Section II: Concept 04

The Health Benefits of Physical Activity

PT 100

Wellness and Lifestyle

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Physical Activity and Health

What physical activity can do for health

- Reduces risks of many chronic diseases
- Promotes weight control
- Slows premature aging
- Improves quality of life
- Overcome genetically-inherited diseases

Physical activity is not a panacea for all medical conditions but it is probably the best single thing a person can do for health.
Hypokinetic Conditions

- Cardiovascular disease
- Cancer
- Back problems
- Obesity
- Diabetes
- Osteoporosis
- Mental health
  - Depression and anxiety

Subsequent slides provide detail on each of these conditions
Hypokinetic Conditions

Characteristics of Syndrome X or Metabolic Syndrome

- Is having three or more of the following:
  - Waist girth > 40 inches
  - Blood TG > 150
  - HDL < 40 mg/dl
  - BP > 135/85
  - Fasting blood glucose > 100

- Should be called “inactivity syndrome” because all are linked to sedentary lifestyle
Cardiovascular Disease

- **Coronary heart disease (CHD)**
  - #1 cause of death
  - Caused by atherosclerosis
- **Stroke**
  - #3 cause of death
  - Caused by atherosclerosis
- **Hypertension**
- **PVD**
- **Congestive heart failure**
Unmodifiable Risk Factors for Coronary Heart Disease

- Age
- Gender
- Heredity

Review table 5
Modifiable Risk Factors for Coronary Heart Disease

- Smoking
- Hypertension
- Hypercholesterolemia
- High glucose levels
- Physical inactivity
- Overweight / overfat
- Diet

American Heart Association
Activity and the Heart

- Produces a strong heart muscle
  - Contractility, larger filling capacity
- Promotes good heart circulation
  - Vasodilatation & capillarization
Activity and the Heart

- HR return to normal faster after exercise & emotional stress
- ↓ production of stress hormones
  - i.e. Epi, NEpi, Cortisol
- ↓ SNS & ↑ PSNS
  - Slower heart rate
    » More efficient heart
      • The heart works less at the same difficulty
    » Less oxygen demand
Cholesterol and Atherosclerosis

- A compound of fat containing a combination of simple fats and other chemicals.
  - Phospholipid, glucolipid and lipoprotein.
- Because lipids do not dissolve in water, lipoprotein transport fats in the blood.
Lipoprotein play a large role in developing and/or preventing heart disease:

- HDL better transporter for fat because has high affinity to fat
- LDL & VLDL bad transporters for fat because has low affinity to fat
Cholesterol

1. The liver regulates the body's production of cholesterol, based on the amount of saturated fat and cholesterol that is consumed.

2. Saturated fat enhances the absorption of cholesterol, thereby signaling the liver to make more. Thus saturated fat is more important than dietary cholesterol for raising serum cholesterol levels.

3. The liver packages cholesterol with triglycerides (fat) and sends it into the bloodstream as very low-density lipoproteins (VLDLs).

4. As VLDLs travel through the bloodstream, they are broken down into triglycerides (fat) and cholesterol-rich low-density lipoproteins (LDLs). Triglycerides are used for energy or fat storage.

5. LDLs deliver cholesterol to cells throughout the body. High LDL levels cause an excess of cholesterol to be delivered to cells.

6. Cholesterol not used by the cells spills out and collects on artery walls. The resulting plaque buildup inhibits blood flow and may result in a heart attack.

7. HDLs return cholesterol to the liver, where it is converted into bile acids for elimination or recycling.

8. HDLs seek out excess cholesterol, reducing the amount available for buildup on artery walls. High HDL levels can reverse heart disease.

9. LDLs deliver cholesterol to cells throughout the body. High LDL levels cause an excess of cholesterol to be delivered to cells.

Figure 2  Atherosclerosis.
### Cholesterol Classifications (mg/dL)

<table>
<thead>
<tr>
<th>Total Cholesterol</th>
<th>LDL-C</th>
<th>HDL-C</th>
<th>TC/HDL-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimal</td>
<td>—</td>
<td>&lt;100</td>
<td>—</td>
</tr>
<tr>
<td>Near optimal</td>
<td>—</td>
<td>100–129</td>
<td>—</td>
</tr>
<tr>
<td>Desirable</td>
<td>&lt;200</td>
<td>—</td>
<td>&gt;60</td>
</tr>
<tr>
<td>Borderline</td>
<td>200–240</td>
<td>130–160</td>
<td>39–59</td>
</tr>
<tr>
<td>High risk</td>
<td>&gt;240</td>
<td>&gt;160</td>
<td>40</td>
</tr>
</tbody>
</table>

Source: Third Report of the National Cholesterol Education Program.
Activity and Atherosclerosis

- Exercise reduces lipids (TC, TG, LDL)
- Exercise increases HDL cholesterol (the “good” cholesterol)
- Exercise reduces fibrin deposits
  - a sticky substance that promotes the adhesion of fat molecules to the walls of the vessels
Comparison of left main coronary artery in (a) sedentary and (b) exercising monkeys on atherogenic diets.
Blood Pressure & Atherosclerosis

Hypertension kills by contributing to atherosclerosis.

- The inner lining of artery walls are normally smooth.
- Blood lipids cannot penetrate the lining unless it is damaged.
- As BP rises, it damages the lining of the arteries.
- Damaged walls are susceptible to fat deposits behind the inner lining of the artery walls causing atherosclerosis.
Hypertension kills by contributing to atherosclerosis.

- Deposits of cholesterol and other fats block the arteries.
- Blocked arteries reduce blood supply to the heart and brain.
- A decreased blood supply can lead to a heart attack or stroke.
Exercise reduces blood pressure in individuals with moderate hypertension

- Due to decrease total vascular resistance
- Increased vasodilatation
- Thins the blood so it is less likely to clot.
### Blood Pressure (silent killer)

#### Blood Pressure Classifications (mmHg)

<table>
<thead>
<tr>
<th>Category</th>
<th>SBP</th>
<th>DBP</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Optimal</strong></td>
<td>&lt; 120</td>
<td>&lt; 80</td>
<td></td>
</tr>
<tr>
<td><strong>Normal</strong></td>
<td>&lt; 130</td>
<td>&lt; 85</td>
<td>Recheck in 2 yrs</td>
</tr>
<tr>
<td>High normal</td>
<td>130-139</td>
<td>85-89</td>
<td>Recheck in 1 yrs</td>
</tr>
<tr>
<td><strong>Hypertension</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage 1 (mild)</td>
<td>140-159</td>
<td>90-99</td>
<td>Confirm within 2 mo</td>
</tr>
<tr>
<td>Stage 2 (moderate)</td>
<td>160-179</td>
<td>100-109</td>
<td>refer to source of care within 1 mo</td>
</tr>
<tr>
<td>Stage 3 (severe)</td>
<td>180-209</td>
<td>110-119</td>
<td>refer to source of care within 1 wk</td>
</tr>
<tr>
<td>Stage 4 (very severe)</td>
<td>≤ 210</td>
<td>≥ 120</td>
<td>refer to source of care Immd.</td>
</tr>
</tbody>
</table>
Activity Reduces Coronary Heart Disease Risk

- It takes only a moderate amount of physical activity to reduce health risks of CHD
- The curve indicates that most of the benefits are gained at lower levels of PA

It is now clear that physical inactivity is an independent risk factor for CHD.
Obesity

- Over half of the population in the US is considered overweight
- Obesity increases the risk of many other diseases
Activity Promotes Weight Control

- Burns calories
- Increases rate of metabolism
- Promotes fat loss and preserves muscle
Diabetes Mellitus (DM)

- **DM is increased blood glucose levels**
  - This increase causes cell and tissue damage
    » i.e. vessels, nerves, eye

- **Type I (juvenile onset)**
  - Pancreas fails to produce insulin

- **Type 2 (adult onset)**
  - Lack of sensitivity to insulin
  - Often caused by obesity

American Diabetes Association
Activity Reduces Risks of Diabetes

**Type 1**
- Reduces disease risk
- Increases quality of life
- Avoid exercising under the effect of insulin injection
  » 2 causes to reduce blood sugar

**Type 2**
- Decreased insulin requirement
  » Improved receptor function
- Reduced fatness
Back Problems

- 80% of the population will experience back pain at some point in their life.

- Back problems are a major cause of inactivity in adults.

- Inactivity results in reduced back muscle strength and joint flexibility.
Activity Reduces Risk of Back Pain

- Improves flexibility of joints and ligaments
- Improves musculoskeletal strength and endurance
Cancer

- 2nd leading cause of death
- Various types of cancer
- Causes still largely unknown
Activity Reduces the Risk of Some Cancers

- Reduced transit time
  - decreased risk of colo-rectal cancer

- Reduced levels of hormones
  - decreased risk of breast cancer and some reproductive cancers

- Improved immune system

- Reduced levels of body fat
Osteoporosis

- Progressive loss of bone mineral density
  - Occurs commonly in old age
  - Occurs at an earlier age and more frequently in women than men
Osteoporosis
Osteoporosis

Factors associated with osteoporosis
- Loss of sex hormones (in women)
- Low calcium levels
- Physical inactivity
- High protein intake
- Smoking
- Caffeine
Activity Reduces Risk of Osteoporosis

- Exercise increases bone loading that leads to increased bone formations and maintenance
  - Increases peak bone mass
  - Slows decline in bone mass
Exercise Improves Mental Health

- Reduced depression
- Reduced anxiety
- Increased self-esteem
Exercise Improves Immune System Function

- Regular mod/vigorous PA aid the immune system fighting diseases
  - Reduce incidences of colds and days of sickness from infection
  - Enhance QOL among HIV patients
- Too much (i.e. too frequent or vigorous) activities may reduce immune function
Exercise Improves Immune System Function

Figure 6 ➤ Physical activity and immune function.
Activity Slows the Aging Process

- Time dependent aging
  - Natural aging process that cannot be altered
- Acquired aging (related to lifestyle)
  - Can be altered with changes in lifestyle
Activity Aging Cycle

- Decrease Physical Activity
- Gain Weight
- Lose Energy
- Perceive Self As Old
- Physical Deterioration
Links between Fitness and Optimal Wellness

- Fitness helps you enjoy leisure
- Fitness helps you work more effectively and efficiently
- Fitness keeps body functioning effectively
- Fitness is the basis for dynamic and creative activity
- Fitness can help you function safely and meet emergencies
Complete the 10 questions on the Heart Disease Risk Questionnaire

- Sum of 1 to 3 = unalterable risk factors
- Sum of 4-10 = alterable risk factors

Calculate total risk and discuss your personal level of risk and what factors you might need to change.