

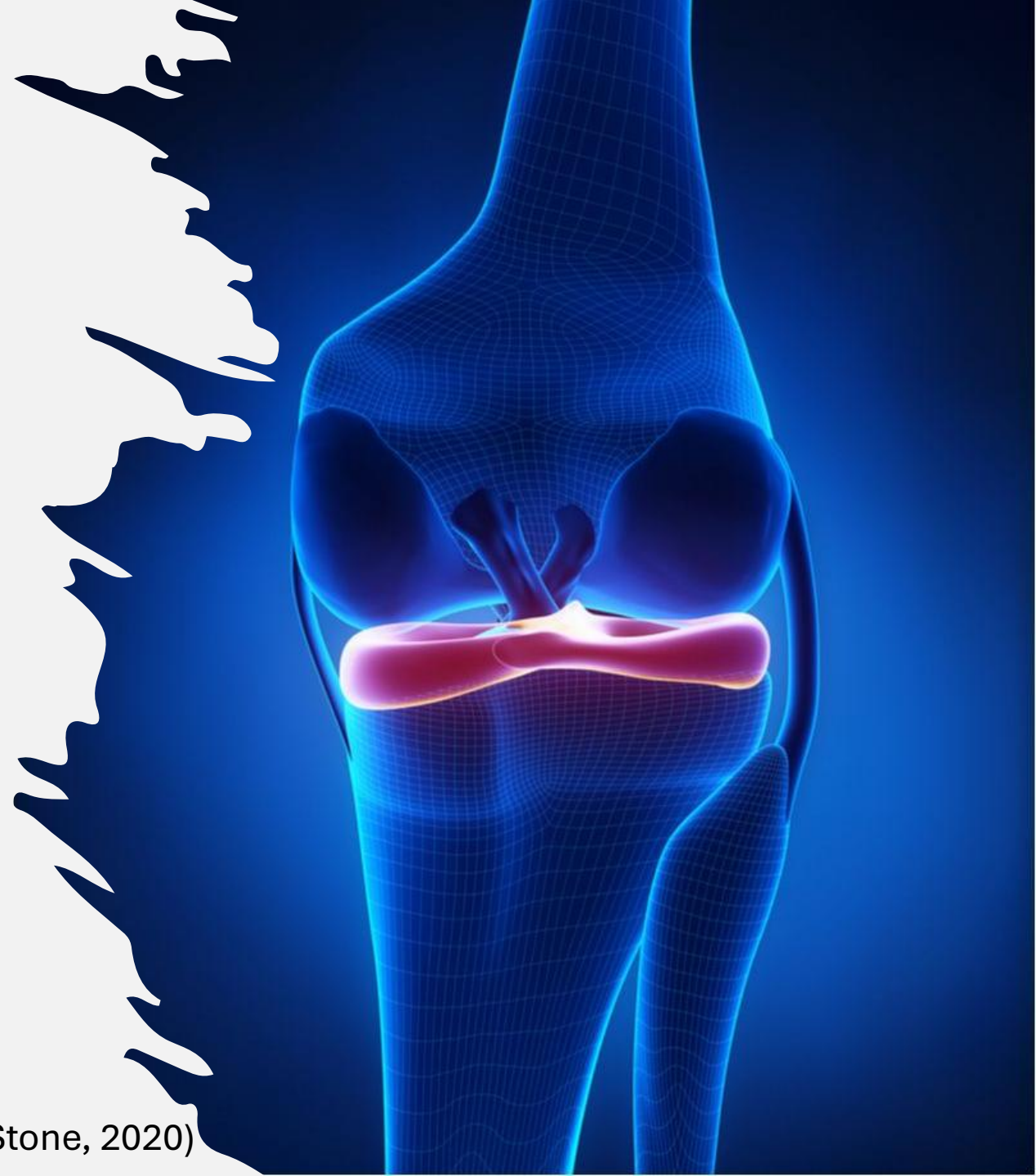
Early to intermediate rehabilitation for a medial meniscus injury in the knee.

BMST5003

2400763

Lowri Lewis

Image 1: (Stone, 2020)



Anatomy:

Structure- Fibrocartilaginous

Lateral meniscus: (Pasinski et al, 2023)

- O shaped
- Mobile
- Covers 75-93% plateau.

Medial meniscus: (Pasinski et al, 2023)

- C shaped
- Stable
- Attached to deep MCL
- Covers 51-74% of plateau

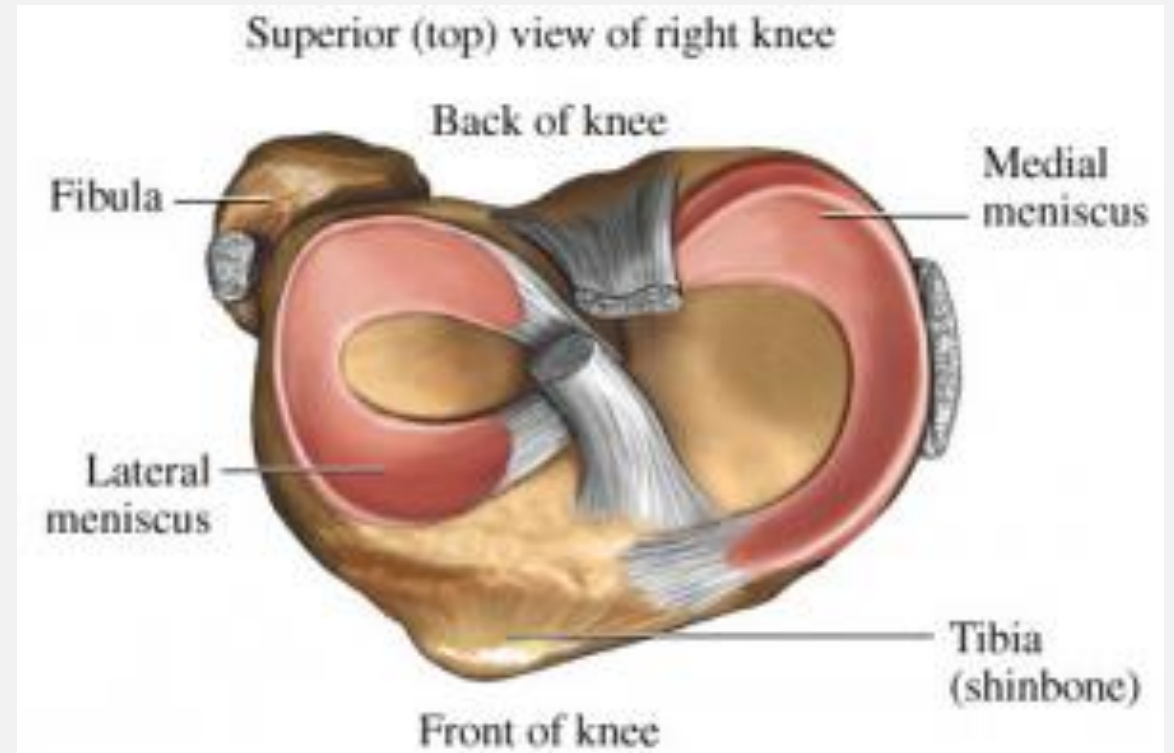


Image 2: (Wynyrd, 2017)

Biomechanics:

Primary role:

- Ease load transmission and stability of knee (Cognetti and Bedi, 2025)
- Transmit 50-85% of joint load (Kawamura et al, 2003)

Hoop stress mechanism:

- Axial compression $\longrightarrow$ circumferential tension
- Prevent extrusion.

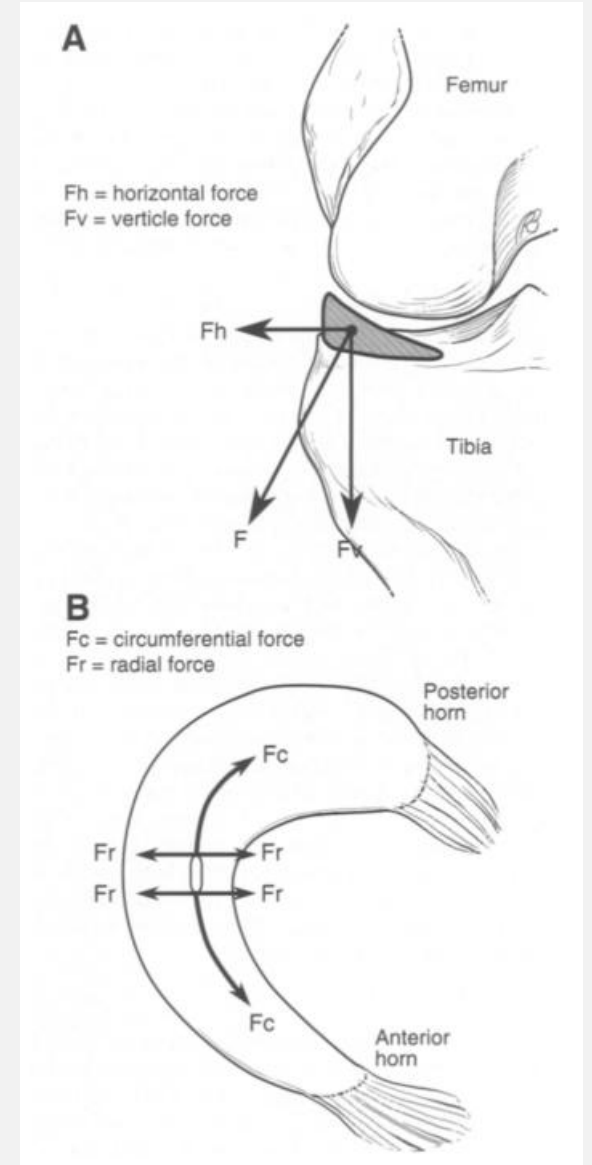


Image 3: (Kawamura et al, 2003)

Stress Strain Curve:

Toe region- 0-2%: removing slack

Elastic region- 2-5%: functional load

Plastic region- >6%: micro-failure

Failure point- 15-20%: complete rupture

(Peloquin et al, 2016)

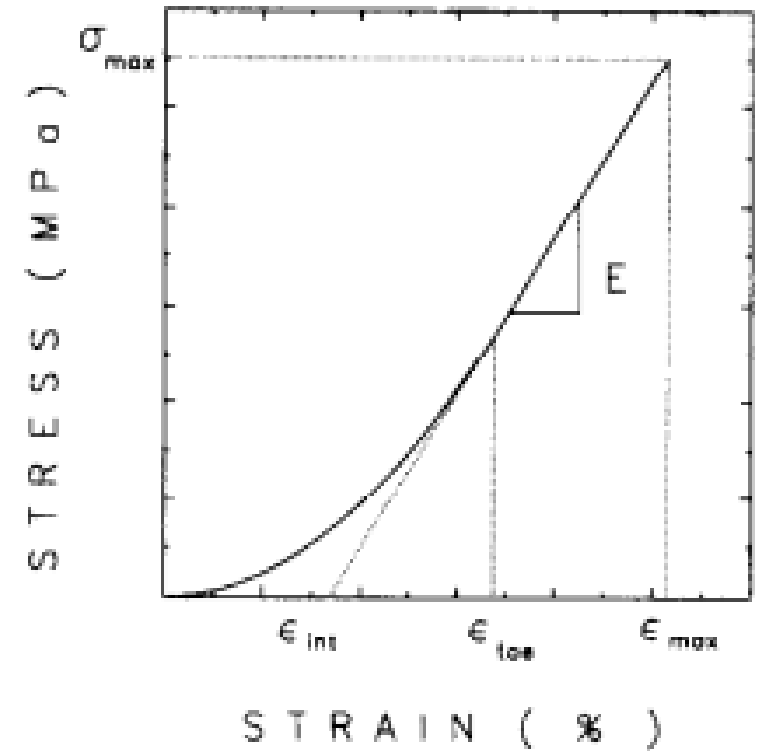


Image 4: (Tissakht and Ahmed, 1995)

Healing times and Constraints:

Zones: (Fox et al, 2012)

- Red zone: Vascular
- Red/White zone: Mixed
- White zone: Avascular

Healing phases: (Kisner and Colby, 2012)

- Acute: 0-6 days- protection
- Proliferation: Week 1-6- Type 3 collagen
- Re-modelling: Week 12+- Type 1 Collagen

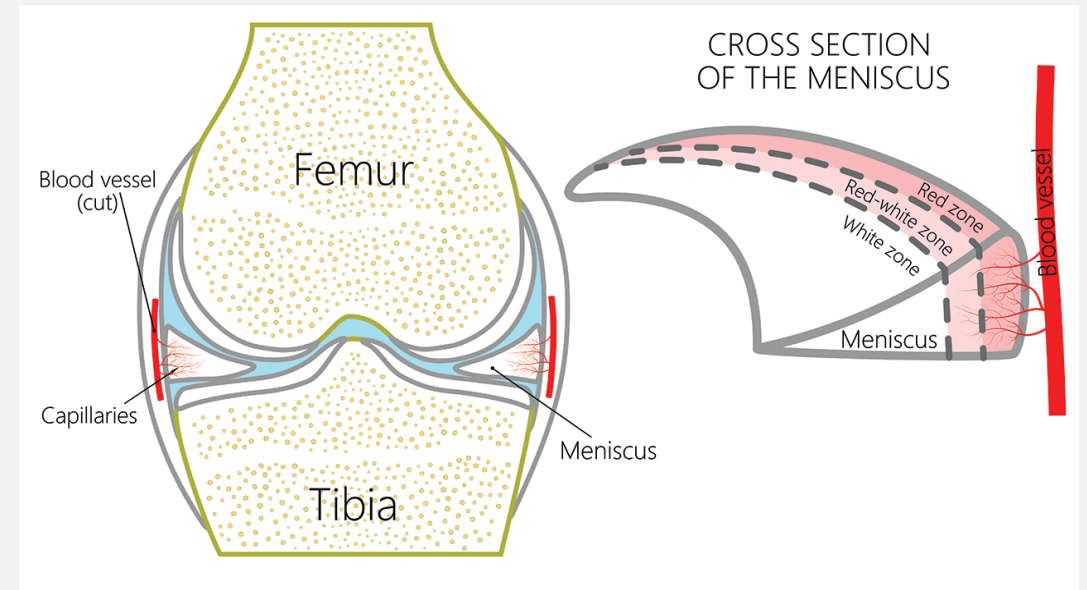


Image 5: (Centeno, 2019)

Specific injury: Medial Meniscus tear

Etiology:

- Rotational force and axial load
- Deceleration, quick change in direction.

Risk factors:

- MCL attachment = decreased mobility
- ACL deficiency

(Raj and Bubnis, 2023)

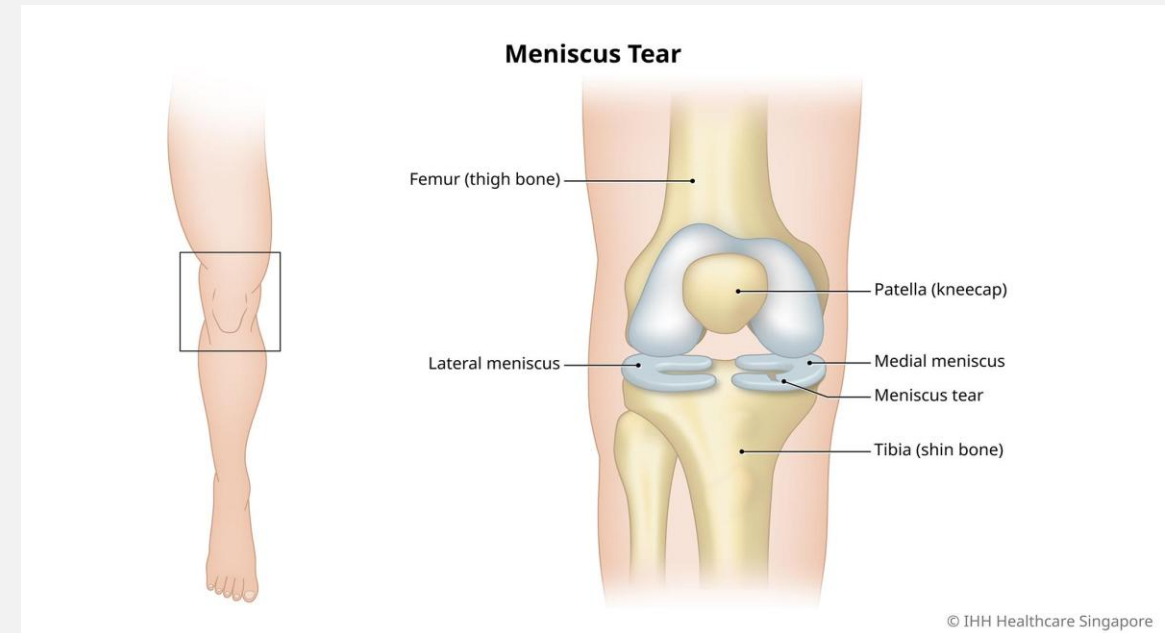


Image 6: (Gleneagles Hospital Singapore, 2025)

Mechanism of Injury:

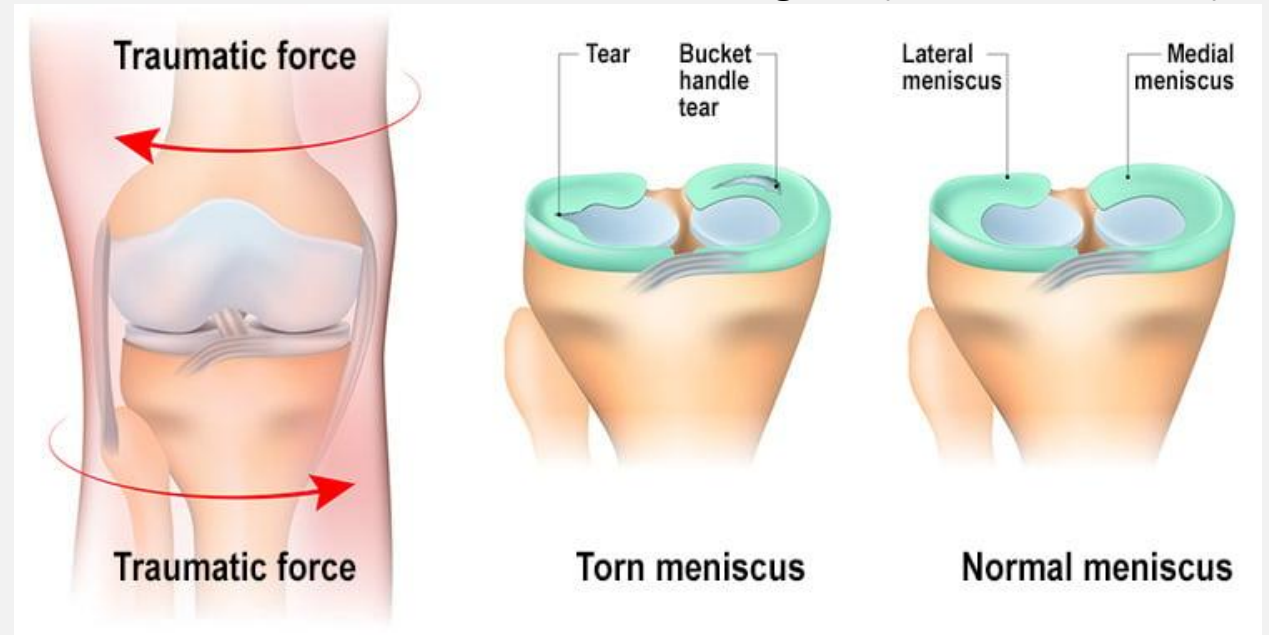
Trap mechanism:

- Medial meniscus: 5.11mm movement in flexion (Thompson et al, 1991)
- Stuck in femoral condyle during deep flexion.

Failure:

- Shear force exceeds radial strength (3MPa) (Tissakht and Ahamed, 1995)

Image 7: (Chen et al, 2025)



Injury Classification and Grading:

Grading: (Stroller et al, 1987)

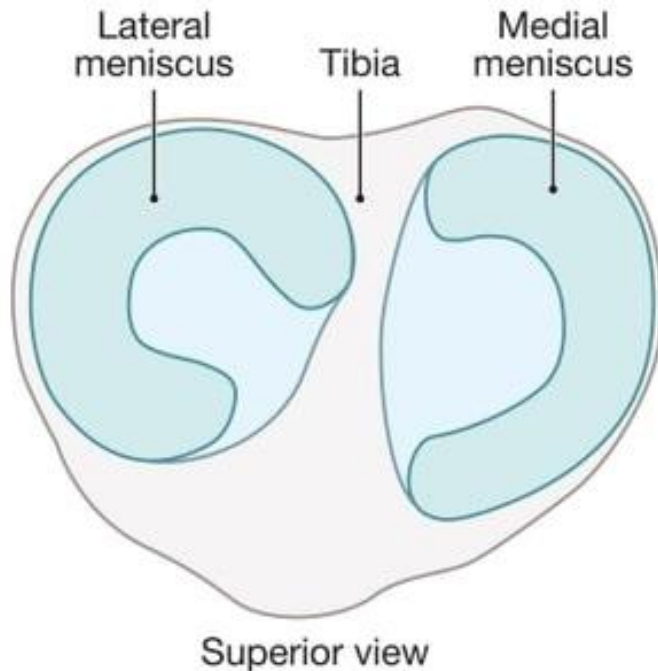
- Grade 1 and 2: degeneration
- Grade 3: complete tear

Morphologies: (Raj and Bubnis, 2023)

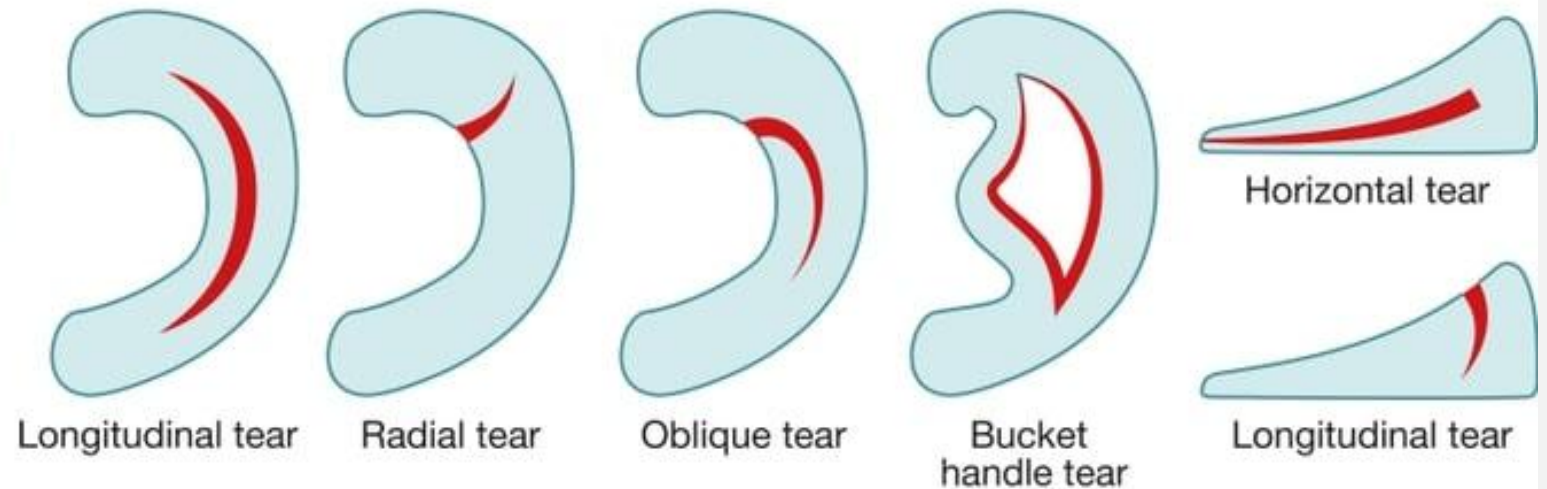
- Longitudinal: Parallel to axis
- Bucket handle: Locking risk
- Radial: Perpendicular

Image 8: (Avramovic, 2025)

Menisci of the knee



Meniscus tears



Rehabilitation guidelines:

Signs of excessive stress: (Kisner and Colby, 2012)

- Swelling, P+ >24 hours

Zones:

- Red zone: Flexion > 90°
- Amber zone: Open chain knee extension
- Green zone: Axial loading and ROM of 0-90°.

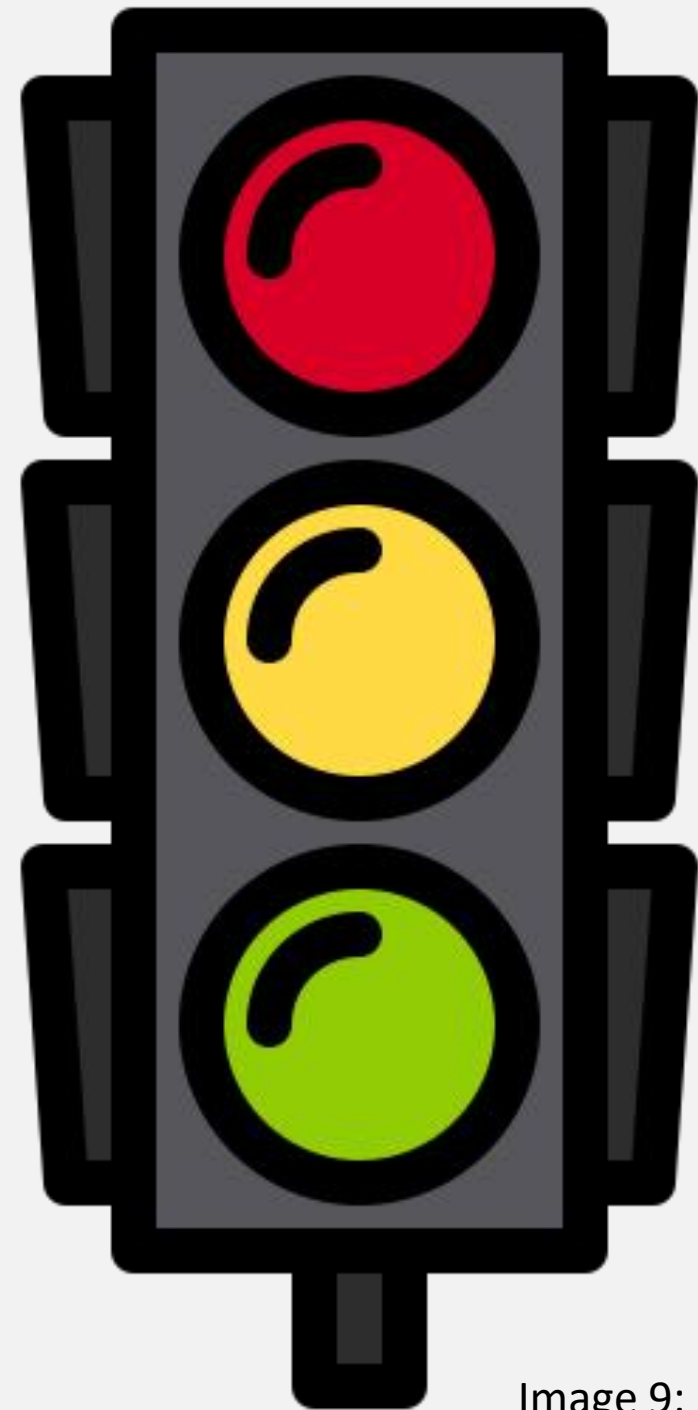


Image 9: (Flaticon, 2020)

Exercise programming and Safety:

Stages of tissue healing: (Kisner and Colby, 2012)

- Phase 1: 0-4 weeks- Isometric and ROM
- Phase 2: 4-6 weeks- Concentric onset
- Phase 3: >6 weeks- Eccentric loading

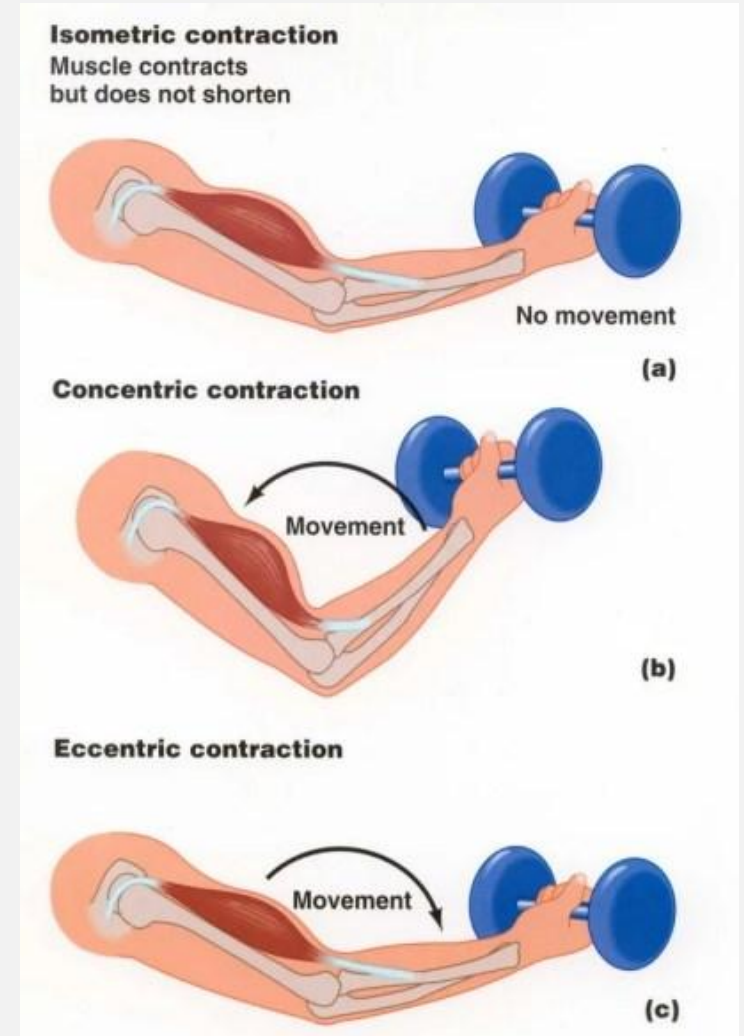


Image 10: (Bradburn, 2013)

Progression criteria:

Meniscus Specific Progression: (Cavanaugh and Killan, 2012)

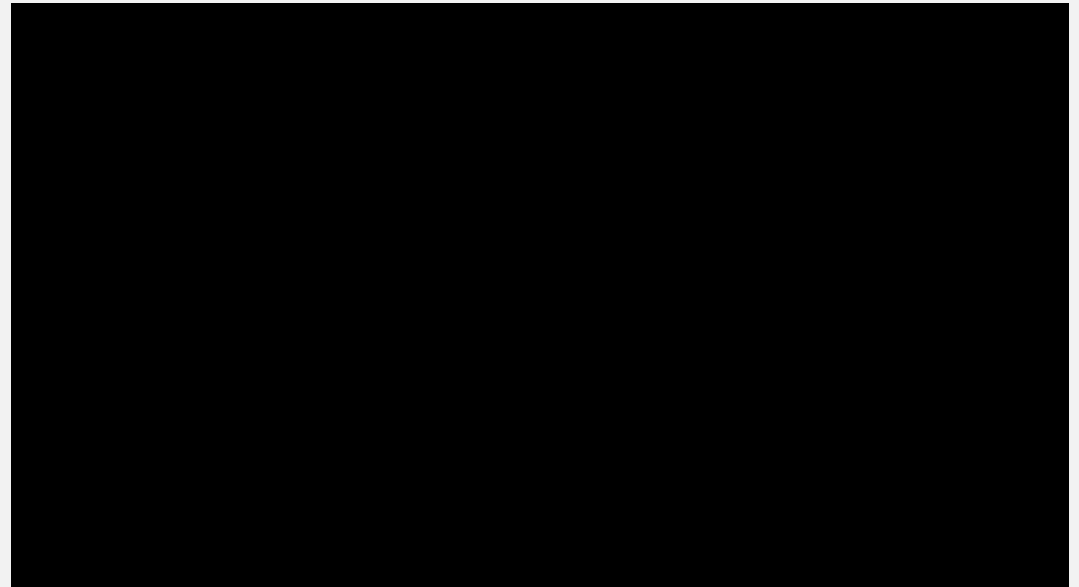
- Phase 1: 0-6 weeks- ROM 90°, no effusion, no quadricep lag
- Phase 2: 6-12 weeks- symmetrical ROM, Normal gait pattern



Image 11: (AdaptiveWork, 2019)

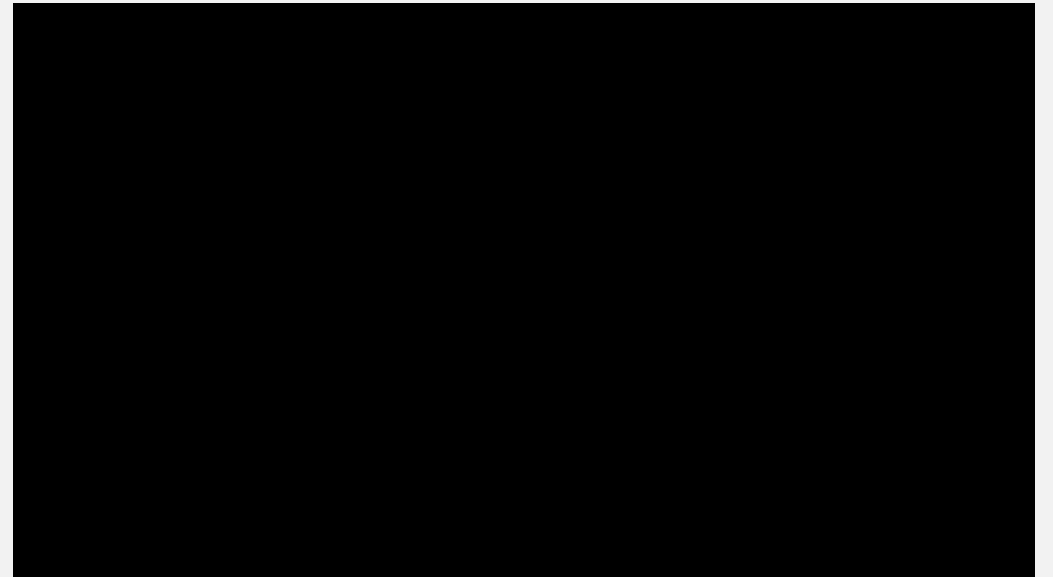
Exercise 1: End of range knee extension with bolder under knee (isometric)

- **Aim-** Quadricep control (Cavanaugh and Killian, 2012)
- **Technique-** Towel under knee, 'push knee down' into floor
- **Regression-** Flat knee extension
- **Progression-** Dual tasking: catching ball



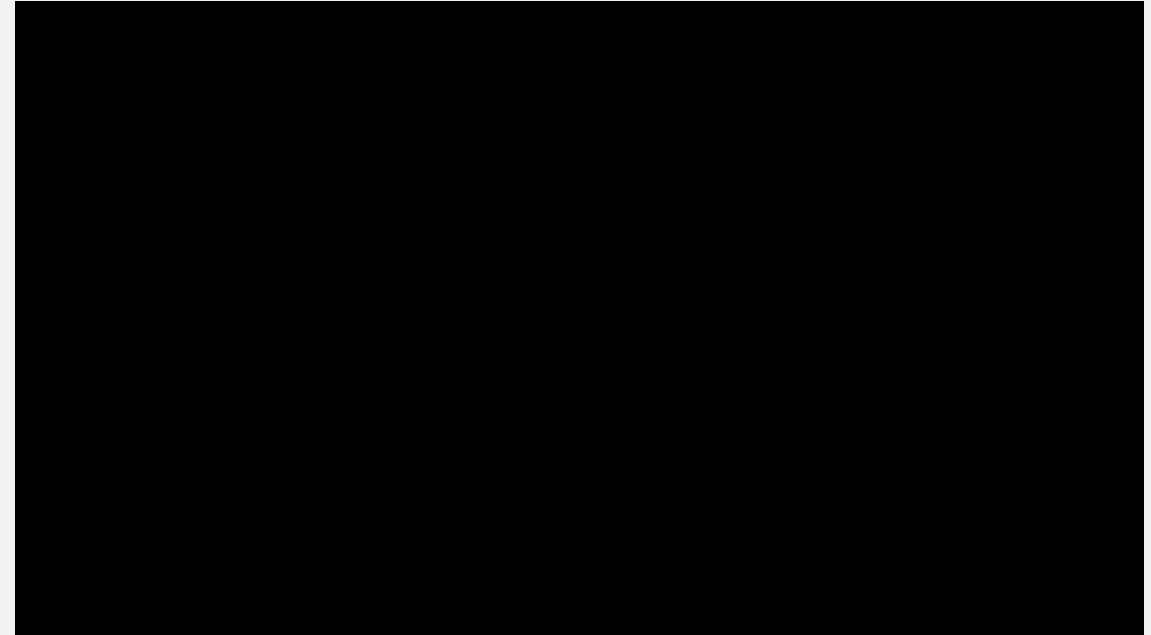
Exercise 2: Adductor squeeze with ball (isometric)

- **Aim-** Proximal hip stability (Powers, 2010)
- **Technique-** Ball between bent knees, 'squeeze' together.
- **Regression-** Wider pillow
- **Progression-** Glute bridge squeeze



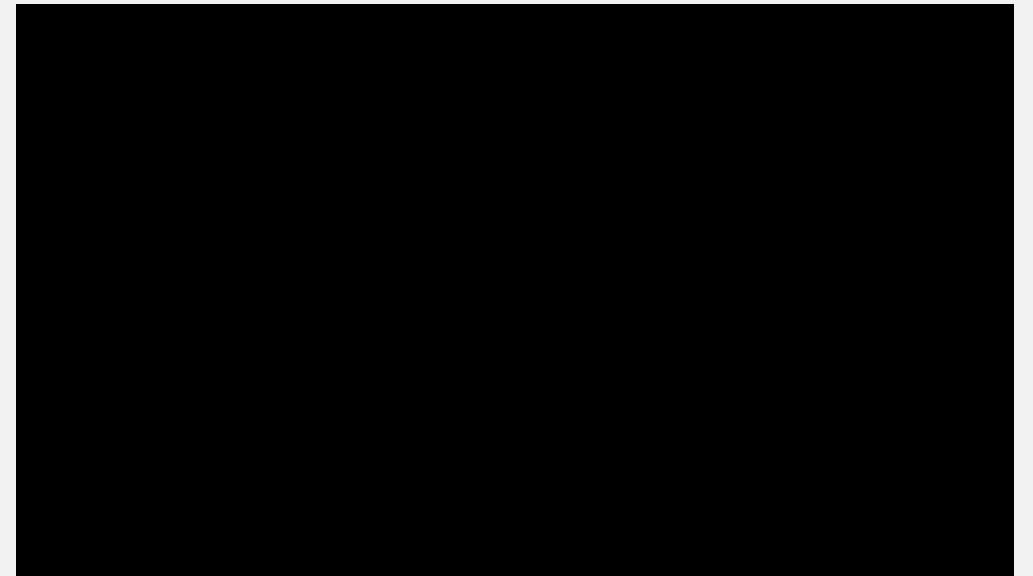
Exercise 3: Heel slides (concentric)

- **Aim-** ROM and synovial nutrition (O'Driscoll and Giori, 2000)
- **Technique-** Pull heels towards buttock.
- **Regression-** Passive towel slide
- **Progression-** Heel hover slides



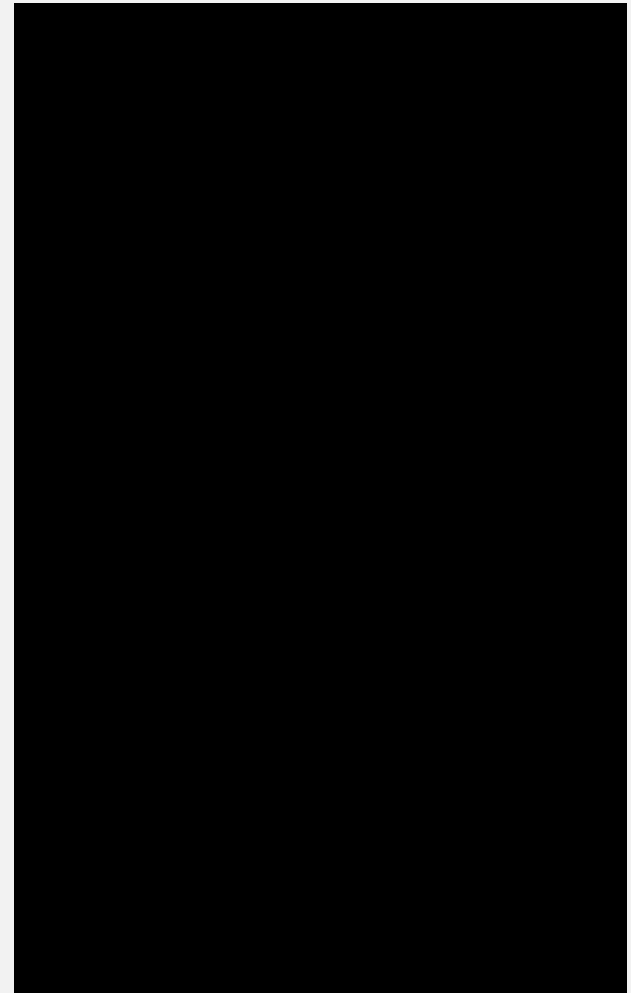
Exercise 4: lying hamstring curls (concentric)

- **Aim-** Isolate hamstrings: co-activation with quadriceps (Baratta et al, 1988)
- **Technique-** Bring heel to buttock lying prone.
- **Regression-** Standing curl
- **Progression-** Banded Resistance



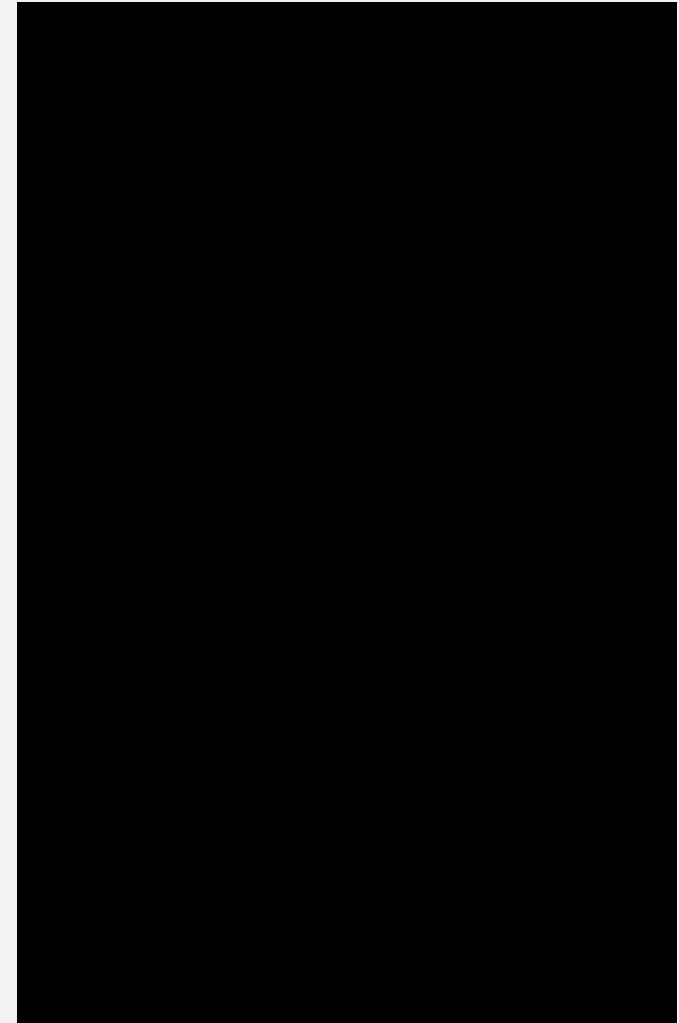
Exercise 5: box squats (eccentric)

- **Aim-** Closed chain axial loading:
less shear force (Escamilla, 2001)
- **Technique-** squat back onto box
- **Regression-** TRX assisted squat
- **Progression-** Goblet box squat



Exercise 6: Forward step downs (eccentric)

- **Aim-** Eccentric deceleration; high level of co-activation (Beutler et al, 2002)
- **Technique-** Step down slowly from box
- **Regression-** Lower step height
- **Progression-** Holding dumbbells



Cardiovascular maintenance:

- **Exercise-** Stationary Cycling: less tibiofemoral compression force (Ericson and Nisell, 1986)
- **Safety-** High seat height: prevent flexion $>90^\circ$



Image 18: (Flaticon, 2021)

Neuromuscular control:

- **Goal:** Restore proprioception
- Meniscus is a sensory organ: mechanoreceptors to brain for knee awareness (Karahana et al, 2010)
- **Exercise:** Single leg stance
- **Progression:** Unstable surface, remove visual dominance.



Image 19: (Roozen, 2016)

Summary:

- **Anatomy:** Respect 'Red zone'- $<90^\circ$
- **Physiology:** Drive nutrition through motion
- **Function:** Restore proximal stability
- **Outcome:** Symmetrical, pain free return to sport.

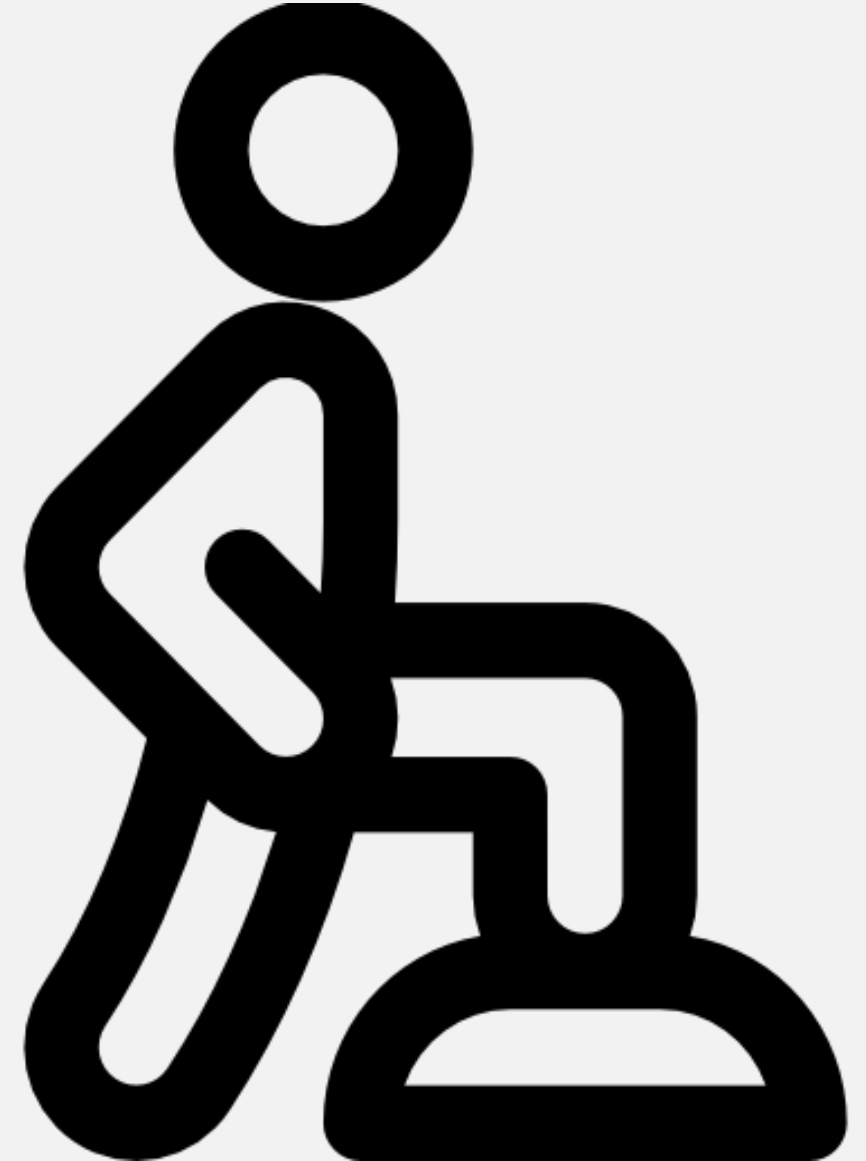


Image 20: (Flaticon, 2017)

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Image Reference List:

- Image 1: Available at: <https://www.stoneclinic.com/blog/meniscus-disease> (Accessed: 1 January)
- Image 2: Available at: <https://www.mgs.physio/knee-meniscus-tears/> (Accessed: 2 January)
- Image 3: Available at: <https://www.sciencedirect.com/science/article/pii/S1060187203800333?via%3Dihub> (Accessed: 7 January)
- Image 4: Available at: <https://www.sciencedirect.com/science/article/pii/002192909400081E> (Accessed: 9 January)
- Image 5: Available at: <https://regenexx.com/blog/meniscus-tear-recovery-time-without-surgery/> (Accessed: 10 January)
- Image 6: Available at: <https://www.gleneagles.com.sg/conditions-diseases/meniscus-tear/symptoms-causes> (Accessed: 10 January)
- Image 7: Available at: <https://www.hss.edu/health-library/conditions-and-treatments/list/meniscus-tear> (Accessed: 13 January)
- Image 8: Available at: <https://www.bojanavramovic.com/tag/meniskus/> (Accessed: 13 January)
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- Image 10: Available at: <https://colebradburn.com/2013/02/06/biomechanical-work/> (Accessed: 14 January)
- Image 11: Available at: <https://blog.planview.com/how-to-create-a-progression-plan-for-your-team-members/> (Accessed: 14 January)
- Image 18: Available at: https://www.flaticon.com/free-icon/bicycle_5147132 (Accessed: 17 January)
- Image 19: Available at: <https://coachrozy.com/friday/coach-rozy-blog-wednesday-exercise-of-the-weak-single-leg-balance-on-unstable-surface-by-connor-fitzsimmons-coach-rozy-2016-intern/> (Accessed: 17 January)
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