**CHAPTER 2**

# ASSESSMENT OF PHYSICAL FITNESS

**OBJECTIVES**

- Identify the health-related components of physical fitness.
- Be able to assess cardiorespiratory fitness.
- Understand the difference between muscular strength and muscular endurance.
- Learn to assess muscular strength.
- Be able to assess muscular flexibility.
- Understand the components of body composition.
- Learn to determine recommended body weight.
- Learn to assess disease risk based on body mass index (BMI) and waist circumference.

**EXPANDED CHAPTER OUTLINE**

I. INTRODUCTION
   A. This chapter covers the assessment of the health-related components of physical fitness:
      1. Cardiorespiratory endurance.
      2. Muscular strength and endurance.
      3. Muscular flexibility.
      4. Body composition.
   B. Fitness testing in a comprehensive program is important to:
      1. Educate yourself regarding the various fitness components.
      2. Assess your fitness level for each health-related fitness component and compare the results to health fitness and physical fitness standards.
      3. Identify areas of weakness for training emphasis.
      4. Motivate you to participate in exercise.
      5. Use as a starting point for your personalized exercise prescription.
      6. Evaluate the progress and effectiveness of your program.
      7. Make adjustments in your exercise prescription, if necessary.
      8. Reward yourself for complying with your exercise program.
   C. Pre- and post-exercise tests (at least 8 weeks apart) are recommended.
   D. A personal fitness profile is provided in Activity 2.1(page 52) to record the test results.
   E. Use the results to write personal fitness goals in Chapter 3, Activity 3.4, page 95).
   F. To begin, determine testing safety by completing the Physical Activity Readiness Questionnaire (PAR-Q) (Activity 1.2).

II. RESPONDERS VERSUS NONRESPONDERS
   **A.** The **Principle of Individuality**
      1. Defined: Heredity plays a major role in individual response to exercise and should be considered when designing exercise programs.
      **2. Responders**
         a. Individuals who exhibit improvements in fitness as a result of training.

b. Increases between 15–20% in $VO_{2max}$ are typical after several months of training.

**3. Nonresponders**

a. Individuals who exhibit small or no improvements in fitness compared to others who undergo the same training program.
b. Constitute less than 5% of exercise participants.
c. May be related to low levels of leg strength.
d. Lower body strength training has been shown to help these individuals.

III. FITNESS ASSESSMENT BATTERY

A. Because health-related fitness has four components, a battery of tests is necessary to determine an individual's overall level of fitness.

B. **Health Fitness Standard** (Figure 2.1)

1. Linked to epidemiological data of better health and disease risk.
2. Requires only moderate amounts of physical activity.
3. Fitness improvements are not as notable.
4. Significant health benefits result:
    a. Reduction in blood lipids.
    b. Lower blood pressure.
    c. Weight loss.
    d. Stress release.
    e. Lower risk for diabetes and other diseases.
    f. Lower risk for premature mortality.
5. Improvement in the **metabolic profile** and **metabolic fitness**:
    a. Better insulin sensitivity.
    b. Better glucose tolerance.
    c. Improved cholesterol levels.
6. Minimal amount of exercise:
    a. Moderate amount of exercise.
    b. Equivalent to walking 2 miles in less than 30 minutes, five to six times per week.

C. **Physical Fitness Standard** (Figure 2.1)

1. Set higher than the health fitness standard.
2. Requires a more vigorous exercise program.
3. May enable the capacity to perform daily work and recreational activities without undue fatigue:
    a. Changing a tire.
    b. Chopping wood.
    c. Climbing several flights of stairs.
    d. Playing a game of basketball.
    e. Mountain biking.
    f. Playing soccer with the grandchildren.
    g. Walking several miles around a lake.
    h. Hiking through a national park.

D. Objective of the fitness program:

1. Use the health fitness standard if the objective is to lower the risk of disease.
2. Use the physical fitness standard if the objective is to participate in a moderate to vigorous fitness program to achieve a much higher level of fitness.

IV. CARDIORESPIRATORY ENDURANCE

A. This is the most important component of health-related physical fitness for all individuals, with the exception among older adults for whom muscular strength is most important.

B. The ability of the lungs, heart, and blood vessels to deliver adequate amounts of oxygen to the cells to meet the demands of prolonged physical activity.

C. Oxygen is used by the cells to convert food substrates (carbohydrates and fats) into energy.

D. Cardiorespiratory-promoting activities are termed **aerobic** because they require significant oxygen and include:

1. Walking.
2. Jogging.
3. Cycling.
4. Rowing.
5. Cross-country skiing.
6. Aerobic dance.
7. Soccer.
8. Basketball.

9. Racquetball.

E. Guidelines to develop cardiorespiratory programs are given in Chapter 3.
F. An introduction and description of benefits of leading aerobic activities are given in Chapter 4.
G. A sound cardiorespiratory endurance program contributes greatly to good health.
H. Benefits of a cardiorespiratory program include:
    1. Higher cardiac strength.
    2. Higher oxygen carrying capacity ($VO_{2max}$).
        a. The maximum amount of oxygen utilized per minute.
        b. Absolute (whole body) measurement units: liters per minute (L/min).
        c. Relative (per average amount of body) measurement units: milliliters per kilogram body weight per minute (mL/kg/min).
    3. Lower resting heart rate.
    4. Lower blood pressure.
    5. Lower blood lipids (cholesterol and triglycerides).
    6. Lower recovery time following exercise.
    7. Lower risk for **hypokinetic** diseases (those associated with **sedentary** living).

**Critical Thinking:** While your absolute maximal oxygen uptake remains unchanged, your relative maximal oxygen uptake can increase without engaging in an aerobic exercise program. How can you accomplish this, and would you benefit from doing so?

I. Oxygen Uptake
    1. Expressed in liters per minute.
    2. A measure of cardiorespiratory capacity and ability to produce energy.
    3. The body is able to produce about 5 calories for every liter of consumed oxygen.
    4. Resting oxygen consumption ranges from 0.3 to 0.5 liters per minute.
    5. Exercise oxygen consumption can exceed 5 liters per minute.
    6. The average person exercises between 50% and 75% of their maximal oxygen uptake, thus expending 7 to 12 calories/min during vigorous-intensity aerobic exercise.
    7. Energy consumption calculations during exercise using oxygen data.
        a. Given: $VO_{2max}$ of 3.5 L/min
        b. Given: exercising at 60% intensity for 30 minutes
        c. Given: 1 pound of fat = 3,500 calories
        d. $VO_2$ consumption = 3.5 L/min × 0.6 = 2.1 L/min
        e. Caloric consumption = 2.1 L/min × 5 calories/L = 10.5 calories/min
        f. Workout energy consumption: 10.5 calories/min × 30 min = 315 calories
        g. Number of workouts to burn 1 pound of fat = 3,500 calories ÷ 315 calories/session = 11 sessions
J. Assessing Cardiorespiratory Endurance
    1. Maximal Tests
        a. Any test that requires all-out effort, such as the 1.5-Mile Run Test or a treadmill stress test.
        b. The American College of Sports Medicine (ACSM) recommends that a physician be present for all maximal exercise tests for apparently healthy men over age 45 and women over age 55.
    2. Submaximal Tests
        a. Not requiring all-out effort, such as the 1.0-Mile Walk Test.
        b. A physician should be present when testing individuals at higher-risk (disease symptoms and disease history).
    **3. 1.5-Mile Run Test**
        a. Used most often to determine cardiorespiratory endurance.
        b. Data collected is the time to cover the 1.5 miles.
        c. Equipment needed is a stopwatch and measured course.
        d. This is a maximal test, requiring all-out effort.
        e. Unconditioned or higher-risk individuals should not participate.

(1) Unconditioned beginners should have 6 weeks of aerobic training before participating.
(2) Those with known cardiovascular disease or risk factors for heart disease or men over 45 years old and women over 55 years old should not participate.

f. Mild stretching, walking, and slow jogging precede the test.
g. Unusual symptoms during the run/walk terminate the test.
h. A 3–5 minute walking or jogging cool-down follows the test.
i. Table 2.1 estimates the individual's $VO_{2max}$ based on test time.
j. Table 2.2 determines the individual's fitness category based on $VO_{2max}$.
k. Example: A 20-year-old female runs in 12 minutes and 40 seconds. Table 2-1 shows a predicted maximum oxygen uptake ($VO_{2max}$) of 39.8 mL/kg/min. Table 2.2 places her in the "good" cardiorespiratory fitness category.

**4. 1.0-Mile Walk Test**

a. Equipment needed is a stopwatch and measured course equal to 1.0 mile (e.g., 440 track would equal four laps).
b. Measure body weight including exercise clothing.
c. Walk 1.0 mile **at a brisk pace**, eliciting at least a 120 beats/minute heart rate.
d. Count a 10-second (carotid or radial; see photos) pulse immediately upon completing the 1.0 mile.
e. Multiply the pulse count by 6 to express the count in beats per minute.
f. Convert the seconds of the walk time into minutes. Do this by dividing the seconds of the walk time by 60.
g. Plug the variables into the $VO_{2max}$ prediction formula: $VO_{2max} = 88.768 – (0.0957 \times W) + (8.892 \times G) – (1.4537 \times T) – (0.1194 \times HR)$
h. W = weight in pound; G = gender (0 for women; 1 for men); T = total walk time in minutes; HR = immediate post exercise heart rate in minutes.
i. Table 2.2 determines the individual's fitness category based on $VO_{2max}$.

V. MUSCULAR STRENGTH AND ENDURANCE

A. Good strength enhances quality of life in the following ways:
1. It increases lean (muscle) mass.
2. It stresses the bones, thus preserving density and decreasing osteoporosis risk.
3. It encourages weight loss and maintenance.
4. It helps increase and maintain **resting metabolism**.
5. It improves balance and restores mobility.
6. It makes lifting and reaching easier.
7. It decreases the risk for injuries and falls.
8. It reduces chronic low back pain and alleviates arthritic pain.
9. It lowers cholesterol, high blood pressure, and the risk for developing diabetes.
10. It promotes psychological well-being.
11. It will also, with time, decrease heart rate and blood pressure response to heavy lifting, which will improve the ability to perform daily function more efficiently and with less injury or fatigue.

B. Muscular Strength and Muscular Endurance

**1. Muscular Strength**

a. The ability to exert maximum force against resistance.
b. Tests focus on muscular strength or a combination of muscular strength and endurance.
c. One cannot develop muscular strength without developing muscular endurance.

**2. Muscular Endurance**

a. The ability to exert submaximal force repeatedly over a period of time.
b. Related more to strength than to cardiorespiratory endurance.
c. One cannot develop muscular endurance without developing muscular strength.

C. Muscular strength and endurance are necessary for everybody. It is valuable in:
1. Performing daily activities:

a. Sitting.
b. Walking.
c. Running.
d. Lifting and carrying.
e. Housework.
f. Recreational activities.

2. Establishing appearance and self-image.
3. Developing sports skills.
4. Promoting stability of joints (very important in the aged population).
5. Meeting life emergencies.

D. Muscular strength and endurance are critically important for elderly individuals.
1. They may be the most important health-related components to maintain.
2. Older individuals have been found to benefit greatly by strength training.
3. Research has shown leg strength improvements as high as 200% in previously inactive adults over age 90.

E. Determining Strength
**1. One repetition maximum (1 RM)**
a. The maximal amount of resistance a person is able to lift in a single effort.
b. Requires a considerable amount of time.

**2. Muscular Endurance Test**
a. Measurement of how many repetitions can be performed against a submaximal exercise.
b. Uses three exercises: Bench Jump, Modified Dip (men), Modified Push-Up (women), and Bent-Leg Curl-Up.
c. Equipment needed includes: stopwatch, metronome, bench or gymnasium bleacher (16.25 inches high), and a partner.
d. **Bench Jump**: Number of times the individual can jump or step entirely up onto and down from the bench (bleacher) step in one minute (see photo).
e. **Modified Dip**: Number of times the elbows can be flexed 90 degrees with hands behind on a bench (bleacher) and a partner (or chair) holding the feet up in front. The motion is done to a 56 beat-per-minute two-step (up–down) cadence (see photo).
f. **Modified Push-Up**: Number of repetitions with hands at shoulder width and fingertips facing forward. The body is supported by the knees, the chest must touch to the floor for each repetition, and the cadence is 56 beats per minute (two-step up–down; see photo).
g. **Bent-Leg Curl-Up**: Number of upright repetitions (up to 100) at a 40 beat-per-minute (up–down) cadence, with knees at 100 degrees, feet on the floor, and arms crossed with hands on shoulders (see photo).
h. **Abdominal Crunch** is recommended when curl-up is contraindicated, but is difficult to eliminate form breaks (see procedure and photo). You can also use a Crunch-Ster Curl-Up Tester available from Novel Products.
i. The percentile rank of each test is found in Table 2.3.
j. Table 2.4 converts the percentiles into fitness categories and point contributions to overall muscular strength and endurance.
k. Table 2.5 determines overall muscular strength and endurance when the point contributions from all tests are added together.
l. These results can be recorded in Activity 2.1.

VI. MUSCULAR FLEXIBILITY
A. The achievable range of motion at a joint or group of joints without causing injury.
B. Most people do not move their joints enough to maintain good flexibility.
C. Flexibility is highly specific and varies by joint and individual.
D. Good flexibility:
1. Promotes healthy muscles and joints.
2. Reduces the risk for injury.

3. Enables movements of turning, lifting, and bending.

E. Poor flexibility:
   1. Can cause poor posture.
   2. Is the cause of 80% of low back pain in the U.S.
   3. This backache syndrome costs billions of dollars in workplace productivity and worker medical compensation each year.

F. Benefits of a regular flexibility program:
   1. It helps to maintain good joint mobility.
   2. It increases resistance to muscle injury and soreness.
   3. It prevents low back pain and other spinal column problems.
   4. It improves and maintains good postural alignment.
   5. It enhances proper and graceful body movement.
   6. It improves personal appearance and self-image.
   7. It facilitates the development of motor skills throughout life.

G. Factors that affect flexibility:
   1. Genetics—some of the factors below.
   2. Joint structure—a tighter fit decreases flexibility.
   3. Ligaments—shorter length decreases flexibility.
   4. Tendons—greater tension decreases flexibility.
   5. Muscles—shorter length decreases flexibility.
   6. Skin—resists joint movement.
   7. Tissue injury—affects extensibility of soft tissue.
   8. Fat tissue—inhibits extreme flexion of a joint.
   9. Body temperature—reduces muscular resistance of joint movement.
   10. Age—decreases the extensibility of soft tissue.
   11. Gender—women are more flexible than men.

H. Other benefits of flexibility exercises:
   1. Successful treatment of **dysmenorrhea** (painful menstruation).
   2. Reduces neuromuscular tension (stress) and knots (trigger points) in muscles and fascia.
   3. Effective contribution to vigorous exercise warm-up preparation and cool-down routines.
   4. Maintenance of mobility in older adults, which enables the participation in (and benefits of) subsequent activity.

I. Assessing Flexibility
   **1. Modified Sit-and-Reach Test**
      a. Equipment needed is the Acuflex I sit-and-reach tester or a yardstick on top of a box.
      b. Begin with feet against the box (shoes off), with hips, back, and head against a wall (see photos).
      c. The reference reach is determined by touching the reach indicator to the fingertips of superimposed extended hands (head and back remains against the wall).
      d. Without bending the knees, the head and back then come off of the wall as the subject bends forward, pushing the box slide with the fingertips and holding the final position 2 seconds.
      e. The average of two trials is recorded with the subject holding the final position on the third stretch forward for each trial.
      f. Table 2.6 shows the percentile ranks by gender and fitness category.
      g. Tables 2.4 and 2.8 convert the percentiles into points and flexibility fitness categories.
   **2. Finger Touch Test**
      a. Used to assess shoulder flexibility.
      b. After warming up, do a few shoulder stretches before beginning.
      c. Bring your right hand over your right shoulder as far as possible, with fingers extended and pointing straight to the ground.

d. Simultaneously, place your left hand behind your lower back, with palm facing out, slide the hand up as far as possible with fingers extended.
e. Objective is to bring the tips of the fingers as close together or overlapping if possible, holding the final reach position for 2 seconds.
f. Measure the nearest half-inch distance between the tips of the fingers, recorded as a negative score, or the amount of overlap between the fingers, recorded as a positive score. If the fingers meet with no overlap, the score is recorded as zero. Conduct the test twice using the average of the two trials as the final score.
g. Repeat the test on the left side (bring the left hand over the left shoulder and the right hand behind the lower back). Do two trials and average the final score.

J. Tables 2.6 and 2.7 determine the respective fitness categories for each test.
1. Overall Flexibility Fitness
a. Table 2.8 converts the points gained from the two tests into overall flexibility fitness categories.
b. Flexibility test results can be recorded onto Activity 2.1, Personal Fitness Profile: Pre-Test.

VII. BODY COMPOSITION

A. About 68% of the adult population in the United States is overweight and 34% is obese.
B. The average American adult gains 1–2 pounds of weight each year.
1. About 0.5 pounds of lean tissue is lost.
2. About 1.5 pounds of fat is gained.
C. By age 65, this gain is about 40 pounds (Figure 2.2).
1. About 20 pounds of lean tissue is lost.
2. About 60 – 100 pounds of fat is gained.
D. Body composition is the fat and nonfat components of the human body (Figure 2.3).
1. **Percent body fat** is an expression of the fat in the body.
a. The fat needed for normal physiological functions is called **essential fat**:
– 3% of body weight in men.
– 12% of body weight in women.
b. The body fat stored in adipose tissue is called **storage fat**:
– **Subcutaneous** fat just below the skin.
– **Visceral** fat around major organs.
2. **Lean body mass** is an expression of the nonfat tissue in the body.

E. Obesity accounts for 15–20% of the annual mortality in the U.S. (Figure 2.4).
1. One of the six major risk factors for coronary heart disease.
2. Obesity is a risk factor for:
a. Hypertension.
b. Congestive heart failure.
c. Elevated blood lipids.
d. Atherosclerosis.
e. Stroke.
f. Thromboembolitic disease.
g. Varicose veins.
h. Intermittent claudication.

F. Underweight individuals also have a higher mortality rate.
1. Anorexia nervosa and bulimia nervosa are discussed in Chapter 5.
2. Medical conditions include:
a. Heart damage.
b. Gastrointestinal problems.
c. Shrinkage of internal organs.
d. Immune system abnormalities.
e. Disorders of the reproductive system.
f. Loss of muscle tissue.
g. Damage to the nervous system.
h. Death.

G. Assessing Body Composition

1. **Dual Energy X-Ray Absorptiometry (DXA)**
    a. Used in research and by medical facilities.
    b. Radiographic technique that uses very low-dose beams of X-ray energy to measure total body fat mass.
    c. Also measures fat distribution patterns and bone density.
    d. Many exercise scientists consider DXA to be the standard technique to assess body composition.
2. **Hydrostatic (Underwater) Weighing and Air Displacement**
    a. Most frequently used in exercise physiology and fitness laboratories.
    b. Requires a water facility, expertise, and subject compliance (see photo).
    c. A person's regular weight is compared to his or her weight taken underwater where fat is more buoyant.
3. **Air Displacement**
    a. Relatively new technique.
    b. Uses computerized pressure sensors to determine the amount of air displaced by a person sitting inside an airtight chamber.
    c. Body volume is calculated by subtracting the air volume with the person from the volume of the empty chamber.
    d. Additional research is needed to determine accuracy.
4. **Bioelectrical Impedance**
    a. Simple to use.
    b. Sends a painless current through the body.
    c. Is based on fat resisting the current more than lean tissue because it consists of less water. The easier the conductance, the leaner the individual.
    d. Accuracy is questionable.
5. **Skinfold Thickness**
    a. Most frequent method used to estimate body composition.
    b. Assumes that approximately half of body fat is subcutaneous.
    c. Assessment sites on the standing right side for women (Figure 2.5):
        – Triceps.
        – Suprailium.
        – Thigh.
    d. Assessment sites on the standing right side for men (Figure 2.5):
        – Abdomen.
        – Chest.
        – Thigh.
    e. Each site is grasped at the definitional position, and the measurement is taken by the skinfold caliper ½ inch below this finger hold of the fold (see photo).
    f. The average of the two closest measurements of three trials is recorded.
    g. Table 2.9 (women) and Table 2.10 (men) estimate percent fat from the sum of the three sites (in mm).
    h. Table 2.11 indicates recommended percent body fatness by age and gender. The low end of the recommended range constitutes the physical fitness standard, and the higher end of the recommended range constitutes the health fitness standard.
6. **Body Mass Index** (BMI)
    a. Uses height and weight.
    b. BMI = 705 × body weight (lb) ÷ body height (in) ÷ body height (in).
    c. Activity 2.2 and Table 2.12 aid these computations.
    d. Table 2.13 shows that:
        – Below 18.5 is underweight, with increased risk for disease.
        – 18.5–22 is considered acceptable.
        – 22–25 indicates lowest risk for disease.
        – 25–30 is classified as overweight (mortality rates >25%).
        – Above 30 is considered obese (mortality rates >50–100%).

e. BMI is a good screening tool for the general population, but it does not differentiate between fat weight and lean body mass. So strength athletes or individuals with a high degree of muscularity will have a high BMI when in fact they have low body fat.

**H. Waist Circumference**

1. The location of major fat deposition may be an indicator of disease risk.
    a. **Android** "apple" deposition around the trunk and abdomen appears to show greater risk.
    b. **Gynoid** "pear" deposition around the thighs and hip appears to show lesser risk.
2. Waist measurement is a simple, less costly alternative to high-tech scanning techniques (Tables 2.14 and 2.15).
    a. Measurements above 40 inches (men) and 35 inches (women) indicate the highest risk for cardiovascular disease, hypertension, and type 2 diabetes. This fat is deposited as visceral fat (around internal organs) and not as much subcutaneous fat (beneath the skin) (Figure 2.6).
    b. Waist circumference may be a better predictor of disease risk than BMI.
    c. Together, waist circumference and BMI data provide the best combination of simple measurements to identify individuals at higher risk due to body fatness (Table 2.15).

**Critical Thinking:** How do you feel about your current body weight? What influence does society have on the way you perceive yourself in terms of your weight? Do the results from your body composition measurements make you feel any different about the way you see your current body weight and image?

I. Effects of Exercise and Diet on Body Composition

1. Assess body composition monthly.
2. More fat weight typically is lost than body weight because muscle is gained.
3. This area will be discussed more fully in Chapter 6.

# CHAPTER 2
# ASSESSMENT OF PHYSICAL FITNESS
# STUDENT ACTIVITIES

## DISCUSSION ON THE INTERNET (WebCT VISTA, BLACKBOARD, ETC.)

As the Internet is very popular with students, provide them with an opportunity to become involved outside of classroom time.

1. Post discussion for students to answer.
2. Establish a Chat Room with specific topics to be discussed by students.
3. Create a time for students to "Ask the Professor" in a live Chat Room format.

## SMALL GROUP DISCUSSIONS (IN CLASS)

Organize students into small groups (5–6 students).

1. Ask students questions specific to the topic(s) being discussed in class.
2. Allow students about 5 minutes to discuss the topic(s).
3. Have each group report on its discussion of the topic(s).
4. Also have each group post its discussion on the course website, so other students can read at their leisure.

## PROGRESS REPORTS

Give simple prospective and retrospective quizzes to keep students reading and thinking.

1. Put multiple-choice, true–false, or short answer questions on a half-sheet of paper.
2. This requires students to make a commitment to some controversial choices.
3. Use the questions as an outline for topics of the day.

## CARDIORESPIRATORY ENDURANCE LAB (Tables 2.1 and 2.2)

1. Decide whether to administer the 1.5-Mile Run Test or 1.0-Mile Walk Test.
2. Mark off the 1.5- or 1.0-mile course. The track allows for constant supervision, even though there is possible lapping and confusion of number of laps completed.
3. For the 1.0-Mile Walk Test, have a clock clearly readable at the finish line to enable an immediate post-exercise heart rate count.
4. Describe and encourage the warm-up procedures.
5. Begin all students at the same time (group them if the course will not contain the whole class) and call out lap times and lap number feedback as they pass throughout the test.
6. Clearly call out finish times and remind them to measure an immediate 10-second heart rate if doing the 1.0-Mile Walk Test.
7. Encourage a cool-down after recording their finish data.
8. Have them submit the evaluated individual results at the next class meeting.

## MUSCULAR STRENGTH AND ENDURANCE LAB (Tables 2.3–2.5; Activity 2.1)

1. Prepare the bleachers, benches, or chairs for the Muscular Endurance Test.
2. Encourage and describe the warm-up procedures.
3. Have students work in pairs to assist each other with the test battery.
4. Make a route of timed stations for the groups if helpful in expediting test administration.
5. Have them then record, rate, and report their data individually using Tables 2.3–2.5 and Activity 2.1.

**FLEXIBILITY LAB** (Tables 2.6–2.8)

1. Have the Acuflex I sit-and-reach tester and Acuflex II total body rotation tester ready for assessment.
2. Describe and encourage the warm-up procedures.
3. Explain the test protocols after dividing students into two- or three-person groups.
4. Each group member serves as technician and subject in rotation, generating data on all students.
5. Have them work on individual calculations and final flexibility assessment using Activity 2.1 and Tables 2.6–2.8.

**SKINFOLD LAB** (Figure 2.5 and Tables 2.9–2.11)

1. Assign students to same-gender partner groups.
2. Demonstrate the skinfold sites and technique as one partner practices on the other. Allow time to switch roles while also instructing the second partners.
3. Have them now measure the three sites and estimate body fatness for each other.
4. "Spot check" the technicians' results by making measurements yourself (another spot-checker of the other gender is sometimes helpful).
5. Direct them to Tables 2.9–2.11, Figure 2.5, and Activity 2.1 for body fatness estimation, classification, and recording.

**RECOMMENDED BODY WEIGHT CALCULATION** (Activity 2.2; Table 2.12)

1. Each student must have the results of the skinfold lab (or another procedure estimating percent body fat).
2. Explain that the most effective way to recommend body weight is to estimate lean body mass and "add back" the desired amount of body fat. This sets the stage for the recommended body weight equation.
3. Use Activity 2.2 to show the recommended body weight calculations.
4. Then discuss what amount of body fat percentage is "desired." Use Table 2.12 (health fitness standard and physical fitness standard) as well as mini case study examples of underweight, ideal, and overweight individuals to set these "desired" body fat goals.
5. Students should then perform the calculations of Activity 2.2 and report results.

**GIRTH LAB** (Tables 2.12–2.15; Activities 2.1 and 2.2)

1. Describe how waist circumference can indicate risk for disease.
2. Discuss the subpopulations at risk based on central adiposity.
3. Have students perform waist measurements and interpretation of the results (Table 2.14).
4. Have students calculate body mass index (BMI) for themselves (Table 2.12).
5. Describe what BMI can and cannot do in assessing body composition and how it can work with waist circumference in assessment (Table 2.15).
6. Finally, have students interpret and record the results using Activities 2.1 and 2.2.

**GUEST SPEAKERS OR FIELD TRIPS**

1. Invite experts to describe/demonstrate techniques of health-related fitness assessment.
2. Alternatively, take the class to a fitness or medical facility to talk with fitness professionals and observe techniques in action.

## QUESTIONNAIRES

Have students fill out:

1. Activity 2.1, Personal Fitness Profile: Pre-Test and Post-Test.
2. Activity 2.2, Computation Form for Recommended Body Weight, Body Mass Index (BMI), and Waist Circumference (WC).

## INTERPRETING THE REAL LIFE STORY

**Jamie's Fitness Test Results**

I didn't exercise a whole lot when I was in high school. I took a few years off from school to work and subsequently to get married. I always watched my weight and although not the athletic type, I felt that I was in shape. When I came back to school, I took a fitness class and the instructor required that we do all the health-related fitness tests. I couldn't run a mile and a half, but it really surprised me that even for the 1-mile walk test I was only in the fair category. My strength and flexibility were fair and good, and although my BMI was in the acceptable category, my body fat was too high. The results of my fitness tests were an eye-opening experience and made sense based on my limited exercise time the last few years. I was determined to do something and started to exercise according to what I learned in class. At the end of the term, I was proud of myself: My body fat was now better than the health fitness standard, and I was also able to do the mile-and-a-half test running the entire time and scoring in the good category. I am proud of my progress, and now in my second year, I still exercise regularly at the Student Rec Center.

**Critical Thinking Questions**

1. Before Jamie went back to school, she was fairly sedentary, yet she was not overweight. Is there a difference between being thin and being fit?
2. According to Jamie's fitness assessment results at the start of her class, in which of the health-related components of physical fitness (cardiorespiratory endurance, muscular strength and endurance, muscular flexibility, and body composition) was she doing well and in which was she doing poorly?
3. Getting subpar results on her fitness assessments made Jamie determined to take charge of her fitness and begin an exercise program. What factors motivate you to want to become more fit?

## WEB RESOURCES

1. The President's Challenge – Physical Fitness Test:
2. How Fit Are You? See How You Measure Up
3. Development and Validation of Criterion-Referenced Clinically Relevant Fitness Standards for Maintaining Physical Independence in Later Years:

**A note regarding the Online Journal:**

An Online Journal is offered as a gradable assignment in MindTap. If you do not use MindTap in your course, an alternate online journal can be used. One alternative is Penzu Classroom. Penzu Classroom allows students to register for an online journal for free with a specific class code as set up by you, the instructor. These journals can be