

Fit & Well - Session II

Cardio-respiratory Fitness (Chapters 3 & 11)

A. Anatomy and Physiology of the Cardiovascular and Respiratory System

Heart – 4 chambered fist-sized muscle. (See textbook).

Heart function: the right side pumps blood into the lungs to discard carbon dioxide and pick up oxygen (alveoli); left side pumps oxygenated blood out of the lungs into the arteries.

Arteries – carry blood away from the heart.

Capillaries – deliver oxygen and nutrient-rich blood to the muscles & tissues and pass on oxygen, then picks up poor waste-carrying blood (carbon dioxide) through small veins.

Veins – carry blood back to the heart for oxygenation.

B. Energy Production, ATP, and Metabolism

Metabolism is the sum of all the chemical processes necessary to maintain the body.

Metabolic rate is the rate at which your body uses energy. At rest you have a low metabolic rate. (Exception, see Muscles at rest vs. muscles at rest that are recovering from a workout).

As you move, your metabolic rate increases. If you jog, your metabolic rate could increase to 800% of resting rate. Olympic-caliber distance runners can increase their metabolic rate by a whopping 2000% or more.

Energy from food – Your body will convert food into energy useful fuels called, **Carbohydrates, Fats, and proteins.**

Carbohydrates break down to glucose for immediate use by the body.

Glucose will also be converted to **glycogen** and stored in the liver, muscles, and kidneys for use by the body.

Glycogen – is the stored form of Glucose. Glycogen is stored in the liver and skeletal muscles for immediate use for most forms of exercise.

If glycogen stores are full and the body's immediate need for energy is met, the remaining glucose is converted to fat and stored in the body's fatty tissue.

Glucose, glycogen, and fat are important fuels for the production of energy in the cells; **protein is a significant energy source only when other fuels are lacking.**

ATP – adenosine triphosphate, the basic form of energy used by cells. When a cell needs energy, it breaks down ATP, a process that releases energy in the only form the cell can use directly. When you exercise, your cells need to produce more energy. Consequently, your body mobilizes its stores of fuel to increase ATP production.

Three Energy Systems

Immediate Energy System – provides energy rapidly but for only a short period of time, 10 or fewer seconds. Examples of activities are; Weight lifting, shot putting, rising from a chair, and picking up a bag of groceries.

Non-oxidative Energy System (Anaerobic activity) used at the start of an exercise session and for high-intensity activities lasting for about 10 seconds to 2 minutes. Examples of activities are; 400 meter dash, running to catch a bus or dashing up several flights of stairs.

Anaerobic activity (Without oxygen)

[Anaerobic](#) literally means "without air", and refers to the energy exchange in muscles during short high intensity workouts. Anaerobic exercise is one where [anaerobic metabolism](#) is taking place. In a long exercise the [glycogen](#) supplied to local [muscles](#) runs out and the body converts to [aerobic metabolism](#); when aerobic metabolism is sustaining the workout it is an aerobic exercise. (Wikipedia Encyclopedia)

Lactic Acid – a by-product of ATP used during anaerobic activity. Lactic acid causes fatigue in muscles. However your body can be trained to deal with the build up of lactic acid. Physical training will help the body deal with the build up of lactic acid and result in longer periods of heavy exercise. (See conditioned athletes)

Oxidative Energy System (Aerobic activity) used during any physical activity that lasts longer than 2 minutes. Examples are; distance running, swimming, hiking, or even standing in line for a long time.

Aerobic activity (requires oxygen) Aerobic exercise is complementary to [anaerobic exercise](#). Aerobic literally means "with [oxygen](#)", and refers to the use of oxygen in [muscles'](#) energy-generating process. Aerobic exercise describes any type of exercise, typically performed at moderate levels of intensity for extended periods of time that increases the heart rate. Oxygen, fats and glucose are used to produce [adenosine triphosphate](#), the basic fuel for all [cells](#). (Wikipedia Encyclopedia)

C. Cardiovascular Health

1. Risk factors - Poor cardiovascular health.

i. Major risk factors – (changeable)

1. Tobacco use.
2. High blood pressure.
3. Unhealthy Cholesterol Levels.
4. Physical Inactivity.
5. Obesity.
6. Diabetes

ii. Contributing risk factors – (changeable)

1. High Triglyceride levels. Blood fats are obtained from food and manufactured by the body.
2. Psychological and Social Factors. Stress / Chronic hostility and anger / Suppressing psychological distress / Depression and anxiety / Social isolation / low socioeconomic status.

iii. Major Risk Factors – (Unchangeable)

1. Heredity
2. Aging
3. Being Male
4. Ethnicity

2. Major forms of cardiovascular disease

i. Hypertension

1. Blood pressure
 - a. Optimal = 120/80
 - b. Normal = 130/85
 - c. High = 130-139/85-89

d. Hypertension – 3 stages

- i. Stage 1 = 140-159/90-99
- ii. Stage 2 = 160-179/100-109
- iii. Stage 3 = 180-up/110-up

ii. **Atherosclerosis** – a form of arteriosclerosis (thickening/hardening of the arteries. The arteries (walls) become narrowed by deposits of fats, cholesterol and other substances.

iii. **Heart Disease and Heart Attacks** – (myocardial infarction) when one of the coronary arteries that supply blood to the heart becomes blocked by a blood clot. Often sudden, without warning.

- iv. **Stroke** (cerebrovascular accident) when the blood supply to the brain is cut off. The brain cells cannot be deprived of oxygen-rich blood. If the brain cells are deprived of blood for more than a few minutes, they die.
- v. **Congestive Heart Failure** (pulmonary edema) when the heart cannot maintain its regular pumping rate and force, fluids begin to back up. Fluids can collect in the lungs and interfere with breathing, particularly when a person is lying down.

3. Protecting yourself against cardiovascular disease

- i. Eat Heart-Healthy
 - 1. Decrease Fat and Cholesterol Intake
 - a. No more than 30% fat of total daily calories.
 - 2. Increase Fiber Intake
 - 3. Alcohol – moderate alcohol consumption
 - a. Women, only 1 drink per day.
 - b. Men, only 2 drinks per day.
 - 4. DASH – Dietary Approaches to Stop Hypertension.
- ii. Exercise Regularly
- iii. Avoid Tobacco
- iv. Know and Manage your Blood Pressure
- v. Know and Manage Your Cholesterol Levels
- vi. Develop Ways to Handle Stress and Anger
- vii. Know Your Risk Factors.

4. Cardiovascular Risk Assessment

Lab 11.1 (page 325)

D. Benefits of Cardio respiratory Endurance Exercise

- ✓ Improved Cardio respiratory functioning
- ✓ Improved Cellular Metabolism
- ✓ Reduced Risk of Chronic Disease
- ✓ Cancer / Diabetes / Osteoporosis / Death from other causes
- ✓ Better Control of Body Fat
- ✓ Improved Immune Function
- ✓ Improved Psychological and Emotional Well-Being

E. Assessment of Your Cardiorespiratory Endurance – 1 mile walk test (Lab 3.1/3.2)

F. Developing a CRE Program

Selecting an aerobic activity, find a CRE program that you will enjoy.

Goal Setting – set short-range attainable goals first then set long-range goals.

F.I.T. – Frequency, Intensity, and Time

Frequency – How many times per week will you exercise?

Intensity – How hard will you work/exercise?

Time (duration) – How long will you work/exercise?

G. Principles

Warm-up and cool down – Your body needs this to function better and to help with recovery.

Maintenance – 3 sessions per week will be necessary to hold your level of fitness.

Safety and Injuries – Proper clothes/shoes/reflective material on clothes. Important for recovery and to avoid injury, stretch before and after exercise sessions. Use **I.C.E.** on strains/pulls. Don't over do it, start slow and gradual. Modify activity when you are sick. Get proper rest/recovery.

H. Sharing of personal insights

For more information about Fitness Concepts that you should know and understand, go to: <http://www.rockwood.k12.mo.us/fitness/FitnessConcepts.htm>