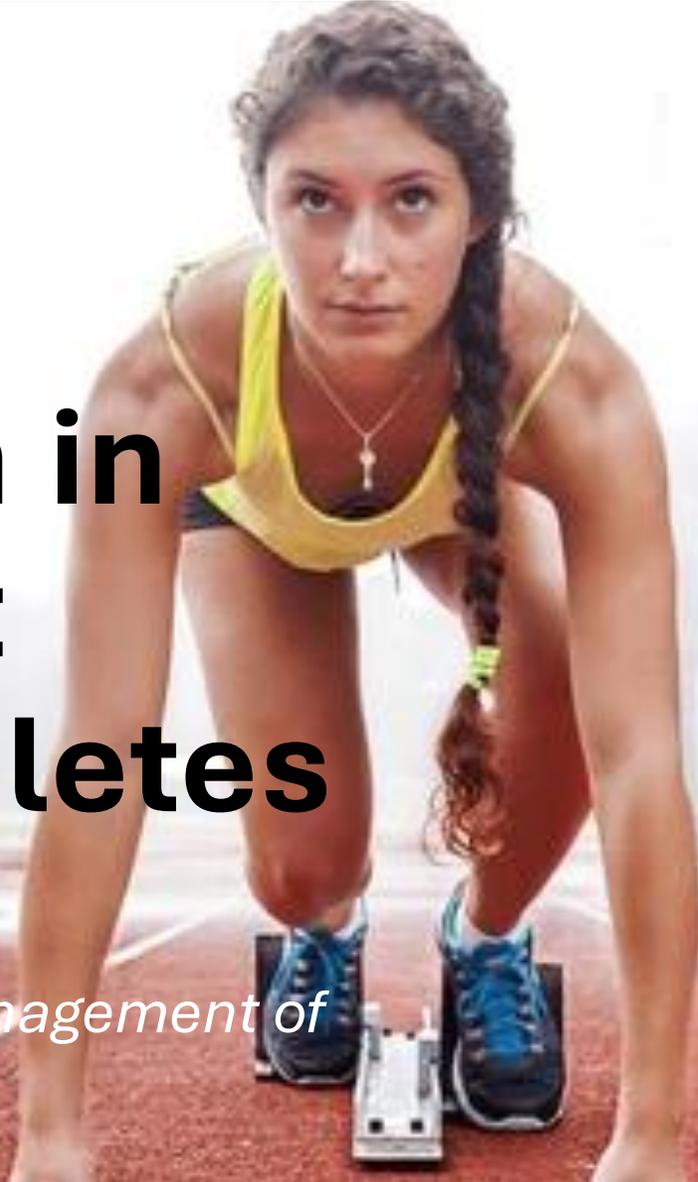


Recurrent Patellar Dislocation in Adolescent Female Athletes

*Causes, diagnosis and management of
the condition*



About me:

- Graduated Macquarie University 2009
- Practicing in Canberra since 2012
- Diplomate in Chiropractic
Neurodevelopmental Paediatrics
- ART practitioner
- FMS/SFMA
- CCMI concussion training
- Currently completing ICSC
- Focus on sport, paediatrics, pregnancy



Overview



Recurrent Patellar Dislocation (RPD)

More frequent in both adolescents and females. Factors specific to this population can influence onset and inform approaches to treatment

Causes

- Anatomical
- Physiological
- Cultural/Sociological

Diagnosis

- History
- Physical exam
- Imaging

Management

- Surgical
- Conservative/non-surgical
 - Rehab
 - Manual therapy
 - Ongoing management



Acute vs Recurrent PD

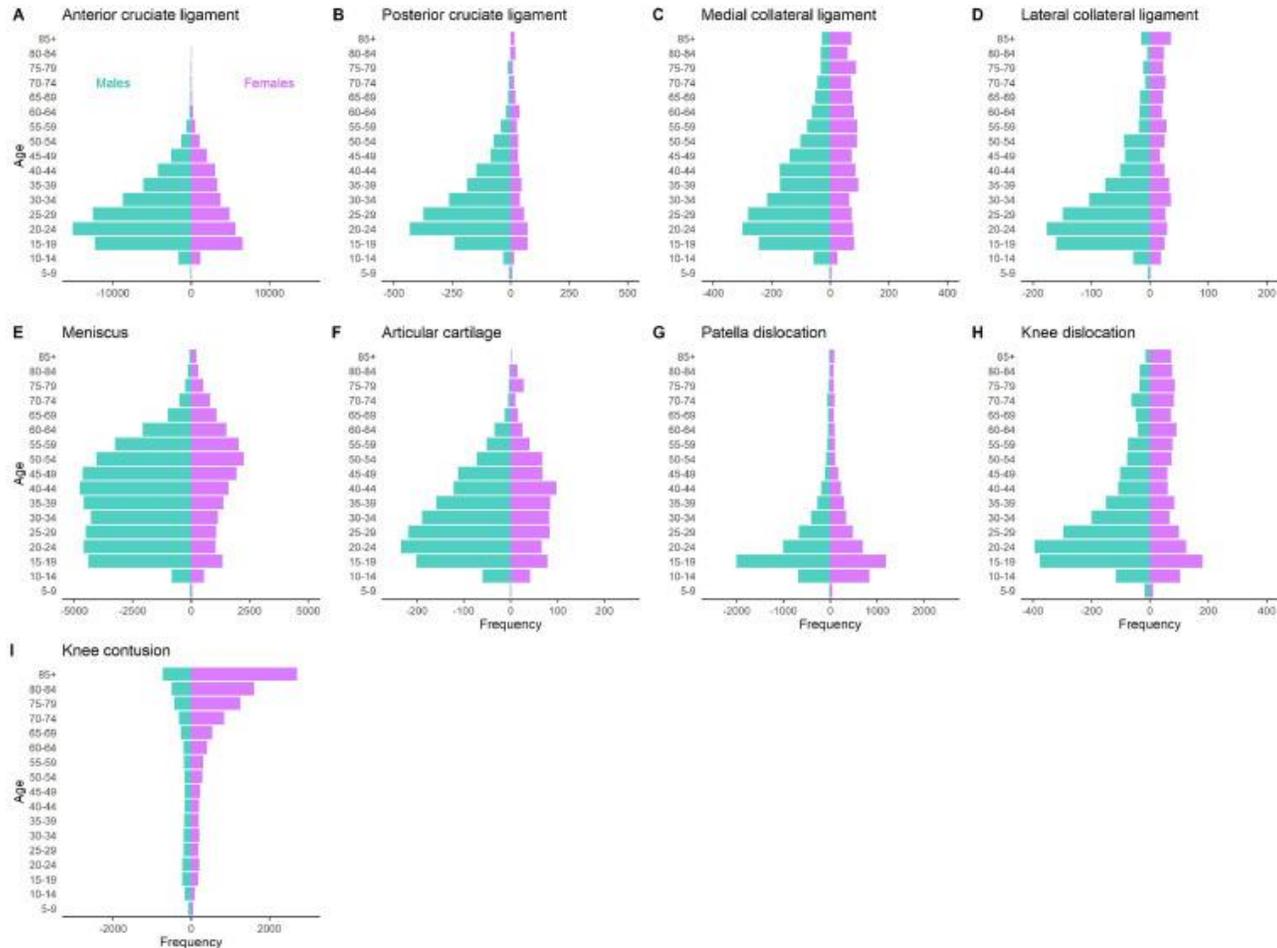
Acute:

- Most commonly traumatic
 - Contact
 - Non-contact
- Predisposing factors

Recurrent:

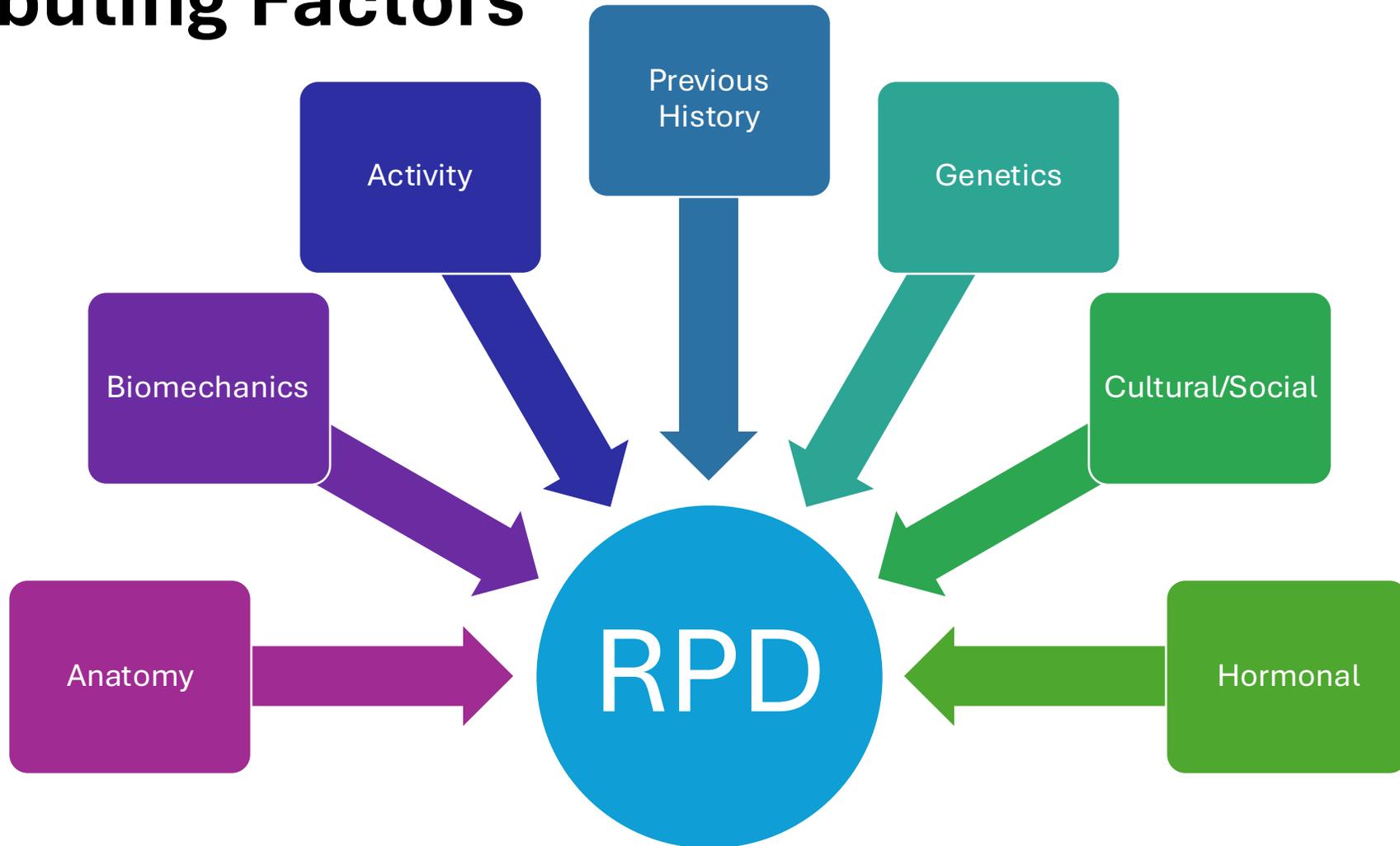
- 15-60% rate following initial incident
- Episodic
- Often trauma-related
- Differentiate from habitual dislocation

Incidence



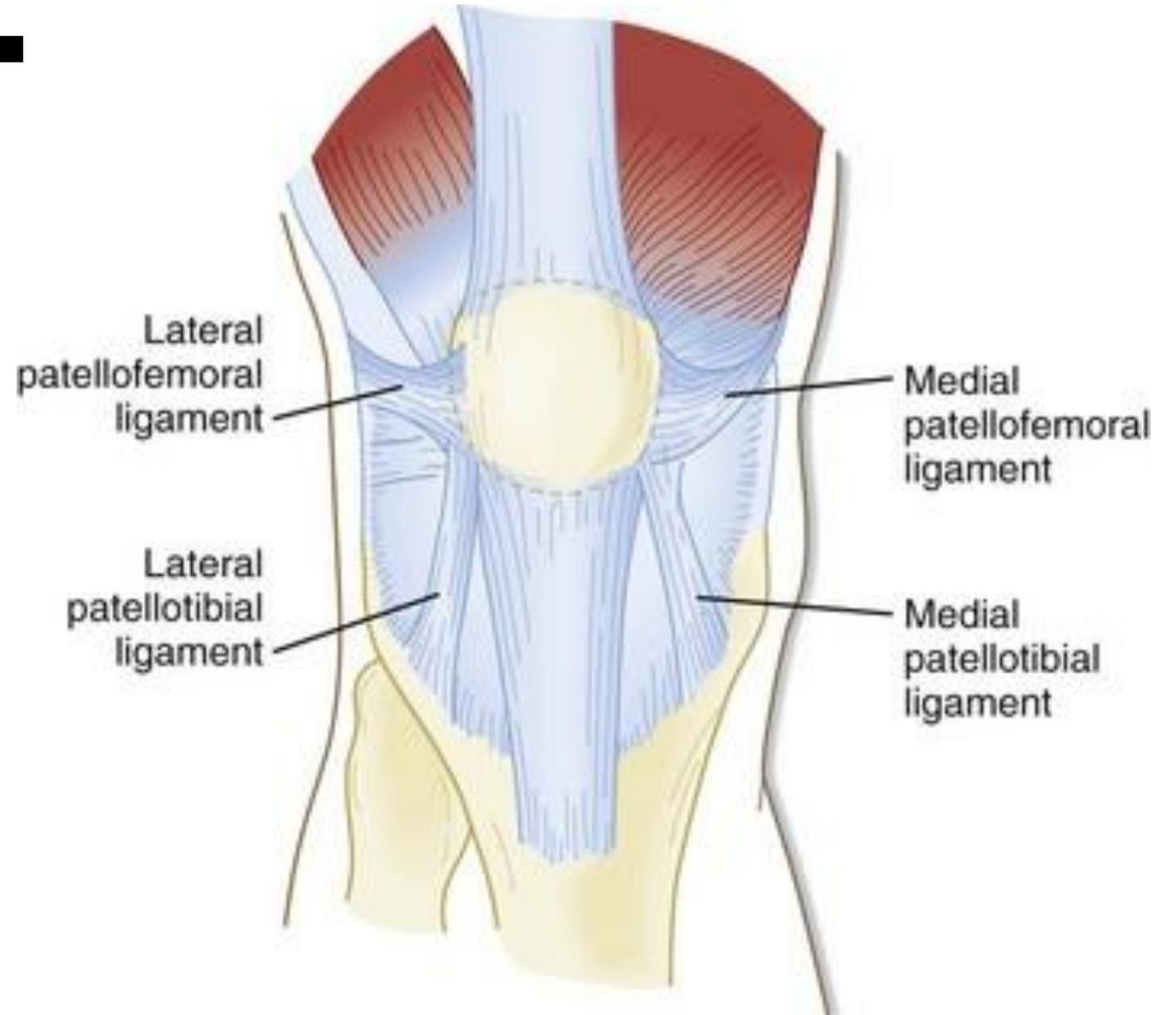
- 70% of first dislocations occur while playing sport
- 69% of first-time dislocations occur in athletes 10-19 years old
- First-time dislocations fairly even between females and males
- Subsequent dislocations more frequent in females, BUT:
 - Rates of knee injury in trained females similar to male controls
 - Rates in UNTRAINED females significantly higher
- Female athletes up to 2.72 times more likely to sustain knee injury than males – training?
- Greater change in risk from childhood to adolescence for females than males – training?
- Rate of patellar instability procedures is rising (in the US) – participation?

Contributing Factors

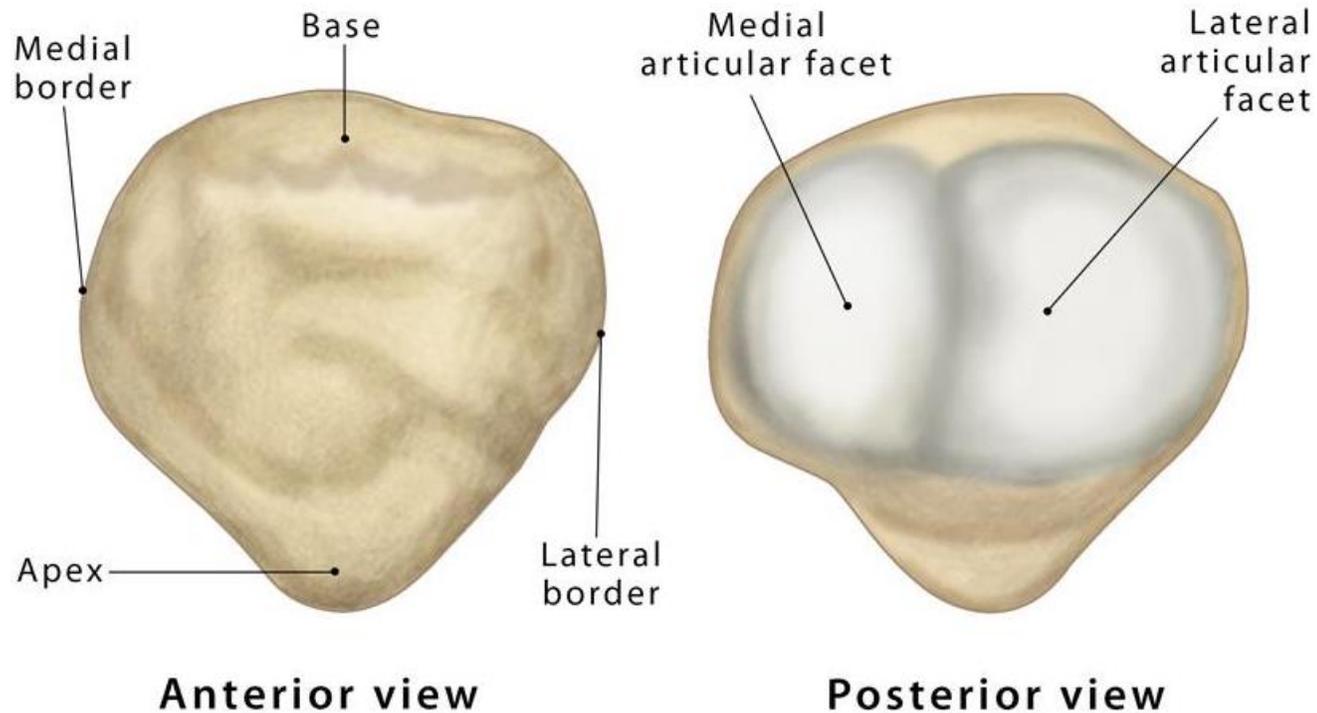


Anatomy of the Knee

- MPFL – contributes 50-80% of the force preventing lateral displacement of patella
- VMO contributes little to knee extension, almost exclusively works on patellar tracking
- Delayed VMO contraction relevant
- Lateral retinaculum and ligaments contributed to by VL and ITB



The Patella: Formation and Growth



Cartilage patella starts forming a center of bone between ages 2-6

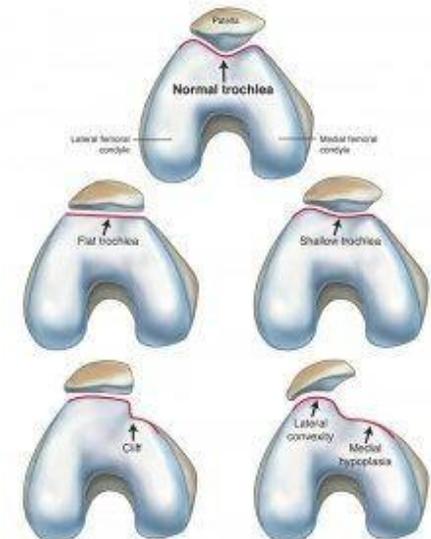
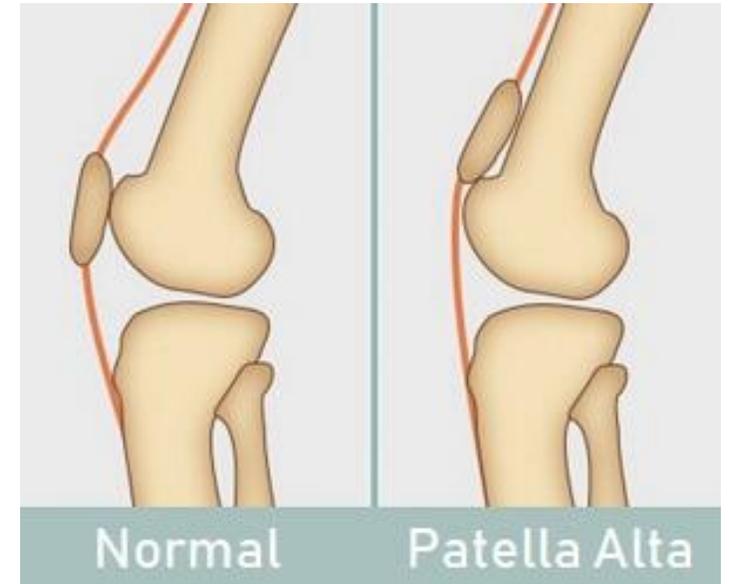
Kneecap may start to form bone at multiple centers within cartilage

Bipartite patella may result if some bone centers do not fuse together

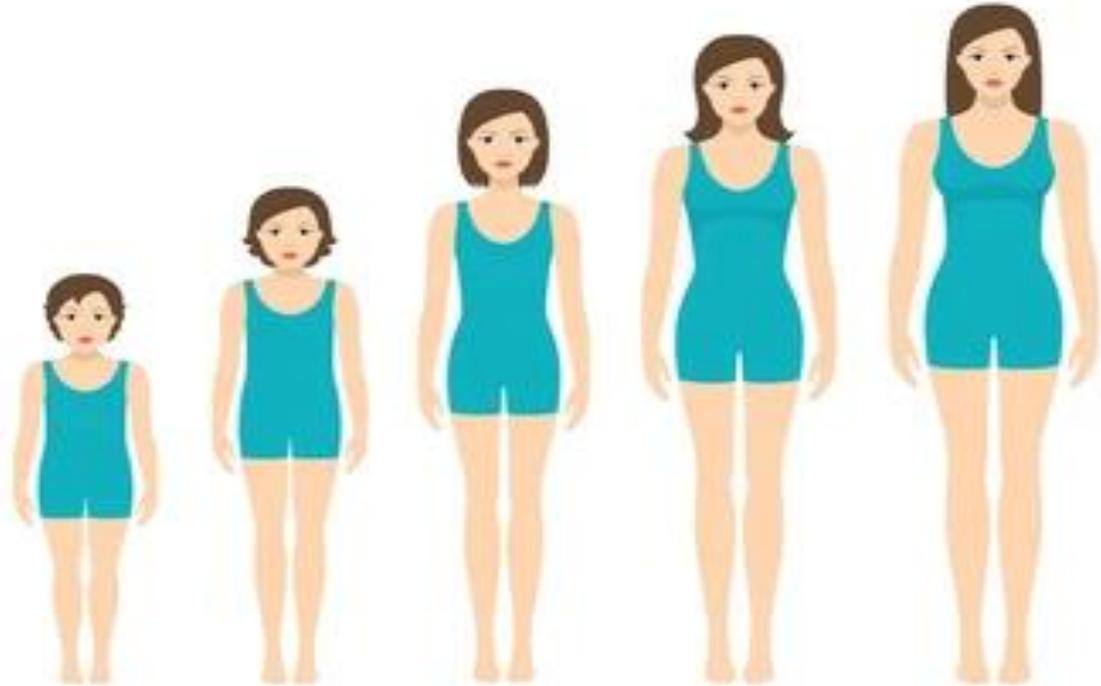
Bone centers will fuse in most adolescent females between ages 13-15

Patella Alta and Trochlear Dysplasia

- Patella alta present in 50-60% of first-time dislocations
- Trochlear dysplasia can increase patellar instability by up to 70%



Adolescence and Puberty



Adolescence: a period of psychological and social changes between childhood and adulthood

Puberty: physical, physiological and neurological development from childhood into adulthood

Onset of both at approximately age 8

Females develop earlier than males

Female development:

- Thelarche
- Pubarche
- Menarche
- Physical growth
- Social/psychological development

Exposure to gender roles, expectations, stereotypes, norms and biases

Physiological Considerations



- Hypermobility
- Connective tissue disorders
- Metabolic issues – REDS
- Effect of breast size on movement
- Neurodiversity – poor sensory integration, body awareness and coordination

Understanding Q Angle

Females have higher mean Q angles than males. **SOME EVIDENCE – NUANCES?**

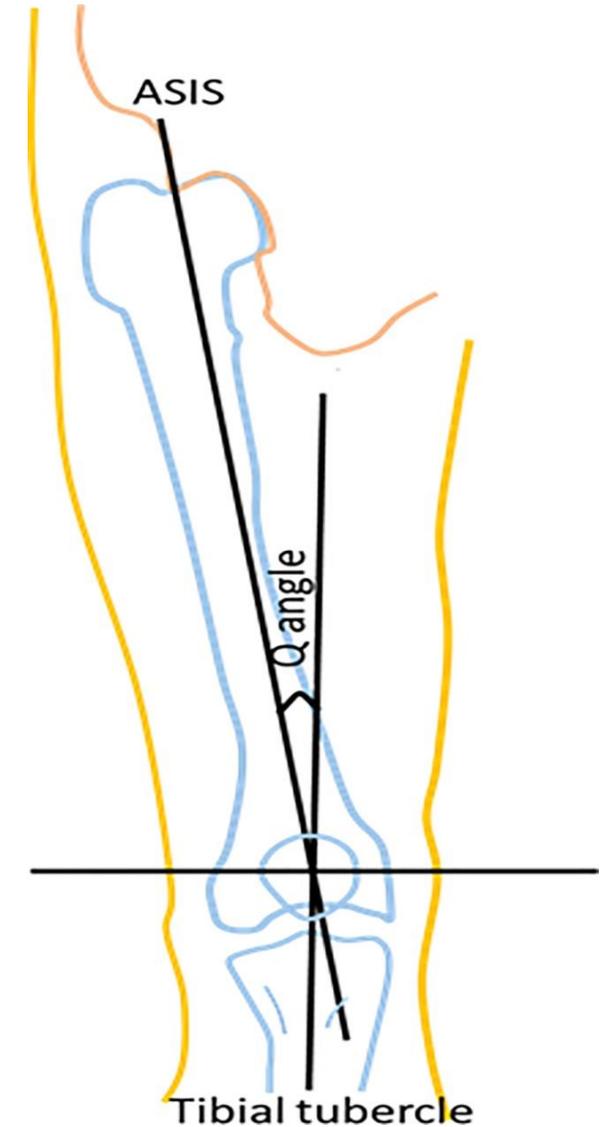
Due to wider pelvis in females. **INSUFFICIENT EVIDENCE**

Due to shorter limb length. **POSSIBLY?**

Higher Q angle is associated with AKPS. **CONFLICTING EVIDENCE**

Change to Q angle for females entering adolescence greater than for males. **CONFLICTING EVIDENCE**

Q angle affected by exposure to training. **POSSIBLY?**



Menstrual Cycle

Low Hormone Phase:

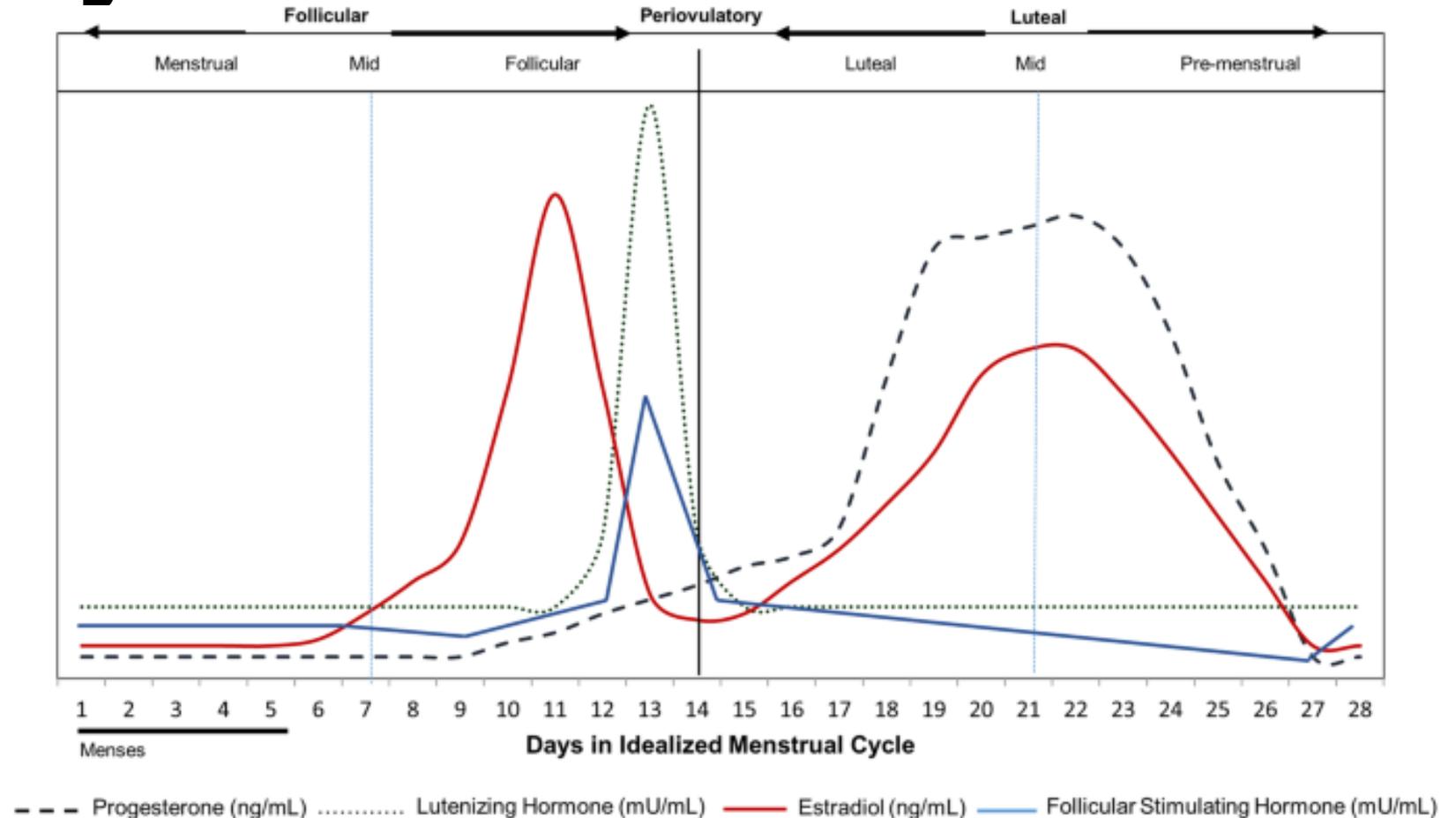
- Follicular Phase the most variable
- Lower inflammation
- Feel stronger
- Faster recovery
- Higher training loads

High Hormone Phase:

- Reduced reaction time
- Reduced neuromuscular coordination
- Reduced manual dexterity
- Impaired spatial cognition

Oestrogen – anabolic

Progesterone - catabolic



Social & Cultural Factors



- Access to S&C programs and resources:
 - Coaches less likely to push female athletes
 - Coaches less likely to utilize certified S&C trainers to implement S&C program
 - Utilization in US varsity teams: 9-17% female to 50% male
- Impact of gender norms:
 - Tension between cultural notions of the female body vs apprehension re “bulking up” with S&C programs
 - Coaches have lower expectations of female athletes’ potential
 - Under-representation of women in sports medicine
 - Lack of research related to female athletes

Biomechanical Factors



- **Knee valgus**
- **Hip stability**
- **Core stability**
- **Foot/ankle – shock absorption**
- **Squat**
- **Jump**
- **Hop**

Diagnosis of Recurrent Patellar Dislocation



More than 2 episodes of patellar dislocation

- **History**
- **Examination**
- **Imaging**

Comorbidities

- **PFPS**
- **Bone bruising**
- **Patellar tracking disorders**

Common Differentials:

- **ACL**
- **MCL**
- **Meniscus injuries**
- **Patellofemoral disorders**

History

- **First incident – mechanism, age, presentation, outcome, treatment, etc**
- **Subsequent incidents:**
 - **Frequency**
 - **Causes**
- **Screening questions:**
 - **Hypermobility**
 - **Training/playing history**
 - **Cycle**
 - **Family Hx**





Examination

Knee:

- Patellar ROM (greater than 50% med/lat)
- Knee ROM (flexion, extension, tibial rotation)
- Patellar apprehension
- J sign
- Observe/palpate for swelling, also around patellar (medial pole)
- Check cruciate and collateral ligs (draw signs, varus/valgus stress, etc...)

Structural:

- Femoral anteversion (Craig's test)
- Genu recurvatum/varum/valgum
- Patella alta (imaging)
- Pes planus
- Q angle
- General ligamentous laxity (Beighton's)

Functional:

- Gait
- Squat
- Single leg squat
- Step up
- Drop jump test (one/two legs)
- Balance
- Hip and core stability
- Muscle testing (manual or dynamometer)

Imaging

Plain Radiography:

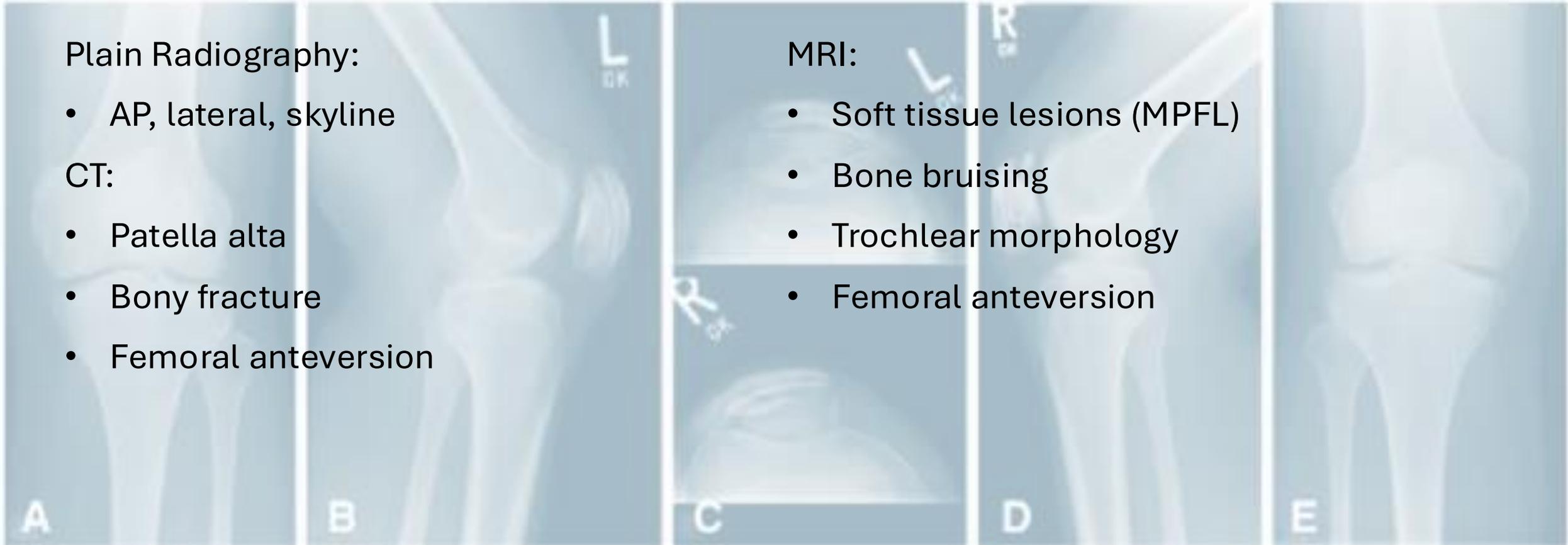
- AP, lateral, skyline

CT:

- Patella alta
- Bony fracture
- Femoral anteversion

MRI:

- Soft tissue lesions (MPFL)
- Bone bruising
- Trochlear morphology
- Femoral anteversion



Management

Surgery

Treatment

Rehabilitation

Education



Surgical Management

Most acute PD managed conservatively

Most recurrent PD requires surgical intervention, and will benefit from rehab and conservative co-management

- **Medial Patellofemoral Ligament Reconstruction**
- **Tibial Tubercle Osteotomy**
- **Lateral Release**

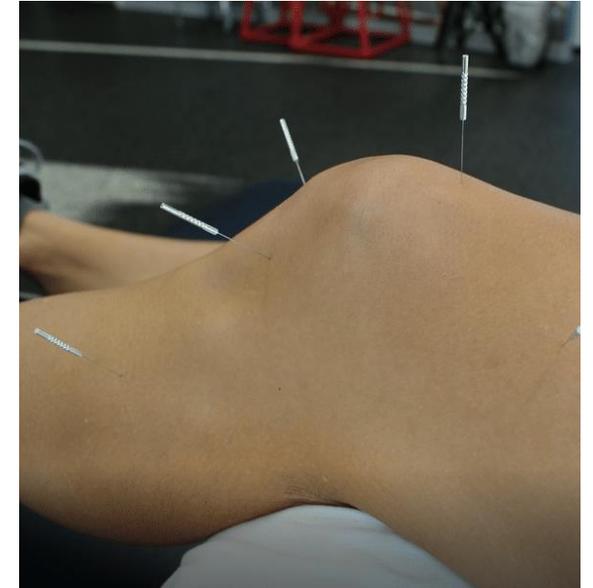


Manual Therapy

Work through the kinetic chain

Check opposite side

Consider asymmetries that have contributed



Rehab and Exercise

Acute:

- Muscle activation
 - VMO
 - Hip stabilisers
 - Core
- Strength & hypertrophy
 - Address imbalances – ratios
 - Address asymmetries – single leg work
 - Compound movements
- Movement patterns/stability
 - Squat
 - Jump
 - Hop
 - Sports specific
 - External locus of control

- Power and speed
 - Plyometrics
 - Jumping and landing
 - Sports specific

Maintenance and development:

- Facilitate engagement in S&C programs
 - Age specific
 - Sports specific
 - Hip stability
 - Core stability
 - Periodisation, pre-season, season, off-season



Braces & Taping



J brace



Patellar stability sleeve



Taping Techniques:

Rigid:

- McConnell taping
- J Taping

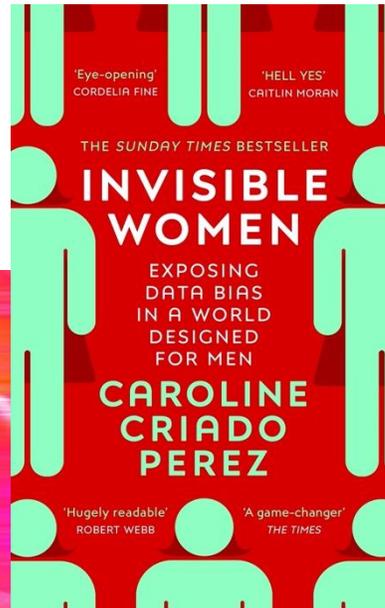
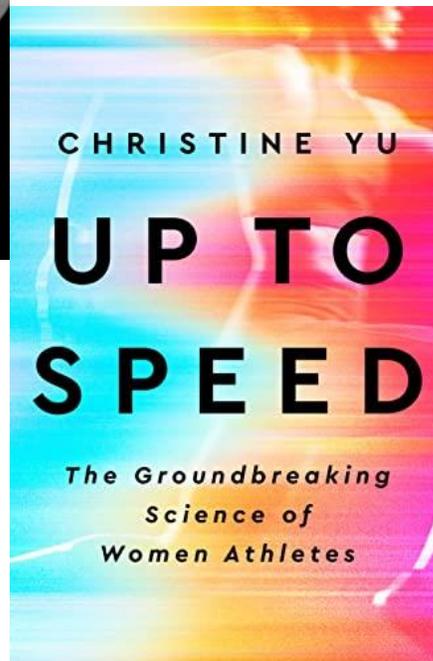
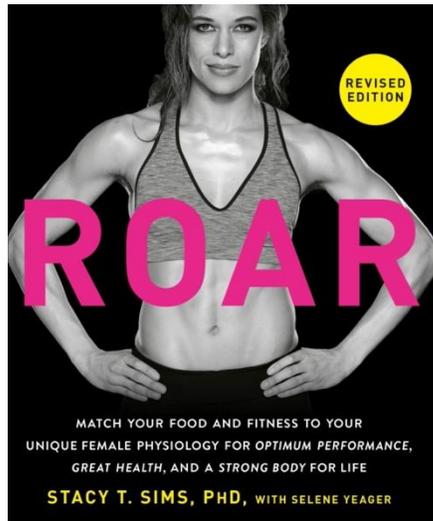
K Tape:

- PFPS technique
- VMO activation
- Hip activation

Active/Dynamic Tape:

- VMO activation
- Hip

Education



Develop with them strategies to manage future episodes

Outline importance of S&C

Address myths/concerns

Encourage to learn more about their own body – training, nutrition, needs and requirements

Empowerment and facilitating autonomy and agency



Conclusion

Treatment specific to gender and age

Education

Access to S&C

Co-management for better outcomes

Resources

References

Examination procedures

Taping techniques

Exercise prescription

More(?)

