Benefits of Physical Activity

- Improved Cardiorespiratory Efficiency
  - Improved ability of heart, lungs and circulatory system to carry $O_2$ to the body's tissues
  - More blood pumped per beat by heart (stroke volume)
  - Resting heart rate and blood pressure decrease
  - Number of red cells increase
  - Improved blood lipid balance
  - Protection from the effects of stress

- Improved Muscular Strength and Flexibility
  - Avoidance of back and other joint and muscle pain
  - Improved functioning in everyday life
  - Good posture helps keep spine aligned properly

- More Efficient Metabolism and Control of Body Fat
  - Body is better able to generate useful energy
  - Fat as fuel is utilized efficiently
  - Improved regulation of energy balance and body weight
Benefits of Physical Activity

- Improved Psychological & Emotional Well-Being
  - Enhanced self image
  - Diminished risk for depression

- Improved Health Over the Lifespan
  - Decreased likelihood of heart disease, stroke diabetes, hypertension, and osteoporosis
  - Avoid problems such as fatigue and weight gain
  - Helps immune functioning
  - Improved overall physical and mental well-being

Components of Physical Fitness

<table>
<thead>
<tr>
<th>Table 10.1 Major Components of Physical Fitness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiorespiratory fitness</td>
</tr>
<tr>
<td>Muscular strength and endurance</td>
</tr>
<tr>
<td>Flexibility</td>
</tr>
<tr>
<td>Body composition</td>
</tr>
</tbody>
</table>


Cardiovascular Fitness

- **FITT Principle**
  - **Frequency**
    - 3-5 days/week
  - **Intensity**
    - Most difficult next page
  - **Time**
    - 30-45 minutes
  - **Type**
    - Rhythmic & continuous

ACSM GUIDELINES for healthy aerobic activity

- Exercise 3 to 5 days each week
- Warm up for 5 to 10 minutes before aerobic activity
- Maintain your exercise intensity for 30 to 45 minutes
- Gradually decrease the intensity of your workout, then stretch to cool down during the last 5 to 10 minutes

Cardiovascular Fitness

- **FITT**
  - **Frequency**
  - **Intensity**
    - 60-75% MHR
  - **Time**
  - **Type**

  *Low intensity, long duration is best!*

CALCULATE your exercise heart rate range...

Estimate your maximum heart rate. Take 220 - age = (this is your maximum); (standard deviation for this equation is 10-12 beats per minute)

Determine your lower-limit exercise heart rate by multiplying your maximum heart rate by 0.6

Determine your upper-limit exercise rate heart by multiplying your maximum heart rate by 0.9

Your exercise heart rate range is between your upper and lower limits.
Muscular Strength & Endurance

- Muscular strength – one repetition maximum (1 RM)
- Muscular endurance – ability of muscle to exert force repeatedly without fatiguing
- Both achieved via resistance training with weights
- Not just for athletes or men

Principles of Muscular Strength Development

- **Overload Principle**
  - A muscle must be overloaded for it to respond with increases in strength and endurance
  - For **sedentary** individuals- minimum threshold for training effect
    - 1 exercise (lift) for each of the 10 major muscle groups:
      - chest, shoulders, back, abdomen, anterior arm, posterior arm, forearm, thighs, hamstrings, calves
    - 1 set of each lift
    - 8 - 12 repetitions to fatigue for each set
    - 2X per week

- **Overload Principle** continued
  - For trained individuals
  - 3-4 exercises (lifts) for each of the 10 major muscle groups:
    - 3-4 sets of each lift
    - 8 - 12 repetitions to fatigue for each set
    - 3+X per week

**Principles of Muscular Strength Development**

- **Range of Motion Principle (ROM)**
  - A joint must be exercised about its entire ROM
  - Less weight is often better

**Principles of Muscular Strength Development**

- **Types of Muscle Activity**
  - *Isometric* muscle contractions – muscle contraction, but no shortening or movement of joint angle
  - *Concentric* muscle contraction causes joint movement and the muscle shortens
  - *Eccentric* muscle contractions – muscle contractions cannot overcome resistance - the muscle lengthens. Most beneficial type of activity for increasing strength

**Principles of Muscular Strength Development**

**Anabolic Steroids: Selected Adverse Side Effects**

- Liver disease including cancer
- CV disease:
  - Decreased HDL-C
  - Increased total cholesterol
  - Hypertension
- Testicular atrophy
- Reduced sperm count
- Irreversible hirsutism (males and females)
Anabolic Steroids: Selected Adverse Side Effects

- Irreversible clitoral hypertrophy
- Irreversible deep hoarse voice
- Menstrual irregularities
- Male pattern baldness
- Aggravates acne

Retards growth in young
- Premature epiphyseal (growth plate) closure
- Sex drive swings
- Increase and then decrease
- Psychological disorders
- Aggression (‘Roid Rage)
- Paranoia
- Lethargy
- Psychological addiction

Training for Flexibility/Range of Motion (ROM)

- Types of Flexibility Exercises
  - Ballistic stretching: repeated bouncing motions - muscle and tendon are rapidly stretched and returned to resting length. Dangerous and not recommended
  - Static: slow, gradual stretching of muscles and their tendons. Recommended
  - Proprioceptive Neuromuscular Facilitation (PNF):
    - Stretch, isometrically contract, relax, stretch again
    - Probably best method

Stretching Exercises to Improve Flexibility
Training for Body Composition

- Do not emphasize body weight
- Look at body composition
  - Ideally: low fat mass, high lean mass
- Not measured with scale, but other devices

Body Fat Mass

<table>
<thead>
<tr>
<th>Classification</th>
<th>Women (% fat)</th>
<th>Men (% fat)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Essential Fat</td>
<td>10-12%</td>
<td>2-4%</td>
</tr>
<tr>
<td>Athletes</td>
<td>14-20%</td>
<td>6-13%</td>
</tr>
<tr>
<td>Fitness</td>
<td>21-24%</td>
<td>14-17%</td>
</tr>
<tr>
<td>Acceptable</td>
<td>25-31%</td>
<td>18-25%</td>
</tr>
<tr>
<td>Obese</td>
<td>32% plus</td>
<td>25% plus</td>
</tr>
</tbody>
</table>

Measuring Body Composition

- Skin Fold Calipers
  - Measures thickness of skin and fat atop muscles
  - Accuracy depends on protocol and skill of technician
  - Commonly used in fitness settings

- Hydrostatic Weighing Underwater
  - Measures how much you weigh in water, not on land
  - Based on Archimedes Principle
  - Determines density, predicts fat mass
  - Gold Standard Technique
  - Only used in research settings
Measuring Body Composition

- **Bioelectrical Impedance**
  - Since fat is a poor conductor of electricity, fat will impede the current more than lean tissue.
  - By measuring the resistance to the current, the machine estimates percent body fat.
  - Measured by a device you hold or stand on.
  - Moderately accurate - dehydration can influence results.

- **Body Mass Index**
  - BMI 25-29 considered overweight.
  - Not particularly accurate method.
  - Does not consider muscular development.

Achieving Health Body Composition

- Combination of Exercise and Diet.
- Aerobic exercise burns “fat for fuel.”
- Diets low in fats result in leaner bodies.
- Will be discussed in more detail in Nutrition lecture.
Fitness Injuries

- Overuse: cumulative stresses placed on tendons, bones and ligaments
- Traumatic injuries: sudden and violent
- Prevention:
  - Appropriate footwear
  - Appropriate exercise equipment

Sport Injury

- First Aid: RICE
  - Rest
  - Ice
  - Compression
  - Elevation

Exercise in the Heat

- Three heat illnesses
  - Heat cramps (heat related muscle cramps)
  - Heat exhaustion (excessive water loss from prolonged work)
  - Heat stroke (sunstroke) emergency involving body's inability to cool itself when exposed to heat
- Avoid heat illnesses by acclimatizing, drinking fluids and dressing appropriately

Planning a Fitness Program

- Remember fitness components:
  - Cardiorespiratory Fitness
  - Muscular Strength and Endurance
  - Flexibility - Range of Motion (ROM)
  - Health Body Composition