

Nemours® Children's Health System



Lower Extremity Injuries

Cassidy Foley Davelaar, DO, FAAP, CAQSM

Nemours Children's Health System

Division of Orthopedics and Sports Medicine

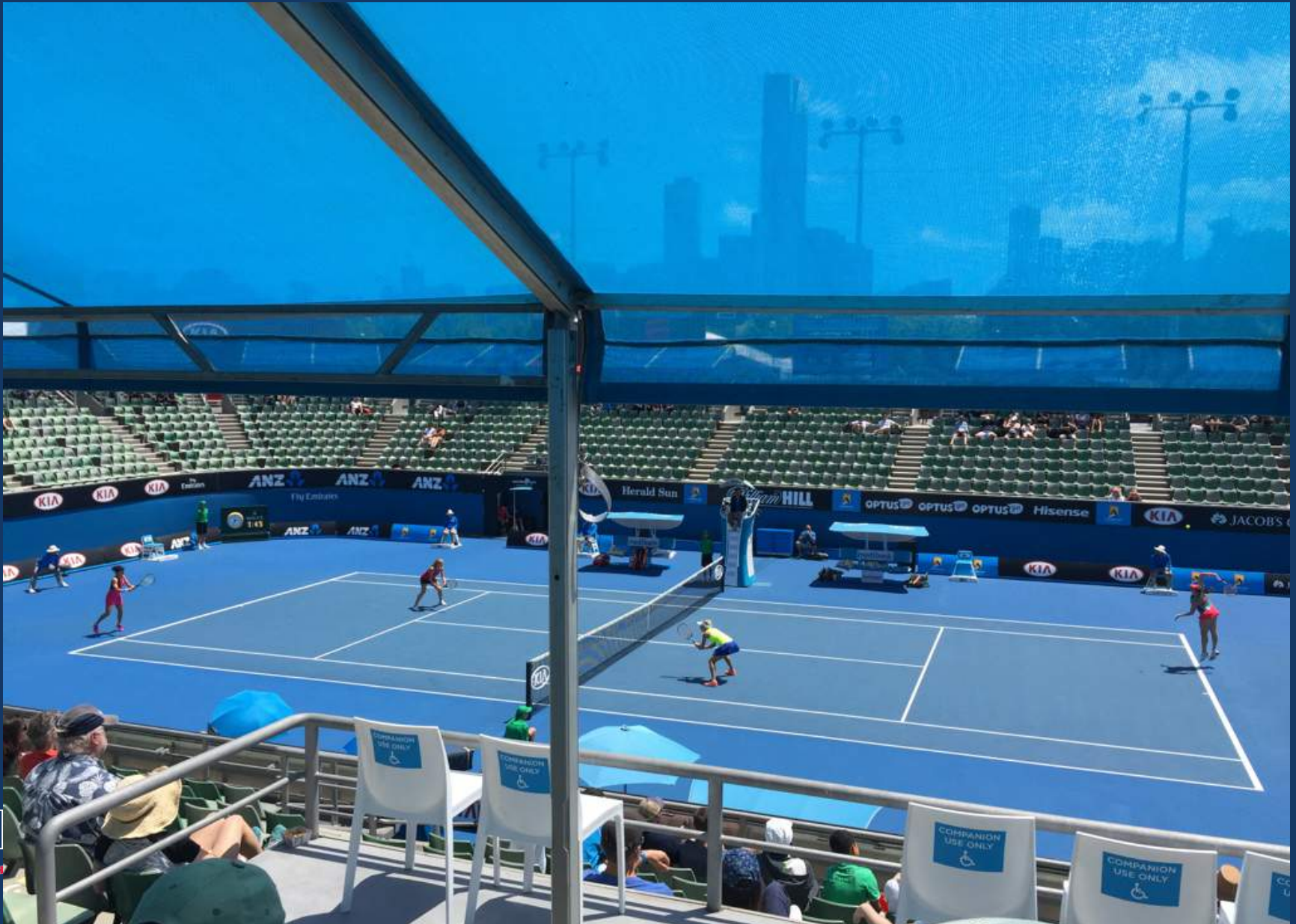
Assistant Professor University of Central Florida College of Medicine

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I have no disclosures



WHY IS THIS IMPORTANT?



Benefits of Sports

- Promote a life of health and fitness
- Opportunities for peer socialization, development of team work and leadership skills
- Build self-esteem
- Fun
- Develop physical activity skills

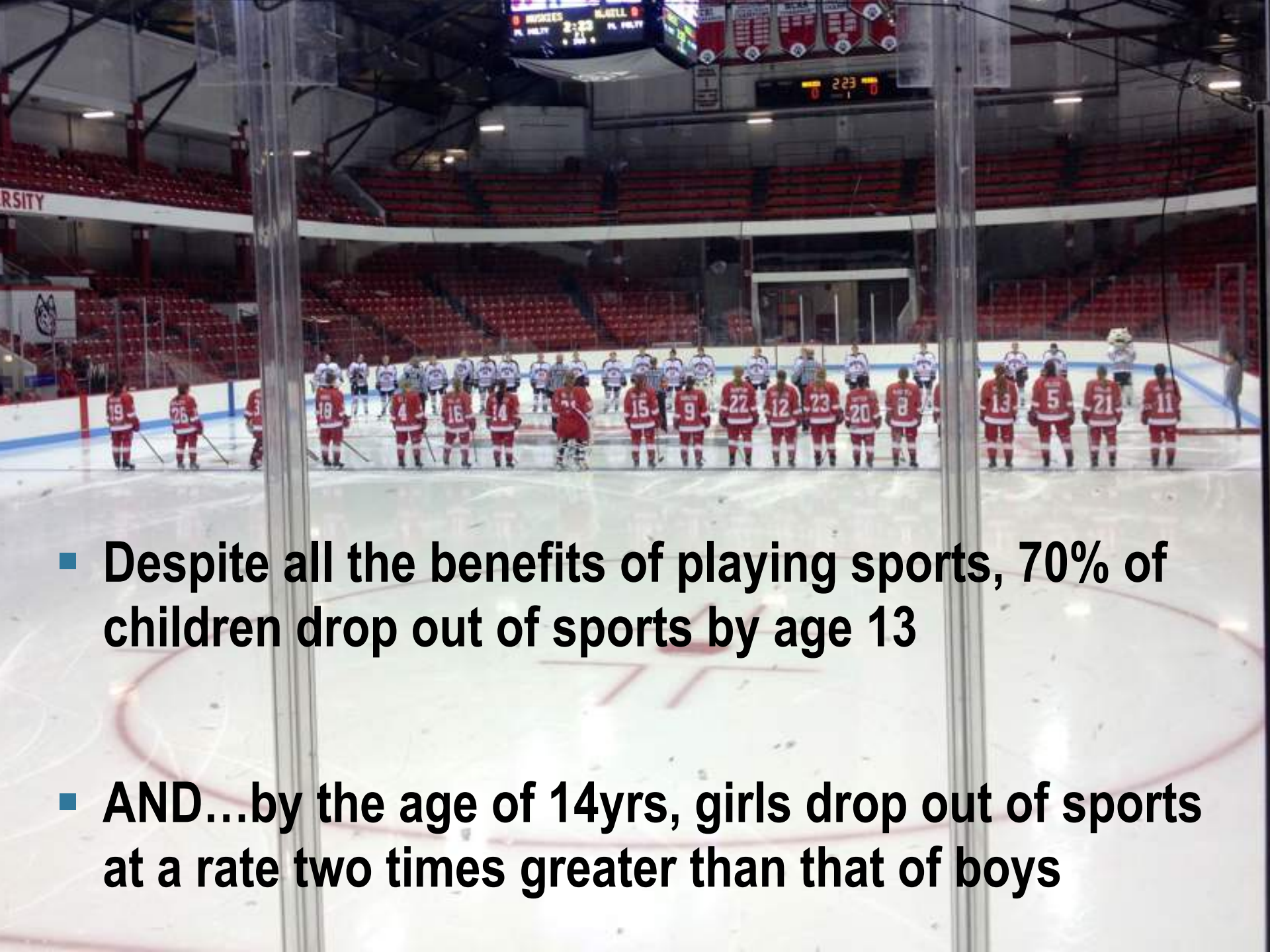
Female athletes are; “more achievement oriented, more independent, more emotionally stable and more assertive than their non-athletic counterparts”

Silby C, Mental Skills Training: Games Girls Play-The Why, What, and When of Mental Fitness. C.J. Stein et al. (eds.), The Young Female Athlete, Contemporary Pediatric and Adolescent Sports Medicine, Springer 2016.

Females Who Participate in Sports

- **Have higher levels of self esteem**
- **Decreased risk of depression**
- **Perform better in school → more likely to graduate from HS, and go to college**
- **Less likely to join gangs or do drugs**
- **Begin having sex later and are less likely to have unprotected sex and unintended pregnancy**
- **7% lower risk of obesity**

Silby C, Mental Skills Training: Games Girls Play-The Why, What, and When of Mental Fitness. C.J. Stein et al. (eds.), The Young Female Athlete, Contemporary Pediatric and Adolescent Sports Medicine, Springer 2016.



- **Despite all the benefits of playing sports, 70% of children drop out of sports by age 13**
- **AND...by the age of 14yrs, girls drop out of sports at a rate two times greater than that of boys**

Pediatric Injuries Differ from Adolescents

■ Pediatrics (5-12 years)

- More trauma
- More upper extremity
- Fracture
- Apophysitis
- OCD
- Non-operative treatment

Adolescents (13-17 years)

More overuse

Head, chest, hip/ pelvis and spine

More soft tissue injury

ACL

Meniscus

Spondylolysis

Surgery more common

Puberty



GROWTH

- **Transient decrease in bone density, which may lower the threshold for injury; acute fracture and overuse stress**
- **Period of rapid growth or peak height velocity (PHV) just prior to the onset of menarche may be the most vulnerable period for musculoskeletal injury**
- **Long bones grow lengthwise and muscles are stretched**
- **Risky knee biomechanics are increased in puberty**

CASE 1 – 16 year old female

- **PMHx: eczema, recently started walking to lose weight**
- **CC: slow onset of ill-defined knee pain**
- **HPI: She cannot pin-point when it started and she cannot remember any trauma**
 - says “it hurts when I go up the stairs at school”
- **When asked where it hurts, she vaguely circles the knee**
- **When asks if it gives way she says, “No, but it feels weak, like I’m going to fall”**

CASE 1 – Physical Exam

- Slender, well appearing female, sitting on exam table
- No swelling of the knee
- No pain with palpation
- No ligamentous laxity
- Strength 5/5 with quad and hamstring testing
- DTRs 2/4
- FROM without pain of hip and ankle
- Negative McMurray test
- She says, she cannot squat, because “That will hurt” ...

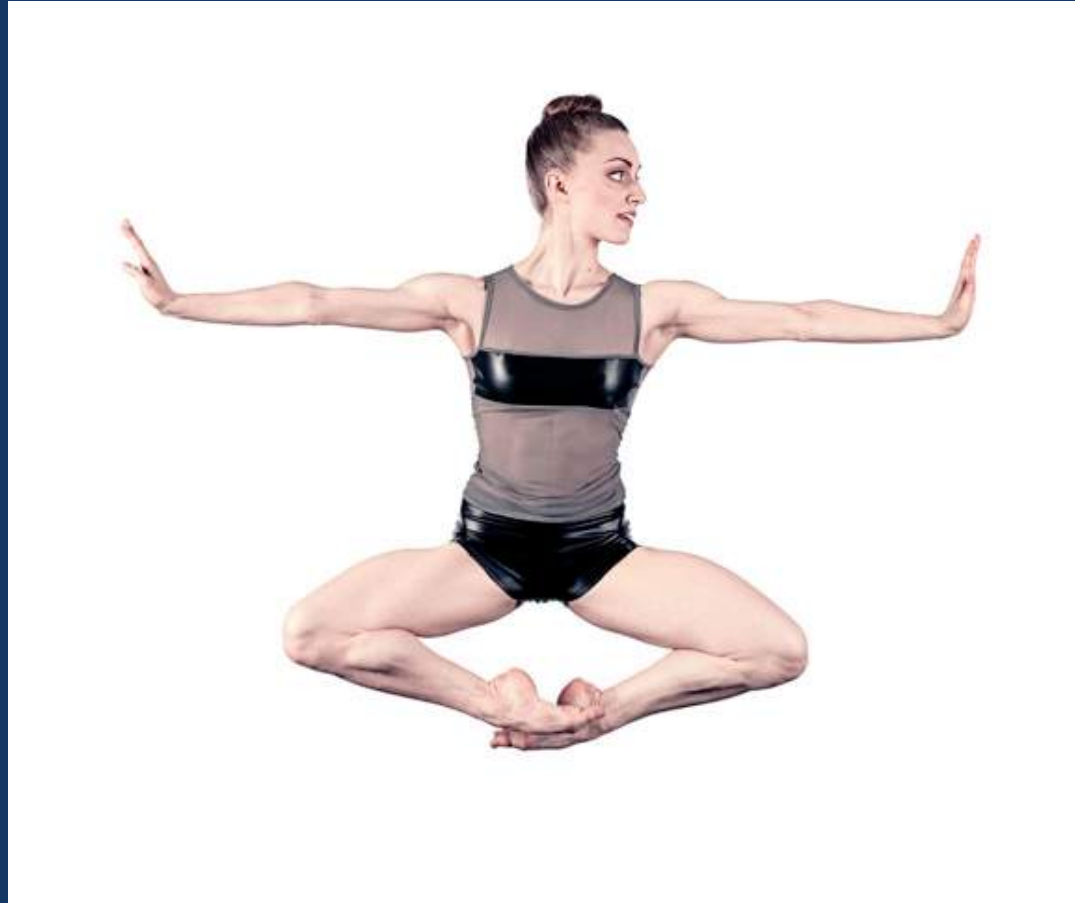
Differential Diagnosis

- Osgood-Schlatters
- Sinding-Larsen-Johansson
- Patellar tendonitis
- Pes anserine tendonitis
- Osteochondritis dissecans
- ITB syndrome
- Chondromalacia patella
- Patellofemoral pain syndrome



Other possible diagnoses

- Patellar dislocation
- Joint infection
- ACL injury
- PCL injury
- MCL or LCL injury
- Discoid meniscus
- Meniscal tear
- Fractures (traumatic and stress fractures)



Lastly on the Differential

- **Rheumatology**
 - Arthritis
 - Enthesopathy
- **Infectious Disease**
 - viral vs bacterial vs spirochete
- **Referred Pain**
 - Hip or lower back pathology
- **Hematology and Oncology**
 - Bone or chondral tumors



CASE 1 - Diagnosis

- Patellofemoral Pain



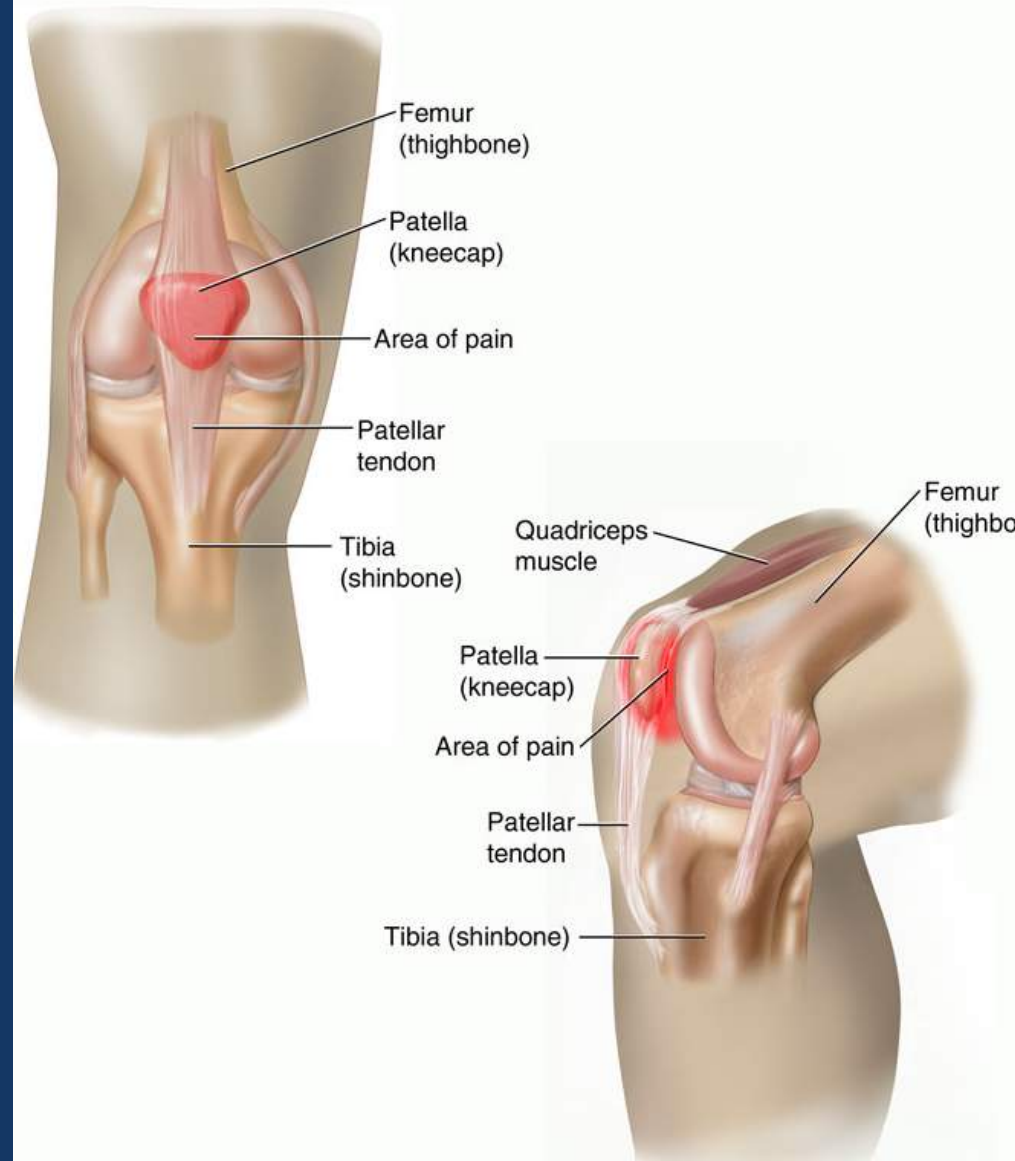
What is Patellofemoral Pain

- Vague ANTERIOR knee pain
- Unilateral or bilateral
- Insidious onset with activity, chronic, may be related to overuse, but may be able to continue activity
- Typically, **no swelling, locking or giving way!**
- Patient may perceive instability due to pain inhibiting proper contraction of the quad

Physical Exam

- Patella alta
- + J-sign
- +/- crepitus w/
Patella grind test

Patellofemoral Pain Syndrome (Runner's Knee)

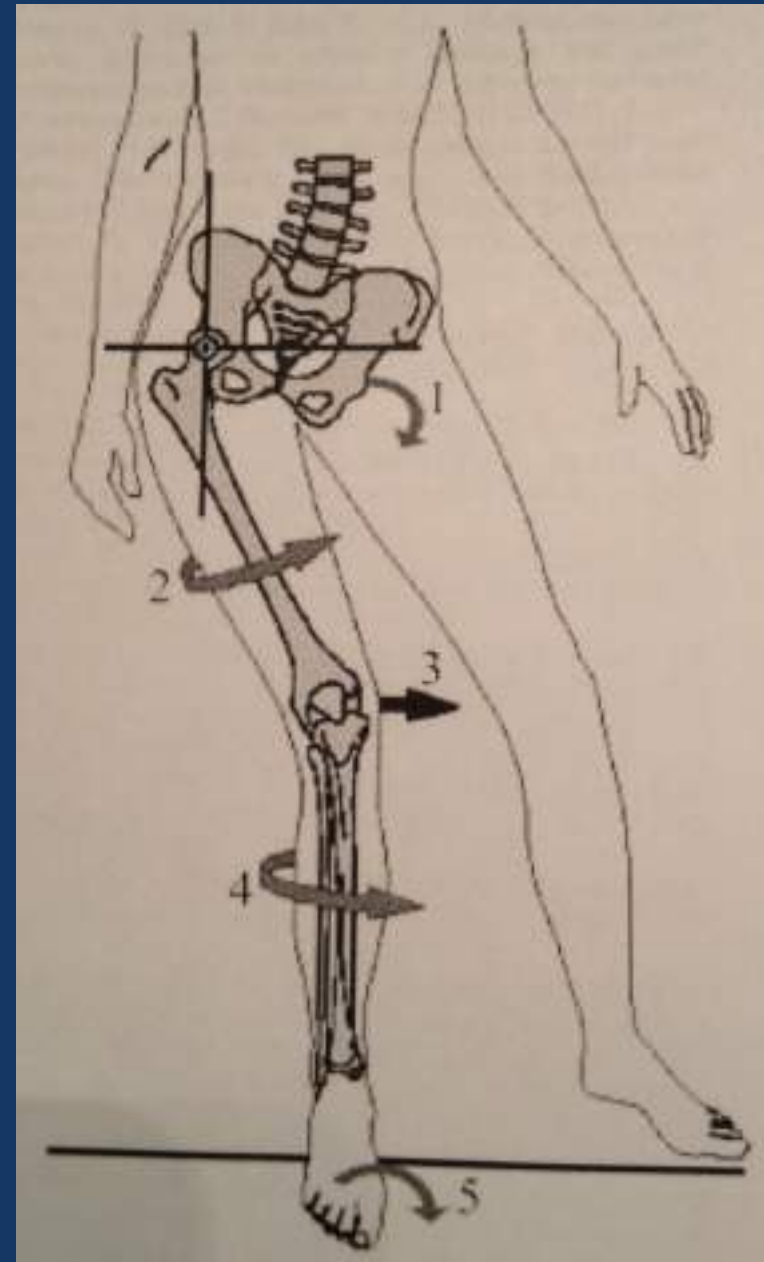


Cause

- **Pain is aggravated by activity that engages the quads**
 - Climbing stairs, knee-bending, squatting, kneeling
 - Kneeling down worse than getting back up
- **Activities that load the patellofemoral joint**
- **Occasionally, prolonged sitting can cause stiffness**
 - Car rides, sitting in class or a movie theater

Causes continued

- Muscle imbalance
- Weak hip abductors
- Hip drop – weak stabilizers
- Medial femoral rotation
- Foot pronation
- Excessive tibial internal rotation
- Poor patellar tracking
- Valgus forces increasing Q-angle



Q-angle and Valgus

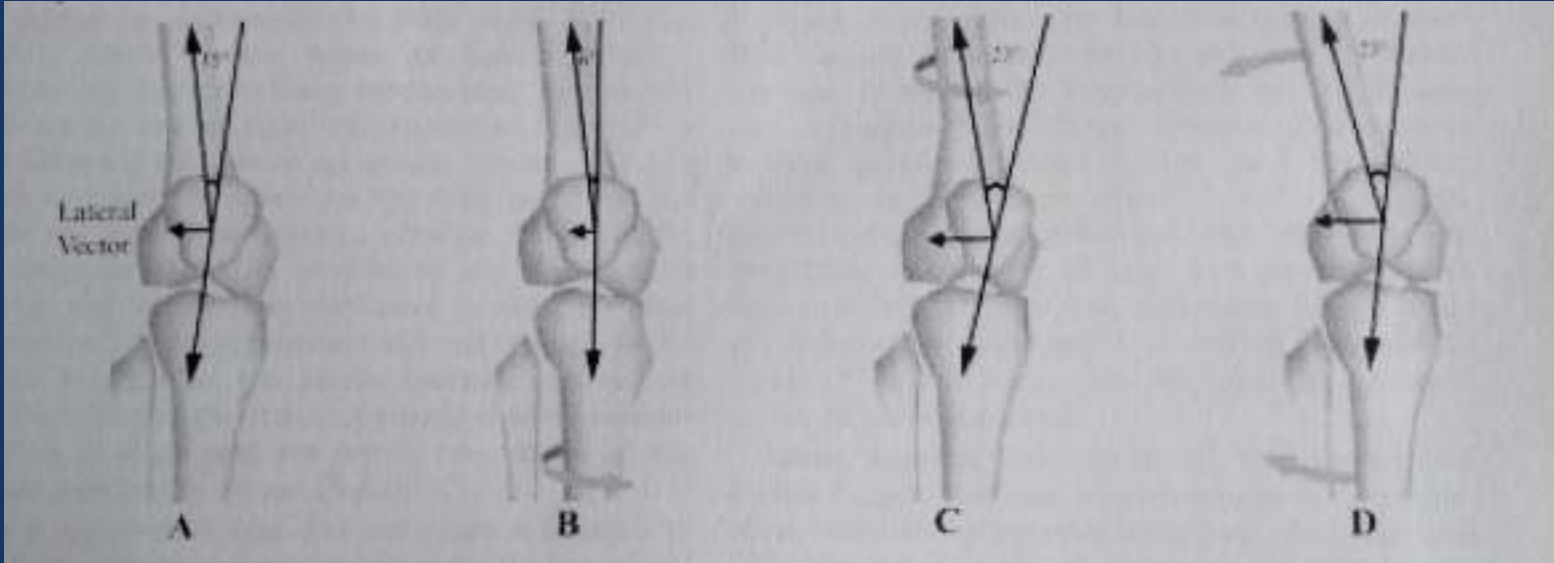
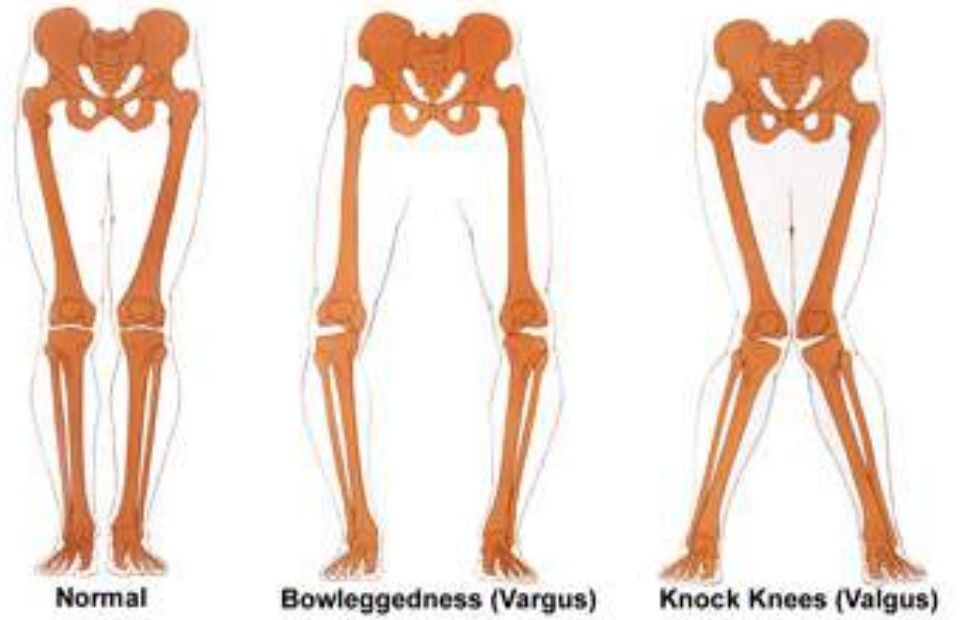


FIGURE 1. (A) The Q angle is measured as the angle formed by the intersection of the line drawn from the anterior superior iliac spine to the midpoint of the patella and a proximal extension of the line of the femur.

Position of Safety		Position of Risk	
Body position		Body position	
Normal lordosis		Forward flexed, rotated to opposite side	
Flexed neutral abduction adduction, neutral rotation		Adduction internal rotation	
Flexed		Less flexed, valgus	
Neutral		External	
In control, neutral position		Poorly controlled, pronated	



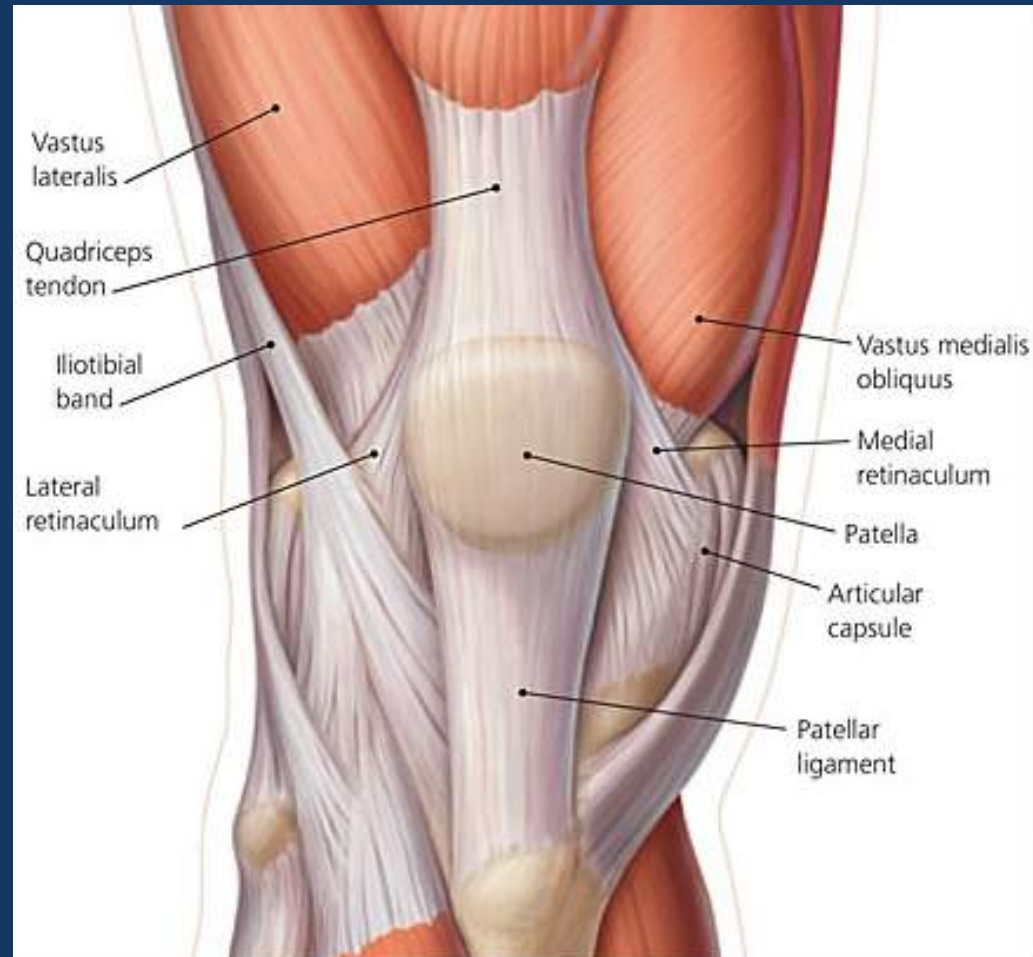
Treatment

■ Strengthening

- Vastus Medialis Oblique (straight leg raise, wall sits, 1-leg squat)
- Hip Abductors
- Hip External Rotators
- Gluteus medius
- CORE

■ Stretch

- Quadriceps; Vastus Lateralis
- Iliotibial band



Treatment cont.

- **Support arch and reduce excessive pronation of foot**
 - Intrinsic foot muscle strength
 - doming, towel curl, marble pick up
 - Soft orthotics
 - Superfeet, Spenco, Powerstep etc
- **Bracing**
 - Soft tissue mobilization, patellar mobilization
 - J-buttness, True Pull
 - McConnell taping

Complications

- **Reoccurrence rate of PFP is very high (25-91%)**
- **Ongoing symptoms – must continue strengthening routine**
- **Multifactorial causes make isolating and treating the cause of the symptoms difficult**
- **Chondromalacia patella**
- **OCD of the inferior patella**
- **Patella subluxation and latera patellar dislocation**

Surgery

- **Surgical repair is usually to correct:**
 - Chondral damage from wear due to tilted patella
 - Chondral damage from tight ITB
 - True patella subluxers
 - Excessive Q angles
 - Medial retinaculum tears

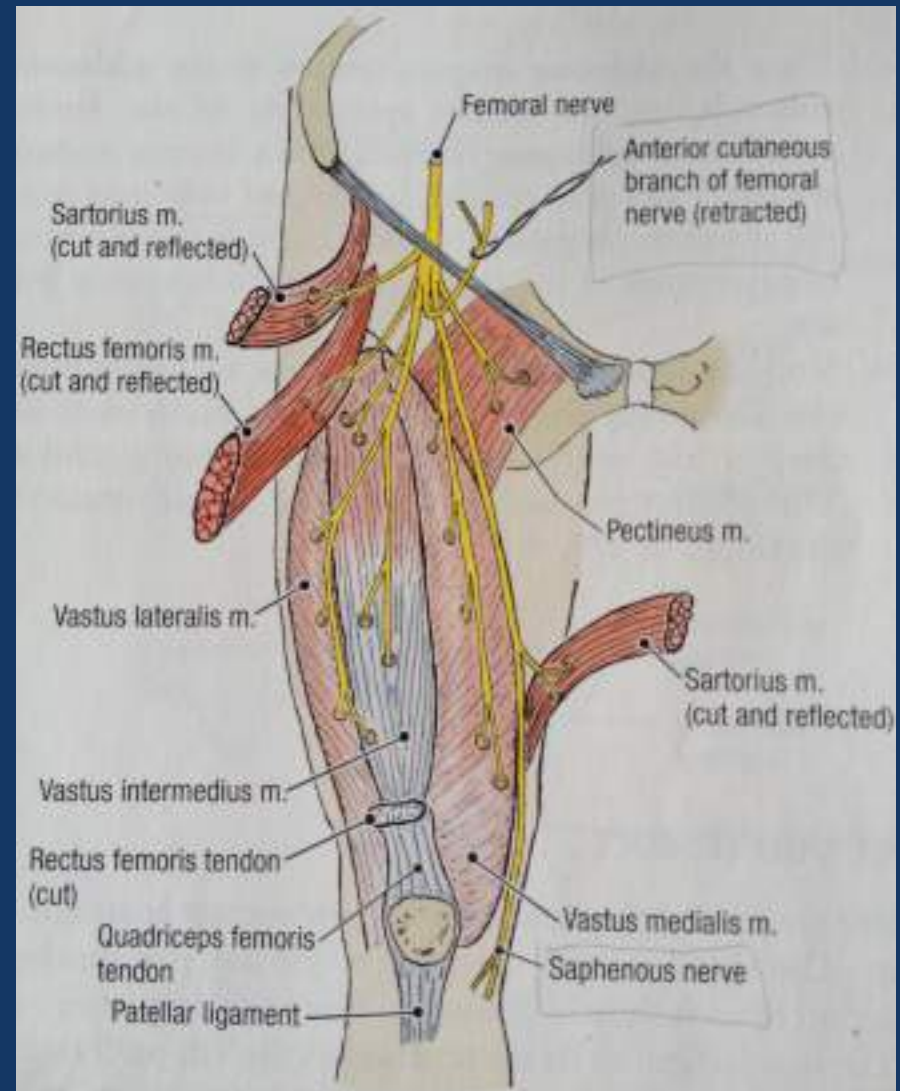
Epidemiology

- Average runner has a 37-56% chance of having pain
- Knee is the most common injured site
- Patellofemoral pain is one of the most common causes of knee pain
 - Incidence ranges from 21-40% in clinics and PT offices
 - Occur 2x as often in females than males
 - The MOST common cause of knee pain in adolescents



Traction Apophysitis

- **Osgood Schlatter**
 - Proximal tibial tubercle
- **Sinding-Larsen-Johansson**
 - Distal pole of the patella



Treatment of OSG and SLJ

- Stretch the quadriceps
- Chopat strap decreases the tension
- Strengthen the hamstring, glutes, hip abductors and CORE
- Decrease pounding activities
- Continue participation as tolerated
- Ice?

Less Common Diagnosis

- Radiograph



Osteochondritis Dissecans

- Adolescents more susceptible (~ Age 11-13)
 - Activity-related knee pain, swelling
 - Repetitive microtrauma / overuse
 - Stress fracture of subchondral bone
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- Can progress to involve overlying cartilage and cause mechanical symptoms