

Exercise As Medicine The Medical Perspective

Julie Bishop, MD

Assistant Professor of Orthopaedics
Ohio State University Medical Center

Fitness

- Muscular Strength and Endurance
- Body Composition
- Flexibility
- Cardiovascular/Respiratory Capacity



Objectives

- What are the components of fitness
- Benefits of fitness
- Exercise prescription

Fitness

Cardiovascular/Respiratory Capacity

- Integrity of heart and lungs
- Ability to use O₂ as fuel
- VO₂ max - max O₂ uptake
 - ✓ Best measure of overall functional capacity
- Anaerobic Threshold

Vo2 Max

- Strong genetic component to Vo2 max
- Intense training can increase Vo2 max 20%



Fitness Benefits

- Physical
- Mental
- Medical



Fitness:

Cardiovascular/Respiratory Capacity

- Anaerobic Threshold (Lactate Breaking Point)
 - ✓ Upper limits of exercise that can be sustained before accumulation of lactic acid causes limitations



Physical Fitness Benefits

- Performance of same amount of work with a decrease in:
 - ✓ Heart Rate
 - ✓ Respiratory rate
 - ✓ Systolic blood pressure

Physical Benefits of Fitness

- Longevity
 - ✓ Effect unclear
 - ✓ Exercise retards aspects of aging
 - Age-related decline in peak performance
 - Age-related decline in max aerobic capacity
 - Decreases muscle and bone mass loss
 - Decreases nl increase in fat
 - ✓ 50% difference fit vrs sedentary

Medical Benefits of Fitness

- Cardiovascular health
- Cardiovascular risk factors
- HTN
- Obesity
- Osteoporosis

Mental Benefits of Fitness

- Too numerous to list!!!!
 - ✓ Stress relief
 - ✓ Improved self image
 - ✓ Less depression
 - ✓ Better sleep
 - ✓ Better ability to focus
 - ✓ Endorphins!!
 - Natural High
 - ✓ Etc, etc



Medical Benefits of Fitness

- Cardiovascular Health:
 - ✓ Maintain or increase myocardial O2 supply
 - ✓ Decrease myocardial work and O2 demand
 - ✓ Increase Myocardial function
 - ✓ Increase electrical stability of myocardium

Medical Benefits of Fitness

- ↓ Risk Factors for CVD
 - ✓ Body weight
 - ✓ % body fat
 - ✓ Smoking
 - ✓ BP
 - ✓ Cholesterol, HDL fraction
 - ✓ Triglycerides

Medical Benefits of Fitness

- Osteoporosis
 - ✓ 8% Bone mass loss/decade after menopause
 - ✓ Weight bearing exercise retards loss
 - ✓ Athletes have up to 40% more bone mass than sedentary people
 - ✓ Exercise with Calcium and estrogen is most effective



Medical Benefits of Fitness

- Hypertension
 - ✓ Exercise decreases HTN overall
 - ✓ Thus, it decreases it as a risk factor for CVD
 - ✓ Strengthened skeletal muscles decreases the rise in BP induced by any lifting task

Medical Benefits of Fitness

- Bone is Sensitive to Load
 - ✓ No load = Lose Bone
 - ✓ Low Load = Maintain Bone
 - ✓ High Load =
 - Bone remodels to withstand new loads
 - Bone Builds
 - Bone gets stronger
 - ✓ Too High Load = Failure → stress Fracture



Medical Benefits of Fitness

- **Weight-Bearing Exercise**
 - ✓ Running, jogging
 - ✓ Dancing
 - ✓ Gardening
 - ✓ Aerobics
 - ✓ Stair-stepper
 - ✓ Not as Good, but still good
 - Walking
 - Biking
 - Elliptical



Exercise Prescription

- **Physicians must take a role!**
 - ✓ Promote exercise
 - ✓ Role models themselves!
- **Regular Exercise**
 - ✓ Predictable Results
 - ✓ Dose-Response curve
 - ✓ Develop a safe and effective program

Exercise Prescription

- **Current Major Causes of Death:**
 - ✓ Heart disease
 - ✓ Cancer
 - ✓ Stroke
- All have links to lifestyle
- Exercise is a form of Preventative Medicine!
- Exercise can be a form of treatment

Exercise Prescription

- How much?
- How often?
- What types of exercise?
- Based on the patients:
 - ✓ Goals
 - ✓ Health/fitness needs
 - ✓ Current level of conditioning
 - ✓ Past or present illnesses/injuries

Exercise Prescription

- Frequency
- Intensity
- Duration
- Type of exercise
- Progression
- Modify as necessary

Prescribing Exercise

- ACSM Guidelines
- Medical Clearance
 - ✓ Risk factors
 - ✓ Known diseases
 - ✓ Intended level of activity
 - ✓ Age of individual
 - ✓ Sex of individual
- Musculoskeletal Conditions
 - ✓ AAOS has guidelines/sample programs

ACSM Guidelines for Exercise Prescription

- Aerobic/cardiovascular
- Strength Training
- Flexibility Training

****Health-related benefits obtained from lower levels than those recommended for fitness**

So – Just MOVE!!

Exercise Prescription

- How Intense?
 - ✓ ACSM: 60 – 90% Max Heart Rate
 - ✓ Max HR: 220 – your age
 - 50 yo male: Max HR = 170
 - Exercise at 70% max HR = 119
 - ✓ May need to adjust based on various health issues

Exercise Prescription

- How Long?
 - ✓ ACSM Rec: 20 – 60 minutes/continuous
 - ✓ To Start:
 - 20 – 30 minutes is great!
 - 3 sessions of 10 minutes is good!
 - ✓ Have patients increase as they adapt

Exercise Prescription

- Age-Related Decline
 - ✓ 15% loss of muscle/decade when > 60yo
 - ✓ Reciprocal Increase in Fat
 - ✓ Change in body composition

Exercise Prescription

- How Often?
 - ✓ Depends...
 - ✓ Just starting:
 - Several short sessions/day
 - ✓ Moderate fitness level
 - 3-5 sessions/wk
 - Depends on intensity

Exercise Prescription Strength Training

- Prevent muscle loss
- Increases strength
- Decreases fragility
- Maintains bone integrity
 - ✓ Stresses the bones
 - ✓ Increases Bone density
- Reduces risk of falls
 - ✓ Falls number 1 risk of hip fractures



Strength Training Recommendations

- Train major muscle groups
 - ✓ 8-10 separate exercises
- 2-3 x/week
- Lighter weights
- 8 – 12 repetitions

Exercise As Medicine The Orthopaedists' Perspective

Exercise Prescription Don't Forget the Core!!

- Supports the Spine!
- Protects the Back
- Improves Balance and Agility!



Objectives

- Overuse Injuries in Exercise
 - ✓ Risk factors
 - ✓ Preventative measures
 - ✓ Recognize the most common
- Treatment options for injuries
- Returning to exercise after an injury

Types of Injuries

- **Acute**
 - ✓ Easy to recognize, sudden event
 - ✓ Sudden onset of symptoms
- **Overuse**
 - ✓ Repetitive trauma that overwhelms the tissue's ability to repair itself
 - ✓ Most common in recreational athlete

Yes!!! BUT....

- **Understand Injury Risk Factors**
- **Address These Risk Factors**
- **Prevention is the Best Method**
- **But, if your patient becomes injured...**
 - ✓ Must recognize the injury
 - ✓ Properly treat the injury
 - ✓ Safely return to exercise

Is it Possible to Start an Exercise Program Without Becoming Injured?

Or, are overuse injuries an inevitable by-product of exercise programs????

Risk Factors

INTRINSIC

- Prior Injury
- Muscle Imbalance
- Inflexibility
- Anatomic Abnormalities
- Nutritional abuse

EXTRINSIC

- Training Errors
- Equipment
- Environment
- Technique

Training Errors

- Too Much: ↑ *Frequency* of training
- Too Far: ↑ *Duration* of workouts
- Too Hard: ↑ *Intensity* of Workouts
 - ✓ Too fast
 - ✓ Switch suddenly to hard surface
 - ✓ Too many hills

“Too MUCH, Too SOON!!”

Proper Training Plans

- Exercise prescription
- Gradual progression in each element
 - ✓ (frequency, duration, intensity)
- Gives the body time to adapt
 - ✓ And become more efficient
- Take a rest!!
 - ✓ Build rest days into plan for recovery

10% Rule

- ↑ Duration/Frequency/Intensity
10%/Week
Keep a journal to keep track!!
- *If* : You dramatically ↑ element
Cut back on another!!

Muscle Imbalance/Inflexibility

- ✓ Muscle strength imbalance
- ✓ Muscle flexibility imbalance
- ✓ Problematic in opposing muscle groups
- ✓ Muscle tightness
 - Excessive pressure/stress on underlying structures
 - Malalignments due to unequal pull of muscles
 - May interfere with proper form

What should be done?

- Increase Flexibility
 - ✓ Decreases Muscular Tension
 - ✓ Increases Range of Motion
 - ✓ Decreases chance of Injury
- Individual flexibility
 - ✓ Predicts injury rate!
- Daily stretching program, pilates/yoga

Strengthen

- Important for Muscle Balance
- Isolate and strengthen opposing muscle groups
- Proper technique: trainer/instructor
- Ok to use
 - ✓ Free weights
 - ✓ Resistance machines
- Start with low weight/high reps

Stretch!!!

- Stretching daily for 6-10 weeks
 - ✓ Can improve muscle flexibility
- Stretch after workout
 - ✓ Most flexibility gains when muscles are warm
- Static stretch best
 - ✓ Hold stretch – steady pressure – 30 seconds
 - ✓ Stretch to point of tension – not pain
 - As Muscle relaxes – increase stretch
- Good Form Essential: No Bouncing

Don't Ignore the CORE!!

- Trunk muscles
- Pelvic muscles
- Abdominal muscles
- Remember – they support the spine and connect upper and lower body

*CORE STABILITY IS KEY!!
AVOID LOW BACK PAIN!!*



Risk Factor – Previous Injury

- Injury weakens the tissue
- Prior to returning to full function
 - ✓ Must restore:
 - Strength
 - Flexibility

Proper Full Rehabilitation can help break the Injury – Reinjury Cycle

Risk Factor - Technique

- “True” poor technique
- OR...Due to excessively tight muscles!!
- If your patient is new to a certain exercise:
 - ✓ Get help!!
 - ✓ Coach/personal trainer/class instructor,etc

Risk Factor - Equipment

- Exercise equipment
 - ✓ Proper use/technique
 - ✓ Sturdy/supportive
 - ✓ Ergonomical setup (ie – bike)
- Proper footwear
 - ✓ Based on patients anatomy
 - ✓ Knowledgeable sales person
 - ✓ Replace every 6 mo/ 300-500 miles

Risk Factor: Anatomic Abnormalities

- ↑ Stress on Surrounding Structures
- No problems in daily activities
- Repetitive activity sports:
 - ✓ Overuse Injuries!!

Common Abnormalities

- Flat feet
- High arches
- Knock knees
- Bow legs
- Unequal leg lengths
- Joint instability
 - ✓ Especially shoulder and kneecap

Common Overuse Injuries

- Upper Extremity Injuries
 - ✓ Rotator Cuff
 - ✓ Tennis Elbow – lateral epicondylitis

What to do?

- If suspect:
 - ✓ Eval by a Sports MD/Sports PT
- Good shoes
- Over the counter arch supports
- Custom made arch supports
- Appropriate stretches
- Correct leg length diff.
 - ✓ Discover cause!



Tendons

- Tendons nourished by good blood supply
- Natural age-related degeneration
- Starts at 40 yo!!
- After 40yo, start to lose that blood supply
- Tendons are more prone to damage

Patient History: Rotator Cuff Tendonitis/Bursitis

- Gradual onset of symptoms
- Pain related to loading the tendon
- Often occurs with an increase in activity
- At first – pain only during sports activity
 - ✓ Sharp pain during activity
- Later stages:
 - ✓ Pain at rest: dull ache
 - ✓ Pain with ADL's



Treatment: Rotator Cuff/Bursitis

- REST
- Avoid aggravating activities
- Short course NSAIDS
- Evaluate form/technique
- Physical Therapy
 - ✓ Strengthen rotator cuff muscles:
unload tendon

Patient History: Concerning for Rotator Cuff Tear

- Worsening Pain
 - ✓ ADL's/Rest
- Weakness
- Difficulty raising arm
- Night Pain



Lower Extremity Injuries

- Patellofemoral syndrome
- Iliotibial band friction syndrome
- Meniscus tears
- Stress Fractures
- Achilles tendonitis
- Plantar fasciitis

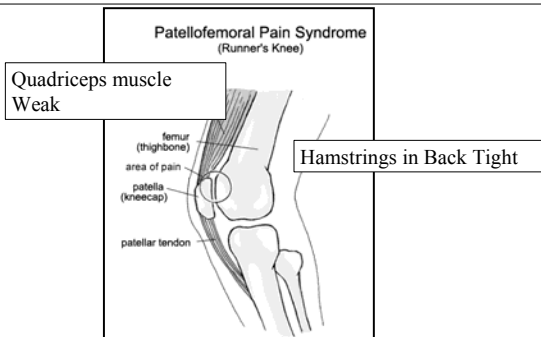
Patellofemoral Pain

- Anterior Knee Pain
- Gradual onset/aching pain
- Worse with activity
- Stairs/sitting long periods painful
- No mechanical symptoms

Iliotibial Band Syndrome

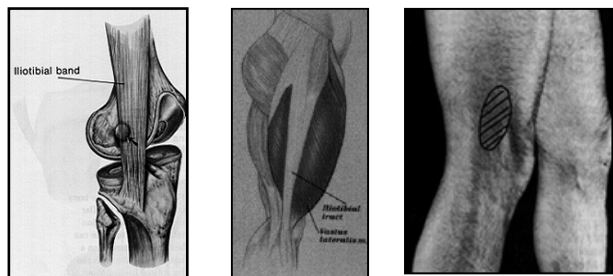
- Lateral knee pain
- No swelling
- No mechanical symptoms
- Worse with activity/better with rest
- Mostly with runners/walkers

Patellofemoral Pain: Muscle Imbalance



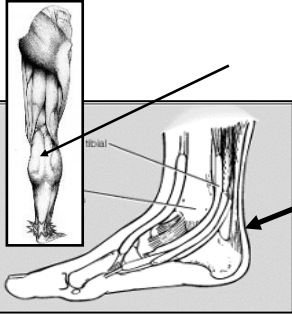
Quadriceps Can't Maintain Proper Alignment of Kneecap = PAIN!!

Iliotibial Band Friction Syndrome

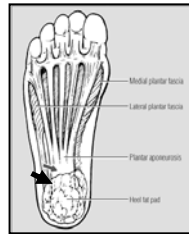


Excessively Tight ITB = ↑Pressure/Rubbing = PAIN!!

Tight Calf Muscles



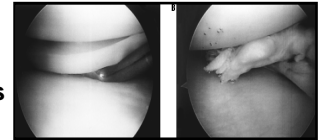
Achilles Tendinitis



**"Heel Pain"
(Plantar
Fasciitis)**

Meniscus Tears

- Onset often after twisting knee
 - ✓ Not always!
- Pain along joint line
- Mechanical symptoms
- Effusion
- Pain worse with activity/also with ADL's



Treatment

- Rest from aggravating activity
- Ice/NSAIDS
- Correct Muscle Imbalance
 - ✓ Stretch tight muscles
 - ✓ Strengthen weak ones
 - ✓ Physical therapy helpful
- Consider Orthotics

Treatment

- Young Pt/Traumatic Tear:
 - ✓ Surgery
- Meniscal Fragment displaced/ knee locked:
 - ✓ Surgery
- Older Pt/minor injury/degenerative tear
 - ✓ Rehab/possible injection
 - ✓ Persistent effusion/mechanical Sx
 - Surgery

Stress Fractures

- Lower extremity: tibia/foot
- Impact sports
 - ✓ Rapid increase in distance
- Localized pain
- Worse with activity
 - ✓ Eventually with ADL's
- PE: point tenderness

Return to Exercise

- No return until symptom free
- Symmetric strength and ROM
- Physical Therapy
 - ✓ Correct muscle imbalances
 - ✓ Help evaluate/correct risk factors
 - ✓ Teach a home exercise program
- Personal trainer correct technique
- Gradual return to prior sport/level exercise
- Plan to maintain fitness while recovering!

Stress Fracture Treatment

- X-rays
- Stop aggravating exercise
- All ambulation must be pain free
 - ✓ Crutches until walking pain free
- Develop fitness plan to maintain fitness
 - ✓ Non-impact sports ok if no pain
- ** Female athlete
 - ✓ Menstrual history/nutritional status