

The Dysfunctional Knee



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REMINDER

Obtain medical clearance and physician's release prior to beginning an exercise program for clients with medical or orthopedic concerns.

The Role of the Fitness Professional in Injury Prevention & Rehabilitation

- May "SCREEN" clients for risk of injury based on written/verbal injury history
- If PAIN is current, MUST refer
 - i.e. Family Doctor, Orthopedic Surgeon, Physical Therapist, Certified Athletic Trainer
- May **NOT** "EVALUATE" injury based on symptoms present
- May Incorporate Exercises to Improve Function if Client is not experiencing Pain or Acute Injury

POST-INJURY



- Maintain and further progress client according to Physical Therapist's and/or Orthopedic Surgeon's recommendations

PART A:
Specific Causes of Knee Pain & Injury

- Compression
- Shear
- Structural & Functional Limitations
- Muscle Imbalances



Compressive Forces on the Knee

- 0 - 60 ° = 1X BW
- 90 ° = 3X BW
- 120 ° = 6X BW
- 135 ° = 9X BW

- Deep flexion potentially wears away articular cartilage beneath the patella



Understanding Shear forces

- The Seated Knee Extension
 - Rehab exercise or general conditioning exercise?
 - Do the risks outweigh the benefits or vice versa?



Structural & Functional Limitations

- **Structural Limitations**
 - Leg length discrepancy
 - Bowed legs vs. Knocked Knees
 - Q-angle
 - Flat Feet
- **Functional Limitations**
 - Movement & Gait Mechanics
 - Mobility at the Hip & Ankle
 - Landing Mechanics
 - Muscle Imbalances

Common Muscle Imbalances Leading to Knee Pain/Injury

- Leg Length Discrepancy
- Weak or Inhibited Glutes
- Weak Hamstrings and/or Quadriceps
- Medial/Lateral Imbalances
- Synergistic Dominances
- Recruitment Issues



Contributing Factors to Knee Pain and/or Injury

1. Poor Hip Mobility or Strength
2. Poor Ankle/Foot Proprioception



1) Maybe it's All in the Hips?

- Hip Strengthening Improves Pain Faster in Women w/ Runner's Knee
– August 2011, JOSPT
- Imbalances b/w Internal & External Hip Rotation Increasingly Common



“The Clamshell Exercise”



- Hip Lateral Rotation with Knees Flexed
- Generate awareness upon palpation of glute medius during hip rotation

Hip Abduction Training

- Begin with Side-Lying Hip Abduction Isometrics and
- Progress to Dynamic Hip Abductor Activities using Elastic Rings



Side Lying Hip Adduction



- Lower portion of Gluteus Maximus is a Hip Adductor
- Extend the Active Hip while Adducting to best engage Glutes
- Progress to standing Hip Adduction with Extension
 - PNF Patterns

2) Ankle/Foot Proprioception

- Visual input must be accounted for in order to optimize proprioceptive challenge
- Shift weight laterally maintaining the hip, knee, and foot alignment
 - Lateral Weight Shifts
 - Unstable Surface Standing



How to Improve Ankle/Foot Proprioception



- Weight Shifting
- Single Leg Balance
- Eyes Closed
- Stable Surfaces 1st
- Unstable Flat-top Surfaces w/ Progression

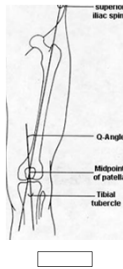
PART B:
**Understanding Knee Injuries &
 How to Work With/Around Them**



1. Runner's Knee
2. Jumper's Knee
3. Ligament Sprain
4. Meniscus Tear
5. Osteoarthritis

1) "Runner's Knee"

- Anterior-Lateral Knee Pain
 - The Most Common Form of Knee Pain
- Causes
 - Leg length discrepancy
 - Knock-knees
 - Flat feet
 - Q angles
 - Muscle imbalances



**How to Prevent or Manage
 "Runner's Knee"**

- Stretching:
 - Quadriceps, IT Band, Gastroc/Soleus
- Strengthening:
 - Quadriceps & Glutes
- Braces and Supports



Superband Stretching for Quads

- ½ Kneeling Position Stretches both Iliopsoas, and Rectus Femoris
- Keep Glute Engaged
- Incorporate Contract-Relax Technique



Strengthening Quadriceps: Perceived Patellar Loading



- Quad Sets
- Straight Leg Lifts
- Terminal Knee Extensions

Terminal Knee Extensions



2) Patellar Tendinitis or "Jumper's Knee"

- Chronic Degenerative Condition
- Caused by:
 - Repetitive eccentric forces as in jumping, deep squats



Patella Loading During Various Activities

- Walking 0.3 x body weight
- Climbing stairs 2.5 x body weight
- Descending stairs 3.5 x body weight
- Squatting 7.0 x body weight

**150 lb client experiences over 1000 lbs of force on the knees when squatting to parallel*

Preventing "Jumper's Knee"



- Strengthen and Stretch Quads
- Manage volume and intensity of Patellar Loading

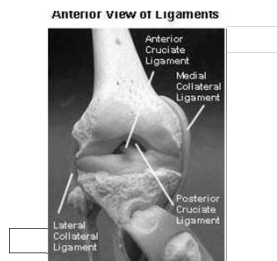
Management of Patellar Stress

- Limit Squats to “parallel” depth
- Keep maximum knee flexion to 90° during Step Up and Lunging Exercises
- Recommend a professional bike fitting
- Avoid or limit time spent in high gears and hill climbing



3) LIGAMENT SPRAINS

- Anterior Cruciate
- Posterior Cruciate
- Lateral Collateral
- Medial Collateral



ACL INJURY RISK & WOMEN



- Estrogen
- Femoral Notch
- Hamstring Firing
- Landing Mechanics
- Q-Angles
- Fatigue

Best Practices to Prevent ACL Injuries

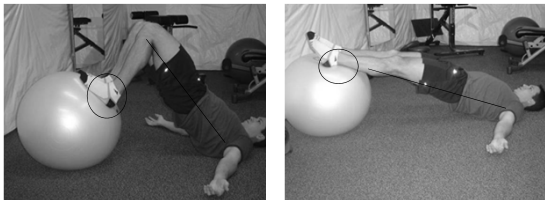
- Strengthen the Hamstrings
- Improve Jump/Landing Mechanics
- Train Change of Direction
 - Running/Jumping



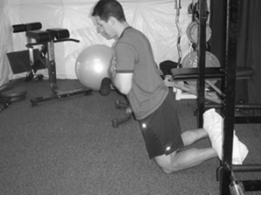
EXERCISE POST-INJURY

- Evaluation and treatment prescribed by an Orthopedic Surgeon or Physical Therapist
- Decrease inflammation
- Improve/sustain mobility
- Stabilize the joint with light strengthening of surrounding muscles

Stability Ball Bridge w/ Leg Curl

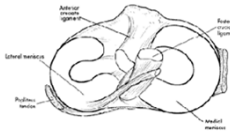


Natural Leg Curl



- Begin with Negatives
- Try Single Leg Variations
- Use Bands for Assistance
- Use DBs, Bands, Weight Vest for Resistance
- Glute-Hamstring Bench

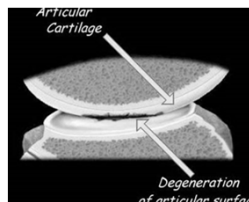
4) Meniscus Tears



- Meniscus absorbs 30% of impact stress at the knee
- Exercise Modifications
 - Limit impact exercise
 - Restrict range of motion in Squat/Lunge
 - Avoid end-range extension/flexion

5) Osteoarthritis

- Formerly Degenerative Joint Disease
- Injuries increase risk of early development



Medical Treatment of Arthritis



- Pain Medication
- Anti-inflammatory drugs
- Surgical Procedures
 - SYNVISIC™
 - Cartilage Repair
 - Total or Partial Knee Replacement

PART C:

Learning to Work Around Pain

- Modifying Exercise Selection
- Reducing/Limiting Range of Motion
- Limit Impact Stress



Adapting the Squat for Clients with Knee Pain



- Half-Squat
- Box Squat
- Stability Ball Squat

Stability Ball Wall Squats



- Older adults experience less knee discomfort while performing this exercise compared to traditional Squats

Prefer the Walking or Reverse Lunge over the Forward Lunge

- Long stride with slight knee flexion on back leg, stretching the psoas & rectus femoris
 - Increases pre-stretch opposite hamstring/glute



Preferred Cardio Exercises for Clients with Knee Pain

- Aquatics
 - Swimming, Jogging, Classes
- Walking/Jogging UP hill
- Cycling
- Upper Body Ergometer
- Rowing



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