

CYCLING INJURIES

Bike Fit + Rehab = Happy Cyclist

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Objectives



1. Epidemiology
2. Biomechanics
3. Overuse injuries
4. Prevention

Cycling Epidemiology

- 100 million Americans ride bicycles
 - 5 million cyclists ride 20 days per month
- Cycling injuries result in 500,000 Physician visits per year
- Estimated cost of 8 billion dollars

Epidemiology

- Overuse injuries most common, traumatic event second
 - Improper training
 - Improper bike fit
- Cycling is a repetitive activity
 - 1 hour = 5400 pedal revolutions
 - Can result in microtrauma or overuse injuries
 - Knee most common location of overuse injury

Injury Incidence

- Wilber et al used questionnaire
 - Neck 48.8%
 - Knee 41.7% (26-65%)
 - Groin/buttock 36.1%
 - Hands 31.1%
 - Back 30.3%



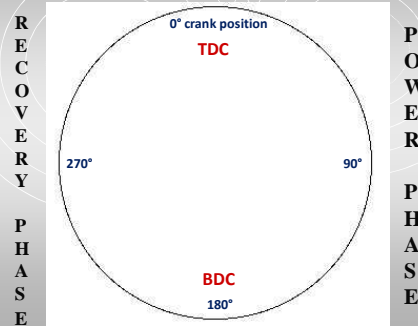
Injury Predictors

- Low weekly mileage - ≤ 26 miles/wk
- Duration in low gears
- Years of cycling experience
- Average speed ≤ 14 mph

Cycling Biomechanics

- Sagittal plane sport and a partially closed kinetic chain activity
- Joints go through restricted ranges of motion due to fixed buttock and foot positions
- Power is transferred from rider to bike via pedal-cleat system
- 2 Phases of the pedal cycle
 - Power
 - Recovery

Terminology

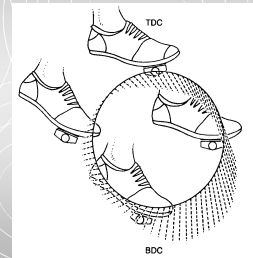


Power Phase

- Starts just prior to top dead center (TDC) and finishes at bottom dead center (BDC)
- Propels bicycle forward
- Greatest muscular activity in this phase

Power Phase Forces

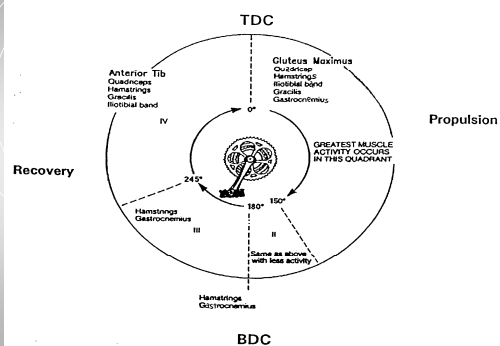
- Forces applied to pedal
 - Seated, half of body weight
 - Standing, 3x body weight
- Greatest F applied at middle half of power phase, F is perpendicular to pedal

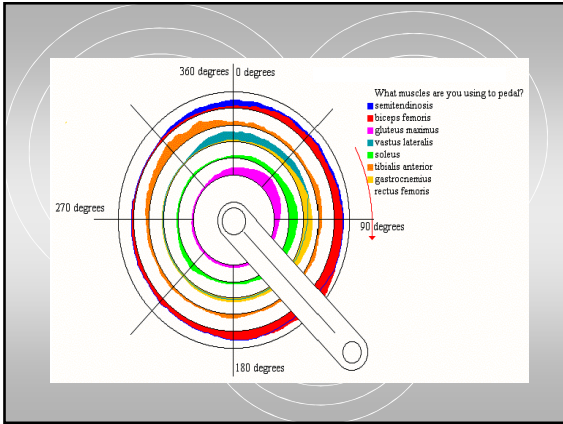


Recovery Phase

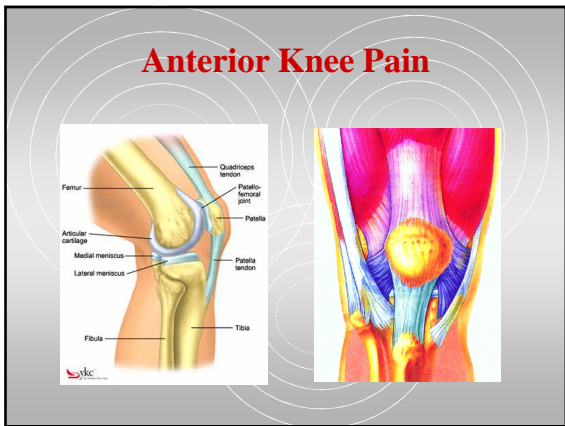
- Starts just before BDC and finishes at TDC
- Realigns foot and leg for next power phase
- Negative recovery phase pedal F (wt of limb applies torque to crank)

MUSCULAR ACTION DURING CYCLE STROKE



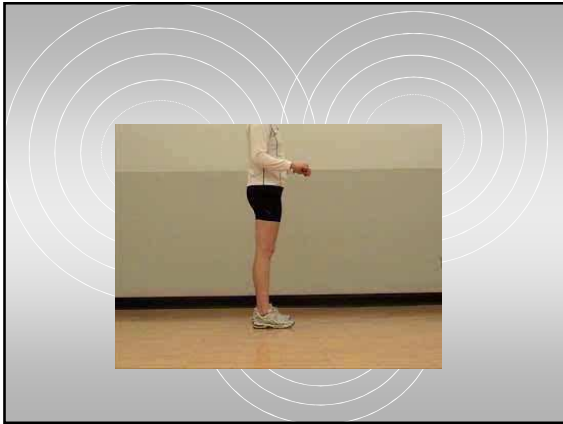


- ### Knee Pain
1. **Anterior**
 - Patellofemoral pain x 2
 - Patellar tendonitis
 2. **Lateral**
 - Iliotibial band syndrome
 3. **Posterior**
 - Hamstring



- ### Patellofemoral Pain
- “Retropatellar knee pain”
- Excessive compressible load between knee cap and femur
 - Causes
 1. Muscular imbalances
 2. Improper pedaling
 3. Seat too low
 4. Seat too far forward
 5. Gears too high
 6. Excessive hill riding
 7. Improper training
-



- ### Treatment
- Retro PFP
- **Flexibility**
 - Quad
 - Hip flexor
 - Hamstring
 - **Strength**
 - Weight bearing co-contraction
 - Gluteals, hamstring, quadricep
 - **Education on pedaling mechanics**



Patellofemoral Pain

“Medial knee pain”

- Excessive shear forces between knee cap and femur
- Causes
 1. Muscular imbalances
 2. Increase Q angle
 3. Foot/LE malalignment
 4. Seat too high
 5. Pedal width too wide
 6. Improper training

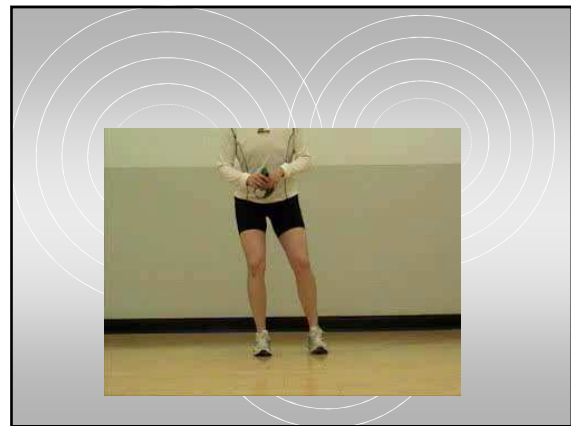



Pronation uncontrolled (knee rotates inward) Pronation controlled with orthotic

Treatment

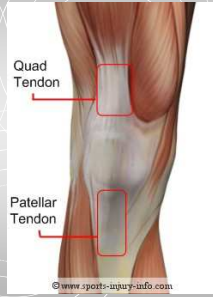
Medial PFP

- Strength
 - Non weight bearing to weight bearing
 - Gluteal, core, hamstrings
 - Knee control
- Foot mechanics
 - Orthotic to shoe or cleat
- Education on pedaling mechanics



Patellar Tendonitis

- Adverse line of pull on tendon
- Causes
 1. Muscular imbalances
 2. LE alignment
 3. Seat too low
 4. Seat too far forward
 5. Improper training

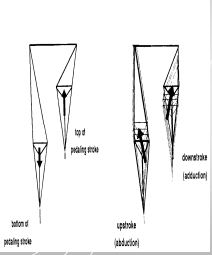


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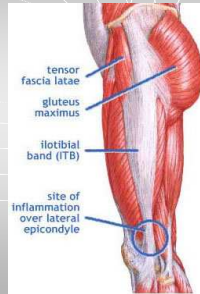
Treatment

Patellar tendonitis

- Strength
 - Non weight bearing to weight bearing
 - Gluteal, core, hamstrings
 - Knee control
- Foot mechanics
 - Orthotic to shoe or cleat

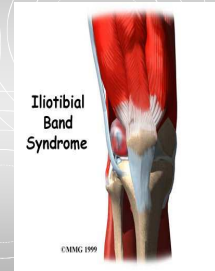


Lateral Knee Pain



Iliotibial Band Syndrome

- Excessive friction of distal IT band over knee (medial femoral condyle)
- Friction can be caused for many reasons
- Causes
 1. Muscular imbalances
 2. LE leg length
 3. Leg alignment
 4. Foot placement on pedal
 5. Seat too far back
 6. Seat too high
 7. Training error



Treatment

Iliotibial Band Syndrome

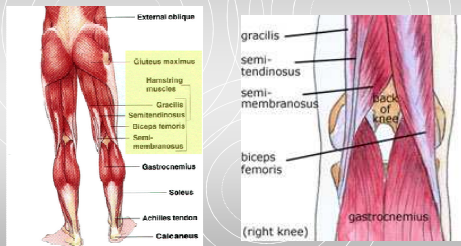
- IT band mobility
 - No stretch, foam roller massage
- Strength
 - Gluteals
 - Core
- Orthotics for leg length and alignment
- Pedaling mechanics – knee position

Treatment

Iliotibial Band Syndrome



Posterior Knee Pain



Hamstring Strain

- Excessive load on tendon in lengthened or stretched position
- Causes
 1. Muscular imbalances
 2. Leg length discrepancy
 3. Previous hamstring injury
 4. Seat too high
 5. Seat too far back



Treatment

Hamstring strain

- **Strength**
 - Eccentric hamstring strength – work hamstring in lengthened position
 - Improve glut strength and pedal mechanics
 - Core
- **Flexibility**
 - Hip flexors or pelvic position
- Correct leg length, usually short side



Hip pain

“soft tissue impingement”

- Excessive compressible load to soft tissue in front of hip
- Causes
 1. Decreased glut and hamstring strength
 2. Poor hip or back mobility
 3. Aggressive tri position
 4. Poor riding technique



Treatment

hip pain

- Hip joint and back mobilizations
 - Self mobs
- Gluteal strengthening
- Pedaling mechanics



Low Back Pain

Causes

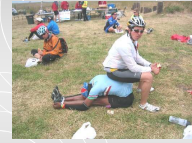
1. Tight musculature
2. Poor core strength
3. Leg length discrepancy
4. Seat too high
5. Handle bar too low
6. Seat too far back
7. Unilateral riding



Treatment

Low back pain

- Flexibility
 - Hamstrings, hip flexors
- Core strengthening
 - Gluts, abdominals, back extensors



Core Strengthening

Plank positions



Physioball exercises



Neck Pain

Causes

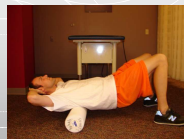
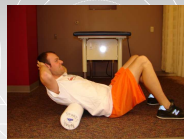
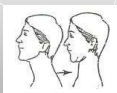
1. Excessive neck extension
2. Poor thoracic spine mobility
3. Seat too far back
4. Handle bars too low



Treatment

neck pain

- Thoracic spine mobility
- Strength
 - Shoulder blades
 - Neck – chin tucks



Prevention

- Good bike fit
- Appropriate training progression
- Multi-planar strength
- Mobility

Summary

- **BIKE FIT!!!!**
- **Symmetrical bicycle, asymmetrical cyclist**
 - Fix asymmetries through rehab or prevention
 - Rehabilitation and Direct Access Physical Therapy
 - 263-4765



Summary

- **Repetitive stress**
 - Training progression with solid base
 - Move in multiple planes to prevent break down
- **Fixed foot and fixed buttock**
 - Higher stress to knee



Thank You



References

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