



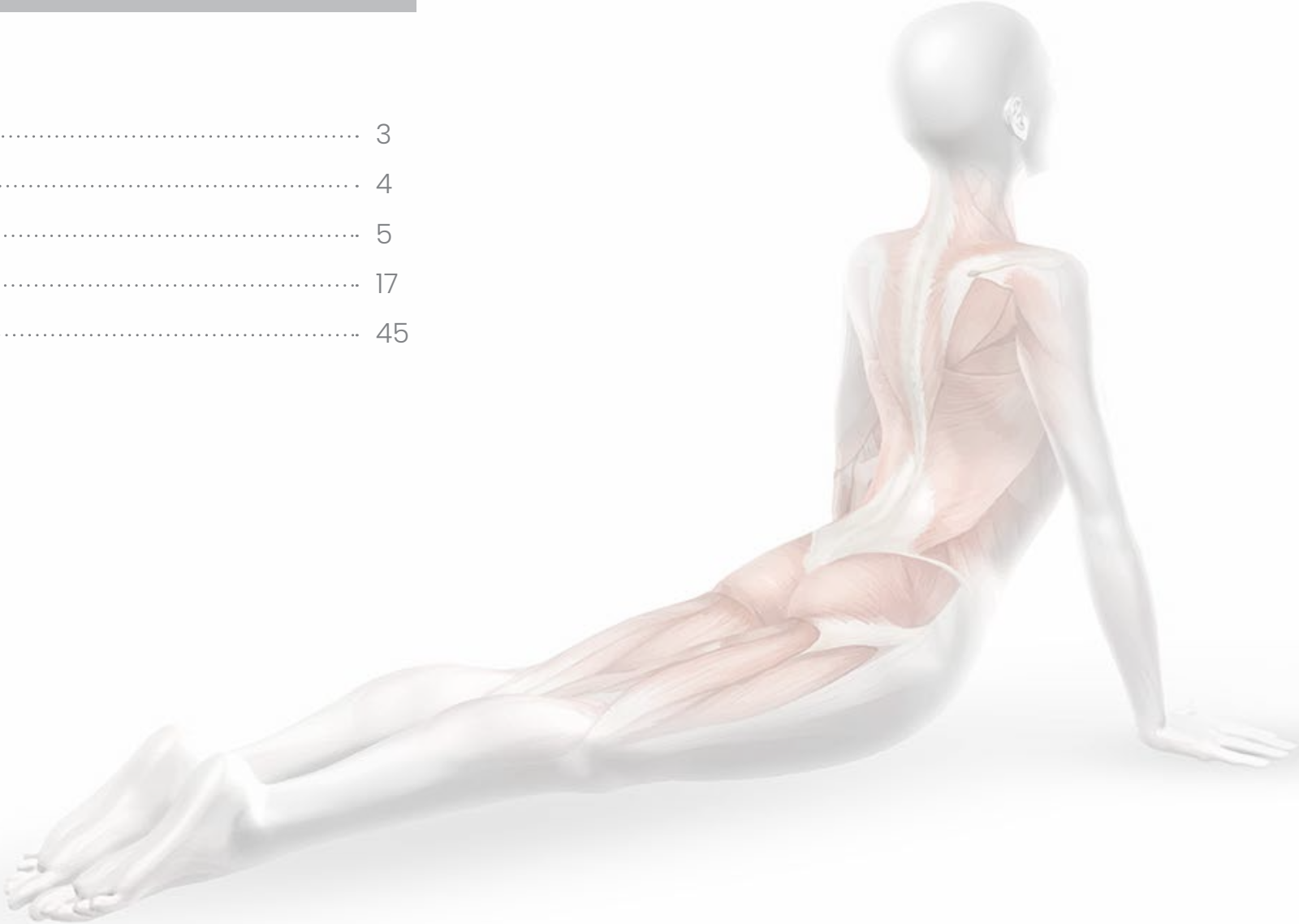
# FUNCTIONAL ANATOMY MANUAL

BY DR. EDEN GOLDMAN



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Dr. Eden Goldman, D.C., C-IAYT, E-RYT500, YACEP is an international Yoga, mindfulness, and wellness lifestyle expert. An avid sports Chiropractor, LA Yoga Magazine contributor, and human movement specialist, Eden has been the Director of the Yoga and the Healing Sciences Program at Loyola Marymount University in Los Angeles, CA for over a decade. He is co-author of Yoga Therapy and Integrative Medicine: Where Ancient Science Meets Modern Medicine and author of The Secret Art of Yoga Assists. Professionally, Dr. Goldman is the Owner of Meditating Mascots, a Yoga and mindfulness company that creates inspired mascot-related plush toys and products intended to create an identity for the Yoga, mindfulness, and wellness communities on college campuses around the country; Director of the 501(c)(3) non-profit College Yoga Day; and Owner and Director of LotusEd, Inc. a higher education and event production company specializing in advanced Yoga studies trainings and continuing education credits for doctors and therapists. He has successfully treated thousands of patients and his work has been featured in many forms of media including ABC News, CBS News, Good Morning LALA Land, AM Northwest, Yoga Journal, Yoga Mind Body Spirit, Enlightened Practice Magazine, and the top-selling book, Yoga for Dummies.

DR. EDEN GOLDMAN

D.C., C-IAYT, E-RYT500, YACEP



## Introduction

Welcome to Functional Yoga Anatomy with Dr. Eden Goldman. We are so excited and honored to have you taking our course and studying with us!

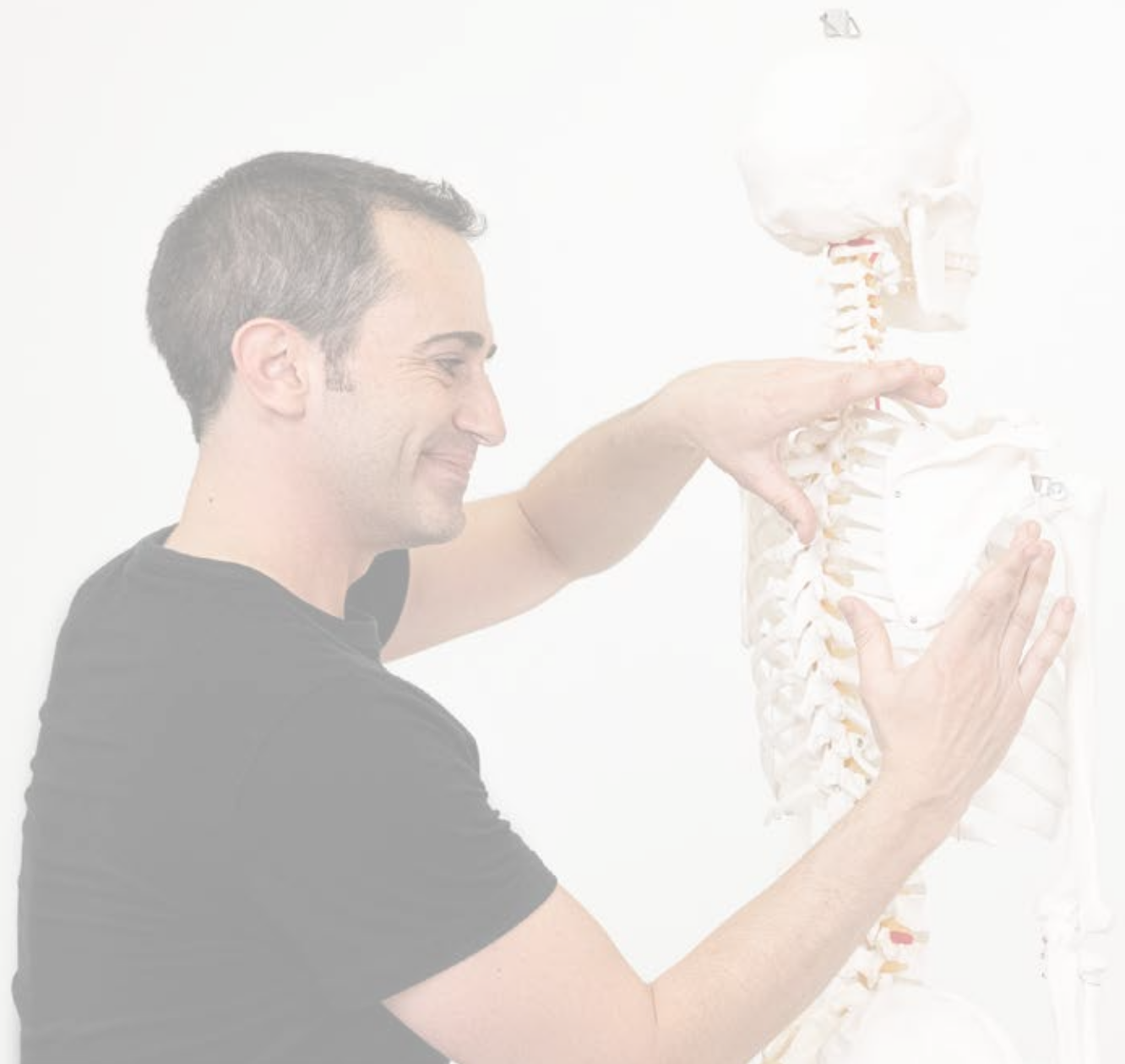
This manual was created for you to highlight some of the most important and supportive information in the course and to help guide your focus and attention through your educational experience with us. And that's the best part!

The course, itself, is designed to be experiential and fun, so that you get to feel the anatomy inside of your body as well as learn intellectually from different traditions about how all the various pieces fit together. More than anything, it is our hope and our goal to help you develop your own personal understanding of how the body moves, breathes, and develops anatomically, biomechanically, and in and outside of the movements and practices of Yoga.

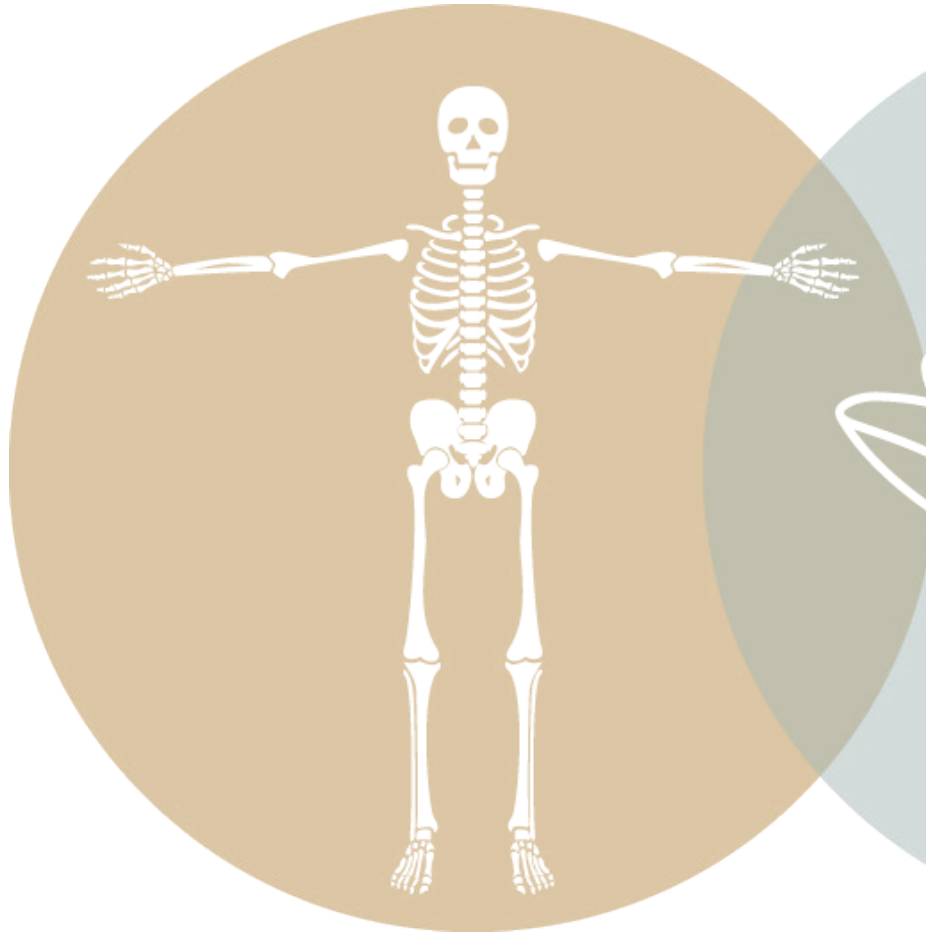
Thank you for your interest in our synergy between higher science and Yoga. May it advance your Yoga practice to new depths and lead to many 'aha' moments both on and off your Yoga mat.

Namaste,  
Dr. Eden Goldman  
IG @dr.edengoldman,  
[www.lotused.com](http://www.lotused.com)

# FOUNDATIONS



# EAST VS WEST



## BODY AS A MACHINE

Health = absence of disease  
and functioning with normative  
parameters

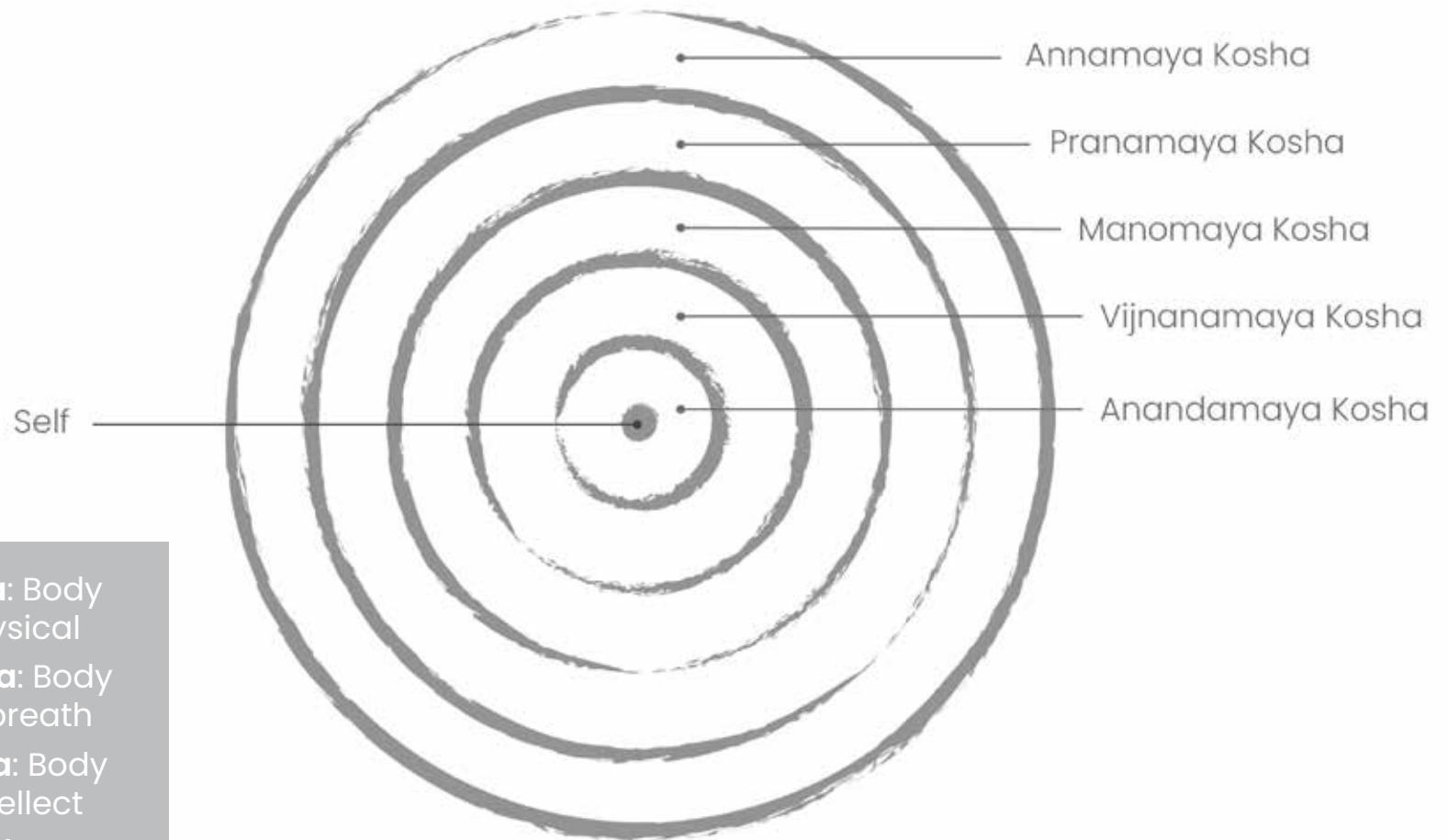


## BODY AS A GARDEN

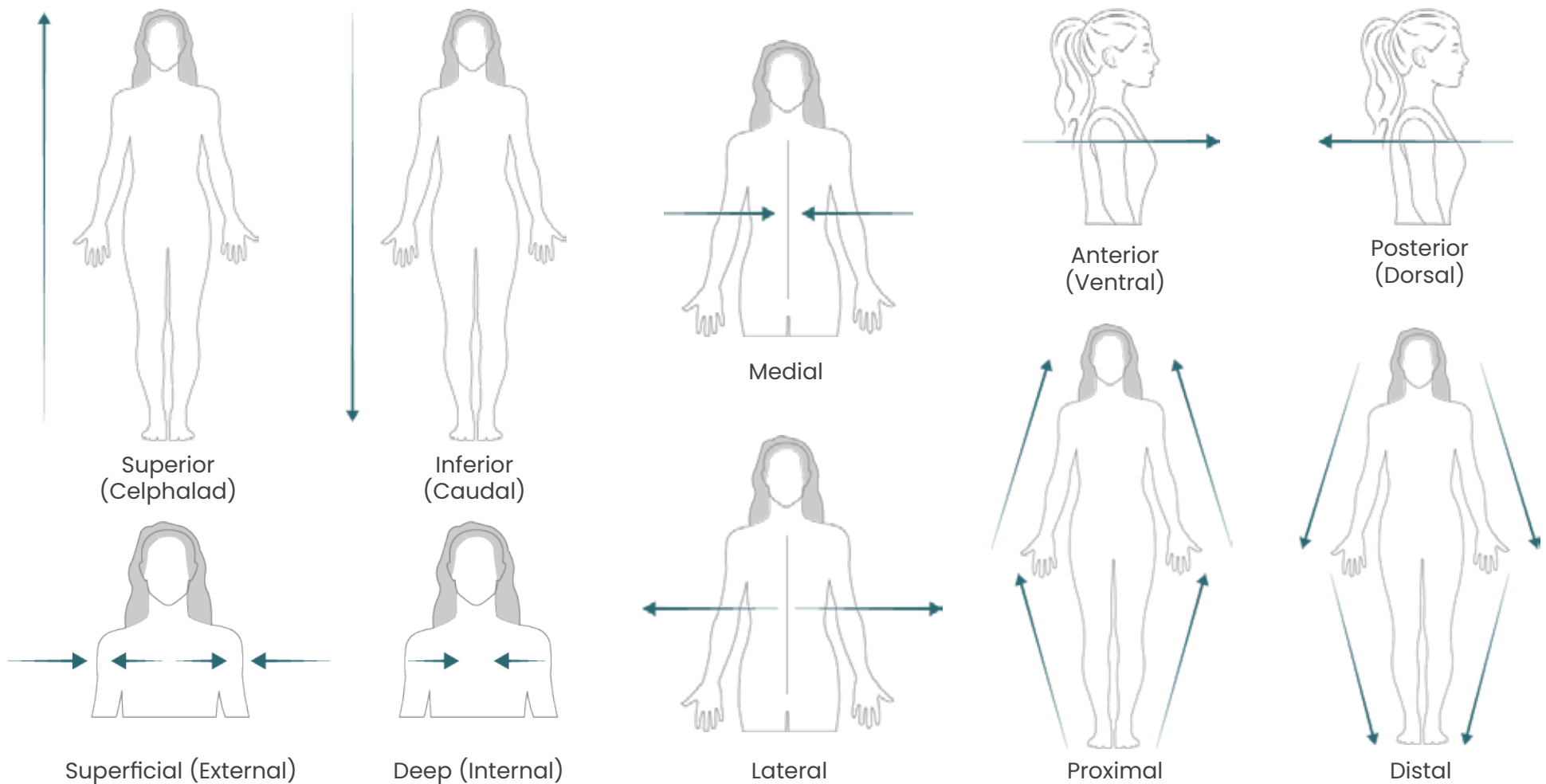
Health = integrity, adaptability,  
continuity

# KOSHAS

## FIVE SHEATHS OF CONSCIOUSNESS



- **Annamaya Kosha:** Body made of food/physical
- **Pranamaya Kosha:** Body made of energy/breath
- **Manomaya Kosha:** Body made of mind/intellect
- **Vijnanamaya Kosha:** Body made of wisdom/personality
- **Anandamaya Kosha:** Body made of bliss/emotions



## ORIENTATION & DIRECTIONAL TERMS

- **Superior (Cephalad)** Toward the head or upper part of the body; above; Ex: In Tadasana the head is superior to the abdomen
- **Inferior (Caudal)** Away from the head, toward the lower part of a structure of the body; below. Ex: In Mountain pose the ankles are inferior to the knees
- **Anterior (Ventral)** Toward or at the front of the body; in front of. Ex: The sternum is anterior to the spine.
- **Posterior (Dorsal)** Toward or at the back of the body; behind. Ex: The heart is posterior to the sternum.
- **Medial** Toward or at the midline of the body; on the inner side of. Ex: The 3rd eye in the forehead is medial to the ears.
- **Lateral** Away from the midline of the body; on the outer side of. Ex: The shoulders are lateral to the neck.
- **Superficial (External)** Toward the surface of the body Ex: The skin is superficial to the skeletal muscles.
- **Deep (Internal)** Away from the surface of the body Ex: The lungs are deep to the skin
- **Proximal** Closer to the origin of the body part or the point of attachment of a limb to the body trunk.
- **Distal** Farther from the origin of a body part or the point of attachment of a limb to the body trunk. Ex: In Anatomical Position, the knee is distal to the thigh.

# BIOMECHANICAL TERMS TO KNOW

**Flexion:** Decreasing the angle between two parts

**Extension:** Increasing the angle between two parts

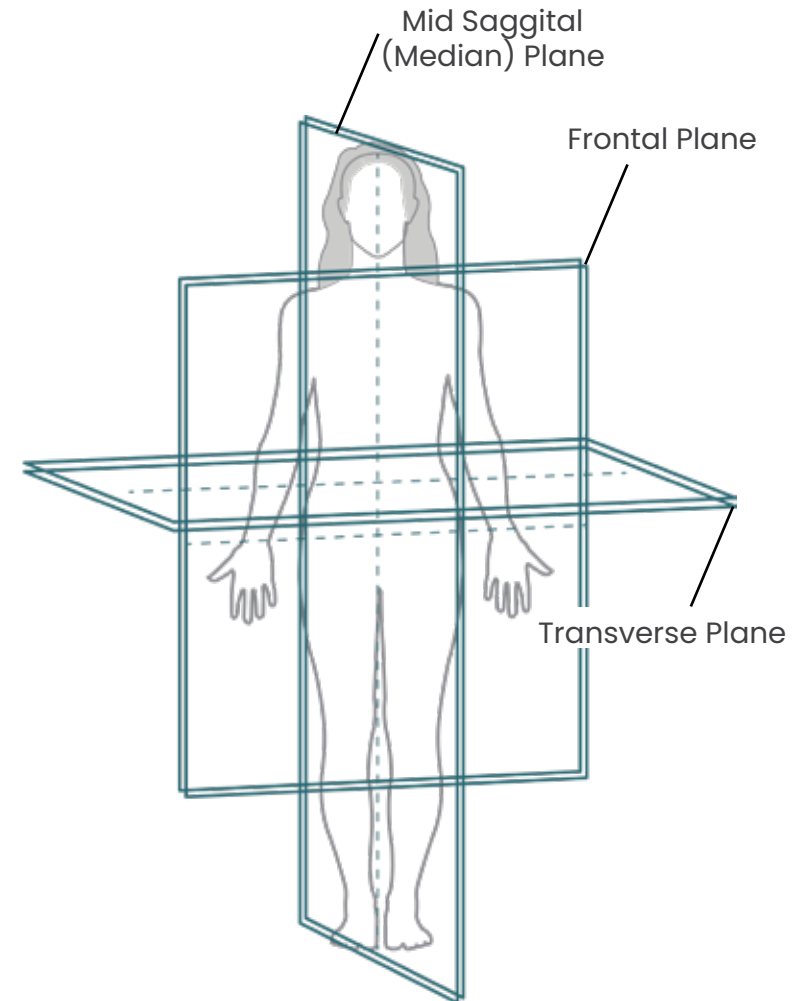
**Abduction:** Moving away from the centerline

**Adduction:** Moving toward the centerline

**Internal Rotation (Medial Rotation):**  
Circular movement toward the midline

**External Rotation (Lateral Rotation):**  
Circular movement away from the midline

**Lateral Flexion:** Bending to the side

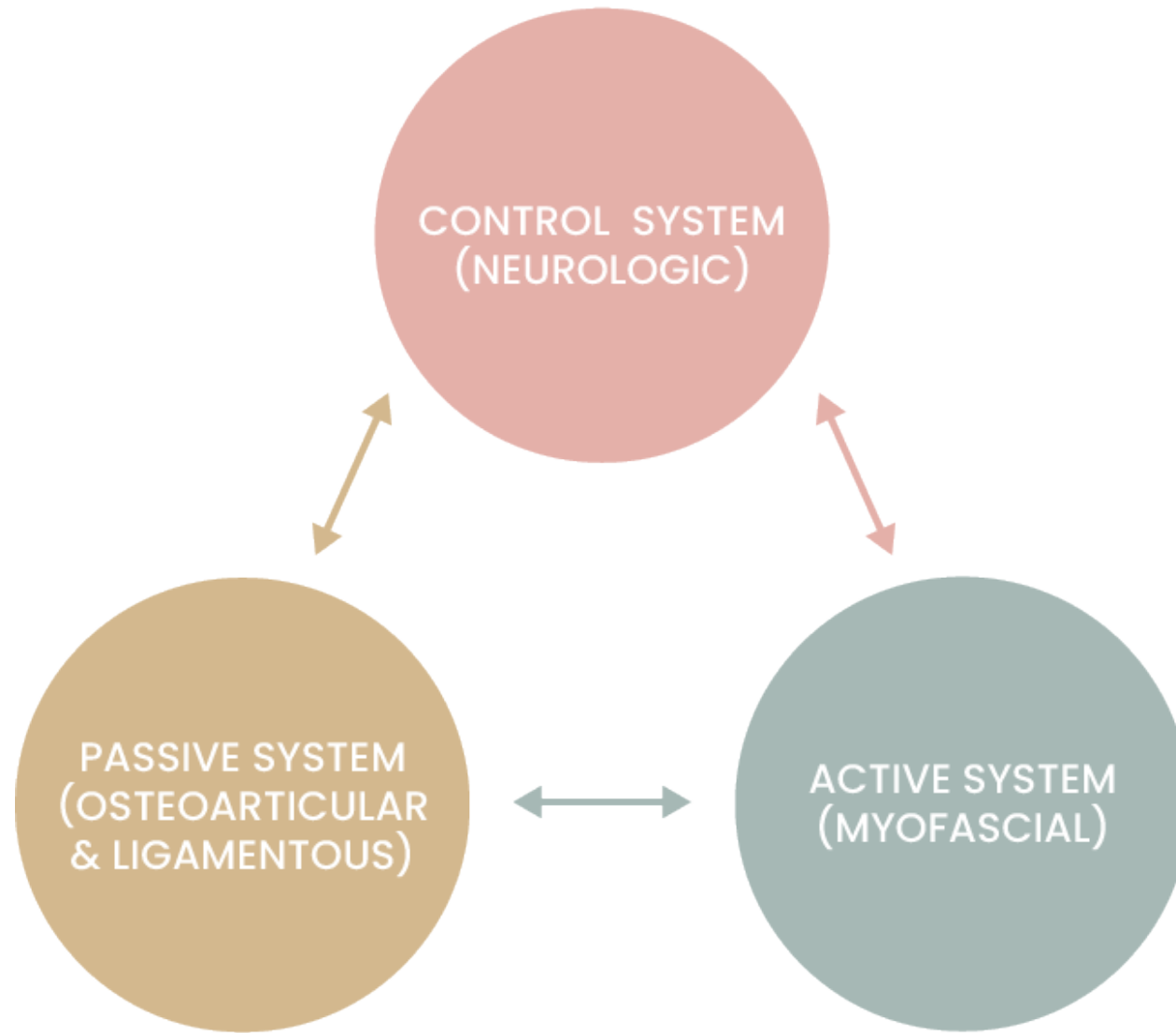


PLANES OF THE BODY

## SPECIAL MOVEMENTS

- Elevation, Depression, Pronation, Supination, Dorsi Flexion, Plantar Flexion, Inversion, Eversion, Protraction, Retraction, Radial Deviation, Ulnar Deviation

# CONCEPTUAL MODEL OF STABILITY



# BASIC ASANA-LOGY FOR YOGA THERAPY

Therapeutically nourishing asanas and postural exercises in body-based Yoga Therapy maintain the following qualities:

**F–Foundation** BOS – Solid base of support

**O–Optimum** Physical Alignment – joint centration

**O–Organized** Breathing – maximize respiratory efficiency

**D–Dynamic** Movement – proprioceptive awareness of neurokinetic movements transitioning in/out of asanas

**S–Stress-Free** Environment – removing stress signs in the body/posture/emotions environment/mind

Notes:

## 3 PRINCIPLES OF STABILITY (STIRRHA)

स्थिरसुखमासनम्

sthira sukham asanam

steady  
stable  
motionless

comfortable  
ease filled

posture

FROM THE U.S. SPORTS ACADEMY

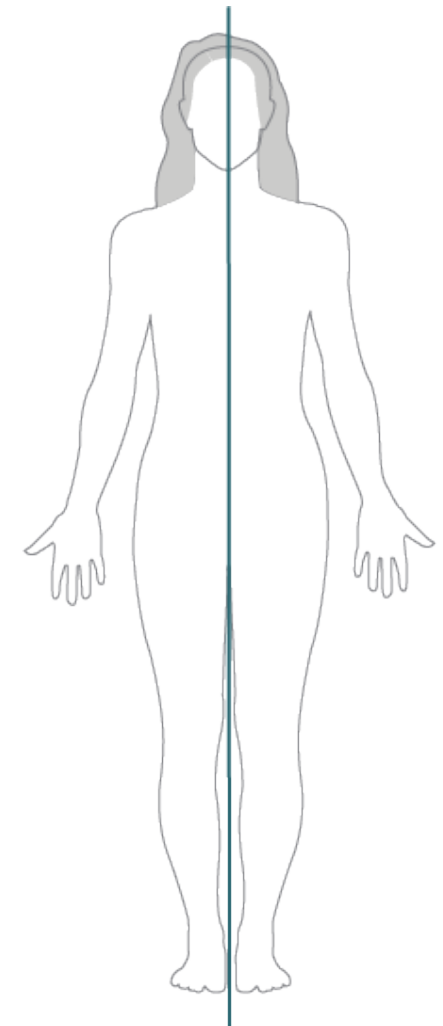
- 1. Broader base of support increases stability**
- 2. Centralizing the line of gravity inside the base of support increases stability**
- 3. A lower center of mass increases stability**

Notes:

# PLUMB LINE (MIDLINE) TADASANA EVALUATION

## OBSERVATION IN TADASANA

- Occiput: For head straightness
- Head tilt: Does it tilt laterally to one side?
- Ear level: Are they even?
- Trapezius symmetry
- Shoulder height
- Scapula: Level, angling and rotation
- Lateral and inferior angles of scapula: Are they the same?
- Space between flank and arms
- Lordosis And kyphosis: Observe the symmetry of the muscles along the spine
- Smoothness of spine
- Rib symmetry
- Iliac crest symmetry
- Greater trochanters of the femur: Are they level?
- Gluteal fold lines
- Hamstrings' balance
- Inward/outward rotation or favoring of the knees
- Popliteal fossa lines
- Shape of calves
- Level of malleoli
- Achilles/calf muscle symmetry
- Pronation and supination of the feet
- Prominence of the arches of the feet



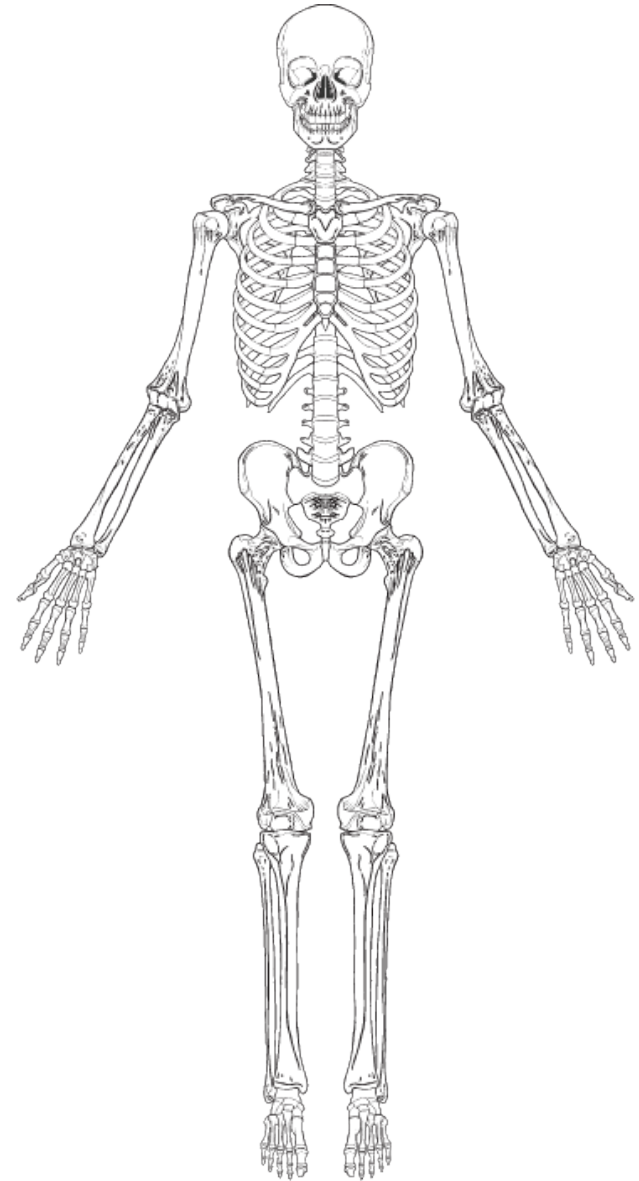
Plumb Line

# THE SKELETAL SYSTEM

The skeleton has 3 major roles:

1. It protects vital organs.
2. It provides body shape.
3. It allows us to move as our muscles are attached to our bones, when our muscles move, our bones move too.

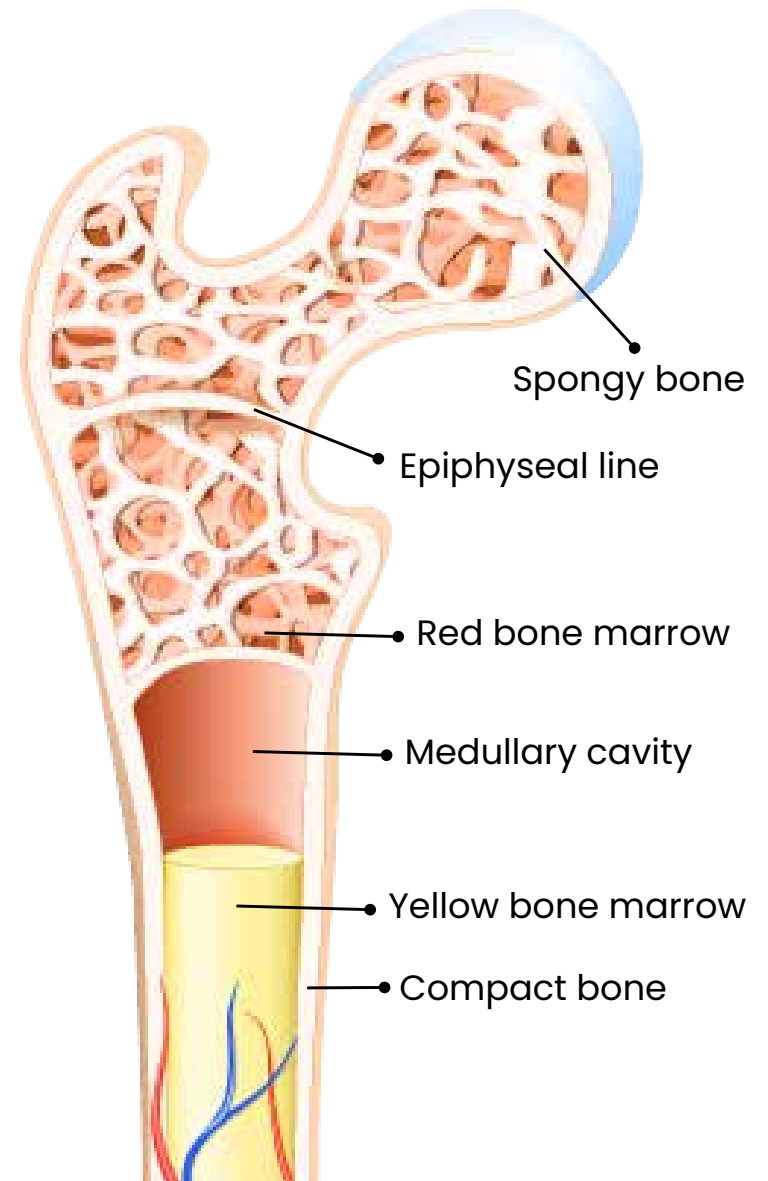
Notes:



# BONE STRUCTURE

- A typical bone has a strong outer layer of compact bone.
- Inside is a layer of flexible spongy bone which looks like honeycomb.
- The middle of some bones consist of a jelly-like substance called bone marrow which is where new red blood cells are produced.

Notes:



# JOINTS

## Hinge Joint

Hinge joints occur where a concave ended bone meets a convex ended bone. The elbows and knees are great examples.

## Ellipsoidal Joint

This type of joint is similar to the ball-and-socket, except movement is more limited. Ball and socket joints can move in all three planes of motion, but ellipsoidal joints can only move into two planes at right angles to each other. The radiocarpal joint of the wrist is an example.

## Gliding Joint

This is where the joint surfaces are flat and one bone slides over another. These kinds of joints are found in the foot and wrist.



The elbow is an example of a hinge joint

## Pivot Joint

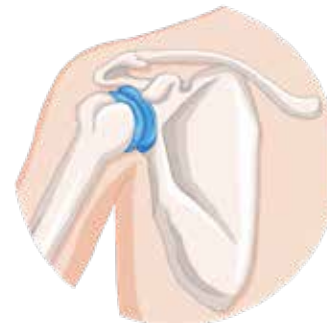
Rotating your hand to one side is the perfect example of a pivot joint at C1 – C2. It is where an extension or projection of bone revolves inside another ring shape bone. Pivot joints move only in one plane.

## Ball-And-Socket-Joint

Ball-and-socket joints occur when a bone with a circular end fits into a bone with a scoop or cup in it. It is the most flexible of joints and typically moves in three planes of motion. The shoulders and hips are examples.

## Saddle joint

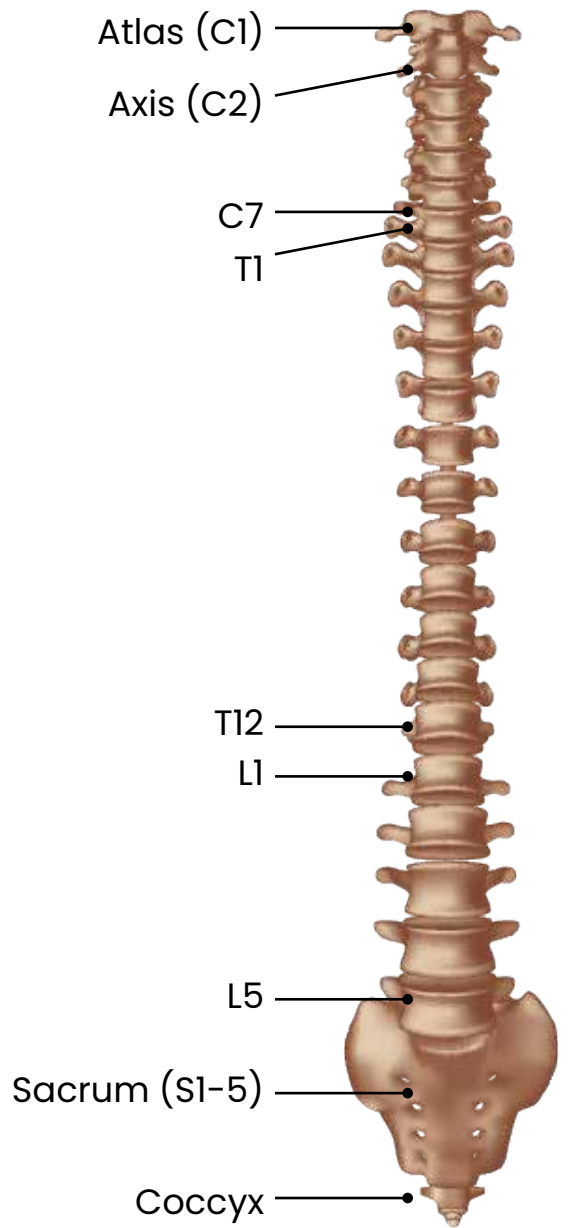
Saddle joints have concave and convex ends, allowing the joint to rotate left and right and back-and-forth two limited degrees. The quintessential example is the thumb.



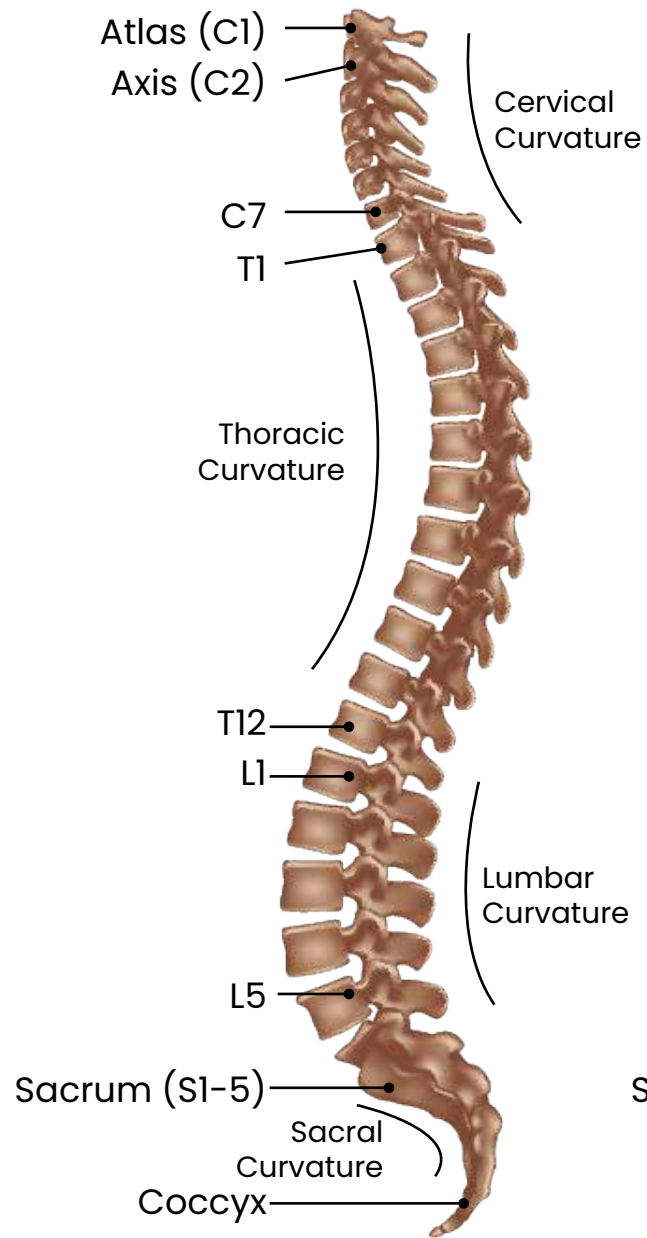
The shoulder is an example of a ball-and-socket joint



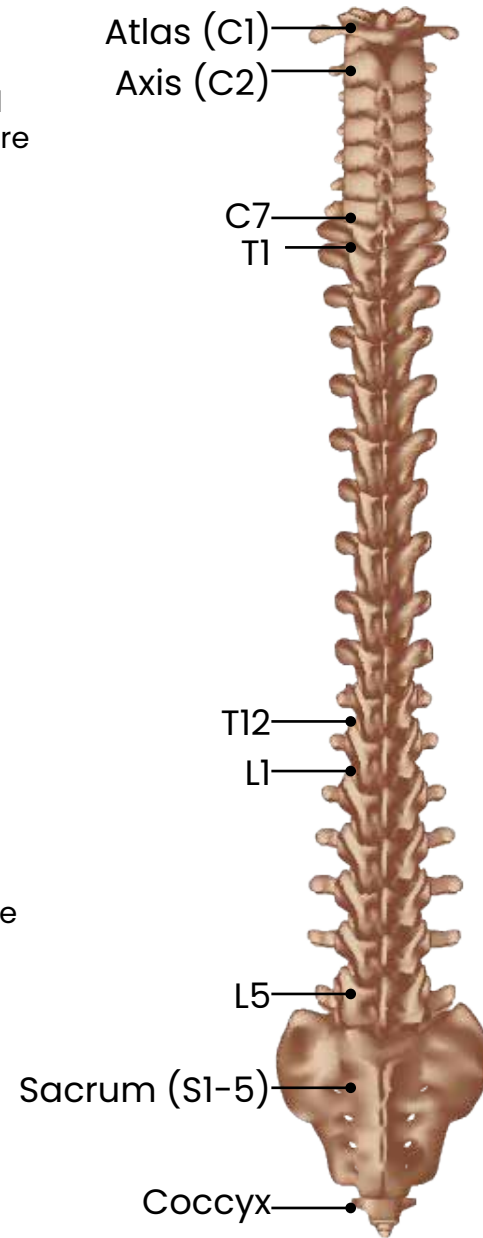
# THE SPINE



Anterior View



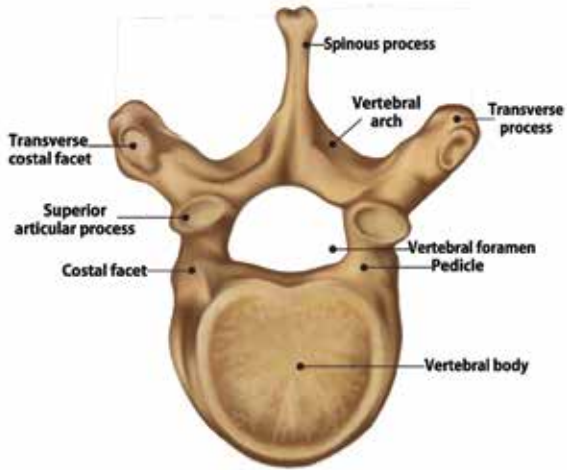
Left Lateral View



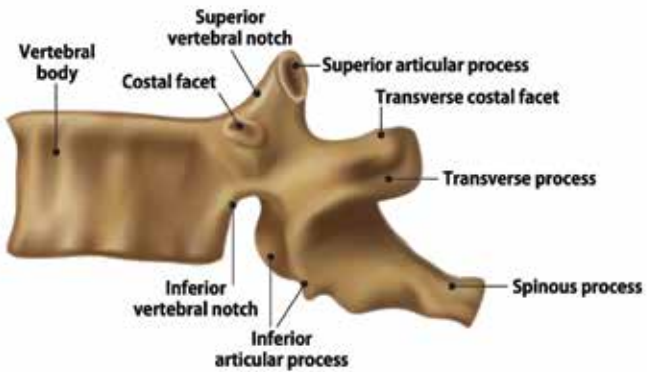
Posterior View

# THE VERTEBRAE

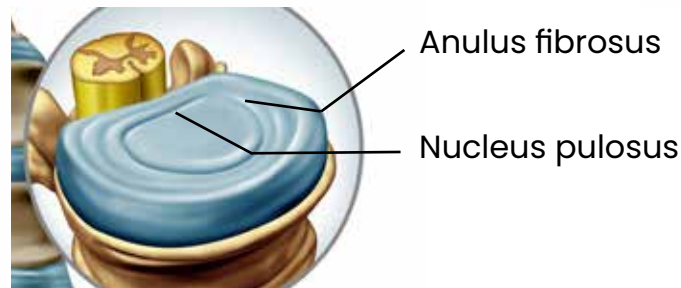
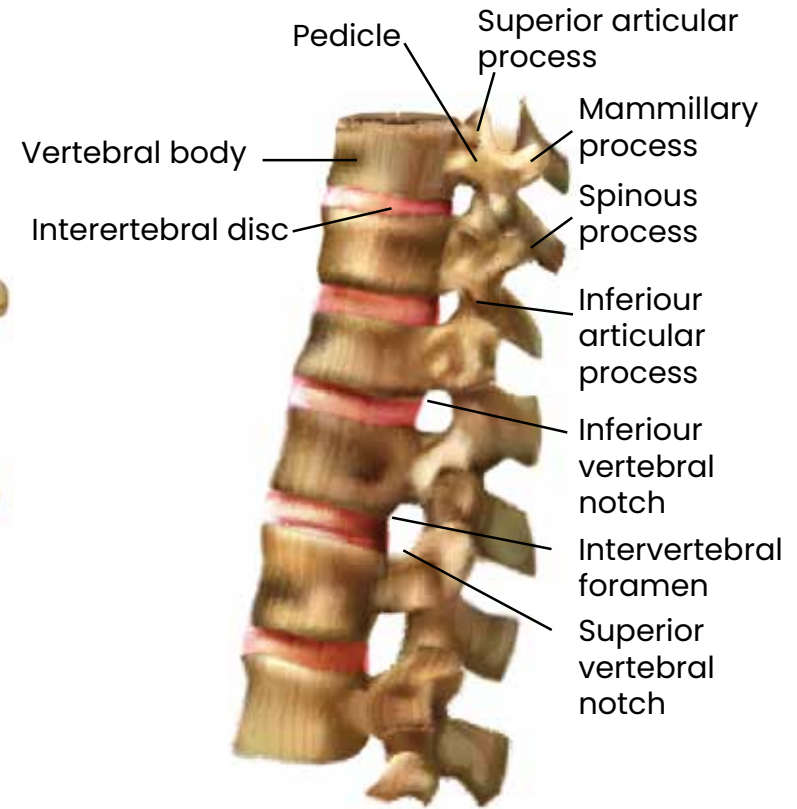
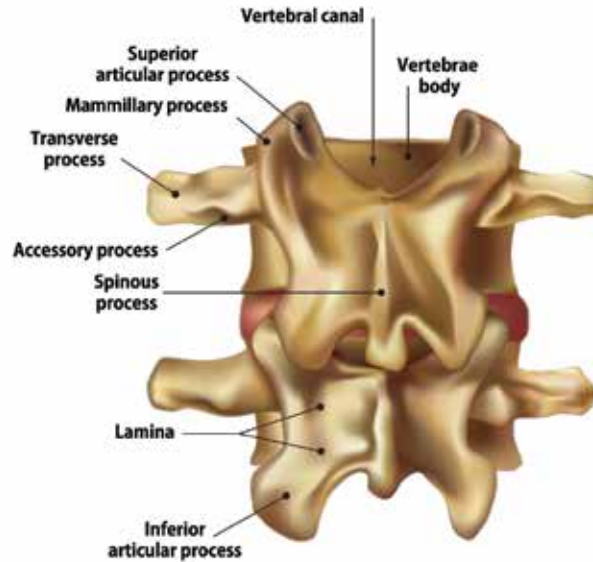
**T6 vertebra**  
**Axial View**



**Lateral View**



**L3 and L4 vertebra**  
**Dorsal View**



# FLEXION FAULTS VS. EXTENSION FAULTS

## Flexion Faults

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- Disc protrusions and bulges
- Sciatica
- Piriformis syndrome
- Vertebral fractures
- Degenerative disc disease

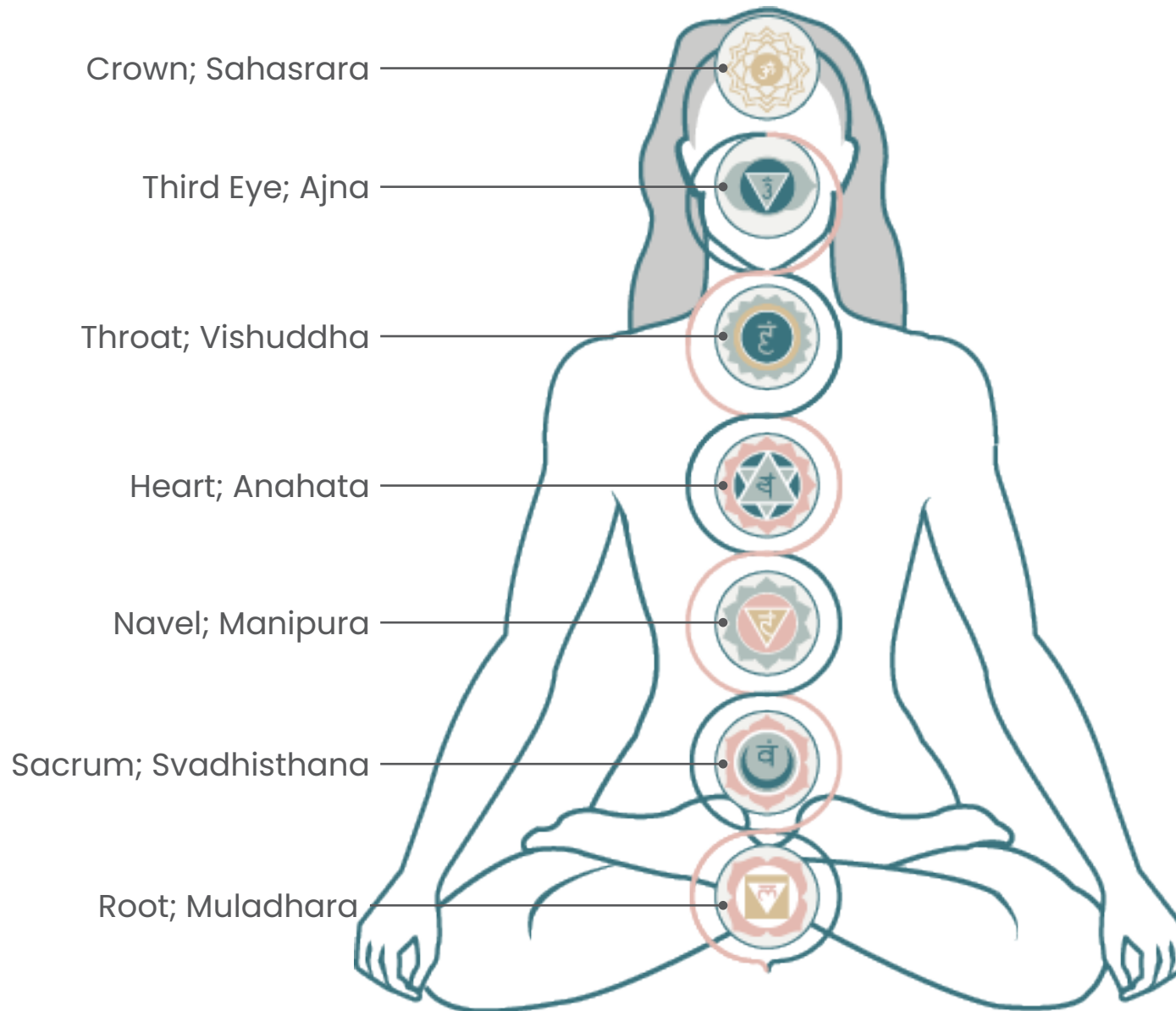
## Extension Faults

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- Spinal stenosis
- Facet joint syndrome/  
joint imbrication
- Spondylolisthesis
- Pregnancy
- Lumbar muscle hypertrophy

\*\*While the above general classification system creates a distinct division between conditions based on pain pattern and directional preference and is an effective and safe guide, an evaluation by a qualified health professional is always advised if pain, numbness, and/or tingling exist.

# SPINAL ENERGETICS



# 7 MAIN CHAKRAS

CHAKRA	COMMON NAME	ANATOMY	ENDOCRINE	LOCATION	ELEMENT	SENSE ORGAN	YAMA
Muladhara	Root	Coccyx	None	Between anus & genitals	Earth	Smell	Aparigraha
Svadhithana	Sacrum	Sacral	Testes/ Ovaries	Lower abdomen	Water	Taste	Brahmacarya
Manipura	Navel	Solar plexus	Adrenals	Solar Plexus	Fire	Sight	Asteya
Anahata	Heart	Heart	Thymus	Center of the Chest	Air	Touch	Satya
Vishuddha	Throat	Throat	Thyroid	Base of the neck	Space	Hearing	Satya
Ajna	Third Eye	Cranium (lower)	Pituitary	Above & between eyebrows	Light	Sixth Sense	Ahimsa
Sahasrara	Crown	Cranium (upper)	Pineal	Top of Head	Thought / Cosmic energy	Beyond the Self	None

# MUSCLES

## MUSCLES FUNCTIONS

- Motion / movement
- Maintain posture
- Send information to the brain and central nervous system
- Produce heat
- Transportation

## MUSCLES CHARACTERISTICS

- Excitability
- Contractility
- Extensibility
- Elasticity

## WAYS OF NAMING SKELETAL MUSCLES

- Location – e.g. Intercostals
- Shape of Muscles – Quadratus Lumborum
- Size – e.g. Gluteus Maximus
- Direction of Muscle Fibres – e.g. Transverse Abdominus and Obliques
- Number of Muscle Parts – e.g. Quadriceps

# TISSUES

## CONNECTIVE TISSUES

- **Tendons:** Fibrous connective tissue linking muscle to bone. More fibrous than muscle tissue; Limited blood supply.
- **Ligaments:** Fibrous connective tissue linking bone to bone; Secure joints, permit and restrict movement. No blood supply.
- **Fascia:** Soft tissue sheet-like web that encapsulates and connects muscles, bones, organs, nerves and blood vessels. Provides structural integrity, support, movement, shock absorption, communication and protection.

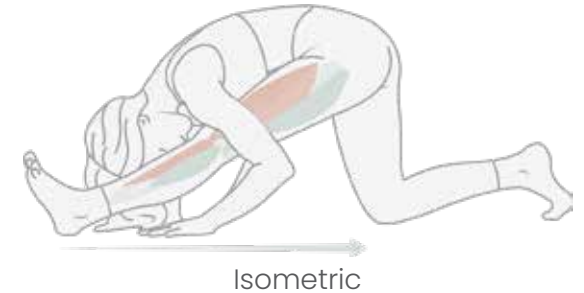


# CONTRACTIONS

## MUSCULAR CONTRACTIONS

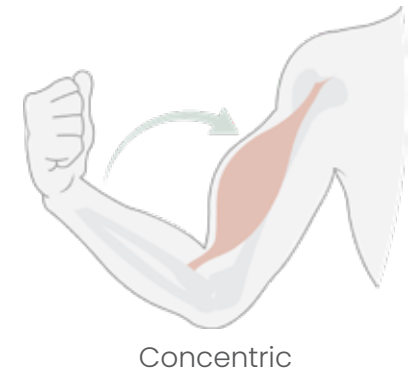
### Isometric (static):

- Activity is present in a muscle without a change in muscle length. Same length, tone change, not distance. Example: Plank Pose



### Isotonic:

- Activity is present in a muscle maintaining the same tone as it changes in length.
- "Same tone, length changes." Example: Bicep curls
- There are two types:
  - **Eccentric:** Activity is present in a muscle during the level of active lengthening of that muscle, especially if it forces that resists gravitational pull.
  - **Concentric:** Activity is present in a muscle during the shortening of that muscle.



### Isokenic:

- Activity is present in a muscle maintaining the same length and tone.

# BREATH

## YOGA AND THE BREATH

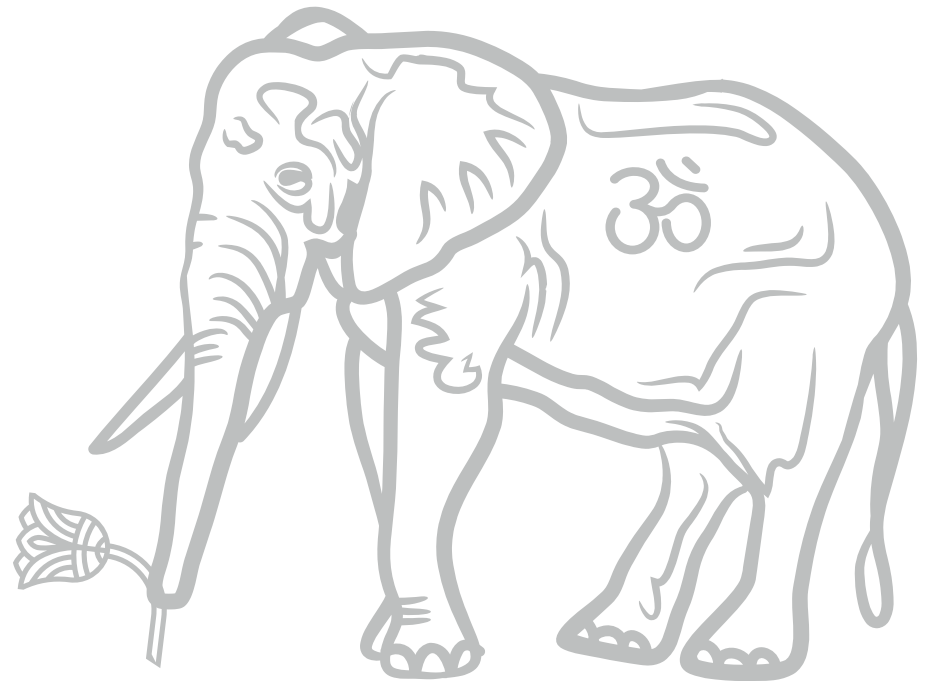
- “Breath is essential to Yoga, because breath is essential to life and Yoga is about life.” – T.K.V. Desikachar
- “What is God? He is the breath inside of breath.” – Kabir
- “Inhale and God approaches you. Hold the inhalation and God remains with you. Exhale and you approach God. Hold the exhalation and surrender to God.”  
– T. Krishnamacharya



## RHYTHM OF RESPIRATION

In addition to influencing the quality of life, the length, or quantity of life is also dictated by the rhythm of the respiration. The ancient yogis and rishis studied nature in great detail. They noticed that animals with a slow breath rate such as pythons, elephants, and tortoises have long life spans. Whereas, those with a fast breathing rate such as birds, dogs, and rabbits, only live for a few years.

From this observation they realized the importance of slow breathing for increasing the human lifespan. Those who breathe in short, quick gasps are likely to have a shorter life span than those who breathe slowly, and deeply.

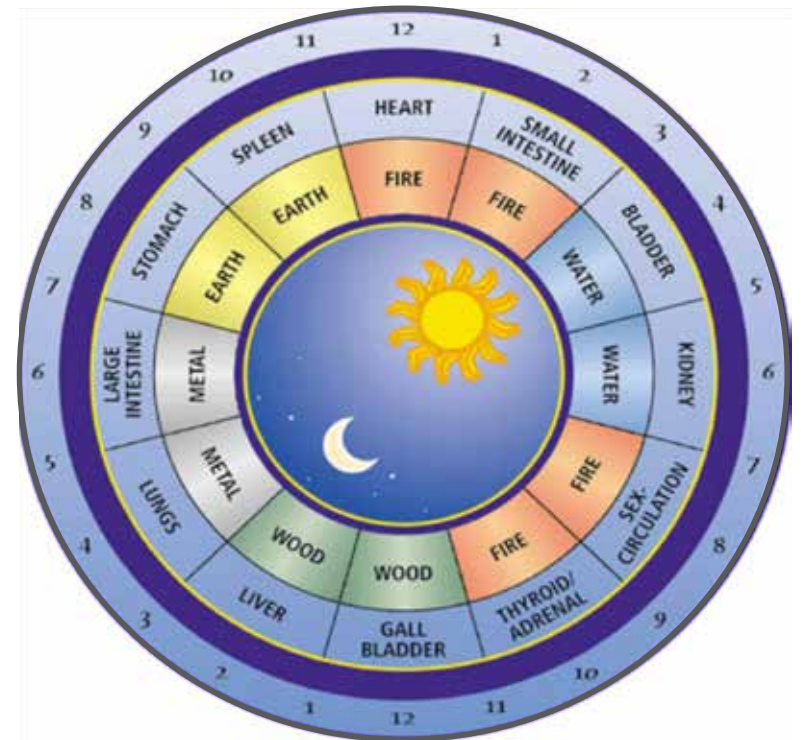


# BREATH

## CIRCADIAN CLOCK ORGAN CHART

(Used in Chinese and Japanese traditions of TCM and QiGong)

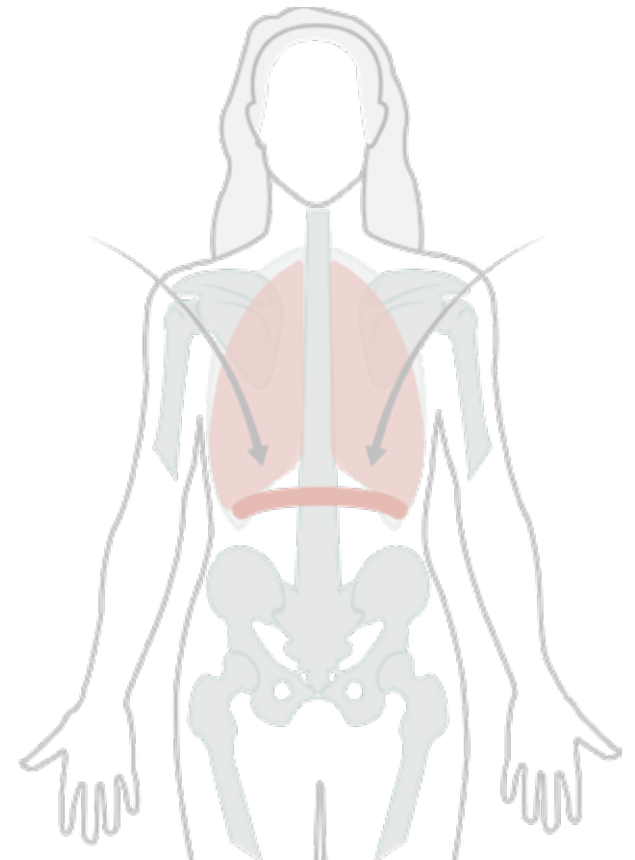
- In TCM, to nourish an imbalanced organ it is customary to deliver a tonifying treatment during the time of the organ or during the opposite time period of the organ.
- Ex: Offer a stimulating treatment to the lungs during 3–5 PM.



# BREATH

## OPTIMAL TIME OF DAY FOR BETTER LUNG FUNCTION

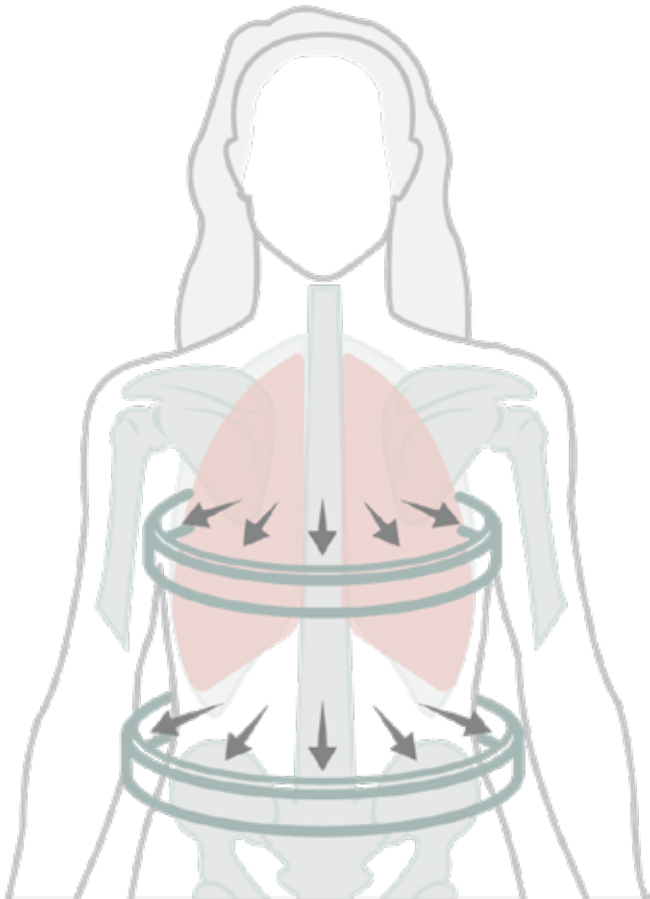
- A study presented at the American College of Chest Physicians looked at 4,835 patients over a 5-year period measuring several breathing tests.
- Results showed that patients' airway resistance was most prominent at noon and reached its minimum 4 PM –5 PM.
- The researchers suggested that their findings may be useful in exercise prescriptions and the "administration of long-action bronchodilators."



# BREATH

## BREATH ANATOMY

The action of inhalation uses two major muscle systems: the diaphragm and the muscles of the ribcage called the intercostal muscles.

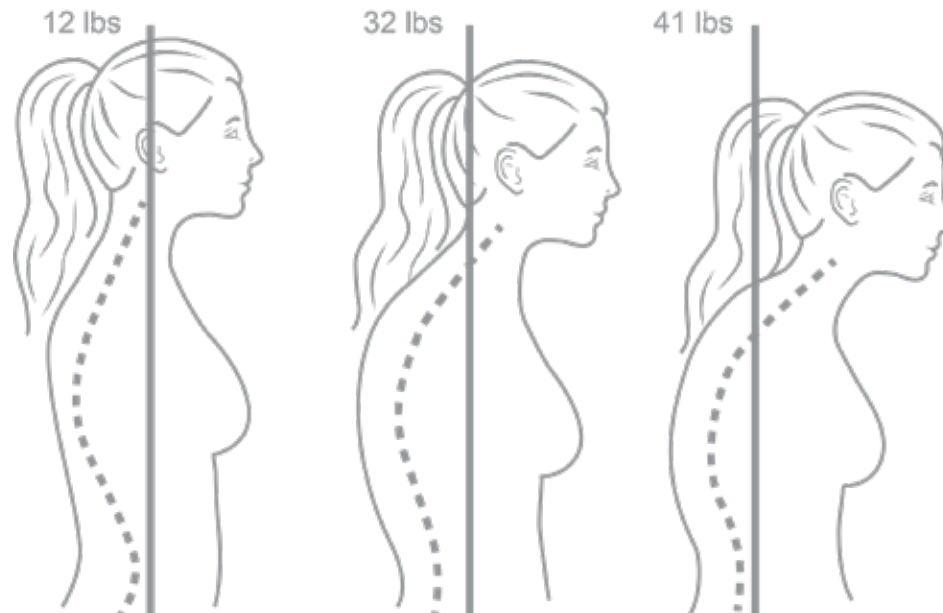


Note the expansion like a balloon in all directions initiating in the abdomen, moving to the lower ribs and then in the upper chest.

**“If breathing is not normalized – no other movement pattern can be.”**

– Karel Lewit, M.D., D.Sc.

# ANTERIOR HEAD CARRIAGE/ FORWARD HEAD POSTURE



## Common Presentation

- Chin protrusion
- Rounding of the shoulders
- Inward rotation of the arms
- Compressed thoracic cavity
- Increased compression on the discs or facet joints
- Loss of range of motion
- Decreased ability to recruit the deep neck flexors
- Decreased lung capacity by as much as 30%
- Increased chance of osteoarthritis
- Increased muscle tension causing headaches
- Up to 30 lbs of additional pressure from the head in reference to what the neck must support
- Freedom of motion in the first four cervical vertebrae can be a major source of stimuli that alters production of endorphins and, if not produced, many non-painful sensations can be experienced as pain

# UPPER CROSS SYNDROME

**Upper Cross Syndrome** Postural syndrome that is developed through myofascial patterning and muscle imbalances.

## Common Presentation:

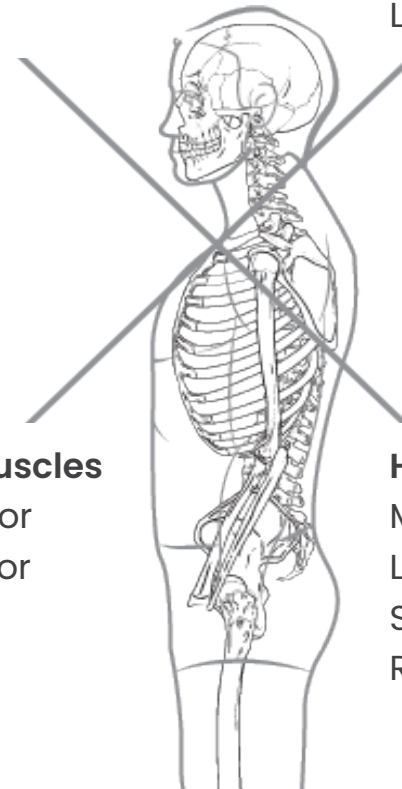
- Anterior head carriage (CT junction stress)
- Shoulder elevation and protraction
- Scapular rotation (glenoid facing caudally) & abduction altered glenohumeral movement
- Altered breath
- Facial pain
- TMJ problems
- Referred pain to chest/shoulder/arms

### Hypotonic Muscles

Deep anterior  
Neck flexors

### Hypertonic Muscles

Upper Trapezius  
Levator Scapulae



### Hypertonic Muscles

Pectoralis Major  
Pectoralis Minor

### Hypotonic Muscles

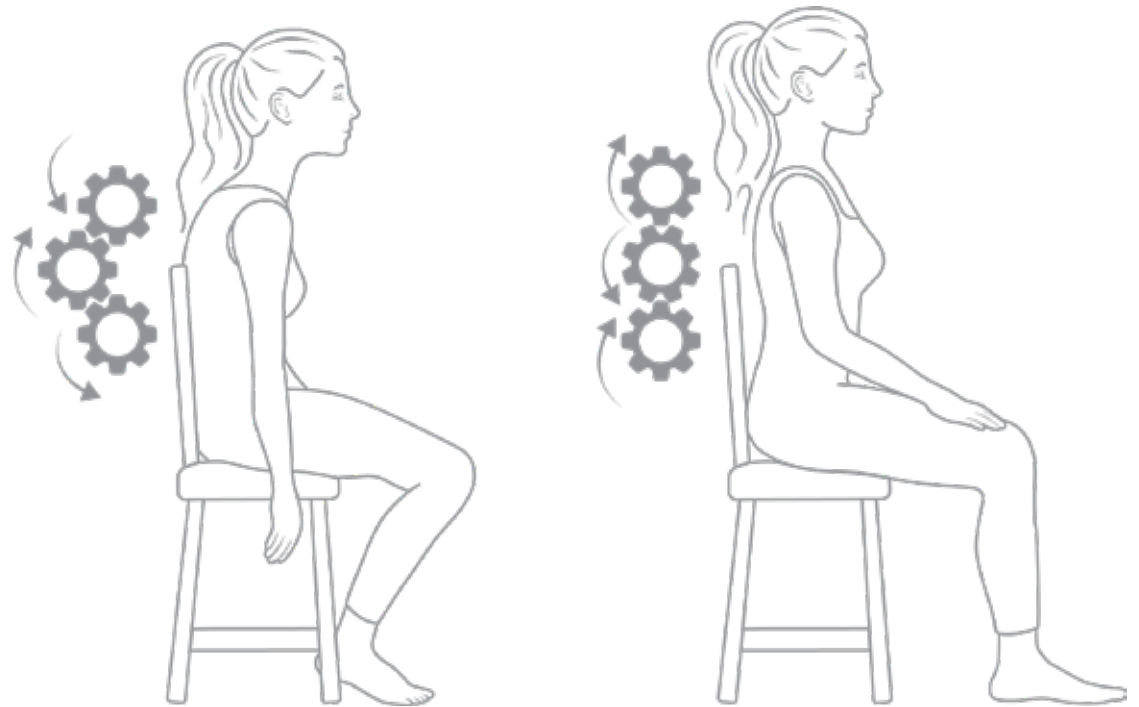
Middle Trapezius  
Lower Trapezius  
Serratus Anterior  
Rhomboids

*For more details see coloring upper cross muscles*

# MID THORACIC DYSFUNCTION

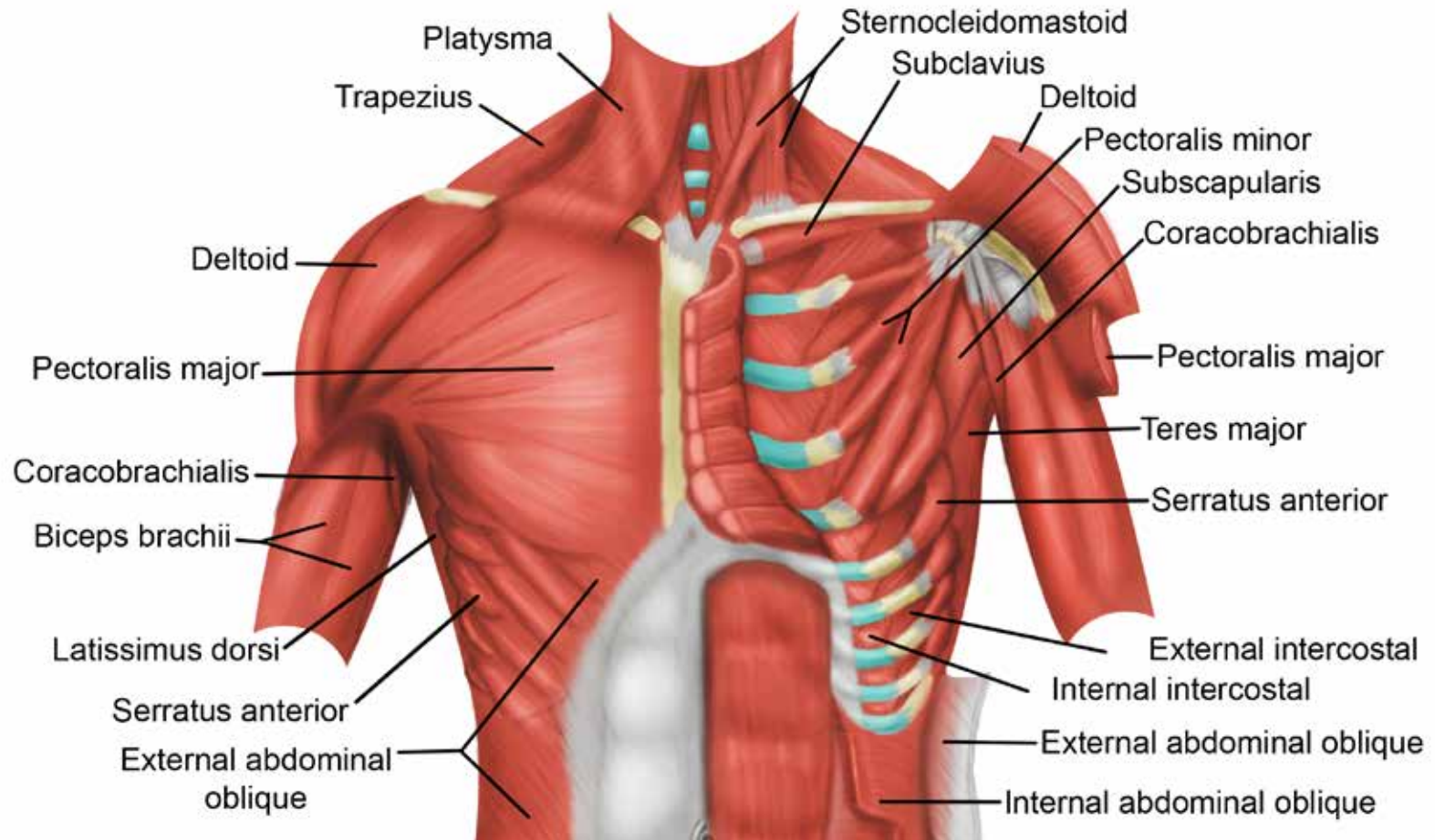
## Common Presentation:

- Round shoulders and upper trapezius overactivity
- Head forward posture
- Chin protrusion
- Sterno Symphyseal approximation
- Increased lumbar lordosis



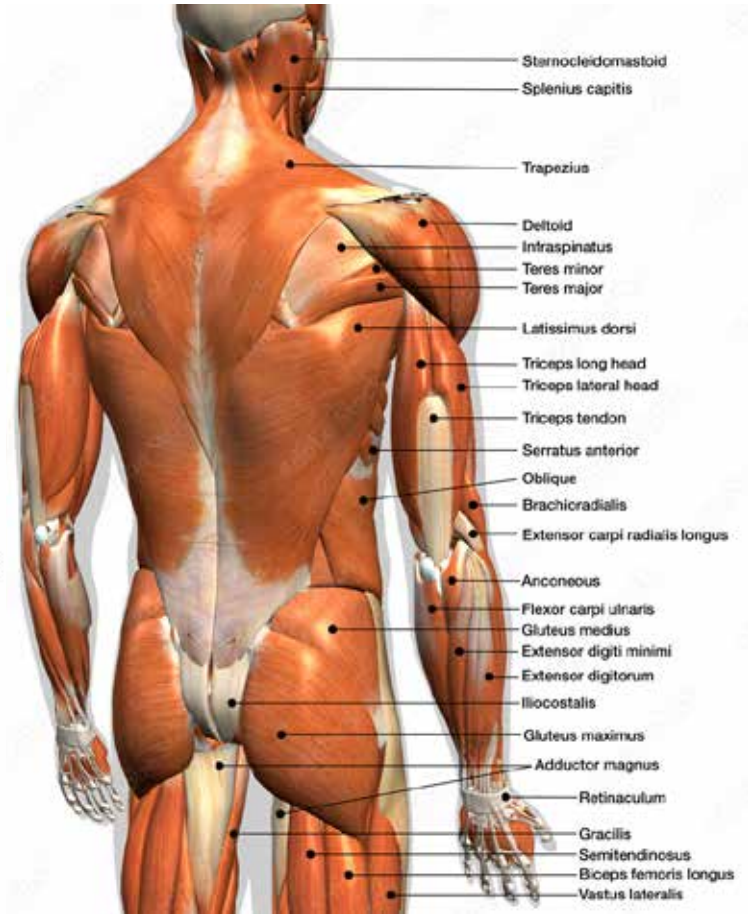
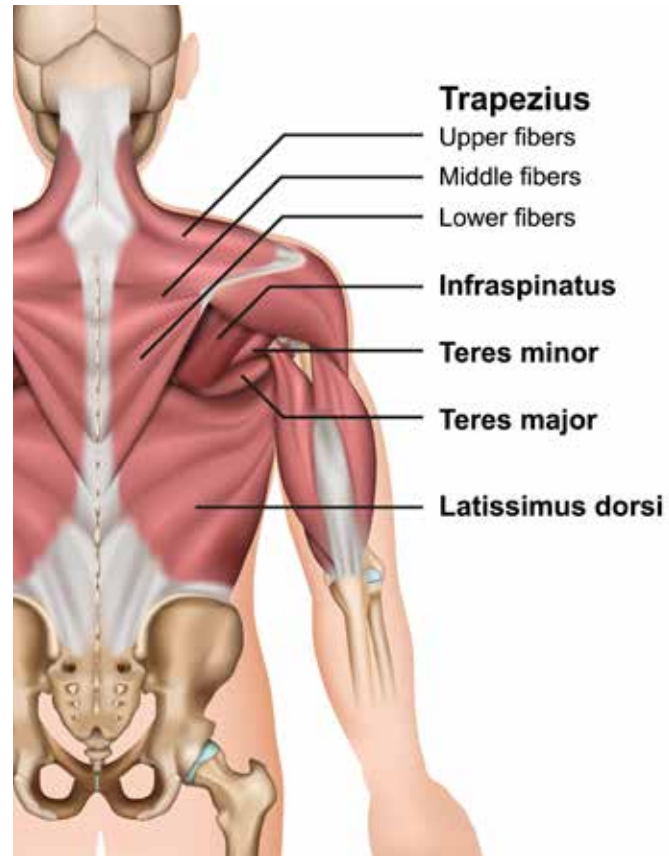
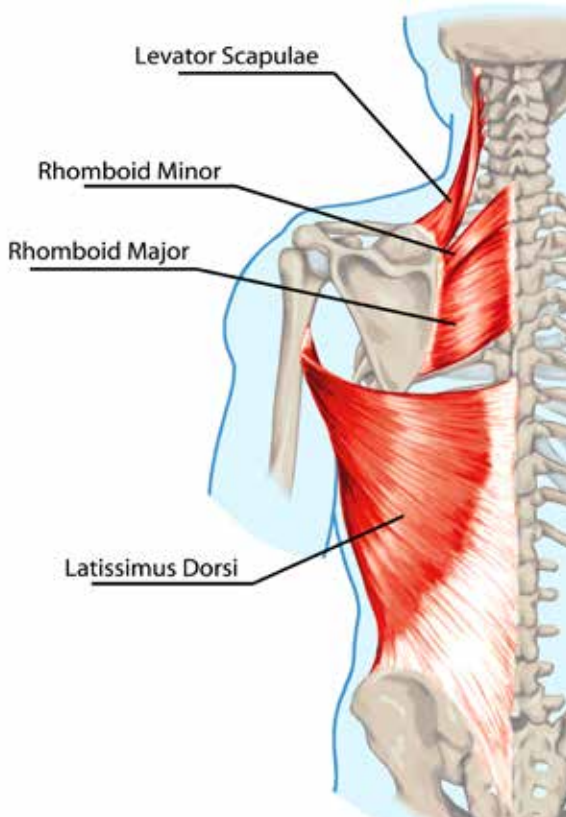
Notes:

# ANTERIOR THORAX



Notes:

# POSTERIOR THORAX



Notes:

# TYPES OF YOGA THERAPY EXERCISES

- **Palliative:** To remove directional preference pain – McKenzie, cobras, forward bends, bracing, sliders.
- **Tissue Sparing:** To remove muscle imbalance pain – Hip hinge, bracing, postural.
- **Stabilizing:** To remove pain due to lack of stability and/or lack of endurance – Bird dog, side bridge, dead bugs, glute bridges, balance.
- **Functional:** To enhance range of motion and athletic performance – Squats, lunges, crescent, standing poses.

Notes:

# THE SUPPORTING STRUCTURES OF THE SHOULDER

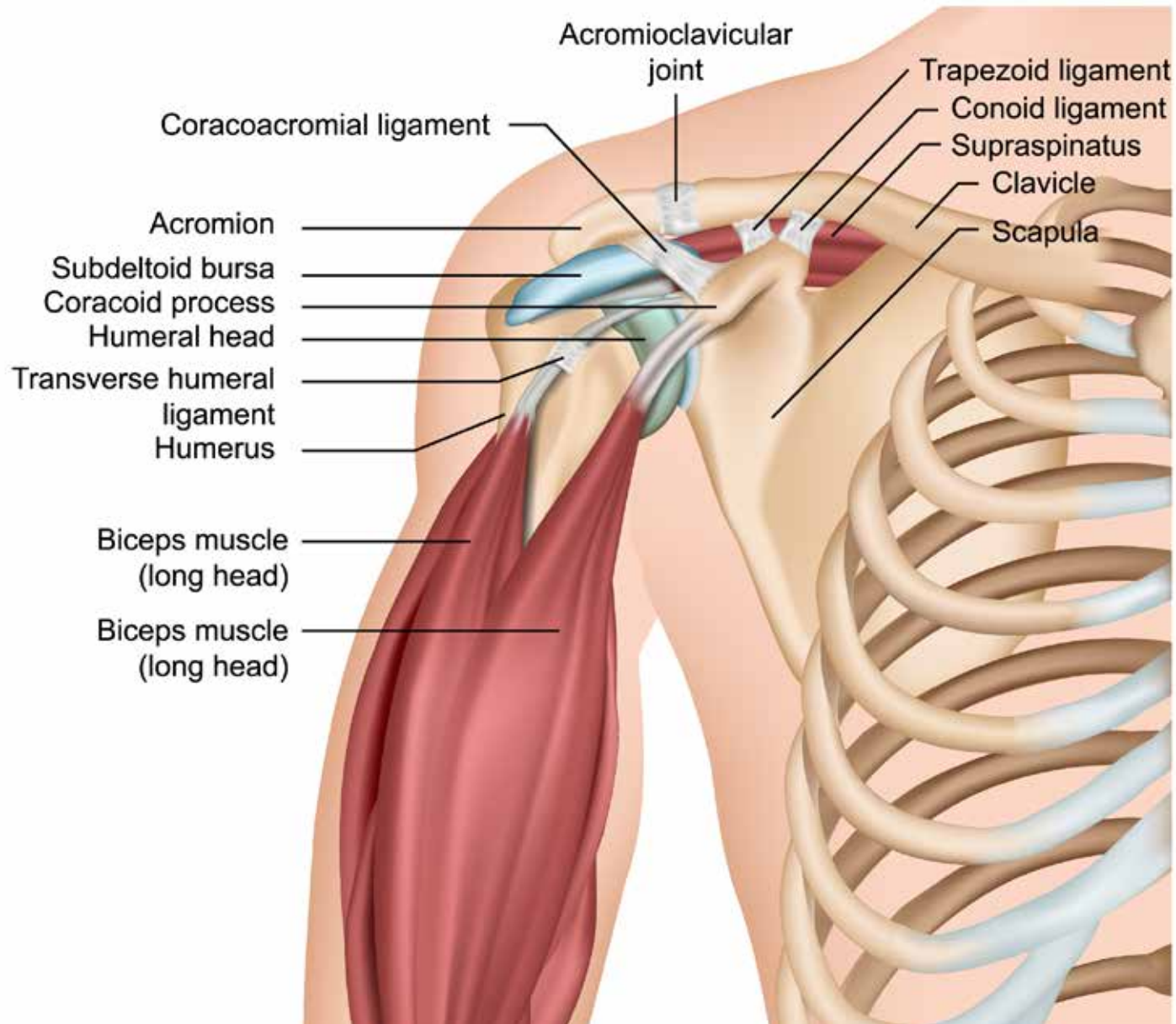
## SUPPORTING STRUCTURES

From superficial to deep layers

- Deltoid, pectoralis major
- Clavicle pectoral fascia, conjoined tendon, pectoralis minor
- Subdeltoid bursa, rotator cuff muscles
- Glenohumeral capsule, coracohumeral ligament

Notes:

# SHOULDER (GLENOHUMERAL)



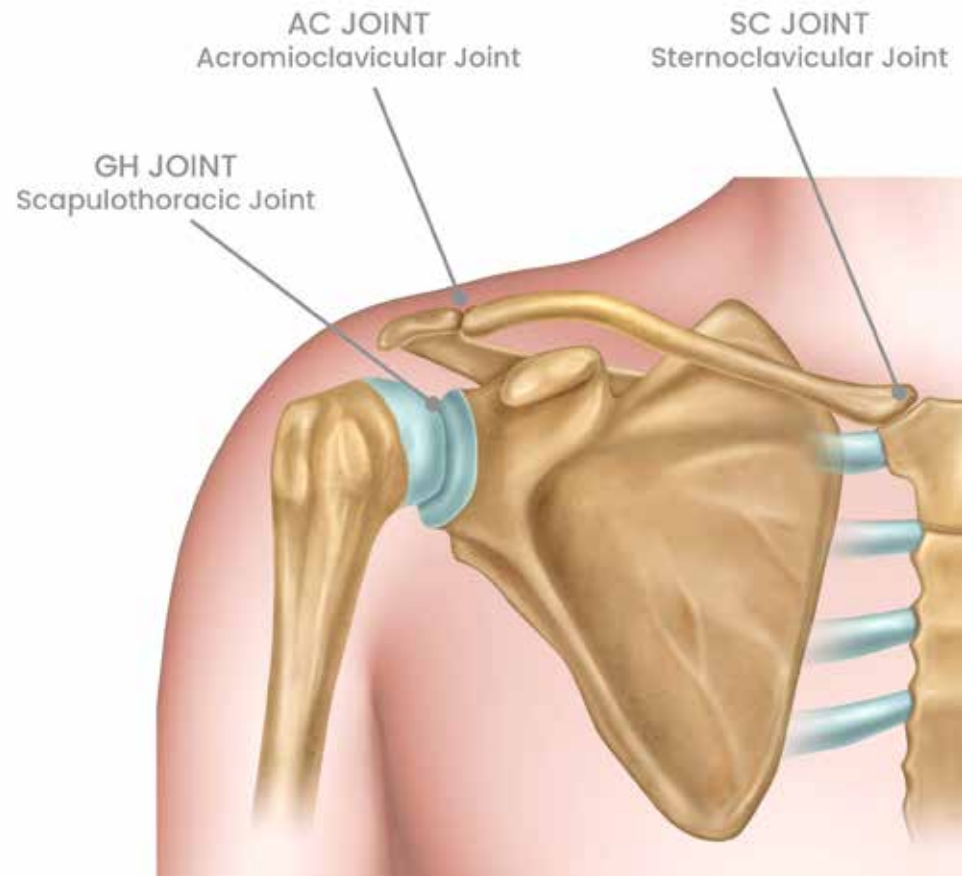
# SHOULDER (GLENOHUMERAL)

- **Glenohumeral Joint:** A spheroidal (ball & socket) joint that is the principal articulation of the shoulder.
- **Inferior Glenohumer Ligament:** A major anterior stabilizer of the glenohumeral joint, especially with the arm abducted.
- **Middle Glenohumer Ligament:** Prevents anterior instability when the shoulder is externally rotated and abducted 45 degrees.
- **Superior Glenohumeral Ligament:** Works with the coracohumeral ligament to prevent inferior instability in the adducted arm.
- **Labrum:** Is a fibrocartilagenous thickening surrounding the glenoid that deepens the glenoid cavity. It prevents abnormal motion and serves to anchor the inferior glenohumeral ligament complex.

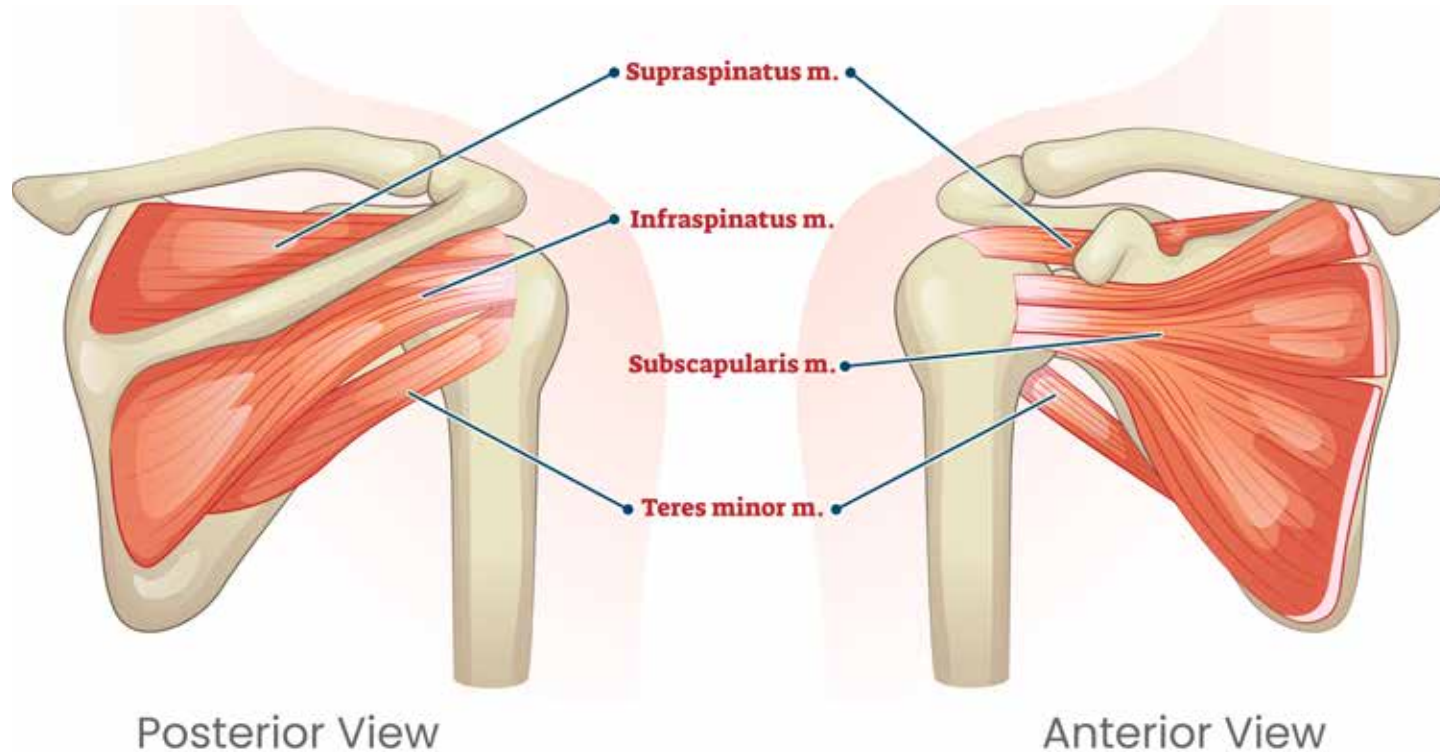
Notes:

# SHOULDER JOINTS

- **Acromioclavicular Joint:** The AC joint is a gliding joint that links the arm to the body at the chest. This joint is primarily stabilized by the AC ligament (horizontal stability) and the coracoclavicular ligament (vertical stability).
- **Sternoclavicular Joint:** The SC joint is a double gliding joint between the sternum (breastbone) and the clavicle, this joint is responsible for rotation and preventing forward and backward displacement of the medial clavicle.
- **Scapulothoracic Joint:** Not a “true joint,” this joint is the articulation of the scapula on the posterior rib cage and its surrounding muscles and fascia.



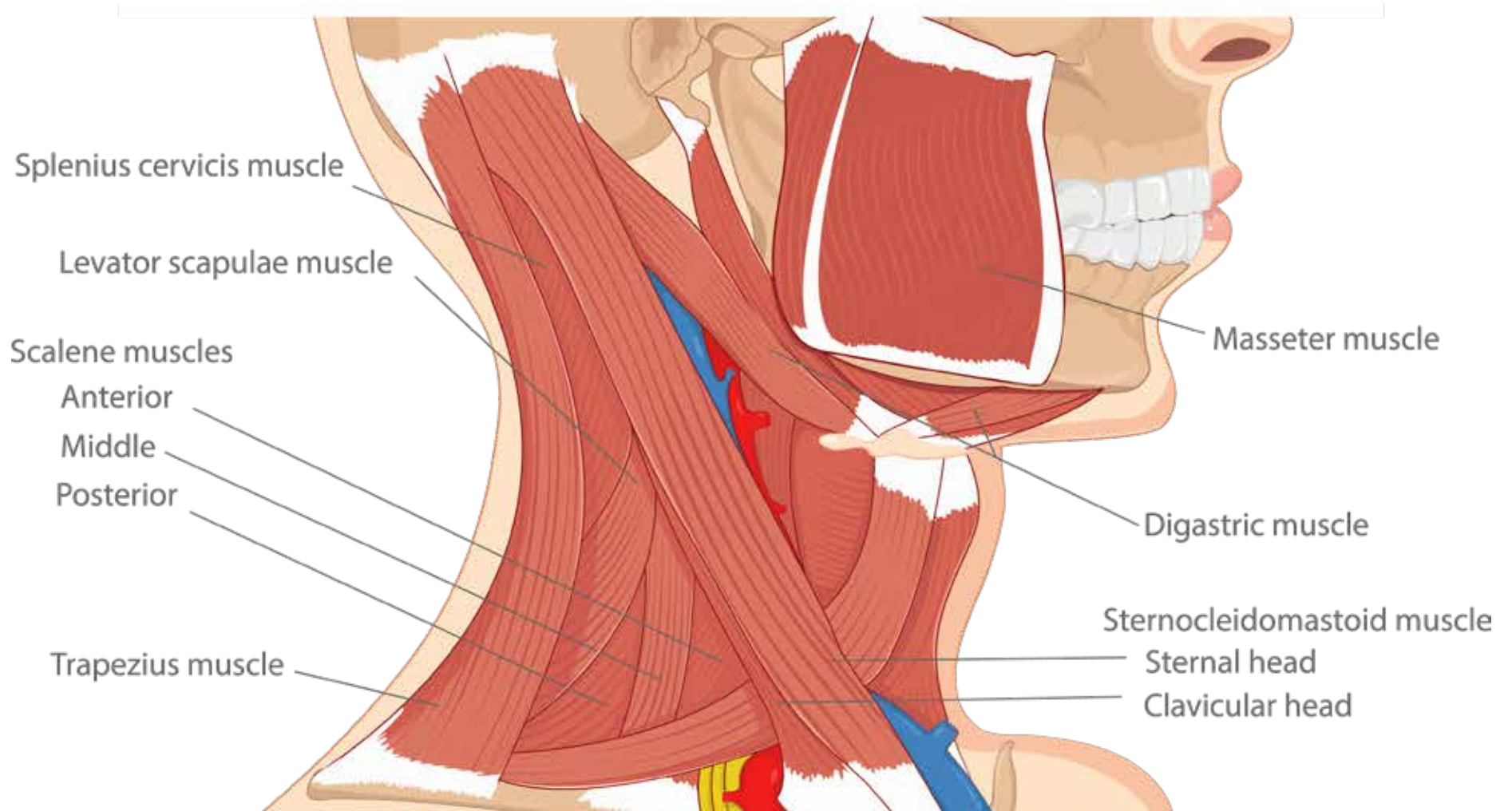
# ROTATOR CUFF MUSCULATURE



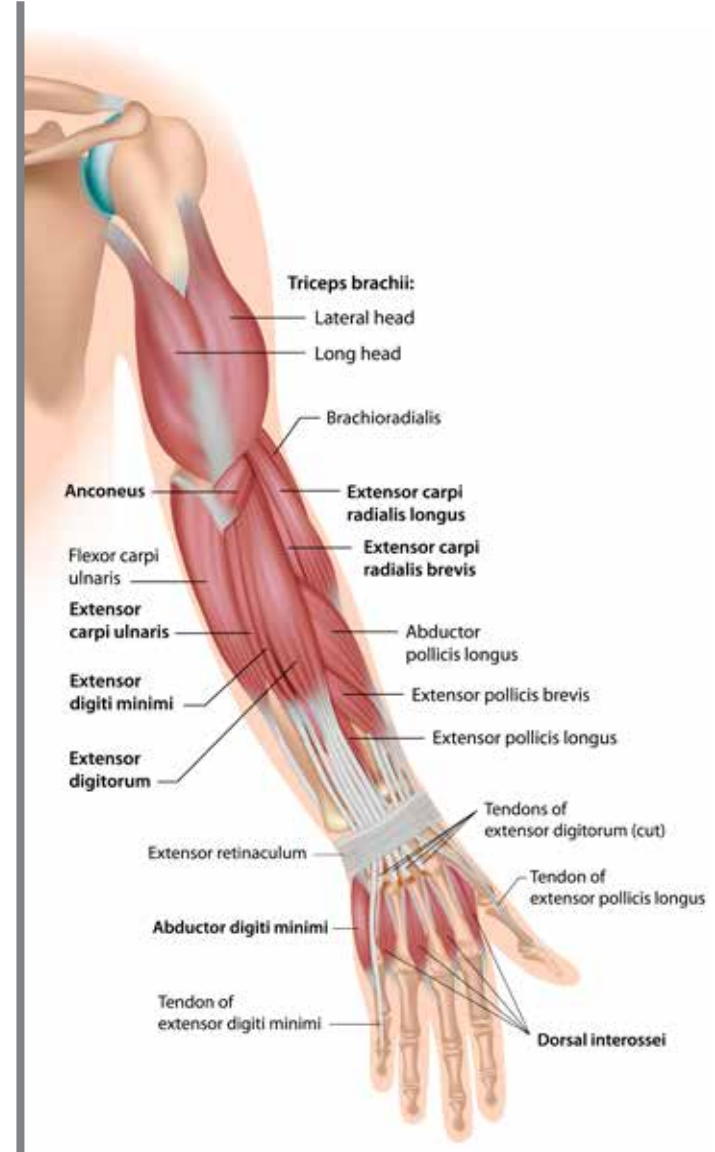
The rotator cuff connects the humerus to the scapula and is formed by the tendons of four muscles:

- Supraspinatus
- Teres Minor
- Infraspinatus
- Subscapularis

# THE LATERAL CERVICAL MUSCLES



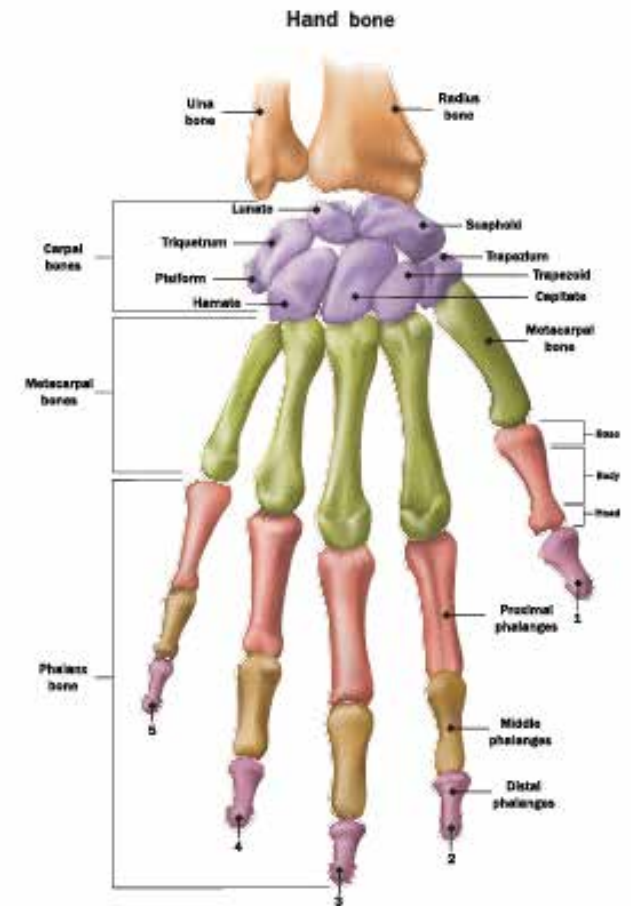
# ARM, FOREARM, AND HAND MUSCLES



# WRIST BONES AND POSITIONING IN REGARDS TO CARPAL TUNNEL

## Carpal Tunnel and Wrist Positioning

- Carpal tunnel syndrome, also called median nerve compression, is a condition that causes numbness, tingling, or weakness in your hand. Caused by pressure on your median nerve, which runs the length of your arm, goes through a passage in your wrist called the carpal tunnel, and ends in your hand.



Notes:



# LOWER CROSS SYNDROME OVERVIEW

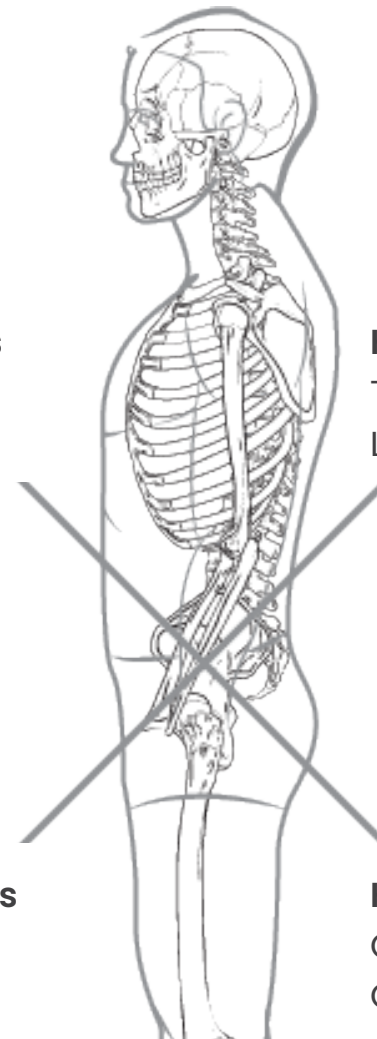
**Lower Cross Syndrome** Postural syndrome that is developed through myofascial patterning and muscle imbalances.

## Common Presentation:

- Anterior pelvic tilt
- Increased hip flexion with compensatory increased lordosis
- TL junction instability

**Hypotonic Muscles**  
Abdominals

**Hypertonic Muscles**  
Thoracic Paraspinals  
Lumbar Paraspinals



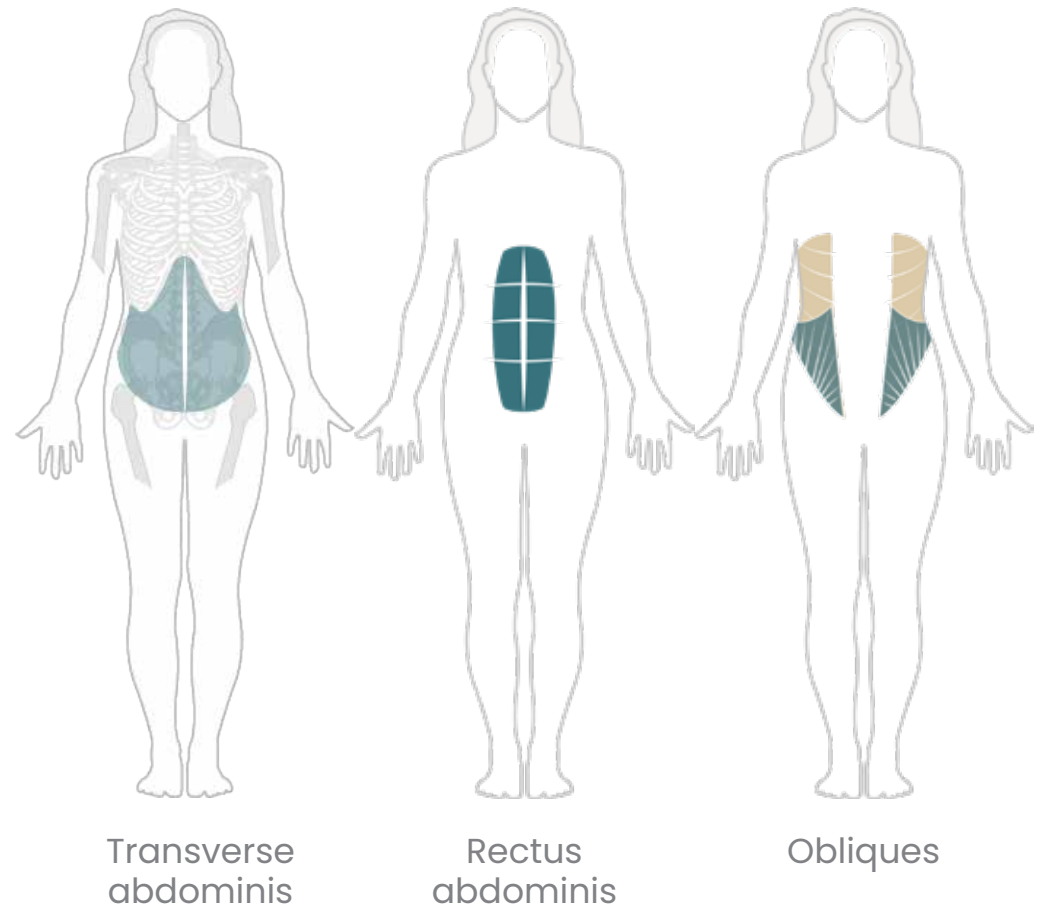
**Hypertonic Muscles**  
Iliopsoas  
Upper Rectus  
Femoris

**Hypotonic Muscles**  
Gluteus Maximus  
Gluteus Medius

# CORE STABILITY

The most important aspect of abdominal muscle performance is obtaining the control that is necessary to:

- Appropriately stabilize the spine.
- Maintain optimal alignment and movement relationships between the pelvis and spine.
- Prevent excessive stress and compensatory motions of the pelvis during movements.



ANTERIOR CORE

# STABILIZERS VS. MOBILIZERS

## What's The Difference?

### Local Stabilizers

- Provide stability for the spinal structures
- Proprioceptive
- Eccentric activity
- Tonic
- Monoarticular
- Turned "on" all the time
- White fibers/anaerobic

### Global Mobilizers

- Provide movement for specific parts of the body
- Contractile
- Concentric activity
- Phasic
- Multiarticular
- Either "on" or "off"
- Red Fibers/aerobic

# LOCAL STABILIZERS

## Function and Characteristics

- Increase segmental stiffness and control segmental movement.
- Control the neutral position.
- Contraction does NOT produce change in length and hence does NOT produce movement.
- Provides proprioceptive information on joint position, range and rate of movement.
- Activity is independent of direction and movement.
- Continuously active throughout movement.

# LOCAL STABILIZERS

## Dysfunction results in

- Muscle stiffness
- Loss of neutral positioning
- Delayed timing and recruitment
- Local inhibition leading to loss of segmental control

## Examples

- Transverse abdominis
- Lumbar multifidus
- Psoas major (posterior fasciculi)
- Middle and lower trapezius
- Deep cervical flexors (longus colli)
- Internal and external obliques

# GLOBAL MOBILIZERS

## Function and Characteristics

- Generate torque to produce movement
- Produce joint movement, especially movements in the sagittal plane
- Tend to contract concentrically (or shorten)
- Absorbs shock
- Non-continuous activity throughout movement

# GLOBAL MOBILIZERS

## Dysfunction Results In:

- Muscle spasm and/or trigger points.
- Loss of muscle length (shortening) limiting accessory and/or physiological range of movement.
- Overactive low threshold, low load recruitment.
- Global imbalance due to shortened and overactive mobilizing muscles resulting in “over-pull” at a motion segment.

## Examples:

- Rectus abdominis
- Iliocostalis (can lead to “buckling” in back)
- Hamstrings
- Latissimus Dorsi
- Levator Scapulae
- Scalenes (anterior, medius and posterior)
- Serratus anterior

# JANDA APPROACH TO TREATMENT OF MUSCLE IMBALANCE AND MOVEMENT IMPAIRMENT

## INCREASE ENDURANCE IN REPETITIVE COORDINATED MOVEMENT PATTERNS

Since fatigue is a predisposing factor to compensated movement patterns, endurance is also more important than absolute strength. Exercises are performed at low intensities and high volumes to simulate activities of daily living.

# JANDA APPROACH TO TREATMENT OF MUSCLE IMBALANCE AND MOVEMENT IMPAIRMENT

## INCREASE AFFERENT INPUT TO FACILITATE REFLEXIVE STABILIZATION

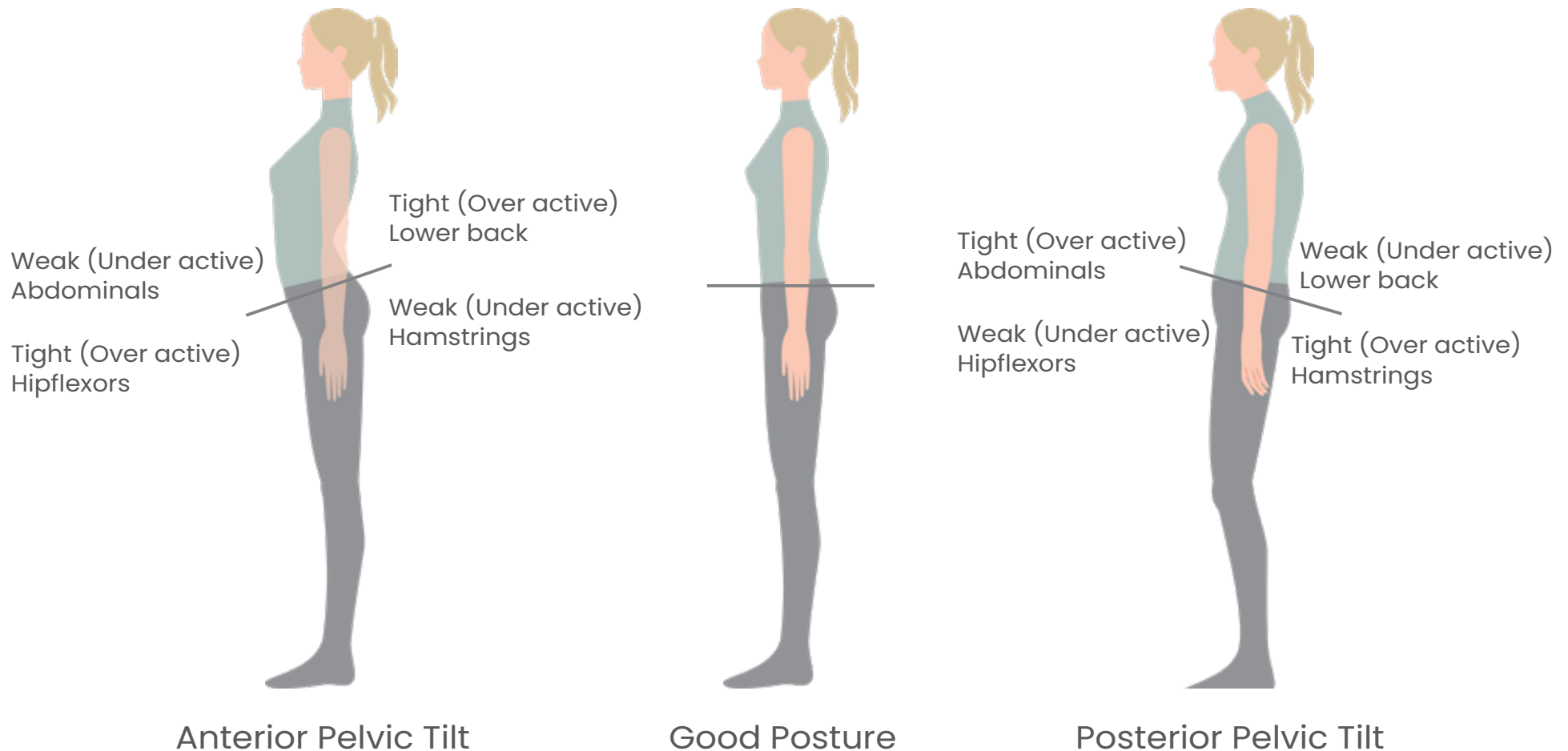
Once muscle balance has been addressed, Janda stresses increasing proprioceptive input into the CNS with... Sensorimotor Training (SMT) (Janda & Vavrova, 1996). Increase afferent information entering the subcortical pathways (including spinocerebellar, spinothalamic, and vestibulocerebellar pathways) to facilitate automatic coordinated movements. SMT involves

progressive stimulation through specific exercises with increasing level of challenge to the sensorimotor system. SMT has been proven to improve proprioception, strength, and postural stability in ankle instability (Freeman et al. 1965), knee instability (Ihara & Nakayam, 1996), and after ACL reconstruction (Pavlu & Novosadova, 2001).

# MUSCULAR IMBALANCES AND PELVIC TILTING

Muscle Imbalance causing lower back pain. Hyperlordosis, Hyperkyphosis, Pelvic Tilting, And Muscle Imbalances.

## MUSCLES THAT CONTROL PELVIC TILT:



# THE STERNAL CRUNCH

- Beginning in a neutral spine position, take a deep breath in and feel how your lower ribs and chest lift up.
- Next take a full exhale breath out and perform a slight sit-up by lifting your upper torso off the ground.
- Feel your upper abdominals engage as the sternum does mini-crunch at the zyphoid process.
- Notice how your lower ribs move down as if the front ribs were moving toward the back ribs while the lateral rib cage flattens out to the sides.
- You will also notice that your low back flattens out a bit when performing this motion, but be certain to keep the pelvis in a neutral position. Make sure there is no anterior pelvic tilt.
- Try to perform this crunch isometrically without raising or curling the upper torso. This is the “sternal crunch.”
- Now add the abdominal brace (described on the next slide) and hold both techniques without holding your breath. This is not easy! But, this is the most effective way to co-contract the abdominal muscles and the best current scientifically proven method of improving spinal stability. Adapted from (Liebenson, 2007).

# ABDOMINAL BRACING

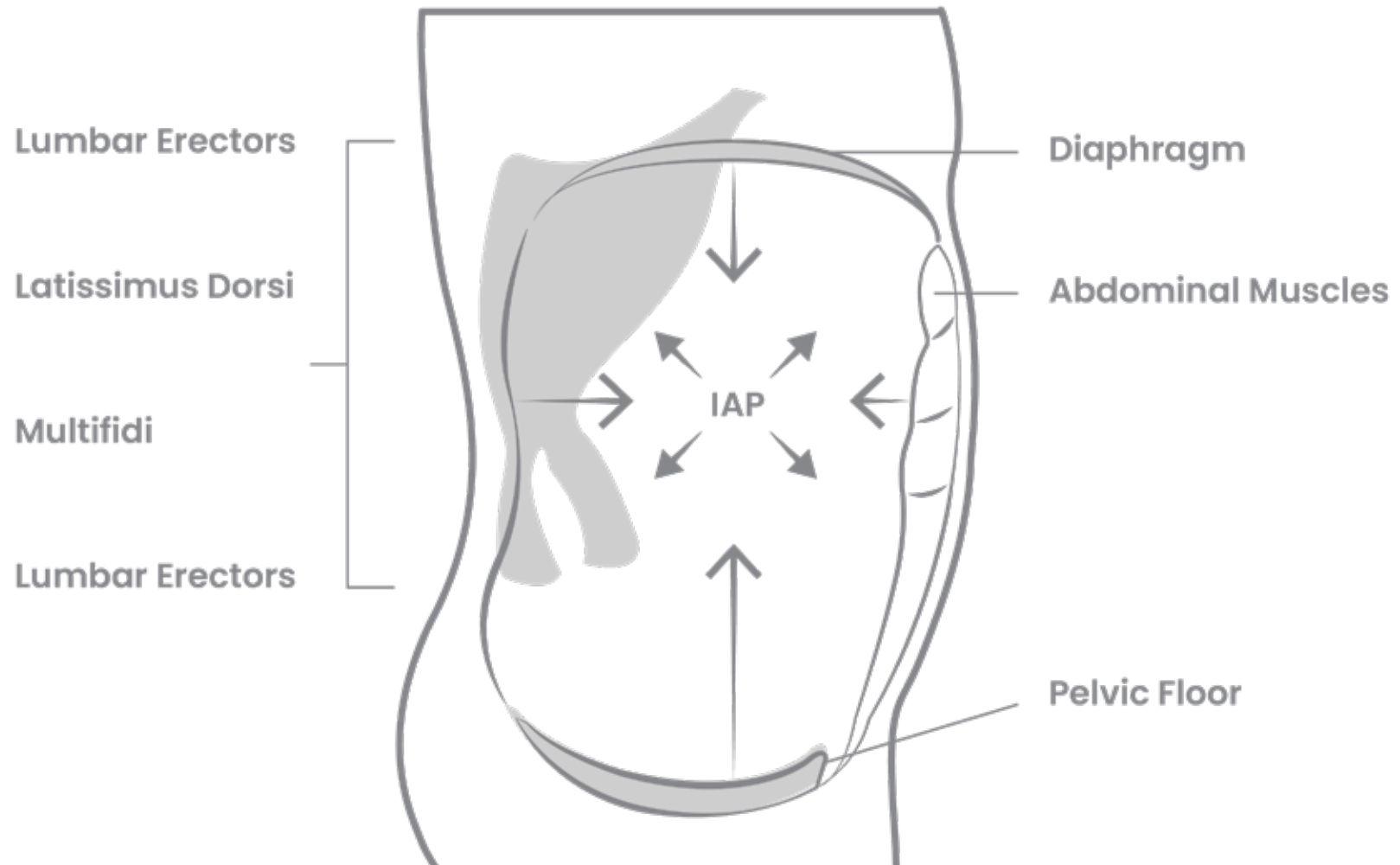
- Beginning in a neutral spine position, bisect the top of the ilium and the 12th rib. Go medial from there ½" to 1" and push your fingers into the soft spot of the abdomen as if they were knife edges. Then, use the lateral contraction of the abdominal musculature to push the fingers out. For further reference, try laughing and notice how each bellow of laughter pushes your fingers and sides outward. This is the first action we are aiming at training – a lateral brace.
- Next contract your anterior abdominals as if bracing for a punch or as if someone were going to drop a weight on your stomach. Don't suck them in; brace and clench them. Feel the abs harden and stick out a little. Concurrently, brace posteriorly while remaining in a neutral spine and feel the lumbar extensors harden.
- Contract the abs in all directions and you have a girdle of support all the way around your spine from back to front. The abs have three layers; contracting them hard in this way makes all the layers stiffen together, for an extra-stiff or solid effect similar to the layered stiffness of plywood. You've locked your ribcage to your pelvis, or locked in the neutral spine. This is the "abdominal brace." Adapted from (Mason, 2009).

“When the spinal curves are maintained, it is considered the most energy-efficient position for the body to stay upright against the forces of gravity and other extrinsic forces.”

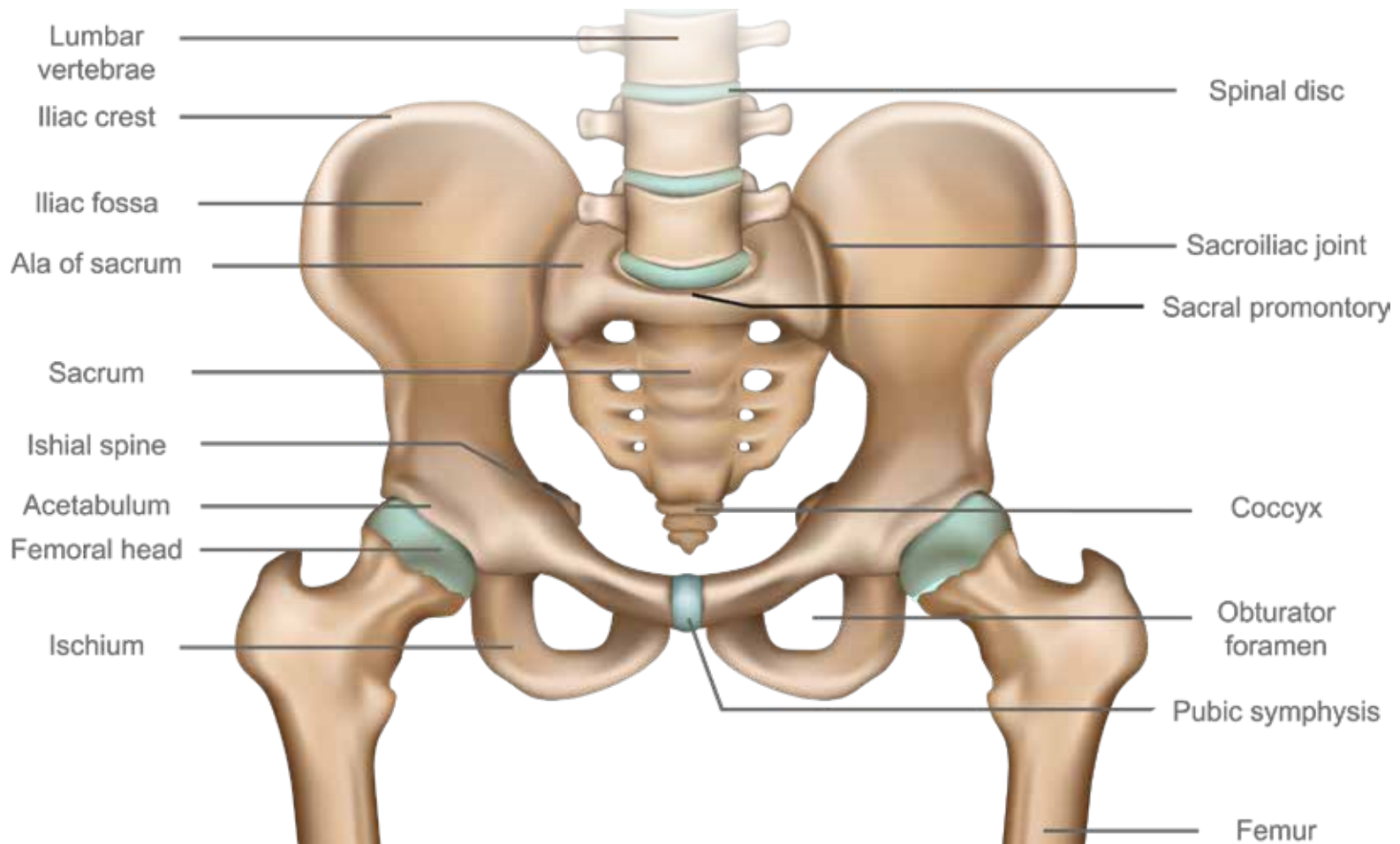
Richardson, Hodges, and Hides 2004; Wallden 2009

# ABDOMINAL PRESSURE

## IAP: Intra Abdominal Pressure



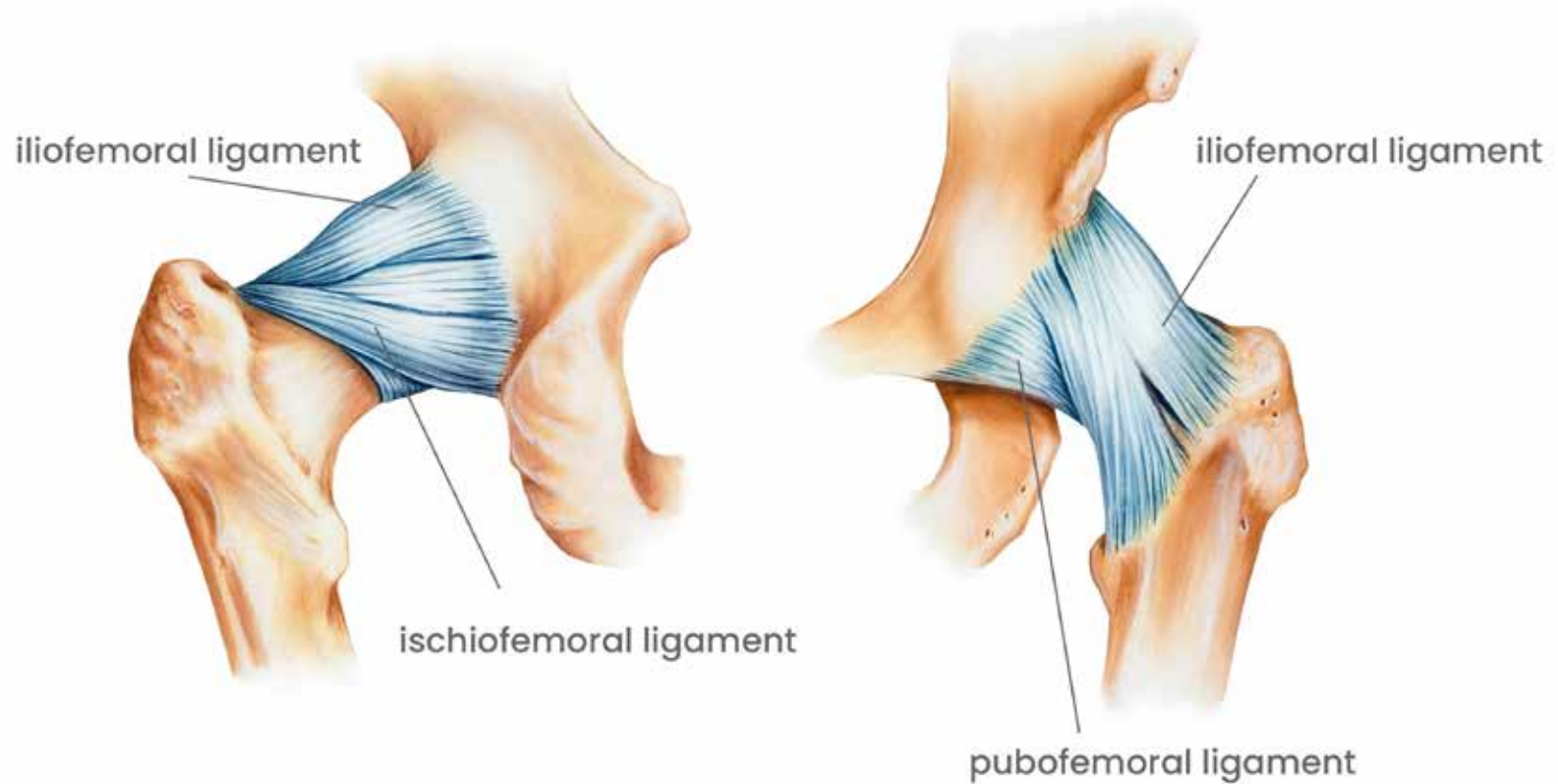
# HIP JOINT OVERVIEW



Notes:

# HIP AND THIGH

## LIGAMENTS OF THE HIP



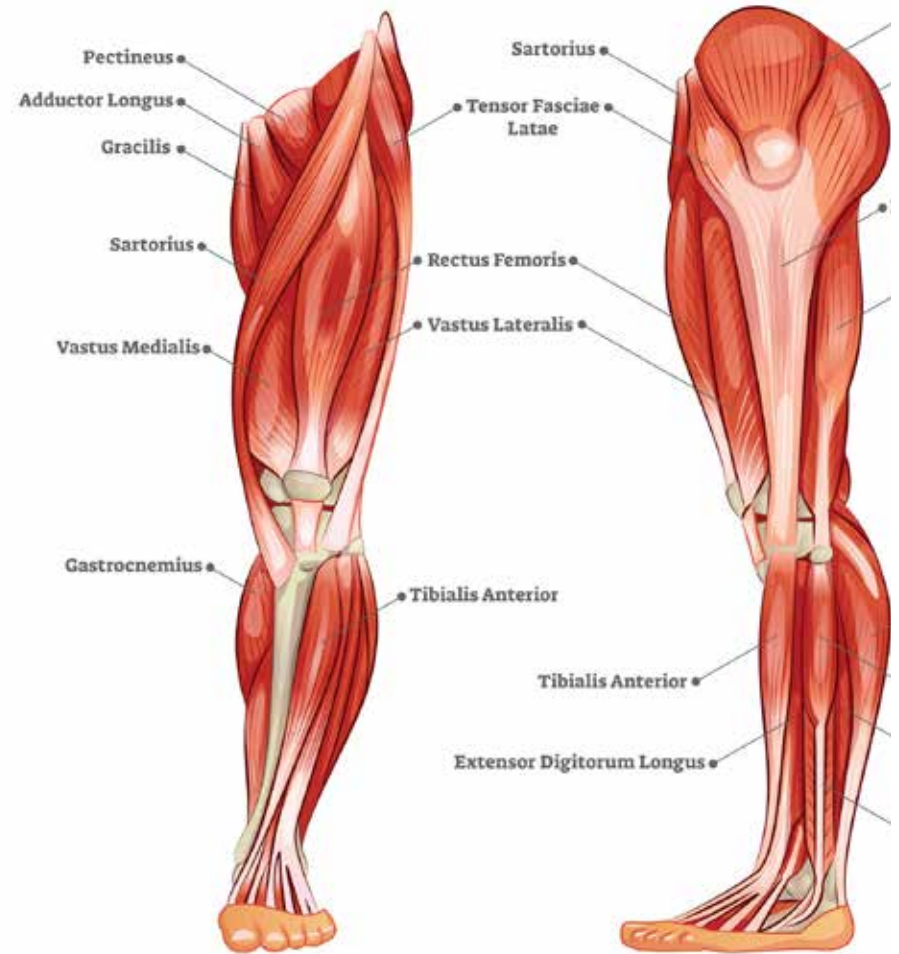
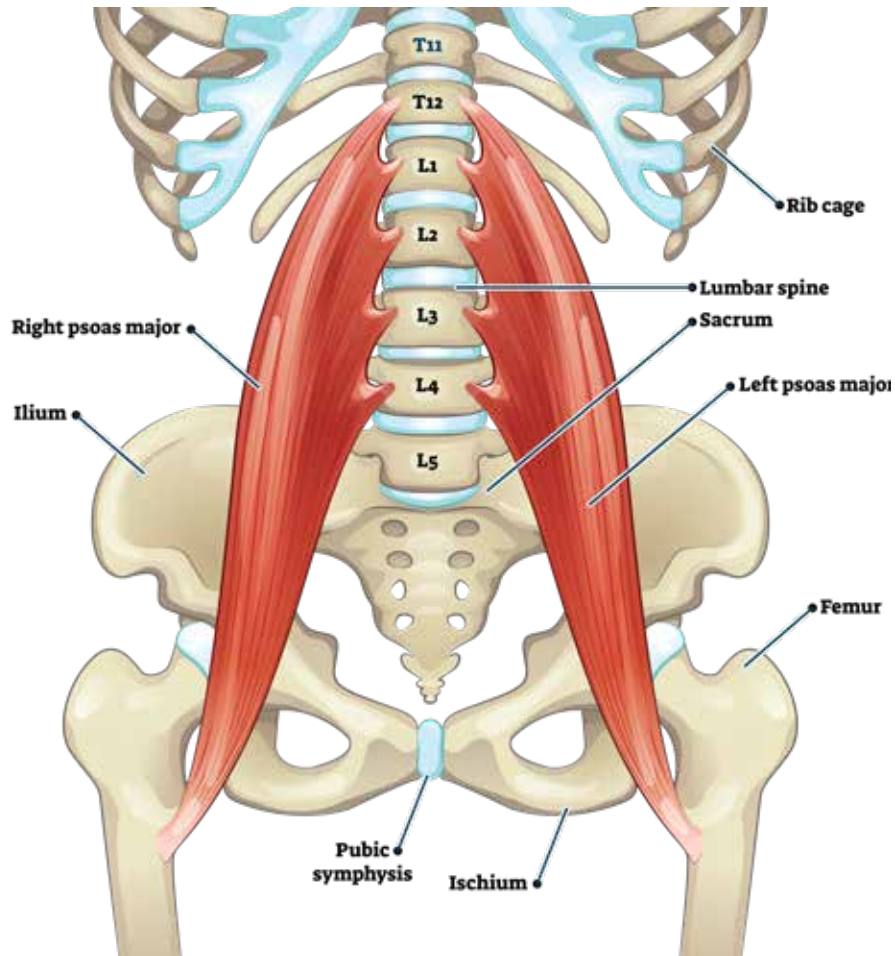
Notes:

# CLOSED CHAIN VS. OPEN CHAIN

- A closed kinematic chain occurs when the hands or feet are fixed on the floor. If one part of the chain is not working properly the whole closed chain is affected.
- An open kinematic chain is evaluated in the non-weight bearing position whereby the joint motions can be tested independently.

Notes:

# ANTERIOR HIP AND THIGH



Notes:

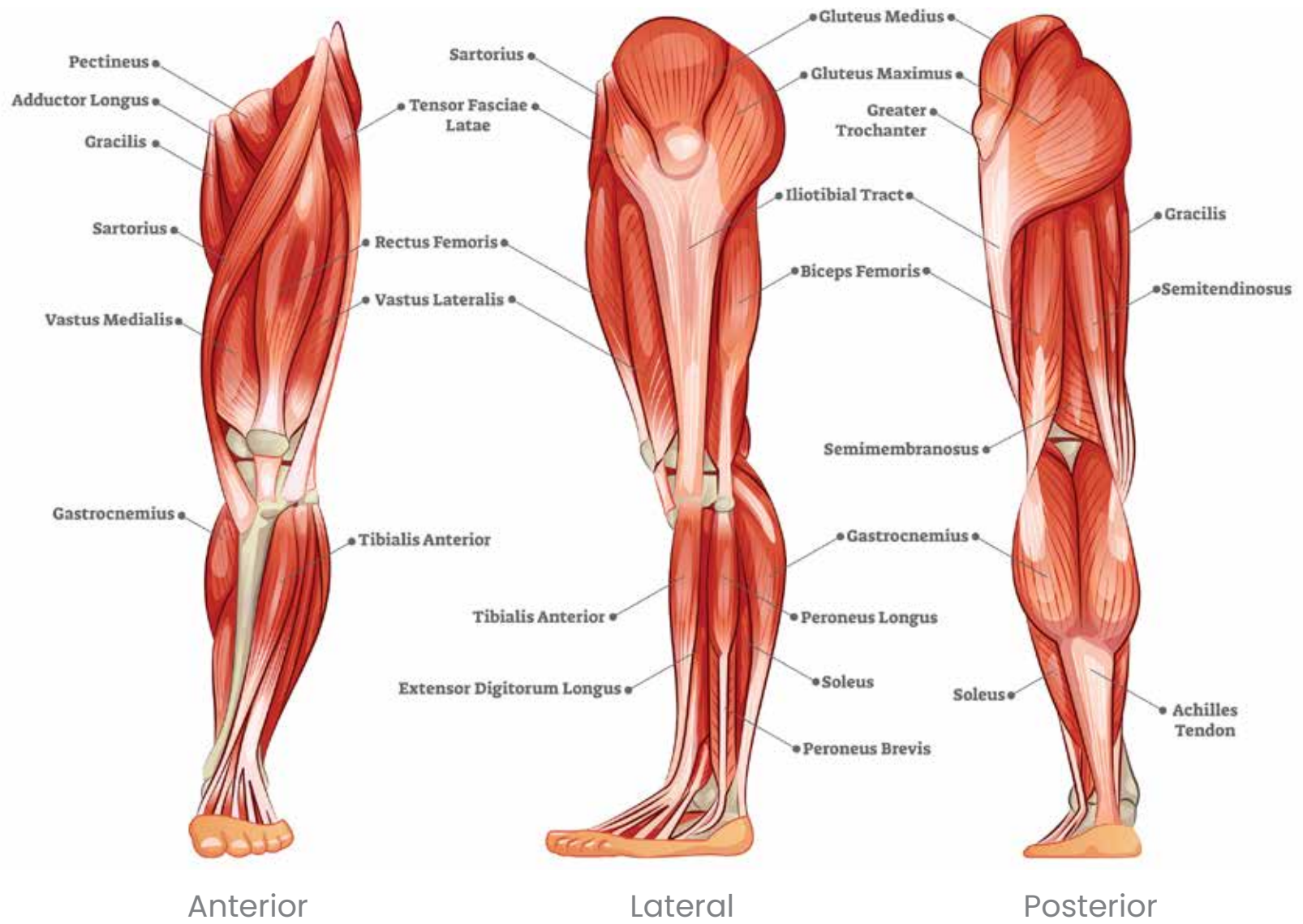
# THE PSOAS

- Primary Action: Hip Flexion
- Secondary Actions: Maintains upright posture, extends L/S while standing, flexes L/S when bending forward, lateral rotation
- Dysfunctional Pain Distribution: Unilateral – vertical along one side, Bilateral – horizontal on both sides
- Stretching: “The effect of rotation on the [psoas] muscle could influence the optimal stretch position. Electrophysiological studies revealed that neither the iliacus nor the psoas was activated during medial rotation of the thigh at the hip, but both muscles often were active during lateral rotation...based on these results, the optimal stretch position would avoid lateral rotation and would place the limb in either neutral or in medial rotation.”

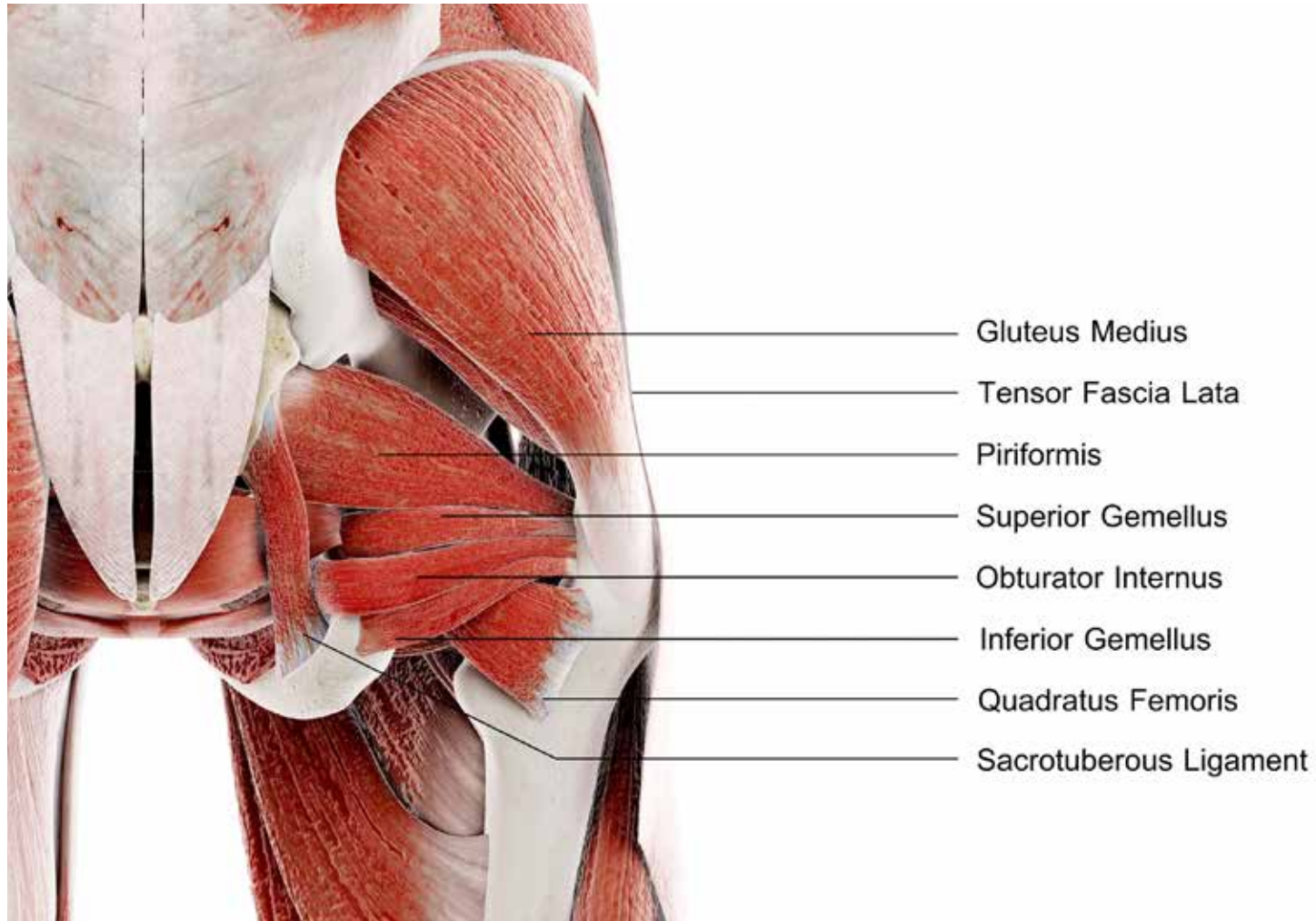
## UDDIYANA BANDHA AND THE CORE

- While it still may be applied for energetic purposes, the abdominal hollowing procedure, known in yoga as uddiyana bandha (the belly lock), was the most ineffective stabilization maneuver for control of spine motion and stability [when compared with abdominal bracing and a natural spine strategy] (Lederman, 2009).
- In addition, it has been reported that “the instability of the hollowing position reduces the potential energy of the spinal column causing it to fail at lower applied loads” (McGill, 2009) and “there seems to be no mechanical rationale for using an abdominal hollowing...to enhance stability” (Grenier, 2007).
- On the other hand, the previously described abdominal bracing technique improved stability [over hollowing] (Lederman, 2009) and “bracing creates better patterns that better enhance overall stability” (Grenier, 2007) providing that the yoga practitioner has no preexisting spinal compression issues like disc pathology or neurologic compromise.

# HIP AND THIGH



# POSTEROLATERAL HIP AND THIGH



Notes:

# THE PIRIFORMIS

## Piriformis Action

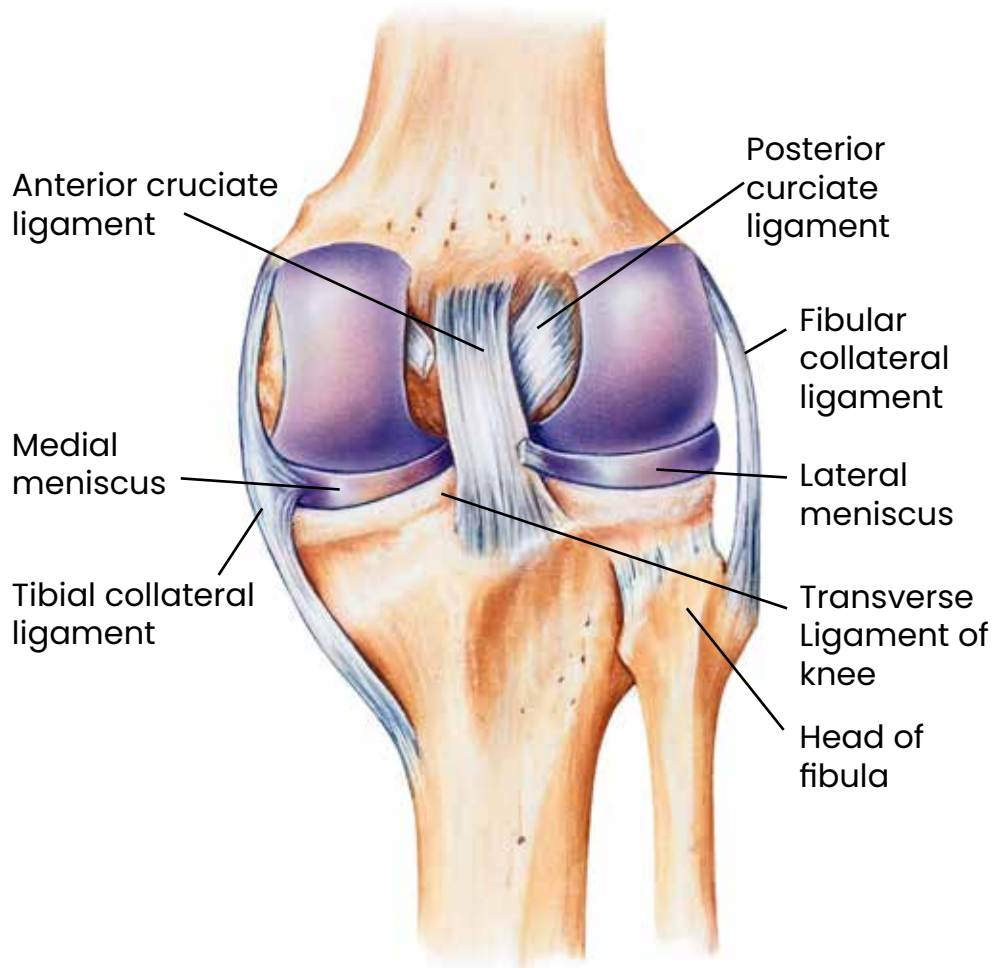
- The degree of flexion of the thigh profoundly affects the function of the piriformis:
- With the hip neutral, piriformis is a lateral rotator contributing some extension and hip abduction.
- With the hip flexed to 90 degrees, piriformis horizontally abducts the thigh.
- At full hip flexion, piriformis rotates the thigh medially.

## Piriformis Syndrome

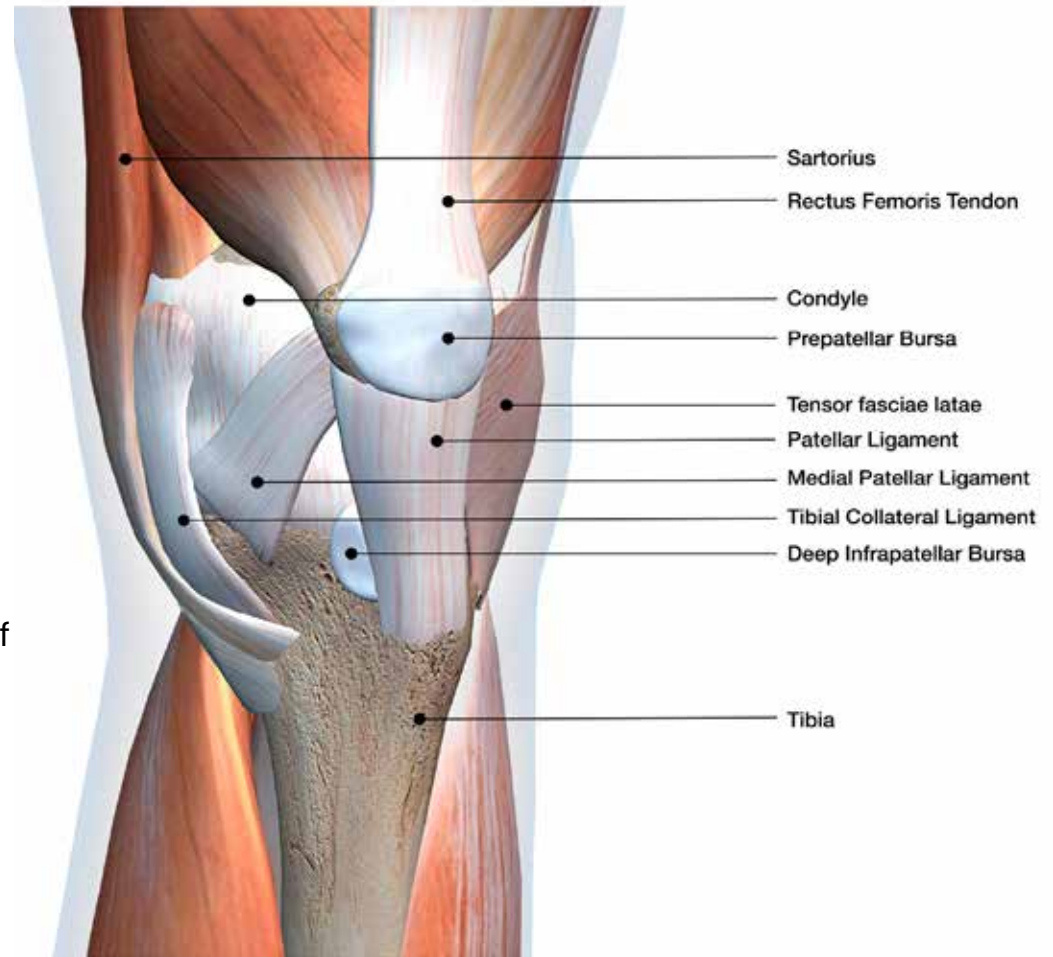
Three potential components include:

1. Myofascial pain referred from trigger points in the piriformis muscle.
2. Nerve and vascular entrapment by the piriformis muscle at the greater sciatic foramen.
3. Dysfunction of the SI joint.

# KNEE JOINT OVERVIEW



LEFT KNEE IN FLEXION  
ANTERIOR VIEW



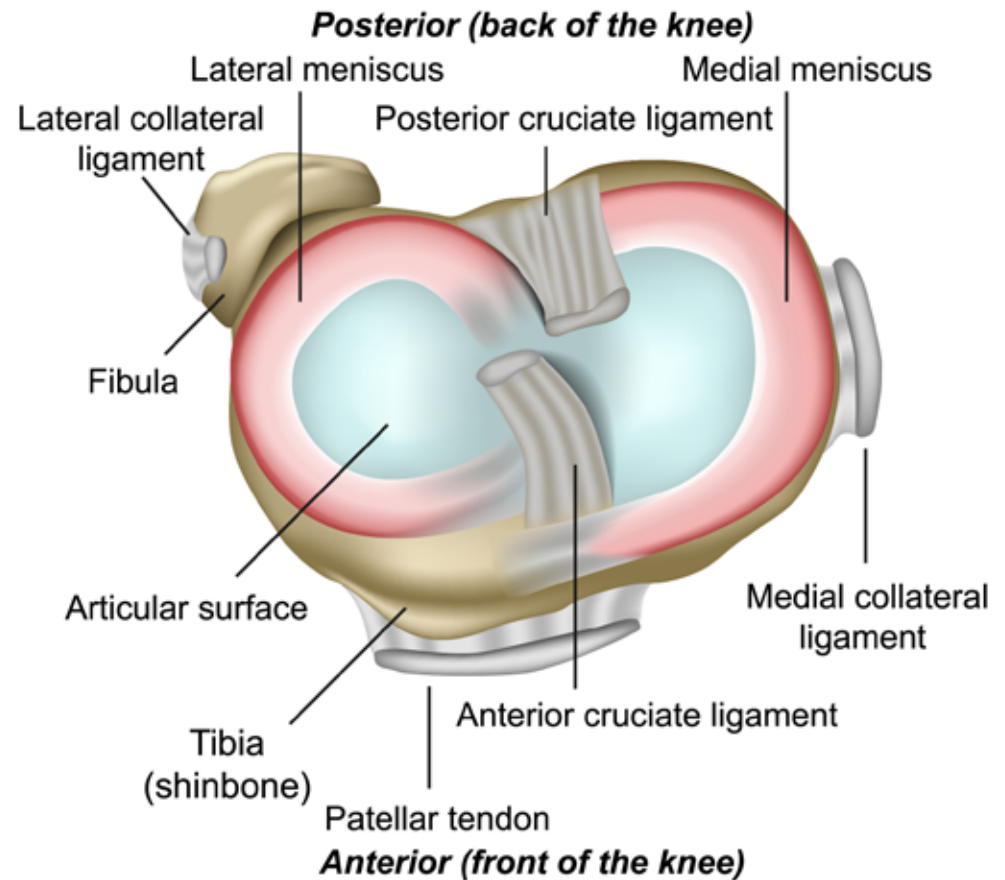
KNEE JOINT  
ANTERIOR VIEW

Notes:

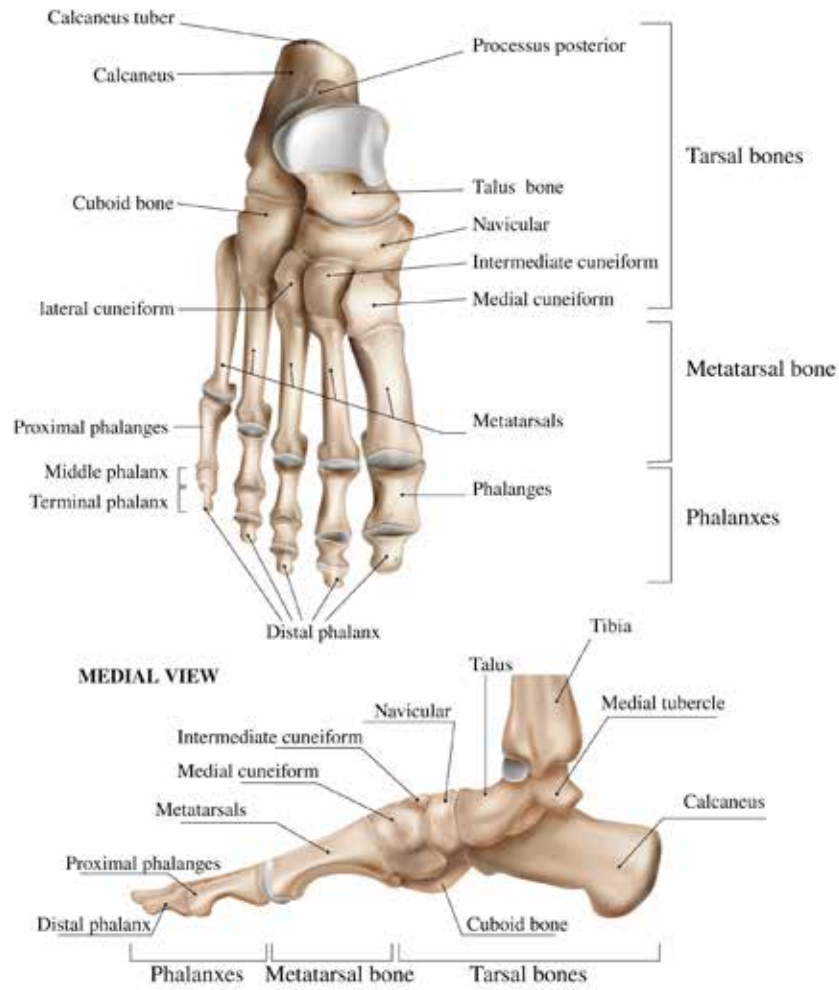
# THE MENISCUS

- Meniscus tears are one of the most common knee injuries.
- Person complains of knee joint pain, clicking, giving way, and occasionally locking.
- There may have been multiple knee pain episodes that previously resolved. There is usually a final episode that prevents activities and sports, or the pain is no longer tolerable.
- Mechanism of injury can be similar to ACL injuries and may have rotary movement such as a quick change of direction (e.g. tennis, soccer, accidental slip/fall, basketball, transitions between yoga poses).

## THE MENISCUS



# ANKLE AND FEET



Notes:



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