Exercise As Medicine
The Medical Perspective

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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

Fitness

• Muscular Strength and Endurance
• Body Composition
• Flexibility
• Cardiovascular/Respiratory Capacity
### 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 ni increase in fat
  - 50% difference fit vrs sedentary

### 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
- Cardiovascular risk factors
- HTN
- Obesity
- Osteoporosis

### 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

• 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

• 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

• 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

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<table>
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<tr>
<th>ACSM Guidelines for Exercise Prescription</th>
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<tr>
<td>- Aerobic/cardiovascular</td>
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<tr>
<td>- Strength Training</td>
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<tr>
<td>- Flexibility Training</td>
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<tr>
<td><strong>Health-related benefits obtained from lower levels than those recommended for fitness</strong></td>
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<tr>
<td>So – Just MOVE!!</td>
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### 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

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

Exercise Prescription

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

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

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## 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

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

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

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## Risk Factors

<table>
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<tr>
<th>INTRINSIC</th>
<th>EXTRINSIC</th>
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<td>Training Errors</td>
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<td>Muscle Imbalance</td>
<td>Equipment</td>
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<td>Inflexibility</td>
<td>Environment</td>
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<tr>
<td>Anatomic Abnormalities</td>
<td>Technique</td>
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</table>
Training Errors

- Too Much: \( \uparrow \text{Frequency of training} \)
- Too Far: \( \uparrow \text{Duration of workouts} \)
- Too Hard: \( \uparrow \text{Intensity of Workouts} \)
  - 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

- \( \uparrow \text{Duration/Frequency/Intensity} \)
  - 10%/Week
  - Keep a journal to keep track!!
- If: You dramatically \( \uparrow \) 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

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### Patellofemoral Pain: Muscle Imbalance

<table>
<thead>
<tr>
<th>Patellofemoral Pain Syndrome (Runner's Knee)</th>
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<tr>
<td>Quadriceps muscle Weak</td>
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<tr>
<td>Hamstrings in Back Tight</td>
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Quadriceps Can’t Maintain Proper Alignment of Kneecap = PAIN!!

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### Iliotibial Band Friction Syndrome

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

Achilles Tendinitis

“Heel Pain” (Plantar Fasciitis)

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

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

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

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!