Chapter 2: Principles of Physical Fitness

LEARNING OBJECTIVES

After reading this chapter, the student will be able to:
- Describe how much physical activity is recommended for developing health and fitness.
- Identify the components of physical fitness and how each component affects wellness.
- Explain the goal of physical training and the basic principles of training.
- Describe the principles involved to design a well-rounded exercise program.
- List the steps that can be taken to make an exercise program safe, effective, and successful.

KEY TERMS AND DEFINITIONS

**physical activity**  Body movement carried out by the skeletal muscles that requires various amounts of energy.

**exercise**  Planned, structured, repetitive movement intended to improve or maintain physical fitness.

**health-related fitness**  Physical capacities that contribute to health: cardiorespiratory endurance, muscular strength, muscular endurance, flexibility, and body composition.

**cardiorespiratory endurance**  The ability of the body to perform prolonged, large-muscle, dynamic exercise at moderate-to-high levels of intensity.

**muscular strength**  The amount of force a muscle can produce with a single maximum effort.

**metabolism**  The sum of all the vital processes by which food energy and nutrients are made available to and used by the body.

**muscular endurance**  The ability of a muscle to remain contracted or to contract repeatedly for a long period of time.

**flexibility**  The range of motion in a joint or group of joints, flexibility is related to muscle length.

**body composition**  The proportion of fat and fat-free mass (muscle, bone, and water) in the body.

**fat-free mass**  The nonfat component of the human body, consisting of skeletal muscle, bone, and water.

**skill-related fitness**  Physical capacities that contribute to performance in a sport or activity: speed, power, agility, balance, coordination, and reaction time.

**physical training**  The performance of different types of activities that cause the body to adapt and improve its level of fitness.

**specificity**  The training principle that the body adapts to the particular type and amount of stress placed on it.

**progressive overload**  The training principle that placing increasing amounts of stress on the body causes adaptations that improve fitness.

**reversibility**  The training principle that fitness improvements are lost when demands on the body are lowered.

**exercise stress test**  A test usually administered on a treadmill or cycle ergometer that involves analysis of the changes in electrical activity in the heart from an electrocardiogram (EKG or ECG) taken during exercise; used to determine if any heart disease is present and to assess current fitness level.

**graded exercise test (GXT)**  An exercise test that starts at an easy intensity and progresses to maximum capacity.
EXTENDED LECTURE OUTLINE

Introduction

Although people vary greatly in their levels of physical fitness, everyone can ultimately achieve the benefits from regular physical activity based on sound physical training principles.

I. Physical Activity and Exercise for Health and Fitness

   A. The Centers for Disease Control and Prevention recently reported the following statistics about the physical activity levels of adult Americans.

      1. About 33% participate in some leisure-time physical activity.
      2. Between 1988 and 2009, leisure time decreased by nearly 6%. About 25% of Americans participate in no leisure time physical activity.
      3. People with higher levels of education exercise more often than people with less education.
      4. People living in large urban areas are less active than those living in smaller communities.

   B. Physical Activity on a Continuum

      Physical activity is movement carried out by skeletal muscles that requires energy in various amounts.

      1. Exercise is planned, structured, repetitive movement intended to improve or maintain a level of fitness.

         a. Level of fitness depends on the following:

             - Physiological factors, i.e. heart’s ability to pump blood
             - Genetics
             - One’s own behavior

      2. Increasing Physical Activity to Improve Health and Wellness

         a. Healthy adults should perform 150 minutes of moderate intensity aerobic exercise or at least 75 minutes of vigorous intensity exercise per week.

         b. Increasing volume and intensity of the exercise (300 minutes a week) will result in additional health benefits.

         c. Moderate to high intensity resistive exercises should be included at least twice a week to promote muscular strength and endurance.

         d. Avoid inactivity, since this will contribute to a sedentary lifestyle and increased risk of obesity.

      3. Increasing Physical Activity to Manage Weight

         a. 66% of Americans are carrying extra weight. Based on this information, recommendations are as follows from the American College of Sports Medicine:

             - GENERAL HEALTH: perform 150 minutes of moderate intensity aerobic exercise or 75 minutes of vigorous intensity exercise per week.
- INCREASED HEALTH BENEFITS: 300 minutes of moderate intensity or 150 minutes of vigorous activity per week.
- MAINTENANCE: 60-90 minutes of moderate activity per day.

- MUSCULAR STRENGTH/ENDURANCE: 2 non-consecutive days of resistance work that focuses on large muscle groups of the upper and lower body.
- FLEXIBILITY: range-of-motion exercises at least 2 times per week.

C. How Much Physical Activity Is Enough?
1. The amount of activity is based on an individual’s health status and goals.
2. Regular physical activity promotes health and can protect one from chronic diseases.
3. For better health and well-being, participate in a structured exercise program that develops all areas of fitness. Any increases will improve your health and well-being.
4. Fit people have more energy and better body control.
5. Regardless if you like sports, you need physical energy and stamina in one’s daily life.

II. Health-Related Components of Physical Fitness

A. Cardiorespiratory Endurance
1. Cardiorespiratory endurance is the ability to perform prolonged large-muscle dynamic exercise at moderate-to-high levels of intensity.
2. It is a central component of fitness that trains the heart and lungs, making them functionally stronger and more efficient.

B. Muscular Strength
1. Muscular strength is the amount of force a muscle can exert with a single maximum effort.
2. Adequate muscular strength is important for performance of daily tasks and body alignment; an increase in muscle mass means a higher rate of metabolism and faster energy use.
3. Maintaining strength and muscle mass is also vital for healthy aging.

C. Muscular Endurance
1. Muscular endurance is the ability to resist fatigue and sustain a given level of muscle tension. This allows the muscles to contract longer over a period of time.
2. It is important for good posture, injury prevention, and performance of physical tasks.

D. Flexibility
1. Flexibility is the ability of joints to move through their full range of motion.
2. Poor flexibility can lead to stiffness, misalignment of posture, and pain.

E. Body Composition
1. Body composition is defined as the proportion of fat and fat-free mass (muscle, bone, and water) in a body.

2. Healthy body composition reduces the risk of heart disease, high blood pressure, stroke, joint pain, type II diabetes, some types of cancers, and lower back pain.

F. Skill-Related Components of Fitness

Speed, power, agility, balance, coordination, reaction and movement time are essential to perform sport-related activities successfully. These components do not contribute to all health-related fitness concepts but can help build your fitness and contribute to enjoyment of certain activities.

III. Principles of Physical Training: Adaptation to Stress

A. The human body adjusts to meet increasing demands placed on it; the greater the demand, the greater the adjustment made.

B. Over time, short term adjustments lead to long-term changes and improvements in fitness levels.

C. Training Principles

1. Specificity—Adapting to Type of Training
   Exercises tend to target specific areas, and a well-rounded exercise program should include exercises geared to each component of fitness.

2. Progressive Overload—Adapting to Amount of Training
   As the amount of exercise is progressively increased, fitness continues to improve. The amount of overload needed to maintain or improve a level of fitness for a particular fitness component is determined through four dimensions, represented by the acronym FITT:
   a. Frequency (F)— how often:
      For most people, a frequency of 3 to 5 days per week for cardiorespiratory endurance and 2 to 3 days per week for resistance and flexibility training is appropriate.
   b. Intensity (I)— how hard:
      Intensity refers to how difficult the exercise is. Fitness benefits occur when exercise is more intense than a normal level of activity such as lifting heavier weights or stretching farther than usual.
   c. Time (T)— how long (duration):
      (1) Cardiorespiratory endurance requires at least 20 to 60 minutes of exercise; other components are usually measured in repetitions such as 50 sit-ups.
      (2) Intensity of the exercise affects duration. High intensity should be done for shorter periods of time, and low intensity should be done for longer periods. If you are not athletic, it is better to start with low intensity and long duration to lessen the risk of injury.
   d. Type (T)— mode of activity
      Type of exercise varies with each fitness component and with personal fitness goals.

D. Reversibility—Adapting to Reduction in Training
1. The benefits of fitness are reversible. Just as the body can adapt to higher levels of activity and become more fit, it can adapt to lower levels of activity and become less fit.

2. Training must be consistent in frequency, intensity, and duration to maintain fitness.

3. When a person stops exercising, 50 percent of fitness improvements are lost within 2 months.

4. If you must temporarily curtail your training, you can maintain your fitness improvements by keeping the intensity of your workouts constant while reducing their frequency or duration.

E. Individual Differences—Limits on Adaptability

1. There are large differences in our ability to improve fitness and perform skills.

2. Some of our ability is genetically predetermined, but for the average individual, adaptability is enough to achieve fitness goals.

3. Physical training improves fitness for everyone, regardless of heredity.

IV. Designing Your Own Exercise Program

Physical training works best when you follow a plan.

A. Getting Medical Clearance

Certain populations and individuals with health problems should see their physician before starting a vigorous exercise program.

B. Assessing Yourself

The first step is to assess your current level of fitness for each of the five health-related fitness components. The results will help set up specific fitness goals and create the program.

C. Setting Goals

Think carefully about what goals will motivate you to begin and stay with an exercise program. Most sport psychologists think setting and achieving goals is the most effective way to stay motivated with regards to exercise.

D. Choosing Activities for a Balanced Program

Your fitness program should combine an active lifestyle with a systematic exercise program. The balanced program includes activities to develop all health-related components of fitness.

1. Cardiorespiratory endurance is developed through activities that involve continuous rhythmic movements of large-muscle groups.

2. Muscular strength and endurance are developed through resistance training or calisthenics.

3. Flexibility is developed by stretching major muscle groups regularly with proper techniques.

4. Healthy body composition is developed through a sensible diet and a program of regular exercise.

E. Guidelines for Training
1. Train the way you want your body to change. Exercise according to what you want to accomplish: for greater strength, lift weights; for more flexibility, stretch.

2. Train regularly. Consistency is the key to improving fitness.

3. Start slowly, and get in shape gradually.
   a. An exercise program can be divided into three phases:
      - Beginning phase: The body adjusts to the new type and level of activity.
      - Progress phase: The targeted level of fitness is sustained over the long term.
      - Maintenance phase: The targeted level of fitness is sustained over the long term.
   b. As you progress, increase duration and frequency before increasing intensity.
   c. If you train too much or too intensely, you are more likely to suffer injuries or become overtrained, a condition characterized by lack of energy, aching muscle and joints, and decreased physical performance.

4. Warm ups before exercise can decrease your chances of injury by helping your body gradually progress from rest to activity.

5. Cool downs after exercise can restore circulation to its normal resting level.

6. Exercise safely with partners, and use good-quality equipment and protective gear.

7. Listen to your body, and get adequate rest. Although you should maintain a structured, consistent workout program, don’t exercise if it doesn’t feel right.

8. Cycle the volume and intensity of your workouts. Some days train intensely and other days train more lightly.

9. Vary your training activities. Try varying the type of training you do during different times of the year.

10. Try training with a partner. Training buddies can motivate and encourage you and ensure that you’re exercising correctly.

11. Train your mind. Be committed, disciplined, patient, and positive about yourself and your goals.

12. Fuel your activity appropriately through good nutrition including rehydration and resynthesis of liver and muscle carbohydrate stores.

13. Have fun, and you will most likely stick with an exercise program.

14. Tracking your progress can help keep you motivated and plot your fitness status.

15. Keep your exercise program in perspective. Training should not consume all of your time and energy—wellness also requires mental health, good relationships with family and friends, and relaxation.