



Dance Medicine

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OMED

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Learning Objectives

- To familiarize the practitioner with the field of Ballet and other dance forms
- To understand the anatomical, physiological and emotional challenges facing dancers today
- To comprehend the vital role of proper alignment in injury prevention
- To have an understanding of “core strengthening”
- To recognize common lower extremity and low back injuries seen in dancers and other athletes and understand their treatment options.



*If you can imagine it, you can achieve it.
If you can dream it, you can become it.*

WILLIAM ARTHUR WARD

Types of Dance

- Tap Dance
 - High Impact dance where sound and rhythm is created using metal attachments connected to the bottom heel and forefoot of shoes.
 - Care with flooring

Tap Shoes



Tap



Modern Dance

- Legs in parallel and turned out
- Dynamic dance that utilizes contraction-release of trunk
- No shoes
- Direct pressure on knees, many movements on floor
- Martha Graham, Horton, Limon, Alvin Ailey

Modern Dance



Modern Dance



Martha Graham



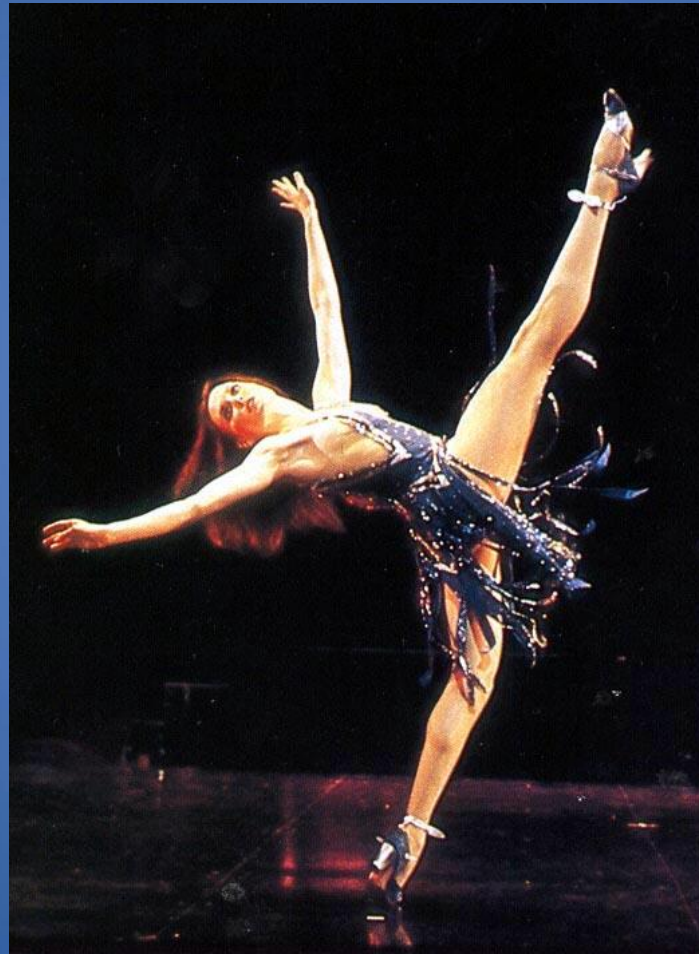
Jazz Dance

- Legs may be in parallel or turned out
- Contemporary dance, performance-theatrical
- Flexibility, dynamic, many forms
- Back injuries, Hip and Knee
- Dance shoes may have suede-leather soles, character shoes, heels or flats

Jazz dance



All That Jazz!



Ballet Is The Base Of All Dance



Alignment and Postural Balance is Key for all Athletes

- Dancers are Athletes
- Avoid injury Cascade
- Anatomical Structure for variable sports
- One instrument out of tune can ruin an entire orchestra
- Faulty biomechanics, postural imbalance, over use-training errors, trauma and compensation for anatomical limitations leads to injury

The Quest for the Perfect Body



Ballet



first position



second position



third position



fourth position



fifth position

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Ballet

- The foundations of ballet training are needed for all dance forms
- Ballet movements are all in the turned out (ER) (hip-70d, knee-tibia 5d, foot-15d) position.
- Dancers attempt to compensate for faulty turn out which leads to malalignment, poor biomechanics and ultimately injury.
- Many Dance instructors force students toward 180 degrees of turn out.

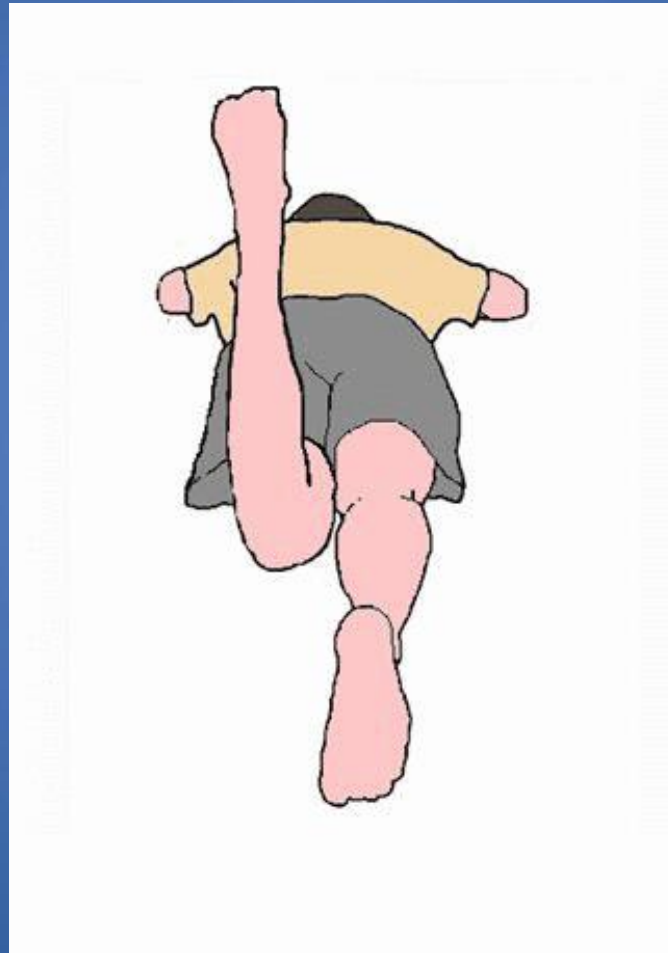
Hip Rotation

- Retroverted femoral head-neck angle preferred for ballet
- Anteverted femoral head-neck angle associated with internal rotation, toe-in, tibial torsion....usually decreases naturally by age 8

Assessment of Hip Rotation



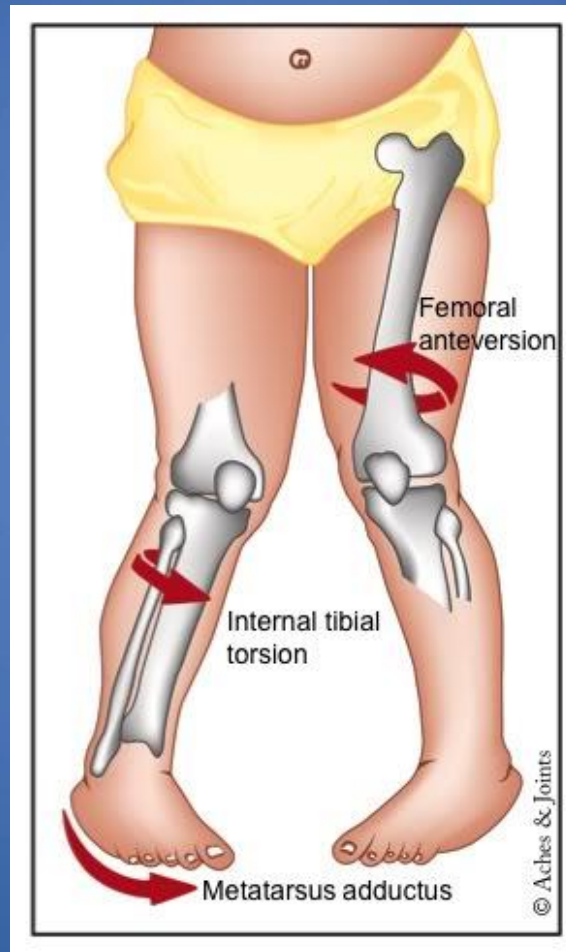
Hip Rotation Assessment



Tibial Torsion

- Internal Tibial Torsion associated with club foot Osgood Schlatter's Dz. And pat-fem instability
- Line of tibial tuberosity through 2nd metatarsal ray with patient sitting and legs hanging off examination table
- Angle Decreases until puberty

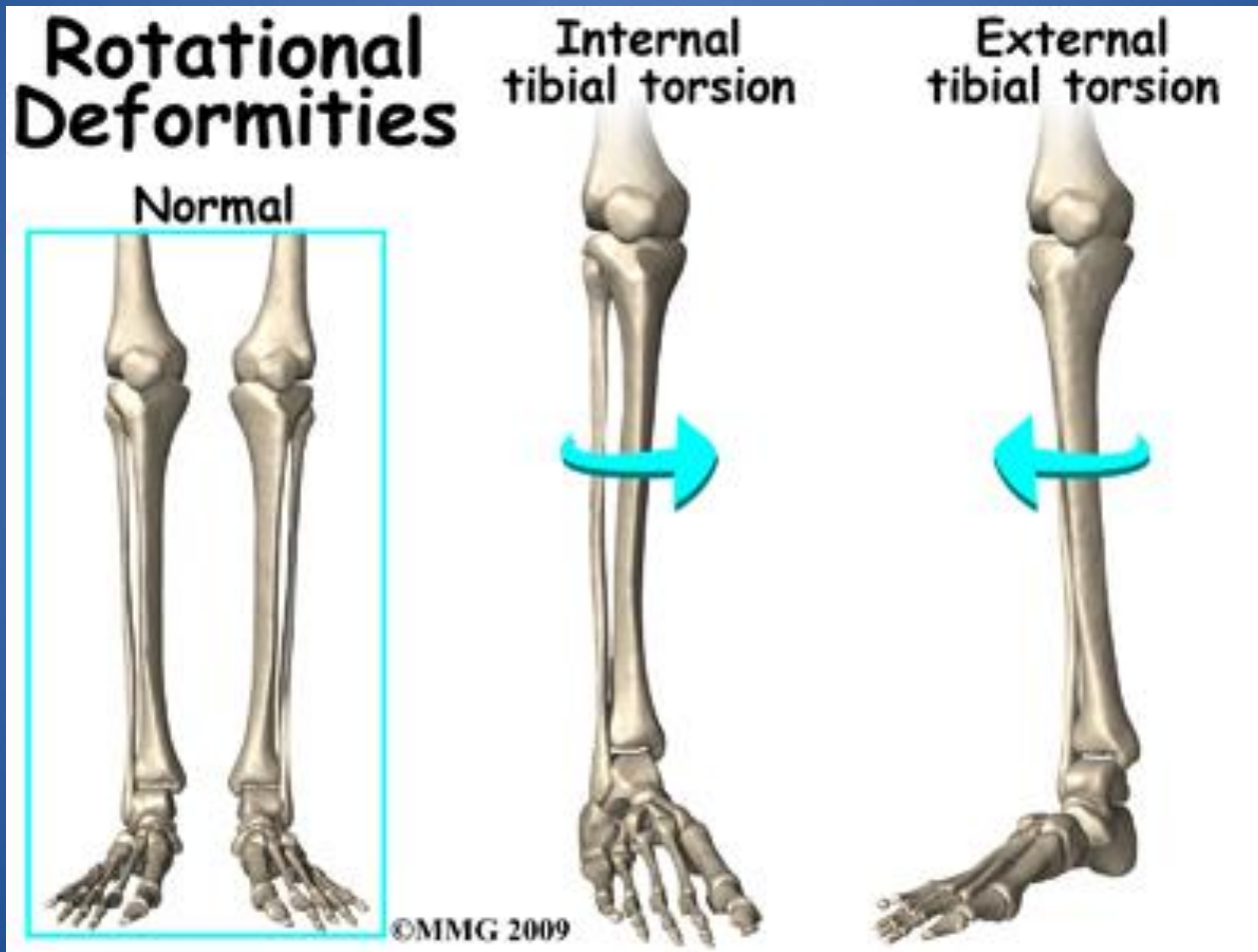
Terrible Triad



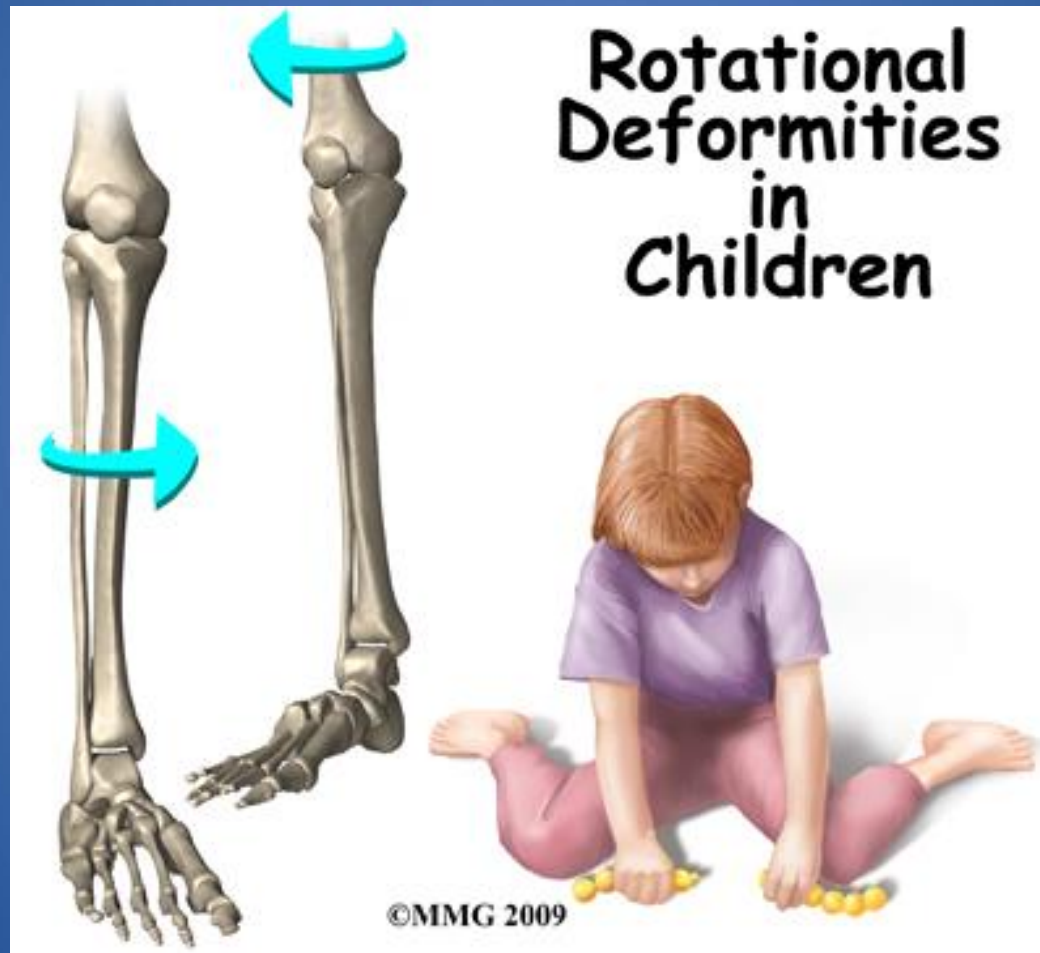
Internal Tibial Torsion



Tibial Torsion



Tibial Torsion

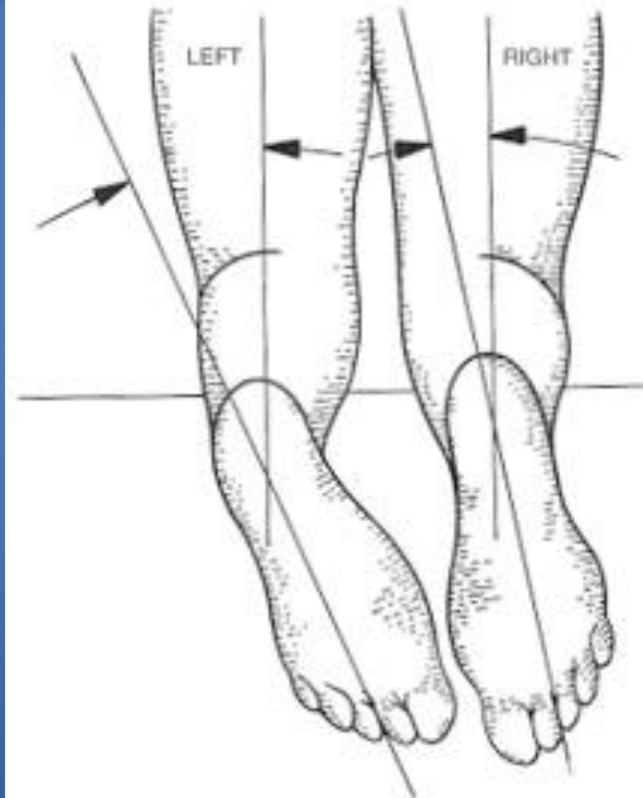


Evaluation of tibial torsion



Assessment of Tibial Torsion

FIGURE 2: Measurement of thigh foot angle with patient in the prone position and knees flexed. Normal external rotation of 10° on the right and an example of internal rotation of 25° on the left side.



Compensation for Limited External Rotation in Ballet

- In an effort to gain increased external rotation of the lower extremities, dancers “cheat” by using faulty body mechanics which leads to poor postural alignment and muscle imbalance placing the dancer at risk for injury.
 - Anterior pelvic tilt (increased lumbar lordosis)
 - Screwing the knee (mm, mcl damage)
 - Foot pronation aka: Rolling in (calcaneal apophysitis, lig laxity, weak intrinsic foot muscles, tendon-synovial sheath irritation, shin splints, FHL and post tibial tendonitis, plantar fasciitis and strain to knee, subtalar and mid tarsal joints)

Ok....So, Can I Improve My Turn Out?!?!?

According to William Hamilton, MD...with proper stretching and strengthening, only modest gains could be expected. Early training might have mild influence on turn out, but by age 12-13 an individuals turn out is primarily established.

Sorry!



Things Could Be Worse!



Strengthen Hip External Rotators

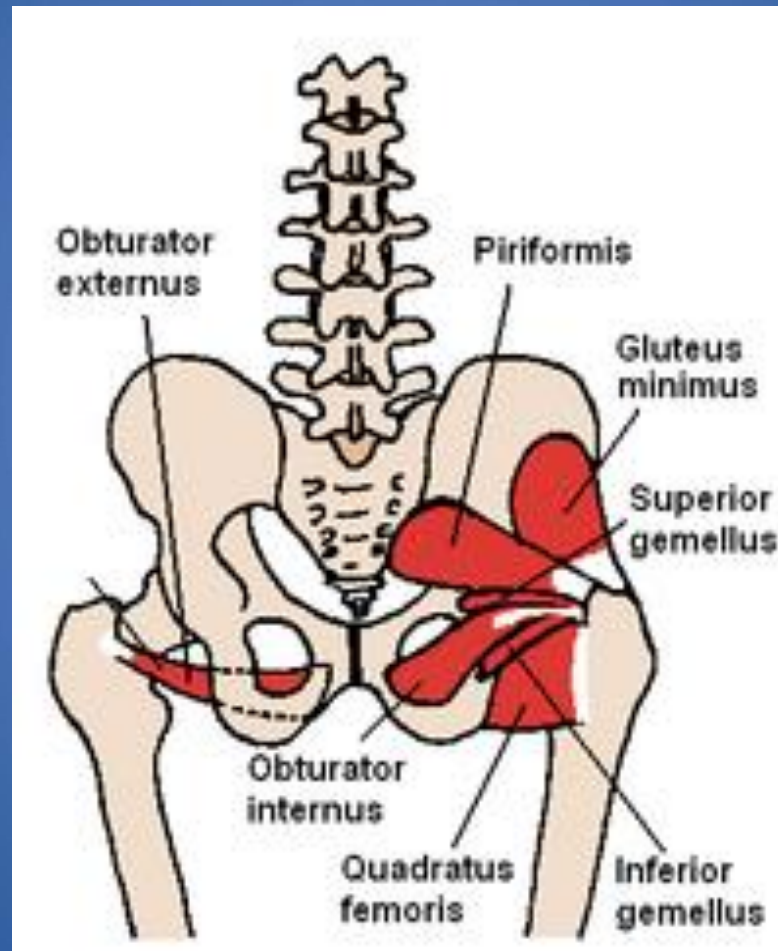
- Piriformis
- Gemellus (superior and Inferior)
- Obturator (Externus and Internus)
- Quadratus Femoris

Above are the 6 Deep External Rotators of the Hip

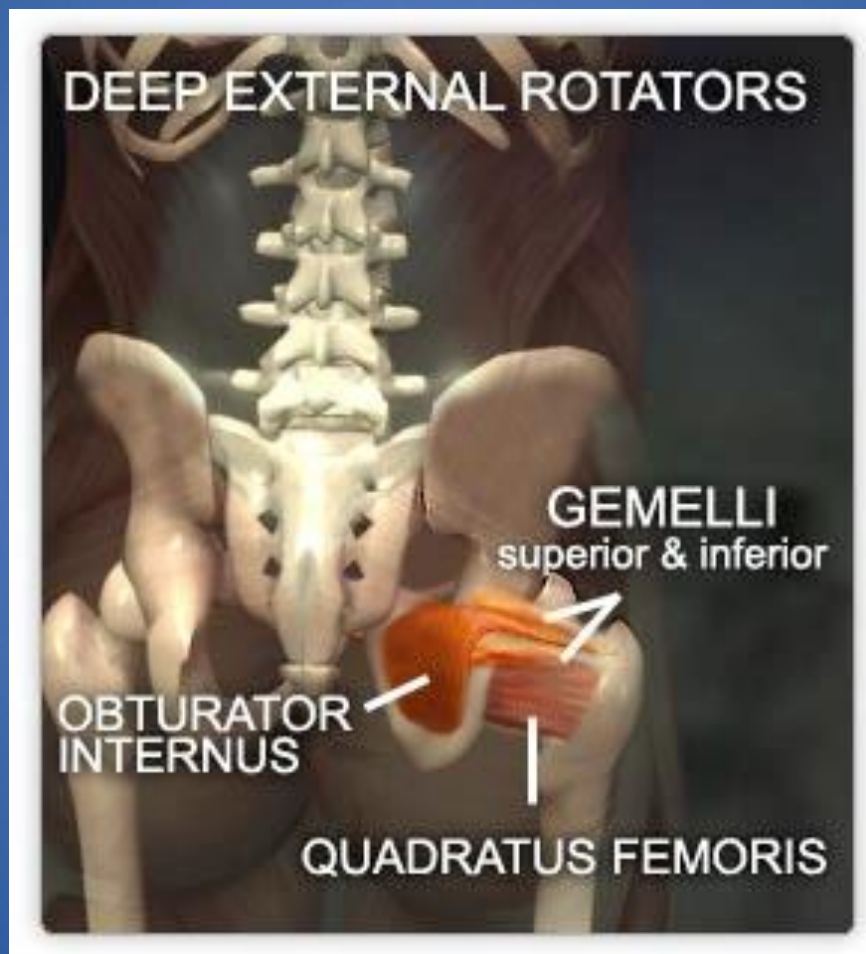
External Hip Rotators continued

- Psoas
- Iliacus
- Sartorius
- Gluteus Maximus
- Gluteus Medius (posterior portion)
- Biceps Femoris (with hip extension)

Deep External Rotators of the Hip



E.R of Hip



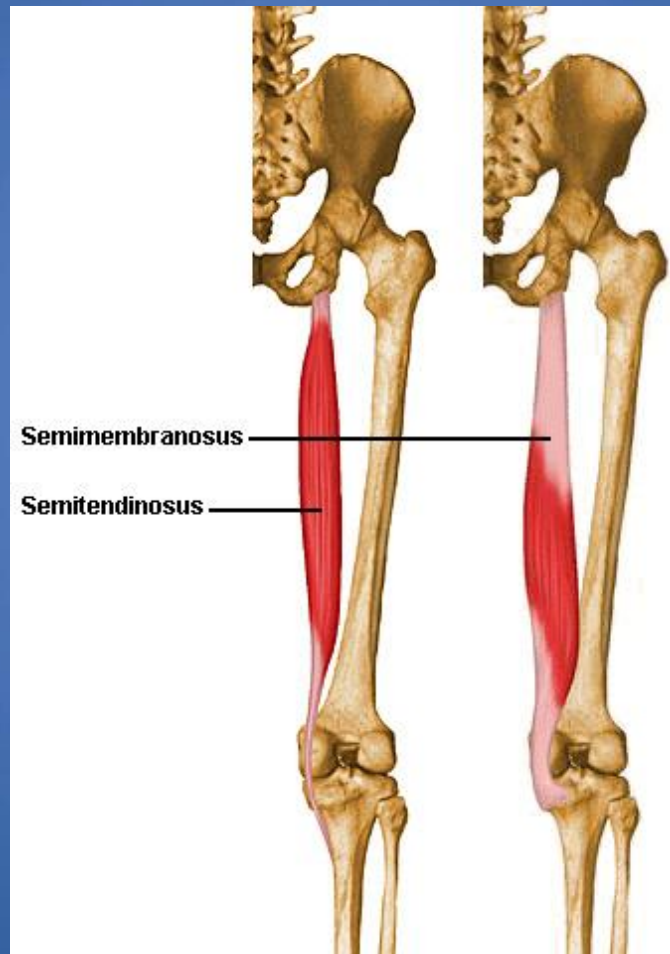
Stretch Internal Rotators of the Hip

- Gluteus Minimus and Medius Muscles
- TFL
- Adductor Longus and Brevis Muscles
- Semitendinosus Muscle
- Semimembranosus Muscle

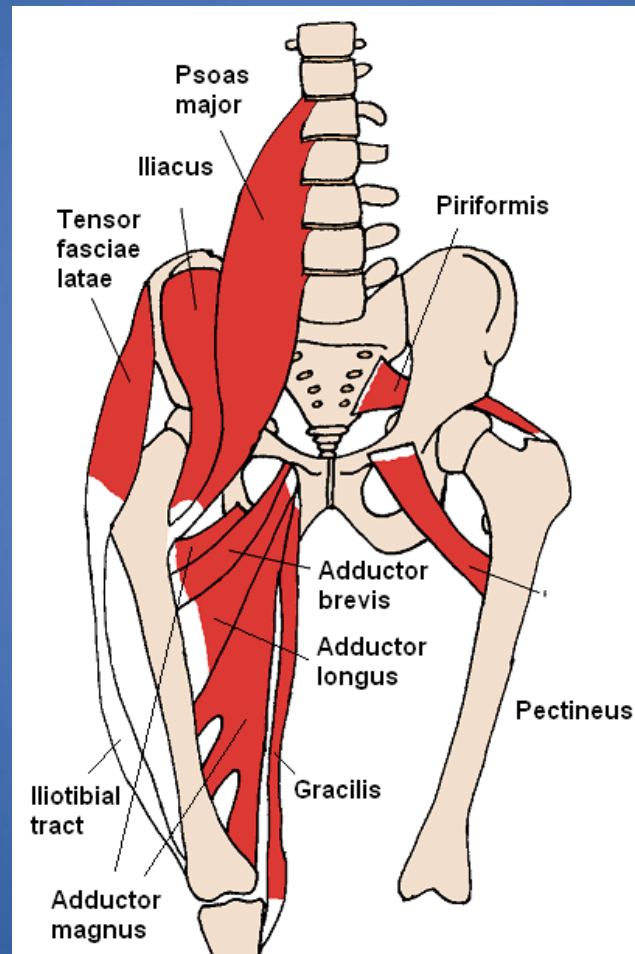
Tensor Fascia Lata



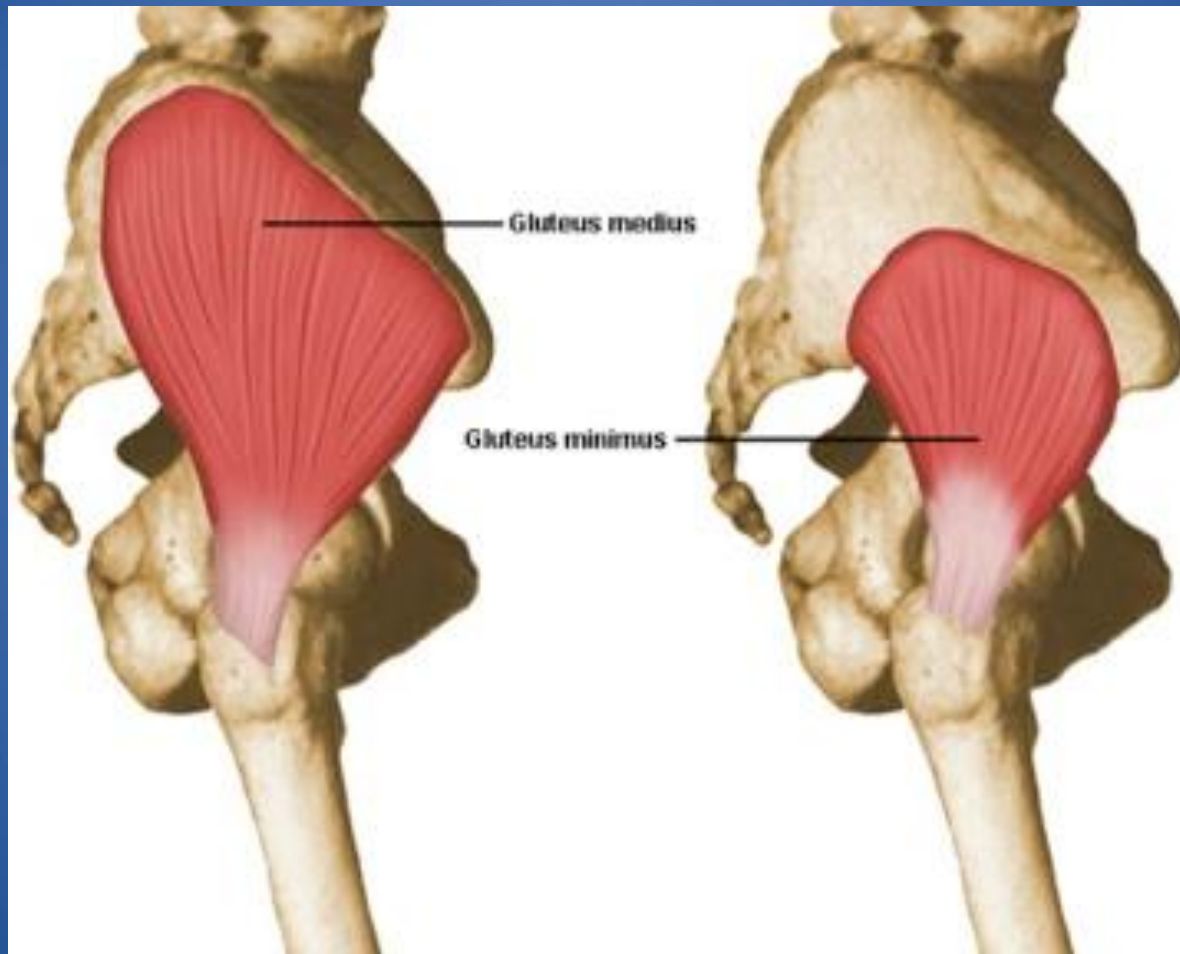
Semitendinosus and Semimembranosus Muscles



Adductor Longus and Brevis muscles



Gluteus Medius and Minimus



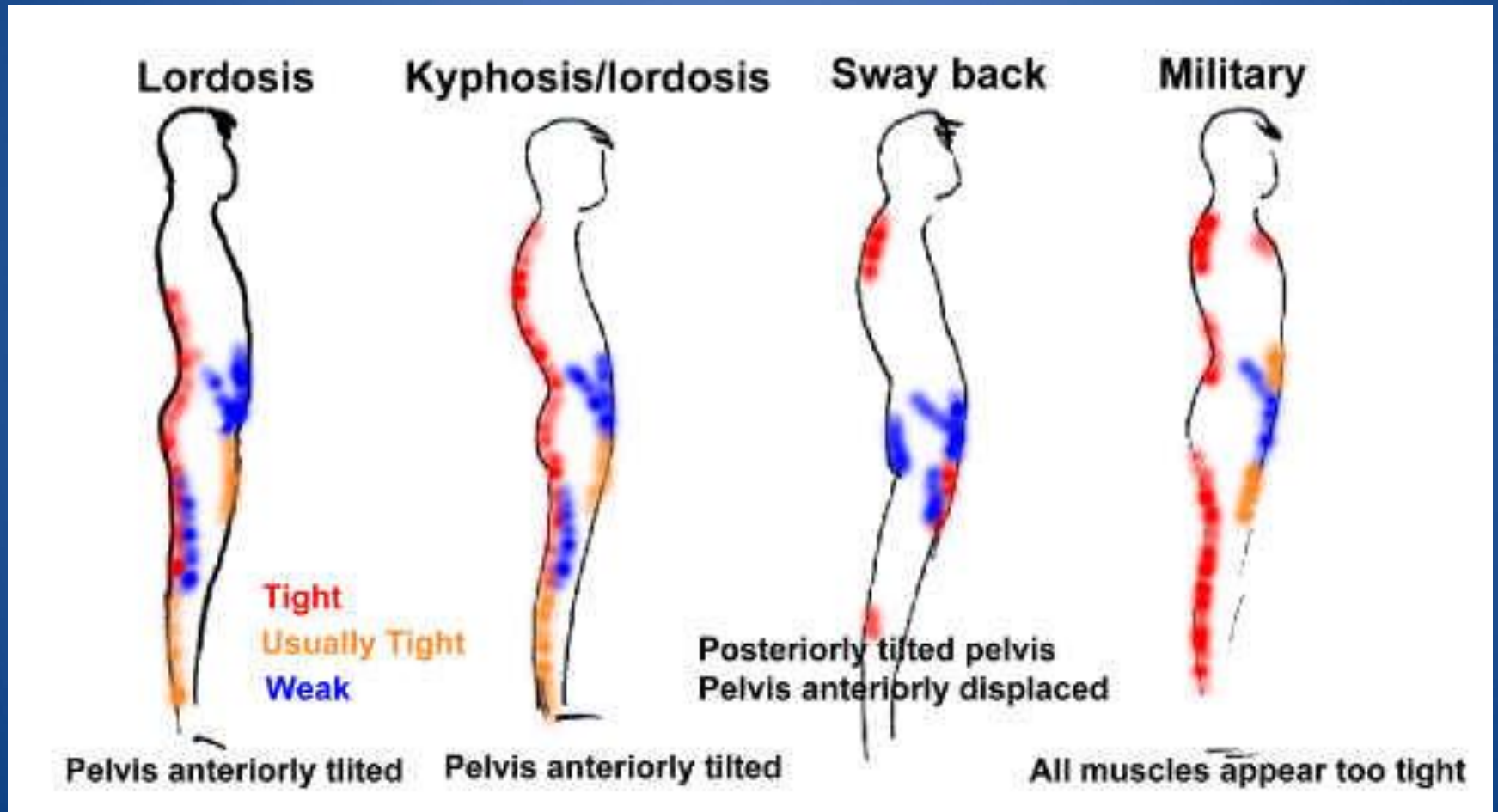
Muscle Imbalance

- Based on works of Vladimir Janda, MD
- Basic Concept: There are two types of muscles:
 - Short/tight, facilitated, hypertonic muscles
 - Weak, inhibited, hypotonic muscles
 - When Particular Muscles are shortened/tight, they will inhibit other muscles, making them weak and hypotonic.
 - Stretch Shortened muscles to symmetry prior to strengthening Hypotonic Muscles and incorporate proprioceptive training

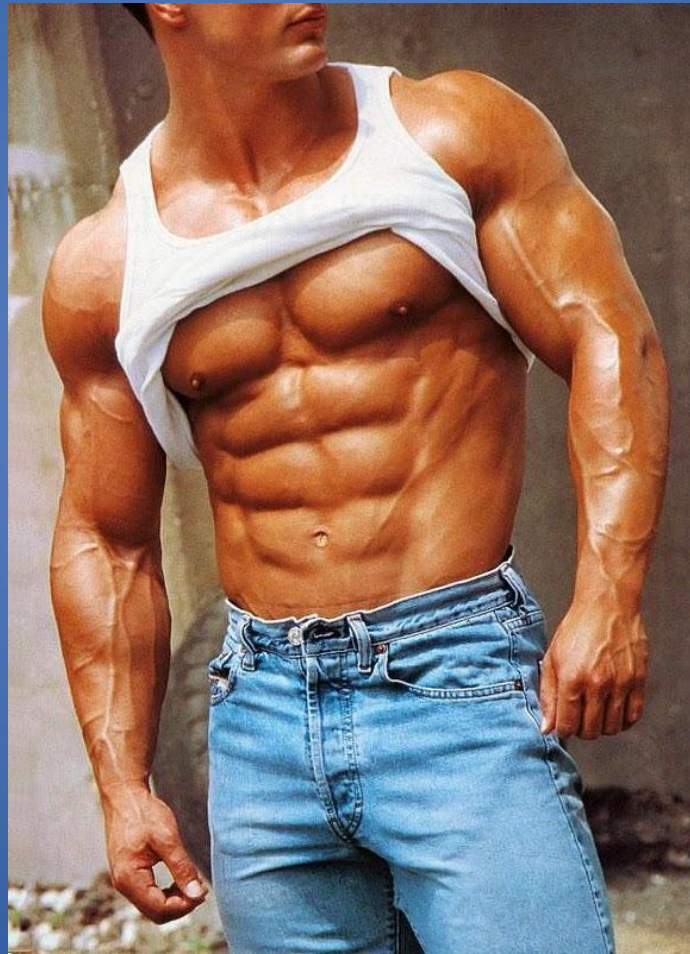
Lower Crossed Syndrome- Philip Greenman, DO

- Weak Glut. Max vs. Short Hip Flexors
- Weak Abdominals vs. Short Lumbar Erector Spinae
- Weak Glut. Med/min vs. Short TFL and QL
- Anterior Pelvic Tilt and increased Lumbar Lordosis
- Hypermobility of L4-5 and L5-S1
 - Runners with tight HS/tears a/c weak glut and anterior hip capsule restriction

Biomechanics



Core Strengthening/Stability

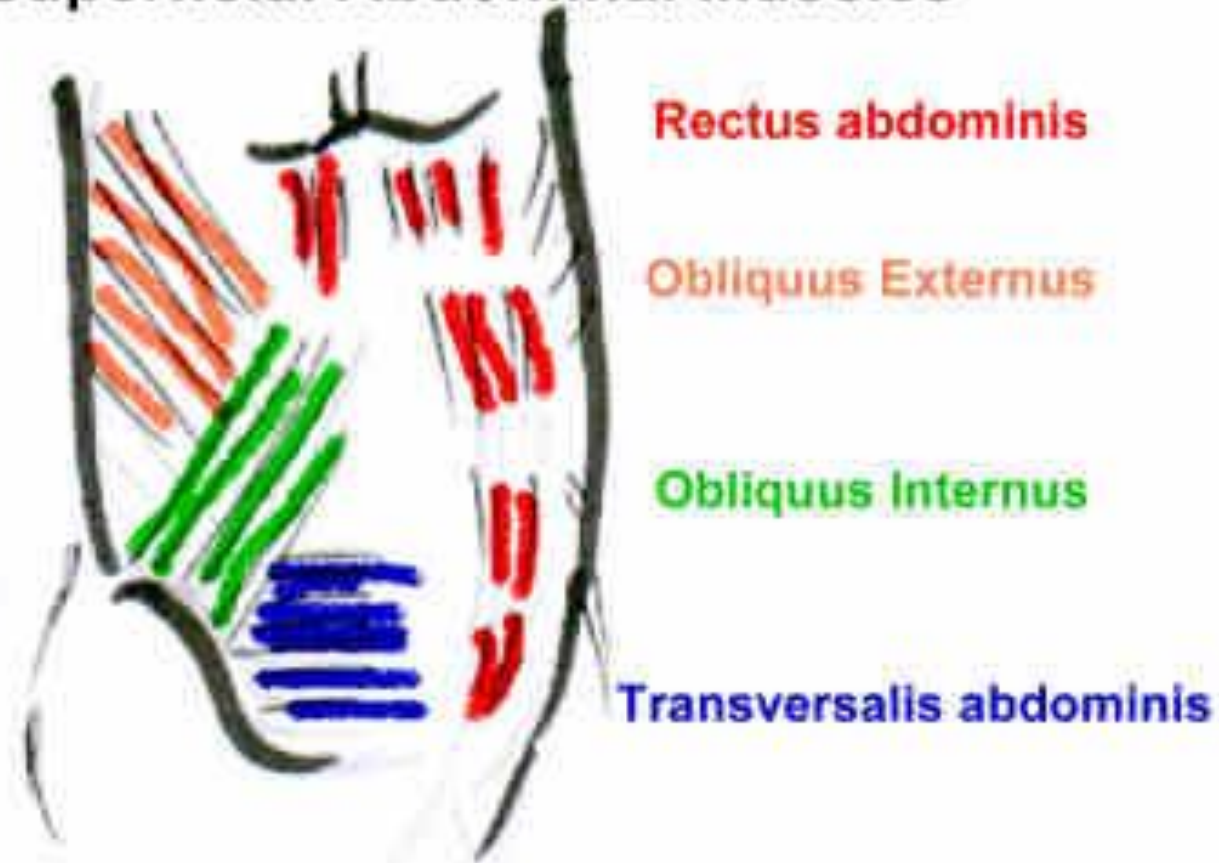


Core Stability

- Muscles of the Hip, Shoulder Girdle and Trunk together form a Functional Core.
- Ability of core muscles to work in an efficient and coordinated fashion to maintain correct alignment of the spine and pelvis while the limbs are moving
 - Core muscles: superficial and deep spinal extensors, abdominal and pelvic floor muscles, hip/shoulder girdle muscles
 - Six Pack Muscle (rectus Abdominis) is NOT a true core muscle bc it runs vertically and not Horizontally

Abdominal Muscles

Superficial Abdominal Muscles



A Dancer's Challenge

- Growth Spurts: Muscles can not keep up with bone growth and dancers experience decrease strength, flexibility, alignment, coordination and technical control. Usually seen ages 11-14 and can last 18-24 months. Can lead to decreased confidence, frustration and depression

A Dancer's Challenge

- Depression
- Anatomical issues/Injuries and career decisions/limitations
- Over Use Injuries: Train/rehearse 5-8 hrs/day, 365 days per year
- Nutrition: Female Athlete Triad (eating disorder, amenorrhea, osteoporosis)
- Eating Disorders: 5 hours dance - 2400 kcal/day for females and 2600 kcal/day males
 - Tremendous pressure on dancers to be thin
 - NYC Ballet's Jennifer Ringer criticized by NY Times writer, Alastair Macaulay, "as if she'd eaten one sugar plum too many" December 2010. She was 37 years old, remarkable for a female ballet dancer!

Jennifer Ringer- Sugar Plum Fairy



Can a Ballet Dancer be too Thin?



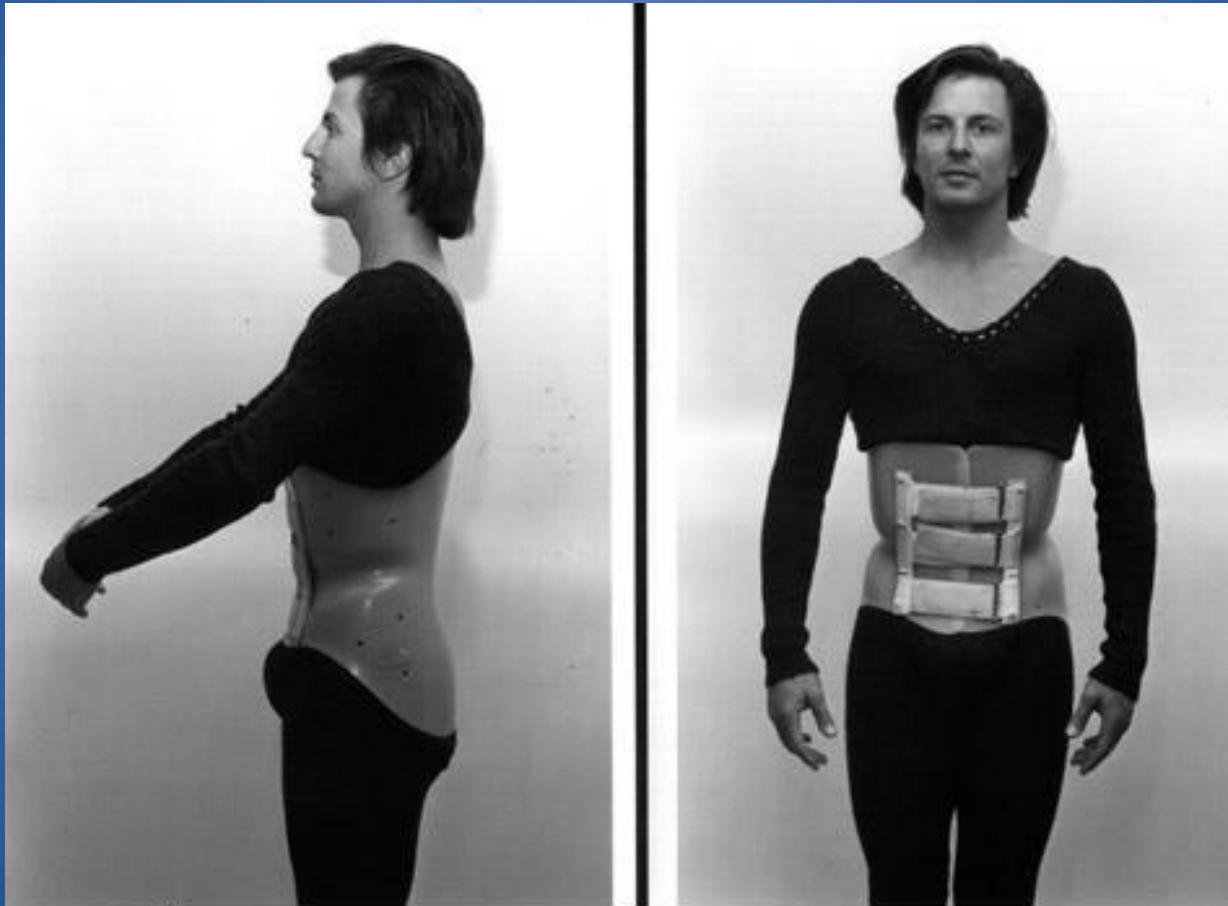
Common Dance Injuries

- Lumbar
 - Spondylolysis:
 - football linemen, gymnasts, dancers
 - Avoid Extension
 - 2-3 months healing
 - Modified Boston Brace

Dance Injuries

- Spondylolisthesis
- Herniated lumbar Discs
- Annular Tears
- Sacral Hypermobility

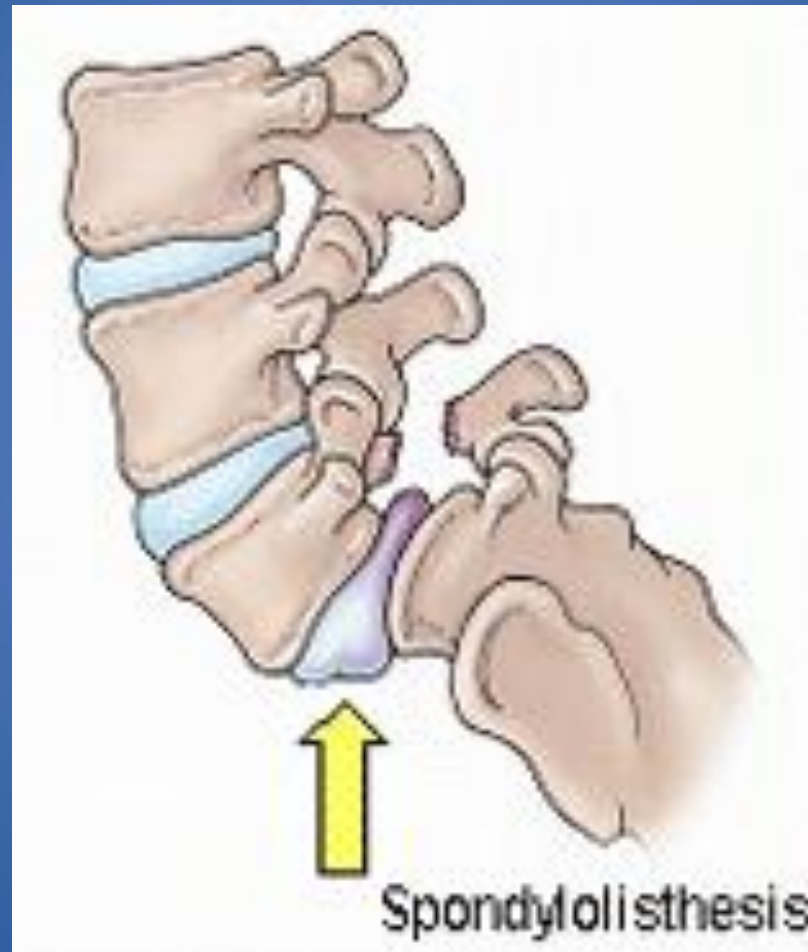
Modified Boston Brace



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Spondylolisthesis



Yikes



Dance Injuries continued

- Injuries of the Hip
 - Snapping hip: clicking with Grand Battements and/or second position developpe. Tendon passes over bony structure (ITB over greater troch. Or Illiopsoas over femur or pelvis)
 - Illiacus Tendinitis
 - Piriformis Syndrome

Dance Injuries continued

- Knee Injuries

- Anterior Knee pain: increase training intensity, growth spurt > decreased flexibility (esp quads) pain with repetitive flexion and standing after prolonged sitting
- Genu Recurvatum: a/c ligamentous laxity, aesthetic for ballet, overactive quad and underactive HS, patella subluxation, shin splints/tibial stress fracture d/t increased load on lower leg
- Patella Femoral Syndrome: Pain with jumps, grand plies, stairs, prolonged sitting. A/c Tight ITB-weak VMO. Dancer must “pull up knee” in 5th position bc if slightly flexed, leads to VMO weakness. Increased pronation > internal rotation of tibia and increased stress to knee
- Jumpers knee (patella tendonitis)

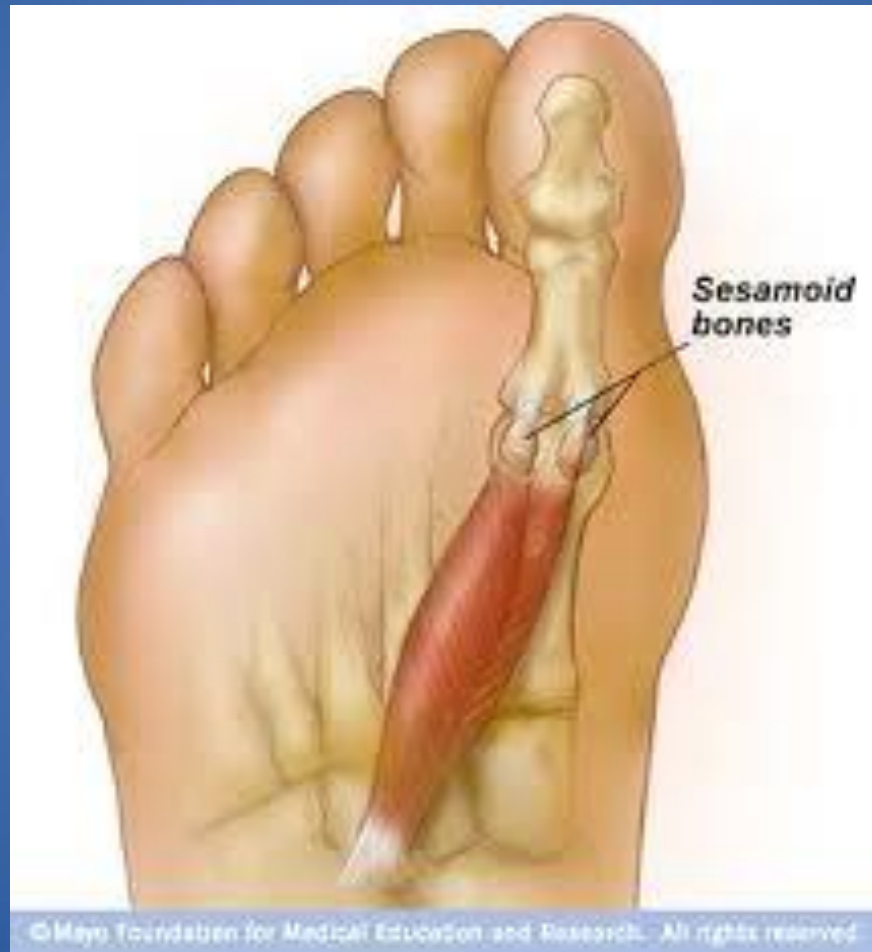
Dance Injuries continued

- Knee Injuries
 - Plica Syndrome
 - Meniscus Tear: a/c “Screwing Home”
 - MCL/ACL Tears
 - OA

Dance Injuries continued

- Injuries of the Foot
 - Dancer's Fracture: 5th Metatarsal Fx a/c landing on inverted foot
 - Sesamoiditis: Support demi- point, pain with F/E great toe, can be fractured (consider bone scan if xray neg) Tx: tape great toe into flexion, J-pad to relieve pressure.

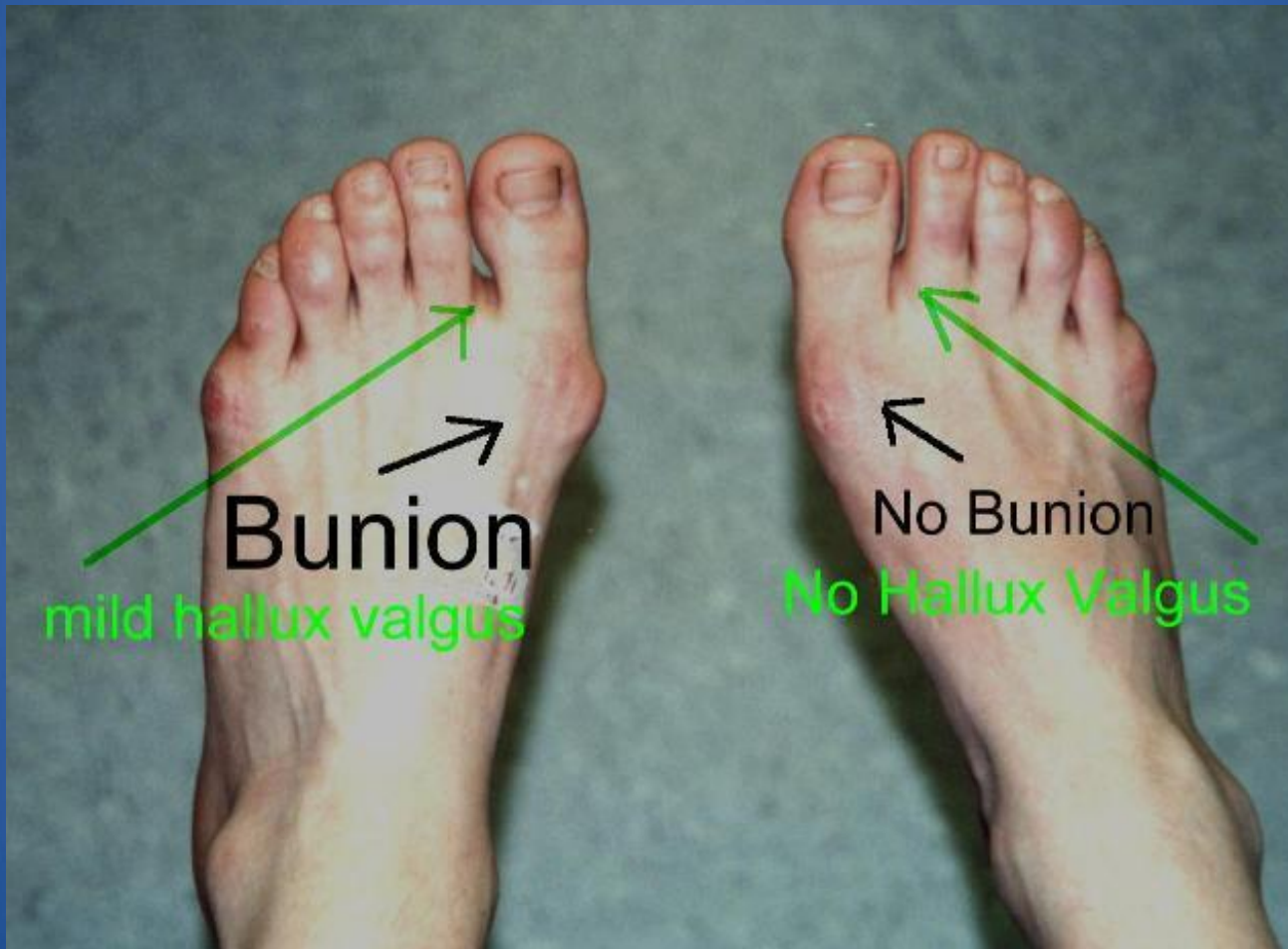
Sesamoid bones



Dance Injuries continued

- Injuries of the Foot
 - Hallux Valgus: Bunions: a/c increased pronation. Orthotics, toe spacer, foot strengthening
 - Hallux Rigidus: Demipoint requires 90 degrees of MTP extension. If demipoint is forced secondary to rom restriction > impingement > spurs. Dancer compensates by “sickling” which leads to lateral ankle sprains. Dancer must use “half demi-point” instead. Tx: taping toe, OMT
 - Plantar Fasciitis
 - Metatarsalgia: pain on ball of foot. A/c instability of joints of smaller toes (laxity) Tx: strengthen toe flexors (towel scrunches) and metatarsal pad

Hallux Valgus



Appropriate MTP angle for demipoint



Half Demi-point



Sickling-compensation



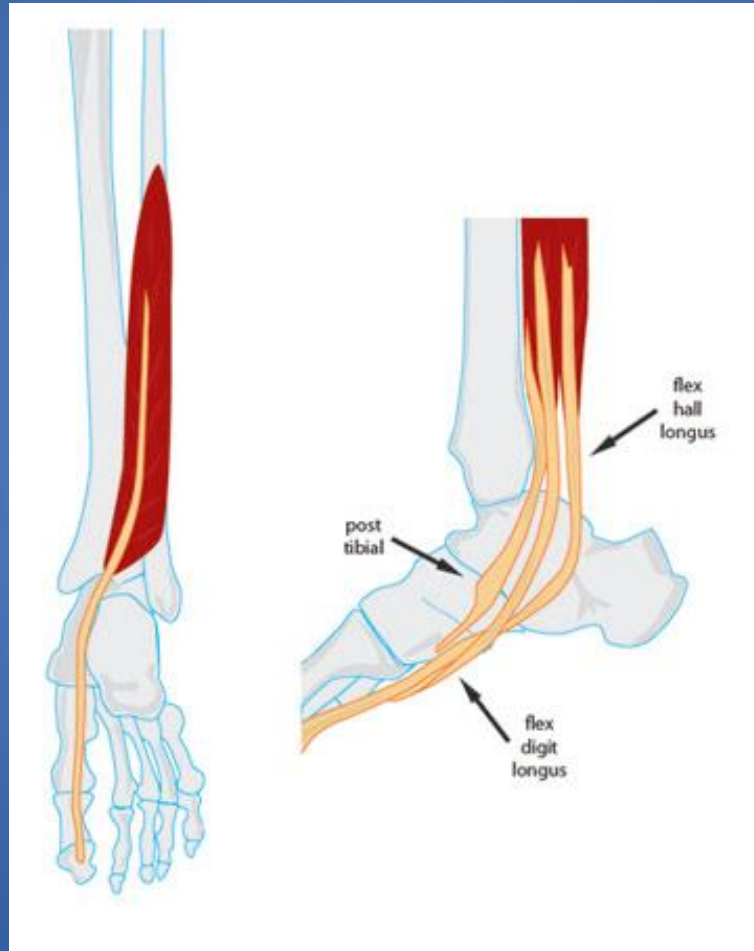
Dance Injuries continued

- Foot Injuries

- Tendonitis

- Flexor Hallucis Longus aka: Dancer's Tendon. Can get frayed, scarred and adhere to sheath. Dancer experiences pain when lowering from demipoint to flat foot
 - Achilles
 - Peroneus Longus/Brevis

Flexor Hallucis Longus



Dance Injuries continued

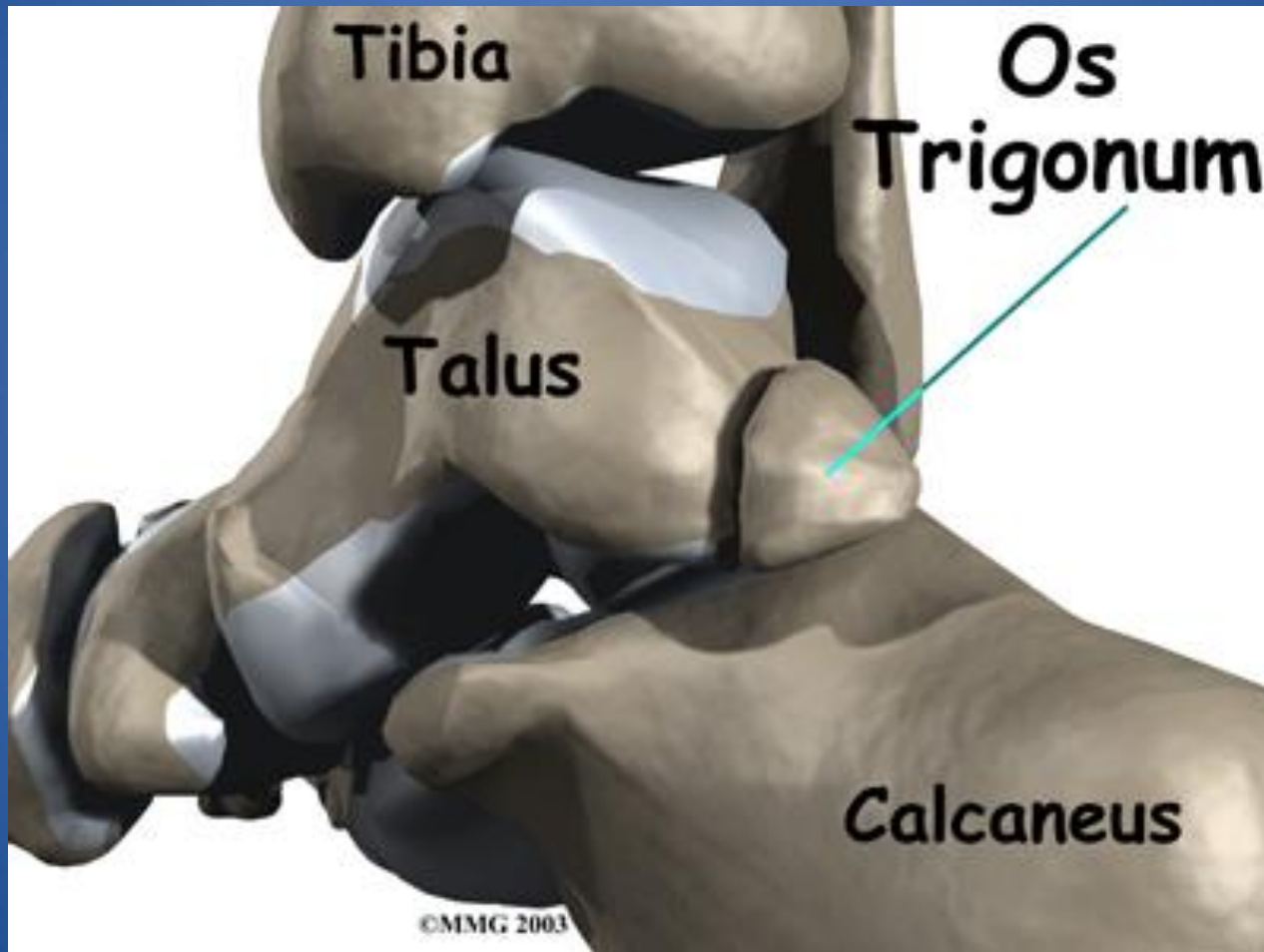
- Ankle and Lower Leg Injuries

- Posterior Impingement- AKA Dancer's heel: may be d/t osseous or soft tissue abnormality (tibial slip or labrum can pinch os trigonum or posterior talus. Pain with PF)
- Anterior Impingement: Pain with DF as spurs develop and joint capsule-synovium becomes pinched. Tx: heel lifts
- ATFL Sprains
- Shin Splints/stress fx/stress reactions : irritation of tibial periosteum or muscles-tendons. When Muscle fatigues stress transfers to soft tissue and bone. Avoid dancing on hard surfaces, correct knee hyperextension, weak abs, tilted pelvis, foot pronation. Must REST!

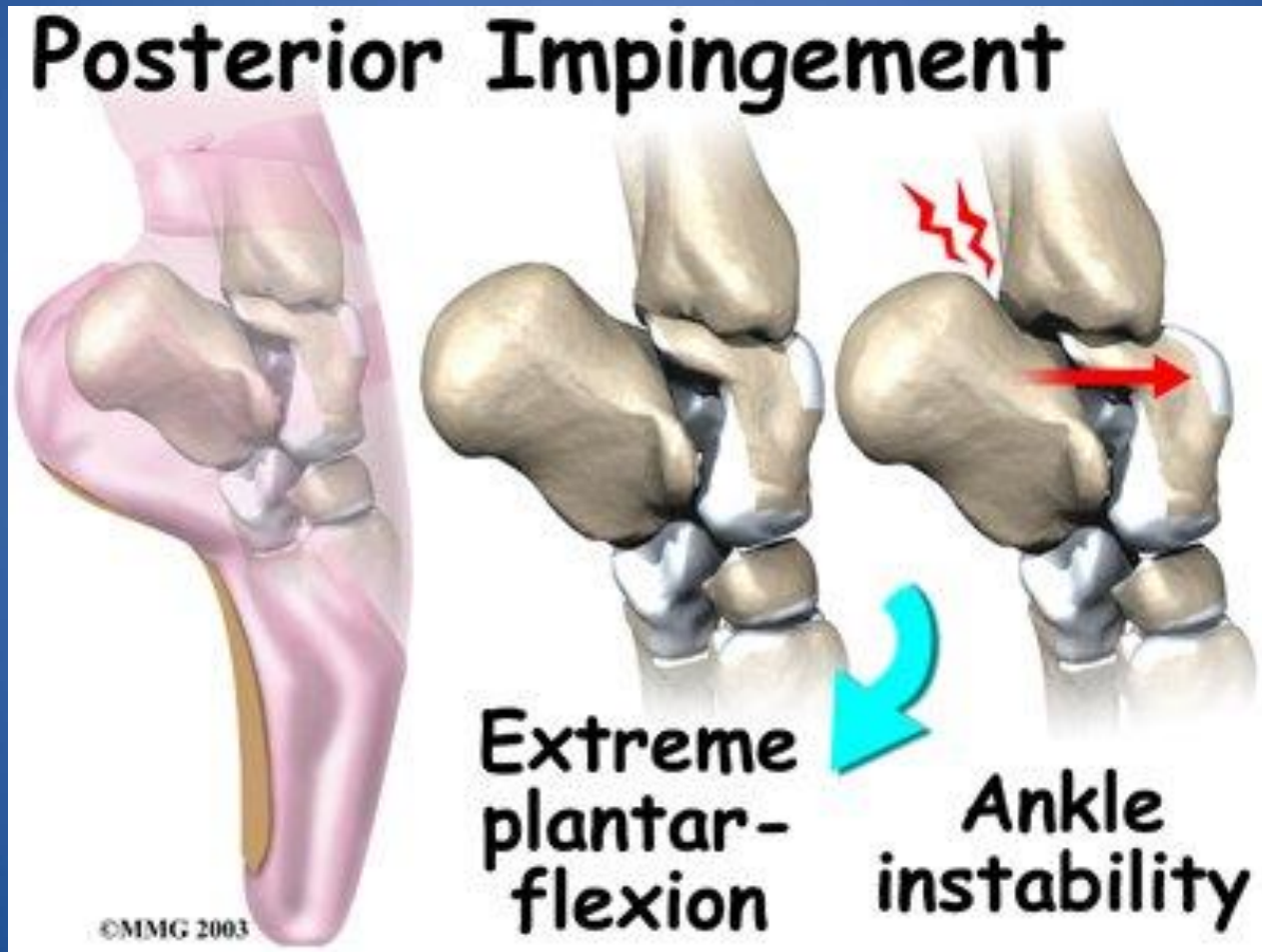
X-Ray in Point shoes



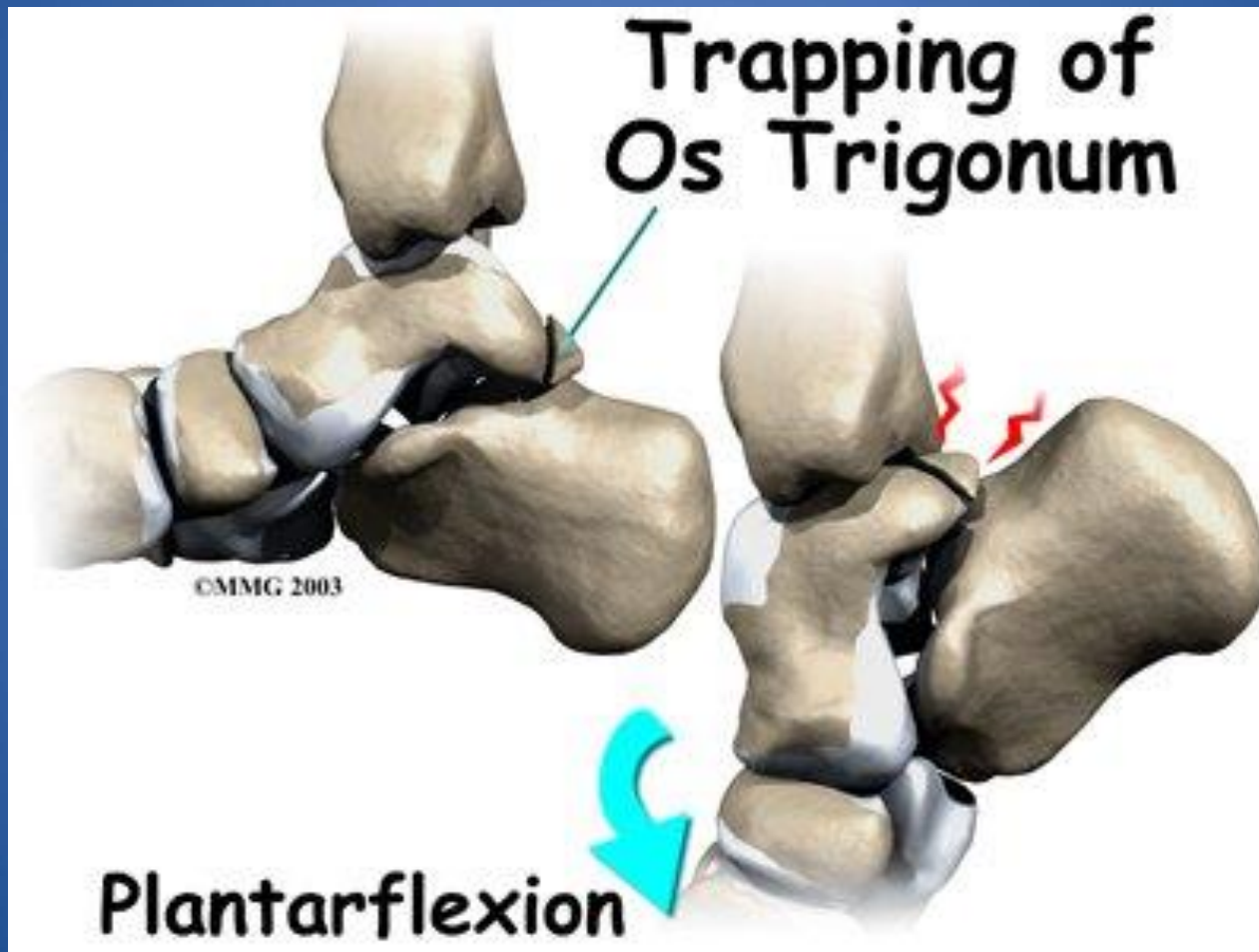
Posterior Ankle Impingement



Posterior Ankle Impingement



Posterior Ankle Impingement



Diagnostic and Treatment Considerations

- MSK Ultrasound: Provides Dynamic view of tendons, joints. May be used for guided therapeutic injections
- Prolotherapy
- Platelet Rich Plasma Injections
- Pilates
- Proprioceptive Training
- OMT (of course!)

What it “Should” Look like

- Karen Lynch: Lynch School of Ballet, Huntington, NY
- Lynch Ballet Company
- Principal Dancer in Major Ballet Companies



Of Interest and Special Thanks to:

- International Association for Dance Medicine and Science (IADMS) www.iadms.org
- Performing Arts Medical Association (PAMA)
- www.artsmed.org
- William Hamilton, MD: Orthopedic Surgery NY, NY
- Donald Rose, MD: Orthopedic Surgery, Founding Director of Harkness Center for Dance Injuries at NYU Hospital for Joint Diseases
- Marika Molnar P.T. West Side Dance Physical Therapy NYC
- Karen Lynch- Lynch School of Ballet, Lynch Ballet Company Huntington, NY

In Loving Memory to my Doctor, my Mentor, my Friend

- Richard M. Bachrach, DO, FAOASM

Thank you for sharing your knowledge with me
so that I may pass on your discoveries and
passion.

Thank You!
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