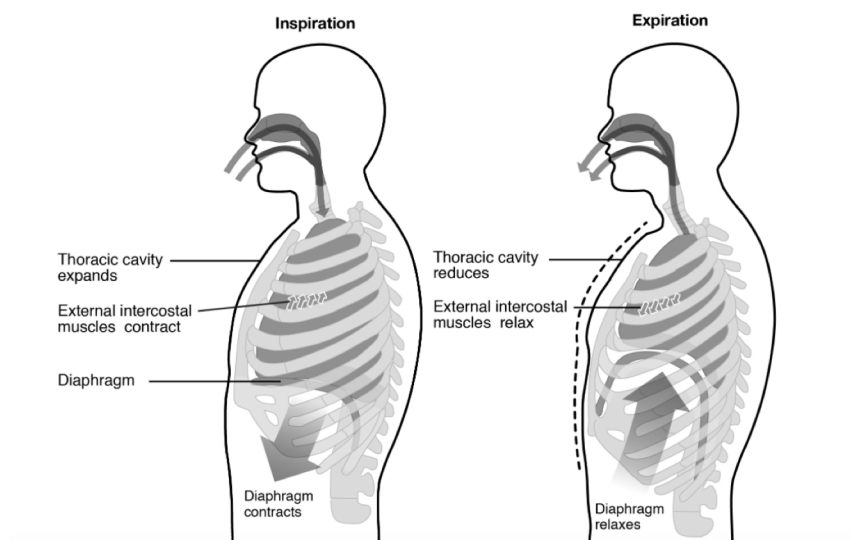


- muscle responsible for normal, quiet, tidal volume breathing
- also provides stability during rapid limb movements

Image CC0 Dawn Hudson
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Tidal Volumes

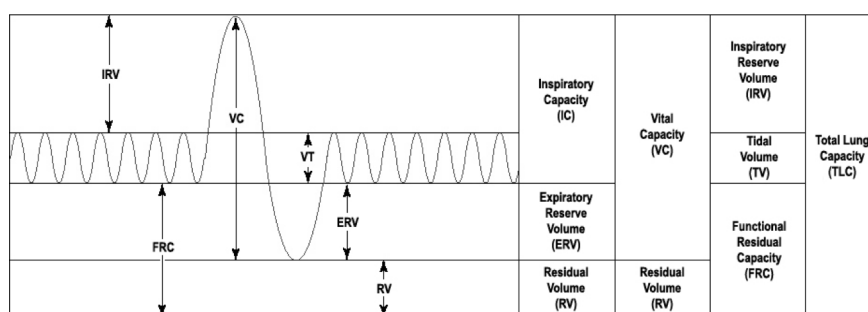


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Therapeutic Breathing Exercises

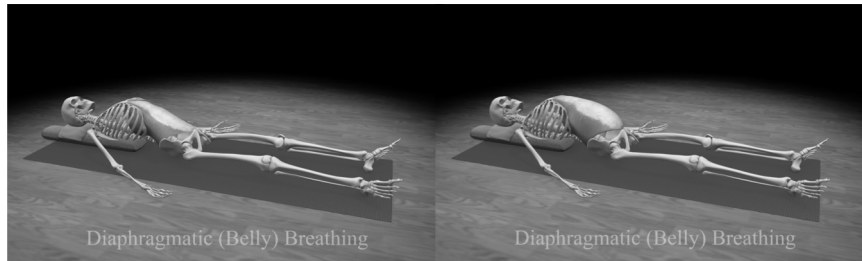
Abdomino-Diaphragmatic (supine)

Thoraco-Diaphragmatic (any position against gravity)

Ujjayi (any position against gravity)

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Abdomino-Diaphragmatic Breath



Exhale

Inhale

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Why named a belly breath?

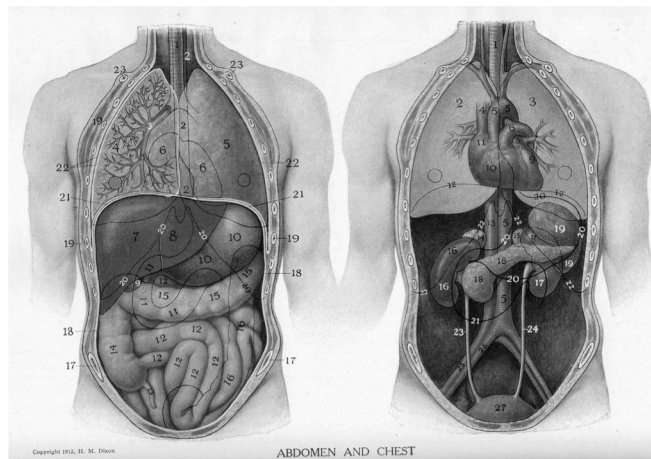


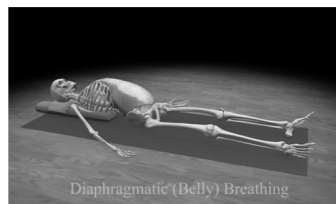
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Abdomino - Diaphragmatic breathing

aka "belly breath"

- Performed in Supine
- Ribs and Vertebra are supported
- TVA remains relaxed



Inhalation *concentric*

- central tendon of the dome is mobile
- costal attachments are stable

Exhalation *eccentric* and passive recoil

Gold Standard for relaxation.

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Different kinds of Diaphragmatic Breathing

Abdomino-Diaphragmatic Breath

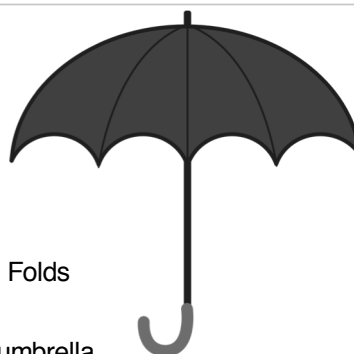
vs.

Thoraco-Diaphragmatic Breath

both help down-regulate the stress response via the Vagus Nerve

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Thoraco - Diaphragmatic breathing



- primarily utilizes the diaphragm muscle
- requires mild tension in the TVA or Vocal Folds
- the abdominal organs act as a cantilever
- the base of the rib cage expands like an umbrella
- the central tendon of the RD is stabilized and the ribs are free to move.
- the base of the rib cage is now the moveable insertion
- anterior, posterior, AND lateral costal expansion

Image: <https://pixabay.com/illustrations/umbrella-open-opened-handle-rain-891442/>

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Thoraco - Diaphragmatic breathing

AKA:

- “Lateral Thoracic Breath”
- “TATD Breath” G. Garner
- “Band Breath” Z-Health
- “Umbrella Breath” J. Wiebe
- “Pilates Breath”



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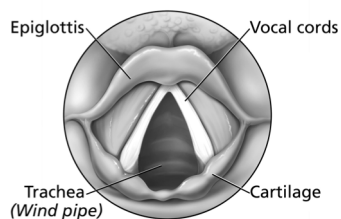
Let's try a seated thoraco-diaphragmatic breath



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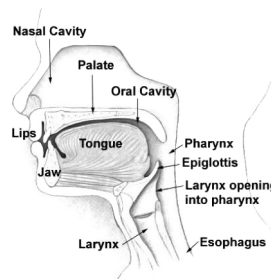
Ujjayi Breath

- “Hissing breath” or “psychic breath”
- Concentric (exhale) and eccentric (inhale) contraction of laryngeal muscles
- “sub-phonation”



National Cancer Institute

Image CC0: Alan Hoofring (Illustrator) Public Domain
National Cancer Institute



By Arcadian - <http://training.seer.cancer.gov/head-neck/anatomy/overview.html>, Public Domain,
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VINYASA: UJJAYI BREATHING



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Therapeutic Core Exercise Progression:

Static (acute) before Dynamic (chronic)
Neutral spine before sagittal (flexion / extension), frontal (side-bend), and transverse (twists / rotation)

Practice against a variety of positions against gravity (supine, prone, seated/standing)

introduce "flat back" exercises (posteriorly rotated pelvis) after static and dynamic core exercises (in neutral spine) have been mastered

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Let's try static core activation

Cues:

"begin in neutral spine"

"exhale and lightly engage your pelvic floor,
deep abdominal muscles, and wings"

"lift the heart and crown"

"inhale into your back and sides while you allow
your pelvic floor and deep abdominals to soften"
Repeat.

Master the core stability and then be creative
with limb movement.

The goal is to get the normal reflexive stability of
the PF, TVA, and scapular stabilizers back
"online".



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Therapeutic Core Exercises

Sitting

Standing

Prone / Quadruped

Supine

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Seated

- “*Computerasana*” / Static seated posture on chair with dowel
- “*Computerasana*” / Dynamic Seated Stability Ball Marching
- Seated Pelvic Tilts on chair
- Seated Pelvic Clocks on Stability ball with block on head
- Shoulder Rolls

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Seated Exercises

Prerequisites: tolerate sitting

Modifications: stable vs dynamic surface, stand

Advantages: great for the computer professional or sitting hobbyist (knitting, quilting, gaming, etc.).

Watch for: neutral spine, hip hiking, pelvis tucking/extension chin/scapular protrusion, breath holding, neutral talus.

Disadvantages: Need equipment (chair, bench, or SB) can be frustrating for rib-flar-ers and breath holders before they build up the core strategies (and can only rely on substituting patterns at first).

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CONTINUED

Cultivating a Sustainable Core, Part II.

“Computerasana”

Static seated posture on chair with dowel



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CONTINUED

Cultivating a Sustainable Core, Part II.



Dynamic Seated Stability Ball Marching (profile)

Video 1

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CONTINUED

CONTINUED

Cultivating a Sustainable Core, Part II.

Dynamic Seated Stability Ball Marching (front)

Video 2



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CONTINUED

Cultivating a Sustainable Core, Part II.



Seated Pelvic Tilts on Chair

Video 3

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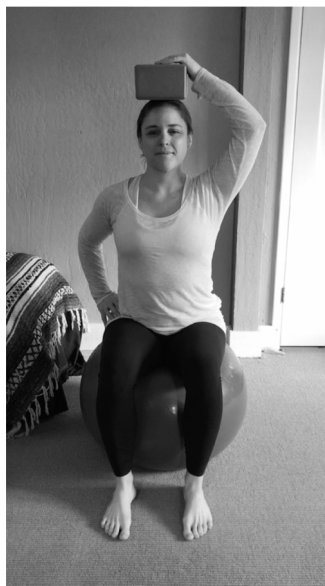
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CONTINUED

Cultivating a Sustainable Core, Part II.

Seated Pelvic Clocks / Hula on Stability Ball

Video 4



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CONTINUED

Cultivating a Sustainable Core, Part II.



Shoulder Rolls

Scapular Elevation,
Retraction, and Depression

Video 5

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CONTINUED

Standing

- *Tadasana* / Static Standing Posture with dowel
- *Utkatasana* / Static Squat with dowel
- *Utkatasana* / Dynamic Squat with dowel on BOSU
- *Vrksasana* / Single leg balance on floor and BOSU
- *Vrksasana* / 1-leg squats - static and dynamic

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Standing Exercises / Postures

Prerequisites: cleared for full weight-bearing lower extremities

Alternatives: Seated posture with pole

Advantages: excellent feedback for home program, pre-functional screen for gait

Watch for: pelvis and feet position, scapulae near wall?

Disadvantage: extra gluteal flesh (use pole or corner of wall)

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CONTINUED[®]

Cultivating a Sustainable Core, Part II.

Tadasana

Static
Standing



57

CONTINUED[®]

Cultivating a Sustainable Core, Part II.



Utkatasana

(Chair Pose)

Squat with
dowel

Video 6

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CONTINUED[®]



Utkatasana

(Chair Pose)

Dynamic
Squat with
dowel (profile)

Video 7

59

Utkatasana (Chair Pose)

Dynamic
Squat with
dowel on
BOSU (front)

Video 8



60



Vrksasana

(Tree Pose)

Single leg
balance on floor
and BOSU

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Single Leg Squats



Videos 9
& 10



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Quadruped

- *Neutral spine with dowel (static)*
- *Pregnant Cats (static)*
- *Cat Cow (dynamic)*
- *Spinal Balance / Bird Dog (dynamic)*
- *Knee to elbow (dynamic)*
- *Serratus Punches with dowel (CKC)*
- *Plank to down-dog*
- *Knee to elbow and nose variations*

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Quadruped Exercises

Prerequisites: Able to tolerate weight-bearing on hands / forearms and knees. Cleared for spinal ROM (no vertebrae fractures).

Alternates: Seated, knees and forearms, standing with hands on the wall

Advantages: gravity neutral spinal ROM, excellent screen for scap. winging / serratus function, dynamic core stability screen

Watch for: breath holding, breath coordination, scapular control, “efforting” and substitutions, TVA working at midrange?

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Quadruped Exercises

Neutral spine with dowel (static)



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Quadruped Exercises

Pregnant Cat (static)



the best one to introduce first when a client/athlete has difficulty isolating their Transverse Abdominus

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CONTINUED

Cultivating a Sustainable Core, Part II.

Quadruped Exercises

*Cat and Cow/Camel**Spinal Flexion and Extension*

Video 11

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CONTINUED

Cultivating a Sustainable Core, Part II.

Quadruped Exercises

Cat and Cow/Camel; Spinal Flexion and Extension

- *Client example*



Video 12

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CONTINUED

continued

Cultivating a Sustainable Core, Part II.

Quadruped Exercises

Spinal Balance / Bird Dog (dynamic)



Video 13

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continued

Cultivating a Sustainable Core, Part II.

Quadruped Exercises

Knee to elbow (dynamic)



Video 14

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continued

continued

Cultivating a Sustainable Core, Part II.

Quadruped Exercises

Serratus Punches with dowel (CKC)



Video 15

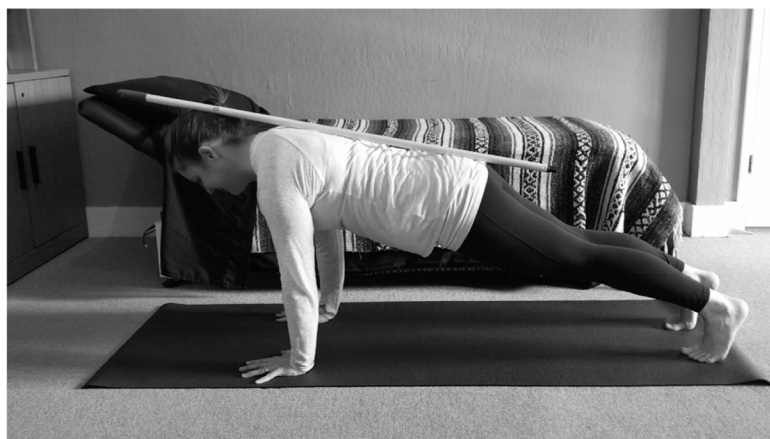
71

continued

Cultivating a Sustainable Core, Part II.

Quadruped Exercises

Plank to down-dog



Video 16

72

continued

Quadruped Exercises

Knee to elbow and nose variations



Video 17

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Supine Exercises

- *Marching on the foam roll (static holds)*
- *Marching on the foam roll (dynamic version)*
- *Dead bugs on foam roll*
- *Curl-ups on foam roll*
- *Serratus Punches and Choo-choos*

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Supine Exercises on Foam Roll

Prerequisites: tolerate pressure on sacrum, static TVA progressions on floor/table

Advantages: quick screen for a variety of reflexive substitutions (breath holding, muscular recruitment pattern)

Watch for: breath holding, deviating from neutral spine (tucking pelvis and/or chin), pelvis hiking, using scapular elevators and protractors

Progressions: increase the lever (progress to Dead Bugs)

Modifications: “spider tip finger” assist (upper extremity weight bearing variations), work on breath coordination with UE movement, input assist to weight-bearing adductors. Lift heel instead of whole leg.

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Supine Exercises

Marching on the foam roll in hook-lying: static holds on a dynamic surface



Watch for breath holding, rib flaring, TVA loafing or flaccid

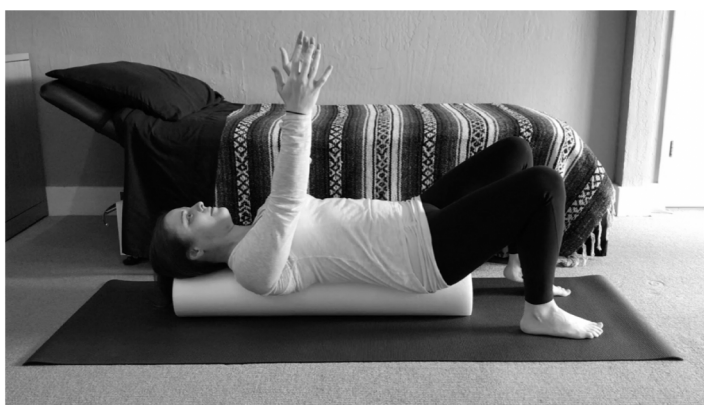
76

continued

Cultivating a Sustainable Core, Part II.

Supine Exercises

Marching on the foam roll (dynamic version)



Video 18

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continued

Cultivating a Sustainable Core, Part II.

Supine Exercises

Marching on the foam roll (dynamic version)

• *Client Example*



Video 19

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continued

continued

Cultivating a Sustainable Core, Part II.

Supine Exercises

Dead bugs on foam roll



Video 20

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continued

Cultivating a Sustainable Core, Part II.

Supine Exercises

Curl-ups on foam roll



Video 21

80

continued

continued

Cultivating a Sustainable Core, Part II.

Supine Exercises

Curl-ups on foam roll

• *client example*



Video 22

81

continued

Cultivating a Sustainable Core, Part II.

Supine Exercises

Serratus Punches and Choo-choos

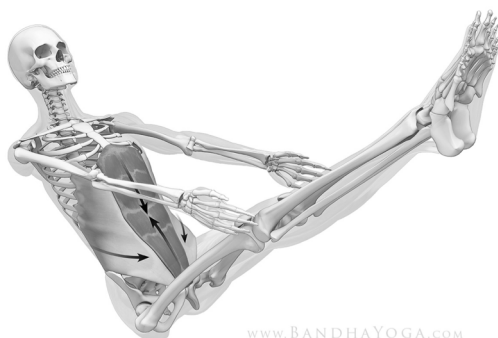


Video 23

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continued

Putting it together:



- Neutral Spine
- Connect to your anticipatory core before moving a limb
- Relax / Lengthen Accessory Breathing Muscles
- Breathe with RD

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Thank You

Contact: Liz@BodyTemplePT.com

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*2018-19 short list (please download complete list separately)