Eliminate Low Back and Knee Pain with Squats and Deadlifts
Goals

• Learn how strengthening the posterior chain can **prevent** and **resolve** low back and knee issues
• Teach correct squat and deadlift technique
• Identify faulty movement patterns
• Use corrective exercise strategies and activation techniques
• Learn squat and deadlift variations
Knee Dominant Patterns

• A.K.A. Quad dominant
• Knee flexion occurs before hip flexion
• Increased tibial translation anteriorly – knees past the toes and heels off
• Increase stress anterior knee
• Increase stress on the lumbar spine (1)
Knee Dominant (cont.) – Lumbar Spine

• Compensations at the lumbar spine
  – Rounding of the low back in an attempt to get deeper into the squat
  – Last second weight shift posteriorly with the hips increasing lordosis and forward lean
Hip Dominant Patterns

- A.K.A. Glute Dominant
- Movement is initiated with hip flexion
- Tibia stays more vertically aligned making it easier for the heels to stay down
- Decreases stress on the anterior knee (2,3)
  - Still a significant quadricep contribution
  - Hamstrings more active
Hip Dominant (cont.)

• Decreases stress on the lumbar spine (1)
  – Easier to maintain neutral lumbar spine
    • Greater hip activation helps to offset excessive lordosis
    • Trunk extensors able to work more effectively as stabilizers – eliminates rounding of the spine
Role of the Glutes

- Prime movers: hip extension, abduction, and external rotation
  - Acceleration
  - Jumping
  - Lifting
  - Blocking/tackling
  - Hitting/pitching
  - Swinging a golf club
Role of the Glutes (cont.)

- Prevention of hip adduction and internal rotation (Stabilizing role)
- Decreases/eliminates valgus collapse at the knee and subtalar pronation
  - Deceleration
  - Landing
  - Lifting
Knee Valgus
Subtalar Pronation

Normal arch

Flatfoot deformity
Mechanisms of Knee Injury

• High load knee flexion + internal rotation = ACL/MCL injuries, meniscal injury

• Chronic low load knee flexion + internal rotation = anterior knee pain/PFPS (2,3)

• High load knee hyperextension = ACL, meniscal injury
  – Hyperextension is a reaction to insufficient strength to decelerate the knee while cutting or landing
    • Quad dominant vs glute dominant (with assist from hams/quad)
Glutes and the Lumbar Spine

• Hips extend so the spine doesn’t have to

• Janda’s Lower Crossed Syndrome
  – Tight and overactive hip flexors and trunk extensors
  – Stretched and underactive abdominals and glutes
  – Equals increased loading on the lumbar spine
Glutes and the Lumbar Spine (cont.)

- Greater hip activation helps to maintain a more neutral spine (4,5)
  - Prevents lordosis – glutes prevent anterior pelvic rotation
  - Prevents kyphosis – glutes are taking the load vs the trunk extensors
Teaching Correct Technique – Why Bother?

• Injury Prevention – now and 5 years from now
• Sports Performance – limit plateaus
• Life
  – Picking up kids
  – Moving furniture
  – Getting groceries out of the car
Case Study

• 16 year old football player with ACL tear requiring surgical repair

• Pre-surgery - 250 lb squat (3/4 depth), deadlift 305 lbs, 20 in. vertical

• Post-surgery (6 months) – 300 lb squat x 7 reps (below parallel), deadlifts 365 lbs.

• Post-surgery (9 months) – 405 lb squat (below parallel), deadlifts 425 lbs, 26 in. vertical
Common Errors - Squat

- Pronation + Hip Internal Rotation = knee valgus
- Excessive lumbar flexion
- Excessive lumbar extension
- Heels come off the floor
Correct Squat Technique
Common Errors - Deadlift

• Knee extension prior to hip extension
• Excessive lumbar and thoracic flexion
• Lacking a posterior weight shift – on the toes vs heels
Deadlift – Poor Technique
Proper Deadlift Starting Position
Squat Corrections – cuing

• Keep your weight on your outer heels (vs. keep the knees apart)
• Spread the floor
• Press the hips back (vs. keep your back straight, don’t let your knees go over your toes)
• Elbows to back pockets
Deadlift Corrections - cuing

- Squat cues
- Stand up (vs extend the knees and hips at the same time)
- Squeeze the shoulder blades and crush the bar – thoracic and shoulder stability
Squat Corrections - Technique

- Low bar position – easier to press the hips back
- Band around the knees – resisting the valgus collapse
- Bring the hands as close as possible – locks up the thoracic spine
  – Does the athlete/client arch the low back to do this?
Deadlift Corrections - Technique

• Trap Bar Deadlift
• Blocks
• Traditional vs Sumo Stance
  – Sumo stance more appropriate for significant hip and ankle mobility issues
  – Sumo stance also requires less stabilization effort through the trunk – decreased angle of inclination (4,5)
Squat/Deadlift Screen

- Functional Movement Screen (FMS) – gold standard
- Squat/Deadlift specific screen
  - Toe Touch
  - Single Leg Stance
  - Deep Overhead Squat
  - Shoulder Mobility Test
  - Lunge Test
Toe Touch

- Is there a posterior weight shift?
- R to L asymmetry?
Single Leg Stance

• Bring hip to 90 degrees, stand 10 seconds
• Hip and trunk stability
• Hip Instability? – hip adducts = Trendelenburg
• Pronation + Hip IR = valgus collapse?
• Shoulders Drop? – core stability vs active hip flexion
• Right to Left Asymmetry?
Deep Overhead Squat

- Ankle, knee, hip, t-spine, and shoulder mobility
- Hip and trunk stability
- Past parallel?
- Valgus collapse?
- Arms stay overhead?
- Weight shift right to left?
- Test unloaded
Deep Overhead Squat
Deep Overhead Squat
Shoulder Mobility

- Shoulder External Rotation – should be able to touch opposite spine of scapula
- Shoulder Internal Rotation – should be able to touch opposite inferior angle of scapula
- Winging?
- Hyperextension of Lumbar Spine?
Lunge Test

• Ankle and hip mobility
• Hip and trunk stability
• Does the heel stay down on the lead leg?
• Valgus collapse of the lead leg?
• Trunk upright?
Lunge Test (cont.)

- Split Squat
Lunge Test (cont.)

- Walking Lunge
Corrective Exercise – Toe Touch

• Toe Touch Progression – Toes Up
Corrective Exercise – Toe Touch

• Toe Touch Progression – Heels Up
Corrective Exercise – Toe Touch

• RDL with stick – contact on head, midback, and sacrum
Corrective Exercise – Toe Touch

• Wall Deadlift
Corrective Exercise – SL Balance

• Core engagement with band – progress to bringing hip to 90 degrees.
Corrective Exercise – SL Balance

• Lateral lunge walk
Corrective Exercise – Deep Overhead Squat

• Squat progression
Corrective Exercise – Deep Overhead Squat

- Front squat with mini-band at knees
Corrective Exercise – Shoulder Mobility

• T-spine extension on foam roller
Corrective Exercise – Shoulder Mobility

• T-spine rotation
Corrective Exercise - Lunge

• Band assisted lunge
Corrective Exercise - Lunge

• ½ kneeling chops and lifts with medicine ball or band
Single Leg Variations

• Require greater control of hip internal rotation and subtalar pronation
• Identify and address asymmetries
• High level – low load
• Forced pronation option
Single Leg Variations

Single Leg Squat
Single Leg Variations

Single Leg Deadlift
Conclusion

• Learning to teach (or correct) the squat and deadlift can:
  – Prevent knee and low back injuries
  – Resolve ongoing knee and back pain
  – Enhance athletic performance
  – Enhance the lives and activity level of your patients and clients
References


Thank You

• Joe Heiler PT, CSCS
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• Slides and videos will be posted at www.sportsrehabexpert.com, go to sample articles to view for free.