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 ability to move the joints through their full ranges of motion.

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.

somatotype A body-type classification system that describes people as predominantly muscular (mesomorph), tall and thin (ectomorph), or round and heavy (endomorph).

skill (neuromuscular)-related fitness Physical capacities that contribute to performance in a sport or activity: speed, power, agility, balance, coordination, and reaction time; neuromuscular fitness refers specifically to maintaining performance levels of balance, agility, coordination, and gait through the control of muscles and movement by the brain and spinal column.

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 to develop a particular fitness component, one must perform exercises designed specifically for that component.

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.

OVERTRAINING A CONDITION CAUSED BY TRAINING TOO MUCH OR TOO INTENSELY, CHARACTERIZED BY LACK OF ENERGY, DECREASED PHYSICAL PERFORMANCE, AND ACHING MUSCLES AND JOINTS.**EXTENDED LECTURE OUTLINE**

Introduction

Although people vary greatly in physical fitness and performance ability, the benefits of regular physical activity are available to everyone.

I. Physical Activity and Exercise for Health and Fitness

A. Almost any kind of physical activity promotes health.

B. A recent study found that short periods of intense exercise do not compensate for hours of inactivity.

C. 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
        - 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 or 150 or vigorous activity a week) will result in additional health benefits.
    c. Moderate to high intensity resistive exercises (at least 2 times a week) promote muscular strength and endurance.
    d. Avoid inactivity; it contributes to a sedentary lifestyle and increased risk of obesity.
3. Increasing Physical Activity to Manage Weight
    a. 66% of Americans are carrying extra weight
    b. U.S. Department of Health and Human Services published physical activity guidelines:
        - 150 minutes per week of physical activity may not be enough to lose weight
        - Recommend up to 90 minutes of physical activity per day.
4. Exercising to Improve Physical Fitness
    a. People can obtain even greater health and wellness benefits by increasing the duration and intensity of physical activity.
    b. Structured, systematic exercise program also improves physical fitness.

D. How Much Physical Activity Is Enough?

1. Regular physical activity promotes health and can protect one from chronic diseases.
2. Fit people have more energy and better body control.
3. Regardless if you like sports, you need physical energy and stamina in one's daily life.
4. 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.

II. 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 health-related fitness because heart and lung function is essential to overall good health.

B. Muscular Strength

1. Muscular strength is the amount of force a muscle can exert with a single maximum effort.
2. Greater muscle mass means faster energy use and a higher rate of metabolism.
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 and injury prevention.

D. Flexibility

1. Flexibility is the ability of joints to move through their full range of motion.
2. Inactivity causes the joints to become stiffer with age.

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.
3. Somatotype, or body build, affects a person's choice of exercise; includes endomorphs, mesomorphs, and ectomorphs.

F. Skill (Neuromuscular)-Related Components of Fitness

Components of skill-related fitness include speed, power, agility, balance, coordination, and reaction and movement time.

III. Principles of Physical Training: Adaptation to Stress

A. The human body is adaptable and adjusts to meet increasing demands placed on it.

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

C. Particular types and amounts of exercise are most effective in developing the various components of fitness.

1. Specificity – Adapting to Type of Training

a. 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

a. As the amount of exercise is progressively increased, fitness continues to improve.

b. 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:

- Frequency: For most people, a frequency of 3 to 5 days per week for cardiorespiratory endurance and 2 or more days per week for resistance and flexibility training is appropriate.
- Intensity: Fitness benefits occur when exercise is more intense than a normal level of activity such as lifting heavier weights or stretching farther than usual.
- Time (Duration): Cardiorespiratory endurance requires at least 20 to 60 minutes of exercise; other components are usually measured in repetitions such as 50 sit-ups; high intensity should be done for shorter periods of time, and low intensity should be done for longer periods.
- Type (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. When a person stops exercising, 50 percent of fitness improvements are lost within 2 months.
3. If you must temporarily curtail your training, you can maintain your fitness improvements by keeping the intensity of your workouts constant.

E. Individual Differences—Limits on Adaptability

1. There are large differences in our ability to improve fitness and perform skills.
2. Scientists have identified specific genes that influence body fat, strength, and endurance.
3. Physical training improves fitness for everyone, regardless of heredity.

IV. Designing Your Own Exercise Program

A. Getting Medical Clearance

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

B. Assessing Yourself

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

C. Setting Goals

1. Think carefully about your overall goals, and be clear about why you are starting a program

D. Choosing Activities for a Balanced Program

An ideal fitness program should combine an active lifestyle with a systematic exercise program 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 technique.
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.
    a. Exercise according to what you want to accomplish.
    b. For greater strength, lift weights; for more flexibility, stretch.
2. Train regularly
    a. Consistency is the key to improving fitness.
    b. Fitness improvements are lost if too much time passes between exercise sessions.
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.
        - 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. Warming up can decrease your chances of injury by helping your body gradually progress from rest to activity.
5. Cool downs after exercise can safely restore circulation to its normal resting level.
6. Exercise safely
    a. Physical activity can cause injury or even death if you don’t consider safety
    b. Overloading your muscles and joints can lead to serious injury, so train within your capacity
7. Listen to your body, and get adequate rest
    a. Rest can be as important as exercise for improving fitness.
    b. Build rest into your training program, and don’t exercise if it doesn’t feel right.
8. Cycle the Volume and Intensity of Your Workouts
    a. Do not train at the same intensity during every workout.
    b. Use cycle training to provide enough recovery for intense training.
9. Vary Your Training Activities
    a. Changing the exercise program from time to time keeps things fresh and helps develop a higher degree of fitness.

   b. Changing activities may also help reduce your risk of injury.

10. Try Training With a Partner
    a. People who train together can motivate and encourage each other.
    b. A commitment to a friend is a powerful motivator.
11. Train your Mind
    a. Becoming fit requires commitment, discipline, and patience.
    b. Use lifestyle management techniques to keep the program on track.
12. Fuel your Activity Appropriately
    a. Good nutrition is part of optimal recuperation from exercise.
    b. Consume enough calories to support the exercise program without gaining body fat.
13. Have Fun
    a. Choose a variety of activities that you enjoy.
    b. Boost enjoyment and build a social support network by exercising with friends and family.
14. Track Your Progress
    a. Monitoring the progress of your program can help keep you motivated and on track.
    b. If the program focuses on increasing daily physical activity, consider using an inexpensive pedometer or exercise GPS.
15. Keep Your Exercise Program in Perspective
    a. Physical fitness is, it is only part of a well-rounded life.
    b. Balance and moderation are key ingredients of a fit and well life.

Student Activities and Assignments

Laboratory Activities

Laboratory Activities located in the textbook and the Online Learning Center:

Lab 2-1: Safety of Exercise Participation

This PAR-Q questionnaire helps assess students' current overall levels of physical activity by tracking and classifying their activities into three general categories. Based on the results, students identify opportunities to increase daily physical activity.

Lab 2-2: Overcoming Barriers to Being Active

This questionnaire asks students a series of questions to help them identify key barriers to physical activity, including factors such as lack of time and fear of injury. The second part of the lab offers recommendations for overcoming common barriers.

Lab 2-3: Using a Pedometer to Track Physical Activity

This lab asks students if they would be more motivated to increase daily physical activity if they had an easy way to monitor their level of activity. This lab has students wear a pedometer for a week to obtain a baseline average daily number of steps. Then they are aided in setting appropriate goals for increasing steps

Additional Laboratory Activities located in the Course Integrator Guide:

Lab A2-1: Examine Your Exercise History and Attitudes

This American Council on Exercise worksheet asks students to examine their feelings about exercise in order to help them plan individualized exercise programs.

Lab A2-2: What's Your Excuse for Not Exercising?

This lab lists common reasons for not exercising and categorizes them. Students who find their excuses falling into one or more categories are given suggestions on combating the excuses.

Lab A2-3: Complete PAR-Q from the Canadian Society for Exercise Physiology

In addition to the PAR-Q questionnaire that appears in Lab 2-1, this lab includes explanatory material and guidelines associated with the PAR-Q. Tips that students may find useful include reminders of principles for active living, healthy eating, and positive self- and body- image.

Lab A2-4: Evaluating a Fitness Facility

This worksheet helps students evaluate a potential gym or facility in areas such as convenience, atmosphere, safety, and cost.

Behavior Change Workbook (student responses can be printed or e-mailed)

Students can complete the 15 activities in the Behavior Change Workbook over the course of the term as they put together and evaluate a behavior change program.

Daily Fitness and Nutrition Journal

Students can start to complete the fitness program planning portion of the log by beginning an analysis of the costs and benefits of increasing physical activity and exercise habits. Students may visit the Online Learning Center for blank sample logs if they need to track their daily activities in order to identify ways to incorporate more lifestyle physical activity into their daily life. They may also refer to the time management section (Activity 10) in the Behavior Change Workbook at the end of the text.

LECTURE RESOURCES

Suggested Group Activities

1. Have students form pairs and take 5 minutes to discuss each of these topics.
    a. How much activity is recommended in a week?
    b. How much activity do you normally perform in a week?
    c. What activity would you choose to perform to increase your activity level? Why?
    d. How long would you have to perform this activity to burn 1,000 calories each week?
2. Have students form small groups of 3 to 5 people each, and appoint a secretary to take notes on each discussion. Take 5 minutes to discuss the following questions about motivation to exercise:
    a. What are your reasons for not exercising?
    b. What are the benefits of exercise?
    c. Which of the benefits of exercise is most important to you? Why?

Have each group choose one reason given for not exercising (e.g., insufficient time, too expensive). Write the reasons on an overhead transparency or on a blackboard. Then have the students suggest ways to overcome each obstacle.

INTERNET RESOURCES

Organizations, Hotlines, and Websites

The Internet addresses (also called uniform resource locators, or URLs) listed here were accurate at the time of publication.

American Alliance for Health, Physical Education, Recreation, and Dance (AAHPERD). A professional organization dedicated to promoting quality health and physical education programs.
http://www.aahperd.org

American College of Sports Medicine (ACSM). The principal professional organization for sports medicine and exercise science. Provides brochures, publications, and audiotapes and videotapes.
http://www.acsm.org

American Council on Exercise (ACE). Promotes exercise and fitness; the Website features fact sheets on many consumer topics including choosing shoes, cross-training, and steroids.
www.acefitness.org

American Heart Association: Just Move. Provides practical advice for people of all fitness levels plus an online fitness diary.
http://www.heart.org/HEARTORG/

Canada's Physical Activity Guide. Offers many suggestions for incorporating physical activity into everyday life; also includes the Physical Activity Readiness Questionnaire (PAR-Q).
http://www.hc-sc.gc.ca/index-eng.php

CDC Physical Activity Information. Provides information on the benefits of physical activity and suggestions for incorporating moderate physical activity into daily life.
http://www.cdc.gov/physicalactivity/

Disabled Sports USA. Provides sports and recreation services to people with physical or mobility disorders.
http://www.dsusa.org/

Georgia State University: Exercise and Physical Fitness Page. Provides information about the benefits of exercise and how to get started on a fitness program.
http://www2.gsu.edu/~wwwfit/

International Health, Racquet, and Sportsclub Association (IHRSA): Health Clubs. Provides guidelines for choosing a health or fitness facility and links to clubs that belong to IHRSA.
http://www.healthclubs.com/

MedlinePlus: Exercise and Physical Fitness. Provides links to news and reliable information about fitness and exercise from government agencies and professional associations.
http://www.nlm.nih.gov/medlineplus/exerciseandphysicalfitness.html

President's Council on Physical Fitness and Sports (PCPFS). Provides information on PCPFS programs and publications including fitness guides and fact sheets.
http://www.fitness.gov/
http://www.presidentschallenge.org/

Shape Up America! Provides information on the benefits of fitness, assessment tests, and tips on overcoming barriers to physical activity.
http://shapeup.org/

Family First. Provides resources for increasing activity and improving diet through small changes in daily habits.
http://familyfirst.com/smallsteps-gov.html

The following provide links to sites with information on a wide variety of activities and fitness issues; evaluate commercial sites carefully.
Fitness Partner Connection Jumpsite:
http://primusweb.com/fitnesspartner/

NetSweat: The Internet's Fitness Resource:
http://www.netsweat.com/Fitness-Web-Site-Information.html