Comprehensive Fitness Programming

“To give anything less than your best is to sacrifice the gift.”
Steve Prefontaine

Objectives

▶ Identify popular cardiorespiratory activities and their specific benefits.
▶ Dispel common misconceptions related to physical fitness and wellness.
▶ Become aware of safety considerations for exercising.
▶ Learn concepts for preventing and treating injuries.
▶ Describe the relationship between fitness and aging.
▶ Be able to write a comprehensive fitness program.

Visit www.cengagebrain.com to access course materials and companion resources for this text including quiz questions designed to check your understanding of the chapter contents. See the preface on page xv for more information.
**What is the best fitness activity?** No single physical activity, sport, or exercise contributes to the development of overall fitness (see Chapter 6, Table 6.9, page 215). Most people who exercise pick and adhere to a single mode, such as walking, swimming, or jogging. Many activities will contribute to cardiorespiratory development. The extent of contribution to other fitness components, though, varies among the activities. For total fitness, aerobic activities should be supplemented with strength and flexibility programs. Cross-training—that is, selecting different activities for fitness development and maintenance (jogging, water aerobics, spinning)—adds enjoyment to the program, decreases the risk of incurring injuries from overuse, and keeps exercise from becoming monotonous.

**Is it best not to eat before exercise?** Despite popular belief, research indicates that eating some food, liquid or solid, prior to physical activity provides energy and nutrients that improve endurance and exercise performance. Of course, how long before exercise, how much food, and what type of food you eat depends on the intensity of exercise and your stomach’s tolerance to pre-exercise food. The primary fuel for exercise is provided by carbohydrates, which the body converts to glucose and stores as glycogen. Some protein along with carbohydrates is also recommended (see next question).

Aim to consume 1 gram of carbohydrate per kilogram of body weight (.5 gram carbohydrate per pound of body weight) within the hour prior to exercise. For high-intensity aerobic activities, sports drinks consumed 30 to 60 minutes prior to exercise are best because they are rapidly absorbed by the body. Solid foods (granola bars, energy bars, bagel, sugar wafers, crackers) or semi-liquid solid foods (yogurt, gelatin, pudding) are acceptable for light-intensity aerobic exercise or strength training. Even a snack consumed a few minutes before exercise will help you, as long as you exercise longer than 30 minutes. Through trial and error you will need to learn which sport snacks best suit your stomach without interfering with exercise performance.

**Are there specific nutrient requirements for optimal development and recovery following exercise?** Carbohydrates with some protein appear to be best. A combination of these nutrients is recommended prior to and immediately following high-intensity aerobic or strength-training exercise. A small snack or a protein-containing sports drink 30 to 60 minutes before intense exercise is beneficial. Intense exercise causes microtears in muscle tissue, and the presence of amino acids (the building blocks of proteins) in the blood contributes to the healing process and subsequent development and strengthening of the muscle fibers. Post-exercise protein consumption along with carbohydrates also accelerates glycogen replenishment in the body after intense or prolonged exercise. Thus, carbohydrates provide energy for exercise and replenishment of glycogen stores after exercise, whereas protein optimizes muscle repair, growth, glycogen replenishment, and recovery following exercise. Although muscles absorb a greater amount of amino acids up to 48 hours following intense exercise, consumption of the carbohydrate/protein snack immediately following intense exercise, and an hour thereafter, appear to be most beneficial. Aim for a ratio of 4 to 1 grams of carbohydrates to protein. For example, you may consume a snack that contains 40 grams of carbohydrates (160 calories) and 10 grams of protein (40 calories). To optimize development, make sure that you consume some protein with snacks or meals for the next 48 hours as well. Examples of good recovery foods include milk and cereal, a tuna fish sandwich, a peanut butter and jelly sandwich, and pasta with turkey meat sauce. Commercial sports drinks and snacks with a 4:1 ratio are now also readily available.

**What is high-intensity interval training (HIIT)?** HIIT is primarily an aerobic training program that had been used mainly by athletes, but has now become popular among fitness participants seeking better, faster, and more effective development. Following an appropriate warm-up, HIIT includes high- to very high-intensity intervals that are interspersed with a low-to-moderate intensity recovery phase. Typically, a 1:3, 1:2, or 1:1 work-to-recovery ratio is used; the more intense the interval, the longer the recovery period. Research indicates that additional health and fitness benefits are reaped as the intensity of exercise increases. HIIT produces the greatest improvements in aerobic capacity (VO_{2max}) and increases the capability to exercise at a higher percentage of that capacity (anaerobic threshold), thus allowing the participant to burn more calories during the exercise session. The data also show that HIIT increases the capacity for fat oxidation during exercise. Although the fuel used during high-intensity intervals is primarily glucose (carbohydrates), molecular changes occur in the muscle that increase the body’s capability for fatty acid oxidation (fat burning). Furthermore, following light- to moderate-intensity aerobic activity, resting metabolism returns to normal in about 90 minutes. Depending on the volume of training (intensity and number of intervals performed), with HIIT it takes 24 to 72 hours for the body to return to its “normal” resting metabolic rate. Thus, a greater amount of calories (primarily from fat) are burned up to three days following HIIT. While the extra calories burned during recovery can make a difference in the long run, keep in mind that the most significant factor are the number of calories actually burned during the HIIT session. The extra calories burned during recovery are minimal as compared to those used during training.
For a few years, whenever I exercised, I always did the same workout. I would bike for about 25 minutes on the stationary bikes at the gym, and then lift weights for 15 minutes. That was fine, but I wasn’t really getting stronger or faster or in better shape. When I took the healthy lifestyle class, we had a lab section where we tried out different activities. I realized that I really liked the variety of doing different things like racquetball, swimming, and aerobics. Not only was it a nice change of pace, but things like playing racquetball were social (I got to talk and joke around with whoever I was playing with), and it was fun to be a little competitive. After the class ended, I still wanted to vary my workouts to include different activities other than just the bike. So now I play racquetball once a week, and sometimes basketball as well, and sometimes I bike outside rather than always using the stationary bike. Also, when I bike now, I often do speed intervals where I sprint for 1 minute and then pedal slower for 3 minutes. And besides doing cardio and weight lifting, I also have a flexibility workout that I got in the habit of doing. I think the greater variety in my exercise program has helped me to stick with it, because I don’t get as bored. It has also helped to work my body in more ways, making me much more fit.

One of the fun aspects of exercise is that you can choose from many different activities to promote fitness. While energy expenditure varies among activities and your intensity of effort, the most important factor to promote health and lifetime weight maintenance is regular participation. Select one or a combination of activities for your program. The choice should be based on personal enjoyment, convenience, and availability. An element of fun and social support from family and friends that are willing to join your program greatly enhance exercise compliance. Set short-term and long-term SMART goals and reward yourself for goals met. To increase motivation, regularly look for fun challenges, such as participating in a walkathon, 5K, swim meet, bike race, extended hike, or sports league (soccer, basketball, volleyball, or tennis). The time to take advantage of the myriad of benefits derived through physical activity and exercise is now by making physical activity a priority in your daily lifestyle.

Your Lifetime Physical Fitness Program

I. What is the most efficient type (mode) of exercise that contributes to good health and contributes to lifetime weight management? Can you explain and justify your answer?

II. Can you name three benefits of cross-training?

III. Have you ever participated in a HIIT program? If so, how did you feel at the end of each training session and what results did you obtain?

IV. Is it better to get fit before playing sports or play sports to get fit? Can you elaborate?

V. What is your take-home message from Connor’s experience and how may it influence your personal fitness program?

Choices of Aerobic Activities

A summary of the most popular fitness activities in the United States and the percentage of adults who participate in these activities is presented in Figure 9.1. To facilitate your choice of activities, a discussion of some of the most popular aerobic activities is presented next in this chapter. The discussion focuses on the benefits, requirements, and safety recommendation for many of these activities.

As you select your activities, keep in mind that exercise sessions should be convenient. To enjoy exercise, be sure to select a time when you will not be rushed. A nearby location is recommended. People do not enjoy driving across town to get to the gym, health club, track, or pool. If parking is a problem, you may get discouraged quickly and quit. All of these factors are used as excuses not to stick to an exercise program.
Walking

The most natural, easiest, safest, and least expensive form of aerobic exercise is walking. Walking at speeds of 4 miles per hour or faster improves cardiorespiratory fitness. From a health-fitness viewpoint, a regular walking program can prolong life significantly (see the discussion of cardiovascular disease in Chapter 10). Although walking takes longer than jogging, the caloric cost of brisk walking is only about 10 percent lower than jogging the same distance.

Walking is perhaps the best activity to start a conditioning program for the cardiorespiratory system. Inactive people should start with 1-mile walks four or five times per week. Walk times can be increased gradually by 5 minutes each week. Following 3 to 4 weeks of conditioning, a person should be able to walk 2 miles at a 4-mile-per-hour pace, five times per week. Greater aerobic benefits accrue from walking longer and swinging the arms faster than normal. Light hand weights, a backpack (4 to 6 pounds), walking poles, or the use of an upper-arm resistive belt add to the intensity of walking. Because of the additional load on the cardiorespiratory system, extra weights or loads are not recommended for people who have cardiovascular disease.

Walking in water (chest-deep level) is another excellent form of aerobic activity, particularly for people with leg and back problems. Because of the buoyancy that water provides, individuals submerged in water to armpit level weigh only about 10 to 20 percent of their weight outside the water. The resistance the water creates as a person walks in the pool makes the intensity quite high, providing an excellent cardiorespiratory workout.

Hiking

Hiking is an excellent activity for the entire family, especially during the summer and on summer vacations. Many people feel guilty if they are unable to continue their exercise routine during vacations. The intensity of hiking over uneven terrain is greater than walking. An 8-hour hike can burn as many calories as a 20-mile walk or jog.

Another benefit of hiking is the relaxing effects of beautiful scenery. This is an ideal activity for highly stressed people who live near woods and hills. A rough day at the office can be forgotten quickly in the peacefulness and beauty of the outdoors.

Jogging

Next to walking, jogging it is one of the most accessible forms of exercise. A person can find places to jog almost everywhere. The lone requirement to prevent injuries is a good pair of jogging shoes.

Jogging three to five times a week is one of the fastest ways to improve cardiorespiratory fitness. The risk of injury, however, especially in beginners, is greater with...
Aerobics

Aerobics is a very popular fitness activity for women in the United States. Routines consist of a combination of stepping, walking, jogging, skipping, kicking, and arm-swinging movements performed to music. It is a fun way to exercise and promote cardiorespiratory development at the same time.

High-impact aerobics (HIA) was the original form of aerobics. The movements exert a great amount of vertical force on the feet as they contact the floor. Proper leg conditioning through other forms of weight-bearing aerobic exercises (brisk walking and jogging), as well as strength training, are recommended prior to participating in high-impact aerobics.

High-impact aerobics is an intense activity, and it produces the highest rate of injuries due to the constant impact of the feet on firm surfaces. As a result, several alternative forms of aerobics have been developed.

In low-impact aerobics (LIA) the impact is less because one foot always remains in contact with the floor. The recommended exercise intensity is therefore more difficult to maintain than HIA. To help elevate the exercise heart rate, all arm movements and weight-bearing actions that lower the center of gravity should be accentuated. Sustained movement throughout the program is also crucial to keep the heart rate in the target cardiorespiratory zone.

Step aerobics (SA) is an activity in which participants step up and down from a bench, which ranges in height from 2 to 10 inches. SA is viewed as a high-intensity but low-impact activity. The intensity is controlled easily by the height of the bench. Aerobic benches or plates, commercially available, can be stacked together safely to adjust the height of the steps. Beginners are encouraged to use the lowest step height and then advance gradually to a higher bench to decrease the risk of injury. Even though one foot is always in contact with the floor or bench during step aerobics, this activity is not recommended for individuals with ankle, knee, or hip problems.

Other forms of aerobics include a combination of HIA and LIA, as well as moderate-impact aerobics (MIA). The latter incorporates plyometric training, a type of training frequently used by jumpers (high, long, and triple jumpers) and athletes in sports that require quick jumping ability, such as basketball and gymnastics. With moderate-impact aerobics, one foot is in contact with the ground most of the time. Plyometric training participants, however, focus on quick, forceful recovery from all lower-body flexion actions. This is done by extending the hip, knee, and ankle joints quickly without allowing the foot (or feet) to leave the ground. These quick movements make the exercise intensity of moderate-impact aerobics quite high.

Swimming

Swimming is another excellent form of aerobic exercise because it requires the use of almost all of the major muscle groups in the body, thereby providing a good...
training stimulus for the heart and lungs. Swimming is a
great exercise option for individuals who cannot jog or
walk for extended periods.

Compared with other activities, the risk of injuries
from swimming is low. The aquatic medium helps to
support the body, taking pressure off bones and joints in
the lower extremities and the back.

Maximal heart rates during swimming are approxi-
mately 10 to 13 beats per minute (bpm) lower than during
running. The horizontal position of the body is
thought to aid blood flow distribution throughout the
body, decreasing the demand on the cardiorespiratory
system. Cool water temperatures and direct contact with
the water seem to help dissipate body heat more effi-
ciently, further decreasing the strain on the heart.

Some exercise specialists recommend that this differ-
eence in maximal heart rate (10 to 13 bpm) be subtracted
prior to determining cardiorespiratory training intensi-
ties. For example, the estimated maximal swimming
heart rate for a 20-year-old would be approximately
180 bpm \(207 - (7 \times 20) - 13\). Studies are inconclusive
as to whether this decrease in heart rate in water also
occurs at submaximal intensities below 70 percent of
maximal heart rate.

To produce better training benefits during swimming,
the swimmer should minimize gliding periods such as
those in the breast stroke and side stroke. Achieving proper
training intensities with these strokes is difficult. The for-
ward crawl is recommended for better aerobic results.

Overweight individuals need to swim fast enough to
achieve an adequate training intensity. Excessive body fat
makes the body more buoyant, and often the tendency is
to just float along. This may be good for reducing stress
and relaxing, but it does not greatly increase caloric expen-
diture to aid with weight loss. Walking or jogging in waist-
or armpit-deep water are better choices for overweight
individuals who cannot walk or jog on land for very long.

Swimming participants need to remember the prin-
ciple of specificity of training, which dictates that cardio-
respiratory improvements cannot be measured adequately
with a land-based walk/jog test. Most of the work with
swimming is done by the upper body musculature. Al-
though the heart’s ability to pump more blood improves
significantly with any type of aerobic activity, the primary
increase in the cells’ ability to utilize oxygen (VO2 or
oxygen uptake) with swimming occurs in the upper
body and not the lower extremities. Therefore, fitness
improvements with swimming are best measured through
a swim test.

**Water Aerobics**

Water aerobics is a form of exercise that is fun and safe
for people of all ages. Besides developing fitness, it pro-
vides an opportunity for socialization and fun in a com-
fortable and refreshing setting.

Water aerobics incorporates a combination of rhyth-
mic arm and leg actions performed in a vertical position
while submerged in waist- to armpit-deep water. The
vigorous limb movements against the water’s resistance
during water aerobics provide the training stimuli for
cardiorespiratory development.

The popularity of water aerobics as an exercise mo-
dality is based on several factors:

1. Water buoyancy reduces weight-bearing stress on
joints and thereby lessens the risk for injuries.
2. Water aerobics is a more feasible type of exercise
for overweight individuals and those with arthritic
conditions who may not be able to participate in
land-based weight-bearing activities such as walk-
ing, jogging, and aerobics.
3. Water aerobics is an excellent exercise modality
to improve functional fitness in older adults (see
section titled “Exercise and Aging” later in this
chapter).
4. Heat dissipation in water is beneficial to obese
participants, who seem to undergo a higher heat
strain than average-weight individuals.
5. Water aerobics is available to swimmers and
nonswimmers alike.

The exercises used during water aerobics are designed
to elevate the heart rate, which contributes to cardiorespi-
atory development. In addition, the aquatic medium
provides increased resistance for strength improvement
with virtually no impact. Because of this resistance to
movement, strength gains with water aerobics seem to be
to better than with land-based aerobic activities.

Another benefit is the reduction of pain and fear of
injuries common to many people who initiate exercise
programs. Water aerobics provides a relatively safe envi-
ronment for injury-free participation in exercise. The
cushioned environment of the water allows patients re-
covering from leg and back injuries, individuals with
joint problems, injured athletes, pregnant women, and
obese people to benefit from water aerobics.

As observed with swimming, maximal heart rates
achieved during water aerobics are lower than during run-
ning. The difference between water aerobics and running

*Image 325x600 to 568x762*

Water aerobics offers fitness, fun, and safety to people of all ages.
Cycling

Most people learn cycling in their youth. Because it is a non–weight-bearing activity, cycling is a good exercise modality for people with lower-body or lower-back injuries. Cycling helps to develop the cardiorespiratory system as well as muscular strength and endurance in the lower extremities.

As a non–weight-bearing activity, raising the heart rate to the proper training intensity is more difficult with cycling. As the amount of muscle mass involved during aerobic exercise decreases, so does the demand placed on the cardiorespiratory system. The thigh muscles do most of the work in cycling, making it harder to achieve and maintain a high cardiorespiratory training intensity.

Maintaining a continuous pedaling motion and eliminating coasting periods helps the participant achieve a faster heart rate. Exercising for longer periods also helps to compensate for the lower heart rate intensity during cycling. Comparing cycling with jogging, similar aerobic benefits take roughly three times the distance at twice the speed of jogging. Cycling, however, puts less stress on muscles and joints than jogging does, making the former a good exercise modality for people who cannot jog or walk for extended periods of time.

The height of the bike seat should be adjusted so the knee is flexed at about 30 degrees when the foot is at the bottom of the pedaling cycle. The body should not sway from side to side as the person rides. The cycling cadence is about 10 bpm. Further, research comparing physiologic differences between self-paced treadmill running and self-paced water aerobics exercise showed that even though individuals worked at a lower heart rate in water (163 bpm versus 152 bpm—the equivalent of 85 and 79 percent of maximal heart rate on land, respectively), oxygen uptake level was the same for both exercise modalities (32.4 versus 32.5 ml/kg/min—both 69 percent of land VO$_2$max). Healthy people, nonetheless, can sustain land-based exercise intensities during a water aerobics workout and experience similar fitness benefits than during land aerobics.

Safety is a key issue in road cycling. More than a million bicycle injuries occur each year. Proper equipment and common sense are necessary. A well-designed and well-maintained bike is easier to maneuver. Toe clips are recommended to keep feet from sliding and to maintain equal upward and downward force on the pedals.

Skill is important in road cycling. Cyclists must be in control of the bicycle at all times. They have to be able to maneuver the bike in traffic, maintain balance at slow speeds, switch gears, apply the brakes, watch for pedestrians and stoplights, and ride through congested areas. Stationary cycling, in contrast, does not require special skills. Nearly everyone can do it.

Bike riders must follow the same rules as motorists. Many accidents happen because cyclists run traffic lights and stop signs. Some further suggestions are as follows:

- Select the right bike. Frame size is important. The size is determined by standing flat-footed while straddling the bike. On regular bikes, a one- to two-inch clearance should exist between the groin and the top tube of the frame. For mountain bikes, the clearance should be about three inches. The recommended height of the handlebars is about one inch below the top of the seat. Upright handlebars can also be used by individuals with neck or back problems. Hard/narrow seats on racing bikes tend to be especially uncomfortable for women. To avoid saddle soreness, use wider and more cushioned seats such as gel-filled saddles.

- Use bike hand signals to let the traffic around you know of your intended actions.

- Don’t ride side by side with another rider.

- Be aware of turning vehicles and cars backing out of alleys and parking lots; always yield to motorists in these situations.

- Be on the lookout for storm drains, railroad tracks, and cattle guards, which can cause unpleasant surprises. Front wheels can get caught and riders may be thrown from the bike if not crossed at the proper angle (preferably 90 degrees).

- Wear a good helmet, certified by the Snell Memorial Foundation or the American National Standards Institute. Many serious accidents and even deaths have been prevented by use of helmets. Fashion, aesthetics, comfort, or price should not be a factor when selecting and using a helmet for road cycling. Health and life are too precious to give up because of vanity and thriftiness.

- Wear appropriate clothes and shoes. Clothing should be bright, very visible, lightweight, and not restrict movement. Cycling shorts are recommended to prevent skin irritation. For greater comfort, the shorts have extra padding sewn into the seat and crotch areas. They do not tend to wrinkle and they wick away perspiration from the skin. Shorts should be

Skill is required for safety and enjoyment of road cycling.
long enough to keep the skin from rubbing against the seat. Experienced cyclists also wear special shoes with a cleat that snaps directly onto the pedal. Take extra warm clothing in a backpack during the winter months in case you have a breakdown and have to walk a long distance for assistance.

- Watch out for ice when it’s cold outside. If there is ice on car windows, there will be ice on the road. Be especially careful on bridges as they tend to have ice even when the roads are dry.
- Use the brightest bicycle lights you can when riding in the dark and always keep the batteries well charged. For additional safety, wear reflectors on the upper torso, arms, and legs. Moving bright objects are easier to see by passing motorists. And stay on streets that have good lighting and plenty of room on the side of the road, even if that means riding an extra few minutes to get to your destination.
- Take a cell phone if you have one and let someone else know where you are going and when to expect you back.

If you decide to try stationary cycling, before buying a stationary bike, be sure to try the activity for a few days. If you enjoy it, you may want to purchase one. Invest with caution. If you opt to buy a lower-priced model, you may be disappointed. Good stationary bikes have comfortable seats, are stable, and provide a smooth and uniform pedaling motion. A sticky bike that is hard to pedal leads to discouragement and ends up stored in the corner of a basement.

**Spinning**

Spinning is a low-impact activity typically performed under the direction of a certified instructor in a room or studio with dim lights, motivational music, and the noise of many bikes working together. This exercise modality gained immediate popularity upon its introduction in the mid-1990s.

Spinning, sometimes referred to as “studio” or “indoor cycling,” is performed on specially designed Spinner bikes that include racing handlebars, pedals with clips, adjustable seats, and a resistance knob to control the intensity of the workout. Use of an exercise heart rate monitor is also encouraged to monitor the intensity of the various stages of the workout.

Spinning programs typically combine five basic movements and five workout stages with the understanding that participants’ exercise needs and goals vary. The five exercise movements are

- **Seated flat.** The basic seated bike-riding position.
- **Seated hill climb.** The basic seated position but with increased resistance on the bike.
- **Standing running.** Pedaling while standing up.
- **Standing hill climb.** Pedaling standing up but with a challenging resistance level.
- **Jumping.** Surging out of the saddle using controlled movements and a constant speed or at a fast pace, such as during a breakaway in a bike race.

The five workout stages, also known as “energy zones,” are used to simulate actual cycling training and racing. The workouts are divided into endurance, all-terrain, strength, recovery, and advanced training. Cadence, exercise movements, and exercise heart rate dictate the differences among the various zones. Workouts are planned according to each person’s fitness level and selected percentages of maximal heart rate during each stage. These workouts provide a challenging program for people of all ages and fitness levels. The social aspect of this activity makes spinning appealing to many exercisers.

**Cross-Training**

Cross-training combines two or more activities in an exercise program. This type of training is designed to enhance fitness, provide needed rest to tired muscles, decrease injuries, and eliminate the monotony and burnout of single-activity programs. Cross-training may combine aerobic and nonaerobic activities such as moderate jogging, speed training, and strength training.

Cross-training can produce better workouts than a single activity. For example, jogging develops the lower body and swimming builds the upper body. Rowing contributes to upper-body development and cycling builds the legs. Combining activities such as these provides good overall conditioning and at the same time helps to improve or maintain fitness. Cross-training also offers an opportunity to develop new skills and have fun with different activities.

Speed training is often coupled with cross-training. Faster performance times in aerobic activities (running, cycling) are generated with speed or interval training. People who want to improve their running times often run shorter intervals at faster speeds than the actual racing pace. For example, a person wanting to run a 6-minute mile may run four 440-yard intervals at a speed of 1 minute and 20 seconds per interval. A 440-yard walk/jog can become a recovery interval between fast runs.

Strength training is also used commonly with cross-training. It helps to condition muscles, tendons, and ligaments. Improved strength enhances overall performance in many activities and sports. For example, although road cyclists in one study who trained with weights showed no improvement in aerobic capacity, the cyclists had a 33-percent improvement in riding time to exhaustion when exercising at 75 percent of their maximal capacity.

**Rope Skipping**

Rope skipping not only contributes to cardiorespiratory fitness, but it also helps to increase reaction time, coordination, agility, dynamic balance, and muscular strength.
Cross-training enhances fitness, decreases the rate of injuries, and eliminates the monotony of single-activity programs.

in the lower extremities. At first, rope skipping may appear to be a highly strenuous form of aerobic exercise. As skill improves, however, the energy demands decrease considerably.

As with high-impact aerobics, a major concern of rope skipping is the stress placed on the lower extremities. Skipping with one foot at a time decreases the impact somewhat, but it does not eliminate the risk of injuries. Fitness experts recommend that skipping be used sparingly, primarily as a supplement to an aerobic exercise program.

**Cross-Country Skiing**

Many consider cross-country skiing to be the ultimate aerobic exercise because it requires vigorous lower and upper body movements. The large amount of muscle mass involved in cross-country skiing makes the intensity of the activity high, yet it places little strain on muscles and joints. One of the highest maximal oxygen uptakes ever measured (85 ml/kg/min) was found in an elite cross-country skier.

In addition to being an excellent aerobic activity, cross-country skiing is soothing. Skiing through the beauty of the snow-covered countryside can be highly enjoyable. Although the need for snow is an obvious limitation, simulation equipment for year-round cross-country training is available at many sporting goods stores.

Some skill is necessary to be proficient at cross-country skiing. Poorly skilled individuals are not able to elevate their heart rate enough to cause adequate aerobic development. Individuals contemplating this activity should seek out instruction to fully enjoy and reap the rewards of cross-country skiing.

**In-Line Skating**

In-line skating has its origin in ice skating. Because warm-weather ice skating was not feasible, blades were replaced by wheels for summertime participation. The in-line concept took hold in the United States in 1980, when hockey skates were adapted for road skating.

In-line skating is an excellent activity to develop cardiorespiratory fitness and lower-body strength. Intensity of the activity is regulated by how hard you blade. The key to effective cardiorespiratory training is to maintain a constant and rhythmic pattern, using arms and legs, and minimizing the gliding phase. Because this is a weight-bearing activity, in-line bladers also develop superior leg strength.

Instruction is necessary to achieve a minimum level of proficiency in this sport. Bladers commonly encounter hazards—potholes, cracks, rocks, gravel, sticks, oil, street curbs, and driveways. Unskilled bladers are more prone to falls and injuries.

Good equipment will make the activity safer and more enjoyable. An adequate blade should provide strong ankle support; soft and flexible boots do not provide enough support. Small wheels offer more stability, and larger wheels enable greater speed. Blades should be purchased from stores that understand the sport and can provide sound advice according to your skill level and needs.

Protective equipment is a must for in-line skating. Similar to road cycling, a good helmet that meets the safety standards set by the Snell Memorial Foundation or the American National Standards Institute is important to protect yourself in case of a fall. Wrist guards and knee and elbow pads also are recommended, because the kneecaps and the elbows are easily injured in a fall. Nighttime bladers should wear light-colored clothing and reflective tape.

**Key Terms**

- **Cross-training** A combination of aerobic activities that contribute to overall fitness.
- **Interval training** A system of exercise wherein a short period of intense effort is followed by a specified recovery period according to a prescribed ratio; for instance, a 1:3 work-to-recovery ratio.
Rowing

Rowing is a low-impact activity that provides a complete body workout. It mobilizes most major muscle groups, including those in the arms, legs, hips, abdomen, trunk, and shoulders. Rowing is a good form of aerobic exercise and, because of the nature of the activity (constant pushing and pulling against resistance), also promotes total strength development.

To accommodate different fitness levels, workloads can be regulated on most rowing machines. Stationary rowing, however, is not among the most popular forms of aerobic exercise. Similar to stationary bicycles, people should try the activity for a few weeks before purchasing a unit.

Elliptical Training/Stair Climbing

If sustained for at least 20 minutes, similar to stair climbing, elliptical training is a very efficient form of aerobic exercise. Precisely because of the high intensity of stair climbing, many people stay away from stairs and instead take escalators and elevators. Many people dislike living in two-story homes because they have to climb the stairs frequently.

Elliptical training and stair climbing are relatively safe exercise modalities. Because the feet never leave the climbing surface, they are considered low-impact activities. Joints and ligaments are not strained during climbing. The intensity of exercise is controlled easily, because the equipment can be programmed to regulate the workload.

Racquet Sports

In racquet sports such as tennis, racquetball, squash, and badminton, the aerobic benefits are dictated by players’ skill, intensity of the game, and how long a given game lasts. Skill is necessary to participate effectively in these sports and also is crucial to sustain continuous play. Frequent pauses during play do not allow people to maintain the heart rate in the appropriate target zone to stimulate cardiorespiratory development.

Many people who participate in racquet sports do so for enjoyment, social fulfillment, and relaxation. For cardiorespiratory fitness development, these people supplement the sport with other forms of aerobic exercise such as jogging, cycling, or swimming.

If a racquet sport is the main form of aerobic exercise, participants need to try to run hard, fast, and as constantly as possible during play. They should not have to spend much time retrieving balls (or, in badminton, the bird or shuttlecock). Similar to low-impact aerobics, all movements should be accentuated by reaching out and bending more than usual, for better cardiorespiratory development.

Specific Exercise Considerations

In addition to the exercise-related issues already discussed in this book, many other concerns require clarification or are somewhat controversial. Let’s examine some of these issues.

1. Do people get a “physical high” during aerobic exercise?

During vigorous exercise, endorphins are released from the pituitary gland in the brain. Endorphins can create feelings of euphoria and natural well-being. Higher levels of endorphins often result from aerobic endurance activities and may remain elevated for as long as 30 to 60 minutes after exercise. Many experts believe that these higher levels explain the physical high that some people get during and after prolonged exercise.

Endorphin levels also have been shown to increase during pregnancy and childbirth. Endorphins act as painkillers. The higher levels could explain a woman’s greater tolerance for the pain and discomfort of natural childbirth and her pleasant feelings shortly after the birth.
2. Can people with asthma exercise?

Asthma, a condition that causes difficult breathing, is characterized by coughing, wheezing, and shortness of breath induced by narrowing of the airway passages because of contraction (bronchospasm) of the airway muscles, swelling of the mucous membrane, and excessive secretion of mucus. In a few people, asthma can be triggered by exercise itself, particularly in cool and dry environments. This condition is referred to as exercise-induced asthma (EIA).

People with asthma need to obtain proper medication from a physician prior to initiating an exercise program. A regular program is best, because random exercise bouts are more likely to trigger asthma attacks. In the initial stages of exercise, an intermittent program (with frequent rest periods during the exercise session) is recommended. Gradual warm-up and cool-down are essential to reduce the risk of an acute attack. Furthermore, exercising in warm and humid conditions (such as swimming) is better because it helps to moisten the airways and thereby minimizes the asthmatic response. For land-based activities (such as walking and aerobics), drinking water before, during, and after exercise helps to keep the airways moist, decreasing the risk of an attack. During the winter months, wearing an exercise mask is recommended to increase the warmth and humidity of inhaled air. People with asthma should not exercise alone and should always carry their medication with them during workouts.

3. What types of activities are recommended for people with arthritis?

Individuals who have arthritis should participate in a combined stretching, aerobic, and strength-training program. The participant should do mild stretching prior to aerobic exercise to relax tight muscles. A regular flexibility program following aerobic exercise is encouraged to help maintain good joint mobility. During the aerobic portion of the exercise program, individuals with arthritis should avoid high-impact activities because these may cause greater trauma to arthritic joints. Low-impact activities such as swimming, water aerobics, and cycling are recommended. A complete strength-training program also is recommended, with special emphasis on exercises that will support the affected joint(s). As with any other program, individuals with arthritis should start with light-intensity or resistance exercises and build up gradually to a higher fitness level.

4. What precautions should people with diabetes take with respect to exercise?

If you have diabetes, consult your physician before you start exercising. You may not be able to begin until the diabetes is under control. Never exercise alone, and always wear a bracelet that identifies your condition. If

Key Terms

Endorphins: Morphine-like substances released from the pituitary gland (in the brain) during prolonged aerobic exercise; thought to induce feelings of euphoria and natural well-being.
you take insulin, the amount and timing of each dose may have to be regulated with your physician. If you inject insulin, do so over a muscle that won’t be exercised, then wait an hour before exercising.

Both types of diabetes improve with exercise, although the results are more notable in patients with type 2 diabetes. Exercise usually lowers blood sugar and helps the body use food more effectively. The extent to which the blood glucose level can be controlled in overweight people with NIDDM seems to be related directly to how long and how hard a person exercises. Normal or near-normal blood glucose levels can be achieved through a proper exercise program.

As with any fitness program, the exercise must be done regularly to be effective against diabetes. The benefits of a single exercise bout on blood glucose are highest between 12 and 24 hours following exercise. These benefits are completely lost within 72 hours after exercise. Thus, regular participation is crucial to derive ongoing benefits. In terms of fitness, all diabetic patients can achieve higher fitness levels, including reductions in weight, blood pressure, and total cholesterol and triglycerides.

The biggest concern for people with diabetes is exercise-induced hypoglycemia during, following, or even a day after the exercise session. Common symptoms of hypoglycemia include weakness, confusion, shakiness, anxiousness, tiredness, hunger, increased perspiration, headaches, and even loss of consciousness. Physical activity increases insulin sensitivity and muscle glucose uptake, thus lowering blood glucose, an effect that may last several hours after exercise. With enhanced insulin sensitivity, a unit of insulin lowers blood glucose to a much greater extent during and following exercise than under nonexercise conditions. Typically, the longer and more intense the exercise bout, the greater the effect on insulin sensitivity.

Both aerobic exercise and strength training are recommended for individuals with type 2 diabetes. According to the American College of Sports Medicine and the American Diabetes Association, patients with type 2 diabetes should adhere to the following guidelines to make their exercise program safe and derive the most benefit:

**Aerobic Exercise**

- **Intensity.** Exercise at a moderate intensity (40 to 60 percent VO2max). Additional benefits, however, are gained through a vigorous-intensity program. The research indicates better blood glucose control by increasing intensity rather than exercise volume. Start your program with 10 to 15 minutes per session, on at least three nonconsecutive days, but preferably exercise five days per week.
- **Duration.** Aerobic activity duration should be no less than 150 minutes per week or the equivalent of 30 minutes per day at least five days per week. As a minimum, each aerobic exercise bout should be at least 10 minutes long and spread throughout the week. Diabetic individuals with a weight problem should build up daily physical activity to 60 minutes per session.
- **Mode.** Any type of aerobic activity or preferably a combination of aerobic activities that involves large muscle groups and increases oxygen uptake (VO2) is recommended. Choose activities that you enjoy doing, and stay with them. As you select your activities, be aware of your condition. For example, if you have lost sensation in your feet, swimming or stationary cycling is better than walking or jogging to minimize the risk for injury.
- **Frequency.** Exercise aerobically at least three times per week and do not allow more than two consecutive days between exercise sessions. Five days per week are strongly encouraged.
- **Rate of progression.** A gradual increase in exercise to at least 150 weekly minutes in both intensity and volume (duration and frequency) is strongly encouraged. Progression up to seven hours per week (420 minutes) has been reported by individuals who have successfully been able to maintain a substantial amount of weight loss.

**Strength Training**

- **Resistance (intensity).** For optimal insulin action, resistance training should be conducted between 50 and 80 percent of the maximal capacity (1 RM) for each exercise, either on free weights or resistance machines.
- **Sets.** A minimum of one set performed to near-fatigue of 5 to 10 exercises involving the body’s major muscle groups (upper body, core, and lower body). Initially, each set should consist of 10 to 15 repetitions maximum (RM).
- **Frequency.** A minimum of twice per week, but preferably three times per week on nonconsecutive days.
- **Rate of Progression.** Progression of intensity, sets, and frequency (in that order) are recommended. Type 2 diabetics are encouraged to gradually increase the resistance and aim to work with 8 to 10 RM. Next, sets can progressively be increased up to four sets per exercise. Finally, frequency may be increased from twice weekly to three times per week.

**Additional Exercise Guidelines**

- Check your blood glucose levels before and after exercise. Do not exercise if your blood glucose is above 300 mg/dL or fasting blood glucose is above 250 mg/dL and you have ketones in your urine. If your blood glucose is below 100 mg/dL, eat a small carbohydrate snack before exercise.
• If you are on insulin or diabetes medication, monitor your blood glucose regularly and check it at least twice within 30 minutes of starting exercise.

• Schedule your exercise 1 to 3 hours after a meal, and avoid exercise when your insulin is peaking. If you are going to exercise 1 to 2 hours following a meal, you may have to reduce your insulin or blood glucose-reducing medication.

• To prevent hypoglycemia, consume between .15 and .20 gram of carbohydrates per pound of body weight for each hour of moderate-intensity activity. This amount, however, should be adjusted based on your blood glucose monitoring. Up to .25 gram of carbohydrates per pound of body weight may be required for vigorous exercise. Your goal should be to regulate carbohydrate intake and medication dosage so as to maintain blood glucose level between 100 and 200 mg/dL. With physical activity and exercise, you will probably need to reduce your insulin or oral medication, increase carbohydrate consumption, or both.

• Be ready to treat low blood sugar with a fast-acting source of sugar, such as juice, raisins, or other source recommended by your doctor.

• If you feel that a reaction is about to occur, discontinue exercise immediately. Check your blood glucose level and treat the condition as needed.

• When you exercise outdoors, always do so with someone who knows what to do in a diabetes-related emergency.

• Stay well hydrated. Dehydration can have a negative effect on blood glucose, heart function, and performance. Consume adequate amounts of fluids before and after exercise. Drink about 8 ounces of water before you start each exercise session. If you are going to exercise for longer than an hour, drink 8 ounces (one cup) of a 6 to 8 percent carbohydrate sports drink every 15 to 20 minutes.

People with type 1 diabetes should ingest 15 to 30 grams of carbohydrates during each 30 minutes of intense exercise and follow it with a carbohydrate snack after exercise.

In addition, strength training twice per week using 8 to 10 exercises with a minimum of one set of 10 to 15 repetitions to near fatigue is recommended for individuals with diabetes. A complete description of strength-training programs is provided in Chapter 7.

5. Is exercise safe during pregnancy?

Exercise is beneficial during pregnancy. According to the American College of Obstetricians and Gynecologists (ACOG), in the absence of contraindications, healthy pregnant women are encouraged to participate in regular, moderate-intensity physical activities to continue to derive health benefits during pregnancy. Pregnant women, however, should consult their physicians to ensure that they have no contraindications to exercise during pregnancy.

As a general rule, healthy pregnant women can also accumulate 30 minutes of moderate-intensity physical activity on most, if not all, days of the week. Physical activity strengthens the body and helps prepare for the challenges of labor and childbirth.

The average labor and delivery lasts 10 to 12 hours. In most cases, labor and delivery are highly intense, with repeated muscular contractions interspersed with short rest periods. Proper conditioning will better prepare the body for childbirth. Moderate exercise during pregnancy also helps to prevent back pain and excessive weight gain, and it speeds recovery following childbirth.

The most common recommendations for exercise during pregnancy for healthy pregnant women with no additional risk factors are as follows:

• Don’t start a new or more rigorous exercise program without proper medical clearance.

• Accumulate 30 minutes of moderate-intensity physical activities on most days of the week.

• Instead of using heart rate to monitor intensity, exercise at an intensity level between “low” and “somewhat hard,” using the physical activity perceived exertion (H-PAPE) scale in Chapter 6, Figure 6.8 (see page 210).

• Gradually switch from weight-bearing and high-impact activities, such as jogging and aerobics, to non-weight-bearing/lower-impact activities, such as walking, stationary cycling, swimming, and water aerobics. The latter activities minimize the risk of in-
jogging and may allow exercise to continue throughout pregnancy.

- Avoid exercising at an altitude above 6,000 feet (1,800 meters), as well as scuba diving, because either may compromise the availability of oxygen to the fetus.

- Women who are accustomed to strenuous exercise may continue in the early stages of pregnancy but should gradually decrease the amount, intensity, and exercise mode as pregnancy advances (most healthy pregnant women, however, slow down during the first few weeks of pregnancy until morning sickness and fatigue subside).

- Pay attention to the body’s signals of discomfort and distress, and never exercise to exhaustion. When fatigued, slow down or take a day off. Do not stop exercising altogether unless you experience any of the contraindications for exercise listed in the adjacent box.

- To prevent fetal injury, avoid activities that involve potential contact or loss of balance or that cause even mild trauma to the abdomen. Examples of these activities are basketball, soccer, volleyball, Nordic or water skiing, ice skating, road cycling, horseback riding, and motorcycle riding.

- During pregnancy, don’t exercise for weight loss purposes.

- Get proper nourishment (pregnancy requires between 150 and 300 extra calories per day), and eat a small snack or drink some juice 20 to 30 minutes prior to exercise.

- Prevent dehydration by drinking a cup of fluid 20 to 30 minutes before exercise, and drink 1 cup of liquid every 15 to 20 minutes during exercise.

- During the first 3 months in particular, don’t exercise in the heat. Wear clothing that allows for proper dissipation of heat. A body temperature above 102.6°F (39.2°C) can harm the fetus.

- After the first trimester, avoid exercises that require lying on the back. This position can block blood flow to the uterus and the baby.

- Perform stretching exercises gently because hormonal changes during pregnancy increase the laxity of muscles and connective tissue. Although these changes facilitate delivery, they also make women more susceptible to injuries during exercise.

6. Does exercise help relieve dysmenorrhea?

Although exercise has not been shown to either cure or aggravate dysmenorrhea, it has been shown to relieve menstrual cramps because it improves circulation to the uterus. Less severe menstrual cramps also could be caused by higher levels of endorphins produced during prolonged physical activity, which may counteract pain. Particularly, stretching exercises of the muscles in the pelvic region seem to reduce and prevent painful menstruation that is not the result of disease.6

7. Does participation in exercise hinder menstruation?

In some instances, highly trained athletes develop amenorrhea during training and competition. This condition is seen most often in extremely lean women who also engage in sports that require strenuous physical effort over a sustained period of time. It is by no means irreversible. At present, we do not know whether the condition is caused by physical or emotional stress related to high-intensity training, excessively low body fat, or other factors.

Although, on the average, women have a lower physical capacity during menstruation, medical surveys at the Olympic Games have shown that women have broken Olympic and world records at all stages of the menstrual cycle. Menstruation should not keep a woman from exercising, and it will not necessarily have a negative impact on performance.

8. Does exercise offset the detrimental effects of cigarette smoking?

Physical exercise often motivates a person to stop smoking, but it does not offset any ill effects of smoking. Smoking greatly decreases the ability of the blood to transport oxygen to working muscles.

Oxygen is carried in the circulatory system by hemoglobin, the iron-containing pigment of the red blood cells. Carbon monoxide, a by-product of cigarette smoke, has 210 to 250 times greater affinity for hemoglobin over oxygen. Consequently, carbon monoxide combines much faster with hemoglobin, decreasing the oxygen-carrying capacity of the blood.

Chronic smoking also increases airway resistance, requiring the respiratory muscles to work much harder and
consume more oxygen just to ventilate a given amount of air. If a person quits smoking, exercise does help increase the functional capacity of the pulmonary system.

A regular exercise program seems to be a powerful incentive to quit smoking. A random survey of 1,250 runners conducted at the 6.2-mile Peachtree Road Race in Atlanta provided impressive results. The survey indicated that of the men and women who smoked cigarettes when they started running, 81 percent and 75 percent, respectively, had quit before the date of the race.

9. How long should a person wait after a meal before exercising strenuously?

The length of time to wait before exercising after a meal depends on the amount of food eaten. On the average, after a regular meal, you should wait about 2 hours before participating in strenuous physical activity. But a walk or some other light physical activity is fine following a meal, as it helps burn extra calories and may help the body metabolize fats more efficiently.

10. What type of clothing should I wear when I exercise?

The type of clothing you wear during exercise is important. In general, clothing should fit comfortably and allow free movement of the various body parts. Select clothing according to air temperature, humidity, and exercise intensity. Avoid nylon and rubberized materials and tight clothes that interfere with the cooling mechanism of the human body or obstruct normal blood flow. Choose fabrics made of polypropylene, Capilene, Thermax, or any synthetic that draws (wicks) moisture away from the skin, enhancing evaporation and cooling of the body. It’s also important to consider your exercise intensity, because the harder you exercise, the more heat your body produces.

When exercising in the heat, avoid the hottest time of the day, between 11:00 a.m. and 5:00 p.m. Surfaces such as asphalt, concrete, and artificial turf absorb heat, which then radiates to the body. Therefore, these surfaces are not recommended. (Also see the discussion about heat and humidity in Question 12.)

Only a minimal amount of clothing is necessary during exercise in the heat, to allow for maximal evaporation. Clothing should be lightweight, light-colored, loose-fitting, airy, and absorbent. Examples of commercially available products that can be used during exercise in the heat are Asic’s Perma Plus, Cool-max, and Nike’s Dri-F.I.T. Double-layer acrylic socks are more absorbent than cotton and help to prevent blistering and chafing of the feet. A straw-type hat can be worn to protect the eyes and head from the sun. (Clothing for exercise in the cold is discussed in Question 14.)

For decades, a good pair of shoes has been recommended by most professionals to prevent injuries to lower limbs. Shoes manufactured specifically for the choice of activity have been encouraged. Shoes should have good stability, motion control, and comfortable fit. Purchase shoes in the middle of or later in the day when you have good stability, motion control, and comfortable fit.

11. What time of the day is best for exercise?

You can do intense exercise almost any time of the day, with the exception of about 2 hours following a heavy meal or the midday and early afternoon hours on hot, humid days. Moderate exercise seems to be beneficial shortly after a meal because exercise enhances the thermogenic response. A walk shortly after a meal burns more calories than a walk several hours after a meal.

Many people enjoy exercising early in the morning because it gives them a boost to start the day. People who

**Key Terms**

- **Dysmenorrhea** Painful menstruation.
- **Amenorrhea** Cessation of regular menstrual flow.
- **Thermogenic response** Amount of energy required to digest food.
exercise in the morning also seem to stick with it more than others, because the chances of putting off the exercise session for other reasons are minimized. Some prefer the lunch hour for weight-control reasons. By exercising at noon, they do not eat as big a lunch, which helps keep down the daily caloric intake. Highly stressed people seem to like the evening hours because of the relaxing effects of exercise.

12. Why is exercising in hot and humid conditions unsafe?

   When a person exercises, only 30 to 40 percent of the energy the body produces is used for mechanical work or movement. The rest of the energy (60 to 70 percent) is converted into heat. If this heat cannot be dissipated properly because the weather is too hot or the relative humidity is too high, body temperature increases, and in extreme cases, it can result in death.

   The specific heat of body tissue (the heat required to raise the temperature of the body by 1°C) is 0.38 calorie per pound of body weight (.38 cal/lb). This indicates that if no body heat is dissipated, a 150-pound person has to burn only 57 calories (150 × .38) to increase total body temperature by 1°C. If this person were to conduct an exercise session requiring 300 calories (e.g., running about 3 miles) without any dissipation of heat, the inner body temperature would increase by 5.3°C (300 ÷ 57), which is the equivalent of going from 98.6°F to 108.1°F.

   This example illustrates clearly the need for caution when exercising in hot or humid weather. If the relative humidity is too high, body heat cannot be lost through evaporation because the atmosphere already is saturated with water vapor. In one instance, a football casualty occurred when the temperature was only 64°F, but the relative humidity was 100 percent. People must be cautious when air temperature is above 90°F and the relative humidity is above 60 percent.

   The ACSM recommends avoiding strenuous physical activity when the readings of a wet-bulb globe thermometer exceed 82.4°F. With this type of thermometer, the wet bulb is cooled by evaporation, and on dry days it shows a lower temperature than the regular (dry) thermometer. On humid days, the cooling effect is less because of less evaporation; hence, the difference between the wet and dry readings is not as great.

   Following are descriptions of, and first-aid measures for, the three major signs of heat illness:

   - **Heat cramps.** Symptoms include cramps, spasms, and muscle twitching in the legs, arms, and abdomen. To relieve heat cramps, stop exercising, get out of the heat, massage the painful area, stretch slowly, and drink plenty of fluids (water, fruit drinks, or electrolyte beverages).

   - **Heat exhaustion.** Symptoms include fainting, dizziness, profuse sweating, cold and clammy skin, weakness, headache, and a rapid, weak pulse. If you incur any of these symptoms, stop and find a cool place to rest. If conscious, drink cool water. Do not give water to an unconscious person. Loosen or remove clothing and rub your body with a cool, wet towel or apply ice packs. Place yourself in a supine position with the legs elevated 8 to 12 inches. If you are not fully recovered in 30 minutes, seek immediate medical attention.

   - **Heat stroke.** Symptoms include serious disorientation; warm, dry skin; no sweating; rapid, full pulse; vomiting; diarrhea; unconsciousness; and high body temperature. As the body temperature climbs, unexplained anxiety sets in. When the body temperature reaches 104 to 105°F, the individual may feel a cold sensation in the trunk of the body, goose bumps, nausea, throbbing in the temples, and numbness in the extremities. Most people become incoherent after this stage.

      When body temperature reaches 105 to 107°F, disorientation, loss of fine-motor control, and muscular weakness set in. If the temperature exceeds 106°F, serious neurological injury and death may be imminent.

      Heat stroke requires immediate emergency medical attention. Request help and get out of the sun and into a cool, humidity-controlled environment. While you are waiting to be taken to the hospital emergency room, you should be placed in a semi-seated position, and your body should be sprayed with cool water and rubbed with cool towels. If possible, cold packs should be placed in areas that receive an abundant blood supply, such as the head, neck, armpits, and groin. Fluids should not be given if you are unconscious. In any case of heat-related illness, if the person refuses water, vomits, or starts to lose consciousness, an ambulance should be summoned immediately. Proper initial treatment of heat stroke is vital.
13. What should a person do to replace fluids lost during prolonged aerobic exercise?

The main objective of fluid replacement during prolonged aerobic exercise is to maintain the blood volume so circulation and sweating can continue at normal levels. Adequate water replacement is the most important factor in preventing heat disorders. Drinking about 6 to 8 ounces of cool water every 15 to 20 minutes during exercise is recommended to prevent dehydration. Cold fluids seem to be absorbed more rapidly from the stomach.

Other relevant points follow:

- Drinking commercially prepared sports drinks is recommended when exercise will be strenuous and carried out for more than an hour. For exercise lasting less than an hour, water is just as effective in replacing lost fluid. The sports drinks you select may be based on your personal preference. Try different drinks at 6 to 8 percent glucose concentration to see which drink you tolerate best and suits your tastes as well.
- Commercial fluid-replacement solutions (such as Powerade® and Gatorade®) contain about 6 to 8 percent glucose, which seems to be optimal for fluid absorption and performance. Sugar does not become available to the muscles until about 30 minutes after consumption of a glucose solution.
- Drinks high in fructose or with a glucose concentration above 8 percent are not recommended because they slow water absorption during exercise in the heat.
- Most sodas (both cola and non-cola) contain between 10 and 12 percent glucose, which is too high for proper rehydration during exercise in the heat.
- Do not overhydrate with just water during a very or ultra long-distance event, as such can lead to hypo-

14. What precautions must a person take when exercising in the cold?

When exercising in the cold, the two factors to consider are frostbite and hypothermia. In contrast to hot and humid conditions, cold weather usually does not threaten health because clothing can be selected for heat conservation, and exercise itself increases the production of body heat.

Most people actually overdress for exercise in the cold. Because exercise increases body temperature, a moderate workout on a cold day makes a person feel that the temperature is 20 to 30 degrees warmer than it actually is. Overdressing for exercise can make the clothes damp from excessive perspiration. The risk for hypothermia increases when a person is wet or after exercise stops, when the person is not moving around sufficiently to increase (or maintain) body heat.

Initial warning signs of hypothermia include shivering, losing coordination, and having difficulty speaking. With a continued drop in body temperature, shivering stops, the muscles weaken and stiffen, and the person feels elated or intoxicated and eventually loses consciousness. To prevent hypothermia, use common sense, dress properly, and be aware of environmental conditions.

The popular belief that exercising in cold temperatures (32°F and lower) freezes the lungs is false, because the air is warmed properly in the air passages before it reaches the lungs. Cold is not what poses a threat; wind velocity is what increases the chill factor most.

For example, exercising at a temperature of 25°F with adequate clothing is not too cold to exercise, but if the wind is blowing at 25 miles per hour, the chill factor lowers the actual temperature to 15°F. This effect is even worse if a person is wet and exhausted. When the weather is windy, the individual should exercise (jog or cycle) against the wind on the way out and with the wind upon returning.

Even though the lungs are under no risk when you exercise in the cold, your face, head, hands, and feet

Key Terms

Heat cramps Muscle spasms caused by heat-induced changes in electrolyte balance in muscle cells.
Heat exhaustion Heat-related fatigue.
Heat stroke Emergency situation resulting from the body being subjected to high atmospheric temperatures.
Hypothermia A breakdown in the body’s ability to generate heat; a drop in body temperature below 95°F.
should be protected because they are subject to frostbite. Watch for signs of frostbite: numbness and discoloration. In cold temperatures, as much as half of the body’s heat can be lost through an unprotected head and neck. A wool or synthetic cap, hood, or hat will help to hold in body heat. Mittens are better than gloves, because they keep the fingers together so the surface area from which to lose heat is less. Inner linings of synthetic material to wick moisture away from the skin are recommended. Avoid cotton next to the skin, because once cotton gets wet, whether from perspiration, rain, or snow, it loses its insulating properties.

Wearing several layers of lightweight clothing is preferable to wearing one single, thick layer because warm air is trapped between layers of clothes, enabling greater heat conservation. As body temperature increases, you can remove layers as necessary.

The first layer of clothes should wick moisture away from the skin. Polypropylene, Capilene, and Thermax are recommended materials. Next, a layer of wool, dacron, or polyester fleece insulates well even when wet. Lycra tights or sweatpants help protect the legs. The outer layer should be waterproof, wind resistant, and breathable. A synthetic material such as Gore-Tex is best, so moisture can still escape from the body. A ski mask or face mask helps protect the face. In extremely cold conditions, exposed skin, such as the nose, cheeks, and around the eyes, can be insulated with petroleum jelly.

For lengthy or long-distance workouts (cross-country skiing or long runs), take a small backpack to carry the clothing you removed. You also can carry extra warm and dry clothes in case you stop exercising away from shelter. If you remain outdoors following exercise, added clothing and continuous body movement are essential to maintain body temperature and avoid hypothermia.

15. Can I exercise when I have a cold or the flu?

The most important consideration is to use common sense and pay attention to your symptoms. Usually, you may continue to exercise if your symptoms include a runny nose, sneezing, or a scratchy throat. But, if your symptoms include fever, muscle ache, vomiting, diarrhea, or a hacking cough, you should avoid exercise. After an illness, be sure to ease back gradually into your program. Do not attempt to return at the same intensity and duration that you were used to prior to your illness.

**Exercise-Related Injuries**

To enjoy and maintain physical fitness, preventing injury during a conditioning program is essential. Exercise-related injuries, nonetheless, are common in individuals who participate in exercise programs. Surveys indicate that more than half of all new participants incur injuries during the first 6 months of the conditioning program.

The four most common causes of injuries are:

1. High-impact activities
2. Rapid conditioning programs (doing too much too quickly)
3. Improper shoes or training surfaces
4. Anatomical predisposition (i.e., body propensity)

High-impact activities and a significant increase in quantity, intensity, or duration of activities are by far the most common causes of injuries. The body requires time to adapt to more intense activities. Most of these injuries can be prevented through a more gradual and correct conditioning (low-impact) program.

Soft training surfaces, such as artificial turf, grass, or dirt, produce less trauma than wood, asphalt, or concrete.

Because few people have perfect body alignment, injuries associated with overtraining may occur eventually. In case of injury, proper treatment can avert a lengthy recovery process. A summary of common exercise-related injuries and how to manage them follows.

**Acute Sports Injuries**

The best treatment always has been prevention. If an activity causes unusual discomfort or chronic irritation, you need to treat the cause by decreasing the intensity, switching activities, substituting equipment, or upgrading clothing (such as buying proper-fitting shoes).

In cases of acute injury, the standard treatment is rest, cold application, compression or splinting (or both), and elevation of the affected body part. This is commonly referred to as **RICE**:

- **R** = rest
- **I** = ice (cold) application
- **C** = compression
- **E** = elevation

Cold should be applied three to five times a day for 15 minutes at a time during the first 36 to 48 hours, by submerging the injured area in cold water, using an ice bag, or applying ice massage to the affected part. An elastic bandage or wrap can be used for compression. Elevating the body part decreases blood flow (and therefore swelling) in that body part.

The purpose of these treatment modalities is to minimize swelling in the area and thus hasten recovery time. After the first 36 to 48 hours, heat can be used if the injury shows no further swelling or inflammation. If you have doubts as to the nature or seriousness of the injury (such as suspected fracture), you should seek a medical evaluation.

Obvious deformities (exhibited by fractures, dislocations, or partial dislocations, as examples) call for splinting, cold application with an ice bag, and medical attention. Do not try to reset any of these conditions by yourself, because you could further damage muscles, ligaments, and nerves. Treatment of these injuries should
always be left to specialized medical personnel. A quick reference guide for the signs or symptoms and treatment of exercise-related problems is provided in Table 9.1.

### Table 9.1 Reference Guide for Exercise-Related Problems

<table>
<thead>
<tr>
<th>Injury</th>
<th>Signs/Symptoms</th>
<th>Treatment*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bruise (contusion)</td>
<td>Pain, swelling, discoloration</td>
<td>Cold application, compression, rest</td>
</tr>
<tr>
<td>Dislocations / Fractures</td>
<td>Pain, swelling, deformity</td>
<td>Splinting, cold application; seek medical attention</td>
</tr>
<tr>
<td>Heat cramp</td>
<td>Cramps, spasms, and muscle twitching in the legs, arms, and abdomen</td>
<td>Stop activity, get out of the heat, stretch, massage the painful area, drink plenty of fluids</td>
</tr>
<tr>
<td>Heat exhaustion</td>
<td>Fainting, profuse sweating, cold/clammy skin, weak/rapid pulse, weakness, headache</td>
<td>Stop activity, rest in a cool place, loosen clothing, rub body with cool/wet towel, drink plenty of fluids, stay out of heat for 2–3 days</td>
</tr>
<tr>
<td>Heat stroke</td>
<td>Hot/dry skin, no sweating, serious disorientation, rapid/full pulse, vomiting, diarrhea, unconsciousness, high body temperature</td>
<td>Seek immediate medical attention, request help and get out of the sun, bathe in cold water/spray with cold water/rub body with cold towels, drink plenty of cold fluids (do not give fluids to an unconscious individual)</td>
</tr>
<tr>
<td>Joint sprains</td>
<td>Pain, tenderness, swelling, loss of use, discoloration</td>
<td>Cold application, compression, elevation, rest; heat after 36 to 48 hours (if no further swelling)</td>
</tr>
<tr>
<td>Muscle cramps</td>
<td>Pain, spasm</td>
<td>Stretch muscle(s), use mild exercises for involved area</td>
</tr>
<tr>
<td>Muscle soreness and stiffness</td>
<td>Tenderness, pain</td>
<td>Mild stretching, low-intensity exercise, warm bath</td>
</tr>
<tr>
<td>Muscle strains</td>
<td>Pain, tenderness, swelling, loss of use</td>
<td>Cold application, compression, elevation, rest; heat after 36 to 48 hours (if no further swelling)</td>
</tr>
<tr>
<td>Shin splints</td>
<td>Pain</td>
<td>Cold application prior to and following any physical activity, rest; heat (if no activity is carried out)</td>
</tr>
<tr>
<td>Side stitch</td>
<td>Pain on the side of the abdomen below the rib cage</td>
<td>Decrease level of physical activity or stop altogether, gradually increase level of fitness</td>
</tr>
<tr>
<td>Tendinitis</td>
<td>Pain, tenderness, loss of use</td>
<td>Rest, cold application; heat after 48 hours</td>
</tr>
</tbody>
</table>

*Cold should be applied three or four times a day for 15 minutes. Heat can be applied three times a day for 15 to 20 minutes.

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### Muscle Soreness and Stiffness

Individuals who begin an exercise program or participate after a long layoff from exercise often develop muscle soreness and stiffness. The acute soreness that sets in the first few hours after exercise is thought to be related to general fatigue of the exercised muscles.

Delayed muscle soreness that appears several hours after exercise (usually about 12 hours later) and lasts 2 to 4 days may be related to actual micro-tears in muscle tissue, muscle spasms that increase fluid retention (stimulating the pain nerve endings), and overstretching or tearing of connective tissue in and around muscles and joints.

Mild stretching before and adequate stretching after exercise help to prevent soreness and stiffness. Gradually progressing into an exercise program is important, too. A person should not attempt to do too much too quickly. To relieve pain, mild stretching, light-intensity exercise to stimulate blood flow, and a warm bath are recommended.

### Exercise Intolerance

When starting an exercise program, participants should stay within safe limits. The best method to determine whether you are exercising too strenuously is to check your heart rate and make sure that it does not exceed the limits of your target zone. Exercising above this target zone may not be safe for unconditioned or high-risk individuals. You do not have to exercise beyond your target zone to gain the desired cardiorespiratory benefits.

Several physical signs will tell you when you are exceeding your functional limitations—that is, experiencing exercise intolerance. Signs of intolerance include rapid or irregular heart rate, difficult breathing, nausea, vomiting, lightheadedness, headache, dizziness, unusually flushed or pale skin, extreme weakness, lack of energy, shakiness, sore muscles, cramps, and tightness in the chest. Learn to listen to your body. If you notice any of these symptoms, seek medical attention before continuing your exercise program.

Recovery heart rate is another indicator of overexertion. To a certain extent, recovery heart rate is related to fitness level. The higher your cardiorespiratory fitness level, the faster your heart rate will decrease following exercise. As a rule, heart rate should be below 120 bpm 5 minutes into recovery. If your heart rate is above

### Key Terms

- **RICE**: An acronym used to describe the standard treatment procedure for acute sports injuries: rest, ice (cold application), compression, and elevation.
- **Exercise intolerance**: Inability to function during exercise because of excessive fatigue or extreme feelings of discomfort.
120, you most likely have overexerted yourself or possibly could have some other cardiac abnormality. If you lower the intensity or the duration of exercise, or both, and you still have a fast heart rate 5 minutes into recovery, you should consult your physician.

**Side Stitch**

Side stitch is a cramp-like pain in the ribcage that can develop in the early stages of participation in exercise. It occurs primarily in unconditioned beginners and in trained individuals when they exercise at higher intensities than usual. As one’s physical condition improves, this condition tends to disappear unless training is intensified.

The exact cause is unknown. Some experts suggest that it could relate to a lack of blood flow to the respiratory muscles during strenuous physical exertion. Some people encounter side stitch during downhill running. If you experience side stitch during exercise, slow down. If it persists, stop altogether. Lying down on your back and gently bringing both knees to the chest and holding that position for 30 to 60 seconds also helps.

Some people get side stitch if they drink juice or eat anything shortly before exercise. Drinking only water 1 to 2 hours prior to exercise sometimes prevents side stitch. Other individuals have problems with commercially available sports drinks during vigorous-intensity exercise. Unless carbohydrate replacement is crucial to complete a long-distance event (over 60 minutes, such as road cycling, a marathon, or a triathlon), drink cool water for fluid replacement or try a different carbohydrate solution.

**Shin Splints**

Shin splints, one of the most common injuries to the lower limbs, usually results from one or more of the following: (a) lack of proper and gradual conditioning, (b) doing physical activities on hard surfaces (wooden floors, hard tracks, cement, or asphalt), (c) fallen arches, (d) chronic overuse, (e) muscle fatigue, (f) faulty posture, (g) improper shoes, or (h) participating in weight-bearing activities when excessively overweight.

To manage shin splints:

1. Remove or reduce the cause (exercise on softer surfaces, wear better shoes or arch supports, or completely stop exercise until the shin splints heal).
2. Do stretching exercises before and after physical activity.
3. Use ice massage for 10 to 20 minutes before and after exercise.
4. Apply active heat (whirlpool and hot baths) for 15 minutes, two to three times a day.
5. Use supportive taping during physical activity (a qualified athletic trainer can teach you the proper taping technique).

**Muscle Cramps**

Muscle cramps are caused by the body’s depletion of essential electrolytes or a breakdown in the coordination between opposing muscle groups. If you have a muscle cramp, you should first attempt to stretch the muscles involved. In the case of the calf muscle, for example, pull your toes up toward the knees. After stretching the muscle, rub it down gently, and, finally, do some mild exercises requiring the use of that muscle.

In pregnant and lactating women, muscle cramps often are related to a lack of calcium. If women get cramps during these times, calcium supplements usually relieve the problem. Tight clothing also can cause cramps by decreasing blood flow to active muscle tissue.

**Exercise and Aging**

The elderly constitute the fastest-growing segment of the population. The number of Americans aged 65 and older increased from 3.1 million in 1900 (4.1 percent of the population) to about 40 million (13 percent) in 2010. By the year 2030, more than 72 million people, or 20 percent of the U.S. population, are expected to be older than 65.

The main objectives of fitness programs for older adults should be to help them improve their functional status and contribute to healthy aging. This implies the ability to maintain independent living status and to avoid disability. Older adults are encouraged to participate in programs that will help develop cardiorespiratory endurance, muscular strength and endurance, muscular flexibility, agility, balance, and motor coordination.

**Physical Training in the Older Adult**

Regular participation in physical activity provides both physical and psychological benefits to older adults. In particular, regular physical activity decreases the risk for cardiovascular disease, stroke, hypertension, type 2 diabetes, osteoporosis, obesity, colon cancer, breast cancer, cognitive impairment, anxiety, and depression. Physical activity also improves self-confidence and self-esteem. Furthermore, both cardiorespiratory endurance and strength training help to increase functional capacity, improve overall health status, and increase life expectancy. Strength training also decreases the rate at which strength and muscle mass are lost.

The trainability of older men and women alike and the effectiveness of physical activity in enhancing health have been demonstrated in research. Older adults who increase their physical activity experience significant changes in cardiorespiratory endurance, strength, and flexibility. The extent of the changes depends on their initial fitness level and the types of activities they select for their training (walking, cycling, strength training, and so on).
Injury to the lower leg characterized by pain and

Ability to carry out activities of

A sharp pain in the side of the abdomen.

In terms of aging, muscle strength declines by 10 to 20 percent between ages 20 and 50; but between ages 50 and 70, it drops by another 25 to 30 percent. Through strength training, frail adults in their 80s or 90s can double or triple their strength in just a few months. The amount of muscle hypertrophy achieved, however, decreases with age. Strength gains close to 200 percent have been found in previously inactive adults over age 90.9 In fact, research has shown that regular strength training improves balance, gait, speed, functional independence, morale, depression symptoms, and energy intake.10 Strength-trained older adults are 30 percent to 50 percent stronger than their sedentary counterparts.

Although muscle flexibility drops by about 5 percent per decade of life, 10 minutes of stretching every other day can prevent most of this loss as a person ages. Improved flexibility also enhances mobility skills.11 The latter promotes independence because it helps older adults successfully perform activities of daily living.

In terms of body composition, lean body mass typically declines by 2 to 3 percent per decade starting at age 30. Muscle mass starts to decrease at age 40 and accelerates after age 65, with the legs losing muscle mass at a faster rate. Sedentary adults gain about 20 pounds of body weight between ages 18 and 55. As a result, body fat continues to increase through adult life, with a greater tendency toward visceral fat accumulation (especially in men), leading to further increase in risk for chronic disease. Regular aerobic activity and strength training have been shown to help older adults properly manage body weight and significantly reduce visceral fat.

Older adults who wish to initiate an exercise program are strongly encouraged to have a complete medical evaluation. Recommended activities for older adults include calisthenics, walking, jogging, swimming, cycling, and water aerobics. Strength training is particularly important for bone health in the absence of weight bearing aerobic activities.

Older people should avoid isometric and very high-intensity weight-training exercises (see Chapter 7). Activities that require all-out effort or that require participants to hold their breath tend to lessen blood flow to the heart, cause a significant increase in blood pressure, and increase the load placed on the heart. Older adults should participate in activities that require continuous and rhythmic muscular activity (about 40 to 60 percent of heart rate reserve). These activities do not cause large increases in blood pressure or overload the heart.

<table>
<thead>
<tr>
<th>Table 9.2</th>
<th>Effects of Physical Activity and Inactivity on Older Men</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exercisers</td>
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<tr>
<td>Age (yrs)</td>
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<tr>
<td>Weight (lbs)</td>
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<td>Resting heart rate (bpm)</td>
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<tr>
<td>Maximal heart rate (bpm)</td>
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<tr>
<td>Heart rate reserve* (bpm)</td>
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<tr>
<td>Blood pressure (mm Hg)</td>
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<tr>
<td>Maximal oxygen uptake (mL/kg/min)</td>
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</tr>
</tbody>
</table>

*Heart rate reserve = maximal heart rate – resting heart rate.

Current Fitness Trends

Twenty-first century way of life requires that we participate in physical activities that promote and maintain fitness, health, and wellness. As people search for proven programs, fitness trends emerge to achieve these goals. Some of the activity trends have been with us and continue to evolve to gain popularity among participants. Popular fitness activities include the following:

Core Training

The “core” of the body consists of the muscles that stabilize the trunk (spine) and pelvis. Core training emphasizes conditioning of all the muscles around the abdomen, pelvis, lower back, and hips. These muscles enhance body stability, activities of daily living, sport performance, and support the lower back. Core conditioning often incorporates the use of stability balls, foam rollers, and wobble boards, among other pieces of equipment. Further information on Core Strength Training is provided in Chapter 7 (page 244).

Fitness Boot Camp

A new vigorous-intensity outdoor/indoor group exercise program that combines traditional calisthetics, running, interval training, strength training (using body weight exercises such as push ups, lunges, pull ups, burpees, squats), plyometrics (see Chapter 7, page 243) and competitive games to develop cardiorespiratory fitness, muscular strength, muscular flexibility, and lose body fat. This program is based on military style-training and also aims at developing camaraderie and team effort. The program (camp) typically lasts 4 to 8 weeks. Fitness boot camps are challenging, but the group dynamic helps to motivate participants.

Functional Fitness

Functional fitness involves primarily weight-bearing exercises to develop balance, coordination, good posture, flexibility, muscular strength and endurance to enhance the person’s ability to perform activities of daily living (walking, climbing stairs, lifting, bending) with ease and with minimal risk for injuries. The program goal is to “train people for real life,” rather than a specific fitness component or a given event. Functional fitness training often requires use of fitness equipment such as stability balls, foam blocks, and balancing cushions.

High Intensity Interval Training (HIIT)

HIIT is a challenging training program, mostly aerobic, that involves high- to very high-intensity (80 to 90 percent of maximal capacity) intervals, each followed by a low- to moderate intensity-recovery interval. Usually a 1:3 or lower work-to-recovery ratio is used. HIIT provides greater health and fitness benefits than traditional lower-intensity programs. Fitness enthusiasts like HIIT because higher fitness and weight loss goals are reached with this type of training (as long as caloric intake is carefully monitored).

Preparing for Sports Participation

To enhance your participation in sports, keep in mind that in most cases it is better to get fit before playing sports rather than playing sports to get fit. A good pre-season training program will help make the season more enjoyable and prevent exercise-related injuries.

Properly conditioned individuals can participate safely in sports and enjoy the activities to their fullest with few or no limitations. Unfortunately, sports injuries are often the result of poor fitness and a lack of sport-specific conditioning. Many injuries occur when fatigue sets in following overexertion by unconditioned individuals.

Base Fitness Conditioning

Preactivity screening that includes a health history (see “See PAR-Q and Health History Questionnaire,” page 34) and/or a medical evaluation appropriate to your sport selection is recommended. Once cleared for exercise, start by building a base of general athletic fitness that includes the four health-related fitness components: cardiorespiratory fitness, muscular strength and endurance, flexibility, and recommended body composition. The base fitness conditioning program should last a minimum of 6 weeks.

As explained in Chapter 6, for cardiorespiratory fitness select an activity that you enjoy (such as walking, jogging, cycling, step aerobics, cross-country skiing, elliptical training) and train three to five times per week at a minimum of 20 minutes of continuous activity per session. Exercise between 60 percent and 80 percent intensity for adequate conditioning. You should feel as though you are training “somewhat hard” to “hard” at these intensity levels.

Strength (resistance) training helps maintain and increase muscular strength and endurance. Following the guidelines provided in Chapter 7, select 10 to 12 exercises that involve the major muscle groups and train two or three times per week on nonconsecutive days. Select a resistance (weight) that allows you to do 8 to 12 repetitions to near fatigue (8 to 12 RM [repetition maximum])
Spinning

Spinning is a low-impact aerobic activity performed on specially designed Spinner stationary bicycles in a room or studio with dim lights, motivational music, and under the direction of a certified instructor. These bikes include racing handlebars, pedals with clips, adjustable seats, and a resistance knob to control the intensity of the workout. Five workout stages, also known as “energy zones” are used to simulate actual cycling training and racing. The workouts are divided into endurance, all-terrain, strength, recovery, and advanced training. Cadence, exercise movements, and exercise heart rate dictate the differences among the various zones. Spinning provides a challenging workout for people of all ages and fitness levels.

Stability Exercise Balls

Stability exercise balls enhance stability, balance, and muscular strength. The emphasis is on correct movements and maintenance of proper body alignment while involving the core as much as possible. Additional exercises can be performed to strengthen other body areas. Further information on Stability Exercise Balls and sample exercises are provided in Chapter 7, pages 246–247).

Strength Training

Strength or resistance training requires the use of weights or resistances to increase functional capacity by developing muscular strength and muscular endurance. Most fitness participants strength train to further develop fitness and maintain muscular strength and endurance as they zone based on your fitness goals—see Chapter 7). That is, the resistance will be heavy enough so that when you perform one set of an exercise, you will not be able to do more than the predetermined number of repetitions at that weight. Begin your program slowly and perform between one and three sets of each exercise. Recommended exercises include the bench press, lat pull-down, leg press, leg curl, triceps extension, arm curl, rowing torso, heel raise, abdominal crunch, and back extension.

Flexibility is important in sports participation to enhance the range of motion in the joints. Using the guidelines from Chapter 8, schedule flexibility training two or three days per week. Perform each stretching exercise four times, and hold each stretch for 15 to 30 seconds. Examples of stretching exercises include the side body stretch, body rotation, chest stretch, shoulder stretch, sit-and-reach stretch, adductor stretch, quad stretch, heel cord stretch, and knee-to-crotch stretch.

In terms of body composition, excess body fat hinders sports performance and increases the risk for injuries. Depending on the nature of the activity, fitness goals for body composition range from 12 percent to 20 percent body fat for men and 17 percent to 25 percent for most women.

Yoga

Yoga consists of a system of exercises designed to help align the musculoskeletal system and develop flexibility, muscular strength and endurance, and balance. Yoga is also used as a relaxation technique for stress management. The exercises involve a combination of postures (known as “asanas”) along with diaphragmatic breathing, relaxation, and mediation techniques. Different forms of yoga exist, including Anuara, Ashtanga, Bikram, Integral, Iyengar, Kripalu, Kundalini, and Sivananda, Viny, Yogalates, and Yogarobics yoga.

Zumba

A relatively new dance fitness program that was created in Colombia by Alberto “Beto” Perez in the mid ’90s. Following great popularity in Colombia, the zumba program was brought to the United States in 1999. The program is now offered globally and classes are offered at most health fitness clubs in the United States. Zumba combines Latin and international music (cumbia, salsa, merengue, reggaeton, tango, and rock and roll among others) with dance to develop fitness and make exercise fun. The zumba motto has become “Ditch the workout, join the party!” Several types of zumba have been developed, including traditional zumba, zumba gold, zumba toning, aqua zumba, zumbatomic, and zumba marumba.

Sport-Specific Conditioning

Once you have achieved the general fitness base, continue with the program but make adjustments to add sport-specific training. This training should match the sport’s requirements for aerobic/anaerobic capabilities, muscular strength and endurance, and range of motion. During the sport-specific training, about half of your aerobic/anaerobic training should involve the same muscles used during your sport. Ideally, allocate 4 weeks of sport-specific training before you start participating in the sport. Then continue the sport-specific training on a more limited basis throughout the season. Depending on the nature of the sport (aerobic versus anaerobic), once the season starts, sports participation itself can take the place of some or all of your aerobic workouts.

The next step is to look at the demands of the sport. For example, soccer, bicycle racing, cross-country skiing, and snowshoeing are aerobic activities, whereas basketball,
racquetball, alpine skiing, snowboarding, and ice hockey are stop-and-go sports that require a combination of aerobic and anaerobic activity. Consequently, aerobic training may be appropriate for cross-country skiing, but it will do little to prepare your muscles for the high-intensity requirements of combined aerobic and anaerobic sports.

**High-intensity interval training** (HIIT), performed twice per week, is added to the program at this time. HIIT allows you to break up your workout into smaller segments so you can perform a greater training volume at a higher exercise intensity. HIIT has been shown to help improve both aerobic and anaerobic fitness at a much faster rate.

Four training variables impact HIIT. The acronym **DIRT** is frequently used to denote these variables:\(^1\)

- **D** = Distance of each speed interval
- **I** = Interval or length of recovery between speed intervals
- **R** = Repetitions or number of speed intervals to be performed
- **T** = Time of each speed interval

Using these four variables, a person can practically design an unlimited number of HIIT sessions.

The intervals consist of a 1:4 down to a 1:1 work-to-recovery ratio. The more intense the speed interval, the longer the required recovery interval. For aerobic intervals (lasting longer than 3 minutes), 1:2, 1:1, or even lower ratios are used. For intense anaerobic speed intervals (30 seconds to 3 minutes), recovery intervals that last two to four times as long (1:2 to 1:4) as the work period are required.

A 1:3 ratio, for example, indicates that you’ll work at a fairly high intensity for, say, 30 seconds and then spend 90 seconds on light- to moderate-intensity recovery. Be sure to keep moving during the recovery phase. Perform four or five intervals at first, and then gradually progress to 10 intervals. As your fitness improves, you can lengthen the high-intensity proportion of the intervals progressively to 1 minute and/or decrease the total recovery time.

For aerobic sports, HIIT at least once per week improves performance. Most commonly done at a 1:2 or lower work-to-recovery ratio, you also can do a 5- to 10-minute aerobic work interval followed by 1 to 2 minutes of recovery, but the intensity of these longer intervals should not be as high, and only three to five intervals are recommended. Note that the HIIT workouts are not performed in addition to the regular aerobic workouts but, instead, take the place of one of these workouts.

Consider sport-specific strength requirements as well. Look at the primary muscles used in your sport, and make sure your choice of exercises works those muscles. Try to perform your strength training through a range of motions similar to those used in your sport. Aerobic/anaerobic sports require greater strength; during the season, the recommendation is three sets of 8 to 12 repetitions to near fatigue, two or three times per week. For aerobic endurance sports, the recommendation is a minimum of one set of 8 to 12 repetitions to near fatigue, once or twice per week during the season.

Stop-and-go sports (basketball, racquetball, soccer) require greater strength than pure endurance sports (triathlon, long-distance running, cross-country skiing). For example, recreational participants during the sport-specific training phase for stop-and-go sports perform three sets of 8 to 12 repetitions to near fatigue, two to three times per week. Competitive athletes and those desiring greater strength gains typically conduct three to five sets of 4 to 12 repetitions to near fatigue three times per week.

For some winter sports, such as alpine skiing and snowboarding, gravity supplies most of the propulsion, and the body acts more as a shock absorber. Muscles in the hips, knees, and trunk are used to control the forces on the body and equipment. Multi-joint exercises, such as the leg press, squats, and lunges, are suggested for these activities.

Before the season starts, make sure that your equipment is in proper working condition. For example, alpine skiers’ bindings should be cleaned and adjusted properly so they will release as needed. This is one of the most important things you can do to help prevent knee
Sample High-Intensity Interval Training (HIIT) Programs

The following are sample HIIT programs that you can use. For intensity levels, you should use the Physical Activity Perceived Exertion Scale (H-PAPE) in Figure 6.8, page 210. Prior to HIIT, be sure to have a sound general aerobic (cardiorespiratory) fitness base—that is, at least six weeks of aerobic training, five times per week for 20 to 60 minutes per session. Once you are ready for HIIT, always have a proper 5- to 10-minute aerobic warm-up prior to the first high-intensity interval. Also, in all cases, follow up the final high-intensity interval with a 5- to 10-minute cool-down phase. You can use the same exercise modality (running, cycling, elliptical training, stair climbing, or swimming) for your entire HIIT, or you may use a combination of these activities with some of the following programs, if such is feasible at your facility. Do not perform back-to-back HIIT on consecutive days. Preferably, depending on the intensity and volume of training, allow 2 to 3 days between HIIT sessions.

**Five-minute very hard-intensity aerobic intervals:** Exercise at a very hard rate (90 percent of maximal capacity) for 5 minutes, followed by 5 to 10 minutes of recovery at a light to moderate intensity. Start with one interval and work up to three by the third to fifth training session. Initially, use a 1:2 work-to-recovery ratio. Gradually decrease the recovery to a 1:1 ratio or even less.

**Step-wise intensity interval training:** Using 3- to 5-minute intervals, start at a light-intensity rate of perceived exertion and then progressively step up to the very hard-intensity level (light, moderate, somewhat hard, vigorous, hard, and very hard). Start with 3-minute intervals, and as you become more fit, increase to 5 minutes each. As time allows and you develop greater fitness, you can add a step-down approach by progressively stepping down to hard, vigorous, somewhat hard, moderate, and light.

**Fartlek training:** Fartlek training was developed in 1937 by Swedish coach Gösta Holmér. The word fartlek means “speed play” in Swedish. It is an unstructured form of interval training where intensity (speed) and distance of each interval is varied as the participant wishes. There is no set structure and the individual alternates the intensity (from somewhat hard to very hard) and length of each speed interval, along with the recovery intervals (light to moderate) and length thereof. Total duration of fartlek training is between 20 and 60 minutes.

**Tempo training:** Although no formal intervals are conducted with tempo training, the intensity of training qualifies it as a HIIT program. Following an appropriate warm-up, tempo runs involve continuous training between vigorous (70%) and hard (80%) for 20 to 60 minutes at a time.

**All-out or supramaximal interval training:** All-out interval training involves 10 to 20 supramaximal or sprint intervals lasting 30 to 60 seconds each. Depending on the level of conditioning and the length of the speed interval, 2 to 5 minutes recovery at a light to moderate level are allowed.

**Cardio/resistance training program:** You may use a combination of aerobic and resistance training for your HIIT. Following a brief aerobic and strength-training warm-up, select about eight resistance-training exercises that you can alternate with treadmill running, cycling, elliptical training, or rowing. Perform one set of 8 to 20 RM (based on personal preference) on each exercise followed by 90 seconds of aerobic work after each set. You can pace the aerobic intensity according to the preceding strength-training set. For example, you may choose a light intensity aerobic interval following a 10 RM for the leg press exercise and a vigorous aerobic interval after a 10 RM arm curl set. Allow no greater recovery time (2 to 5 seconds) between exercise modes than what it takes to walk from the strength-training exercise to the aerobic station (and vice versa).

Overtraining

Rest is important in any fitness conditioning program. Although the term overtraining is associated most frequently with athletic performance, it applies just as well to fitness participants. We all know that hard work improves fitness and performance. Hard training without adequate recovery, however, breaks down the body and leads to loss of fitness.

**Key Terms**

**High-intensity interval training (HIIT)** Training program that involves high- to very high-intensity (80 to 90 percent of maximal capacity) intervals, each followed by a low-to-moderate intensity recovery interval. Usually 1:3 or lower work-to-recovery ratio is used.

**Overtraining** An emotional, behavioral, and physical condition marked by increased fatigue, decreased performance, persistent muscle soreness, mood disturbances, and feelings of “staleness” or “burnout” as a result of excessive physical training.
Periodization is a training approach that uses a systematic variation in intensity and volume to enhance fitness and performance. This model was designed around the premise that the body becomes stronger as a result of training, but if similar workouts are constantly repeated, the body tires and enters a state of staleness and fatigue.

Periodization is used most frequently for athletic conditioning. Because athletes cannot maintain peak fitness during an entire season, most athletes seeking peak performance use a periodized training approach. Studies have documented that greater improvements in fitness are achieved by using a variety of training loads. Using the same program and attempting to increase volume and intensity over a prolonged time will be manifested in overtraining.

The periodization training system involves three cycles:

1. Macrocycles
2. Mesocycles
3. Microcycles

These cycles vary in length depending on the requirements of the sport. Typically, the overall training period (season or year) is referred to as a macrocycle. For athletes who need to peak twice a year, such as cross-country and track runners, two macrocycles can be developed within the year.

Macrocycles are divided into smaller weekly or monthly training phases known as mesocycles. A typical season, for example, is divided into the following mesocycles: base fitness conditioning (off-season), preseason or sport-specific conditioning, competition, peak performance, and transition (active recovery from sport-specific training and competition). In turn, mesocycles are divided into smaller weekly or daily microcycles. During microcycles, training follows the general objective of the mesocycle, but the workouts are altered to avoid boredom and fatigue.

The concept behind periodizing can be used in both aerobic and anaerobic sports. In the case of a long-distance runner, for instance, training can start with a general strength-conditioning program and cardiorespiratory endurance cross-training (jogging, cycling, swimming) during the off-season. In preseason, the volume of strength training is decreased, and the total weekly running mileage, at moderate intensities, is progressively increased. During the competitive season, the athlete maintains a limited strength-training program but now increases the intensity of the runs while decreasing the total weekly mileage. During the peaking phase, volume (miles) of training is reduced even further, while the intensity is maintained at a high level. At the end of the season, a short transition period of 2 to 4 weeks, involving light- to moderate-intensity activities other than running and lifting weights, is recommended.

Periodization is frequently used for development of muscular strength, progressively cycling through the various components (hypertrophy, strength, and power) of strength training. Research indicates that varying the volume and intensity over time is more effective for long-term progression than either single- or multiple-set programs with no variations. Training volume and intensity are typically increased only for large muscle/multi-joint lifts (e.g., bench press, squats, and lat pull-
Periodization is not for everyone. People who are starting an exercise program, who enjoy a set routine, or who are satisfied with their fitness routine and fitness level do not need to periodize. For new participants, the goal is to start and adhere to exercise long enough to adopt the exercise behavior.

### Table 9.3: Periodization Program for Strength

<table>
<thead>
<tr>
<th>Periodization Program for Strength</th>
<th>One Macrocycle</th>
<th>Mesocycle 1* Hypertrophy</th>
<th>Mesocycle 2* Strength &amp; Hypertrophy</th>
<th>Mesocycle 3* Strength &amp; Power</th>
<th>Mesocycle 4* Peak Performance</th>
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<tbody>
<tr>
<td>Sets per exercise</td>
<td>3–5</td>
<td>3–5</td>
<td>3–5</td>
<td>1–3</td>
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<tr>
<td>Repetitions</td>
<td>8–12</td>
<td>6–9</td>
<td>1–5</td>
<td>1–3</td>
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<tr>
<td>Intensity (resistance)</td>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
<td>Very High</td>
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</tr>
<tr>
<td>Volume</td>
<td>High</td>
<td>Moderate</td>
<td>Low</td>
<td>Very Low</td>
<td></td>
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<tr>
<td>Weeks (microcycles)</td>
<td>6–8</td>
<td>4–6</td>
<td>3–5</td>
<td>1–2</td>
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</tr>
</tbody>
</table>

*Each mesocycle is followed by several days of light training.*

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For nonathletes, a periodization program does not have to account for every detail of the sport. You can periodize workouts by altering mesocycles every 2 to 8 weeks. You can use different exercises, change the number of sets and repetitions, vary the speed of the repetitions, alter recovery time between sets, and even cross-train.

Periodization is not for everyone. People who are starting an exercise program, who enjoy a set routine, or who are satisfied with their fitness routine and fitness level do not need to periodize. For new participants, the goal is to start and adhere to exercise long enough to adopt the exercise behavior.

### Personal Fitness Programming: An Example

Now that you understand the principles of fitness assessment and exercise prescription given in Chapters 6 through 8 and this chapter, you can review this program to cross-check and improve the design of your own fitness program. Let’s look at an example.

Mary is 20 years old and 5 feet 6 inches tall. She participated in organized sports on and off throughout high school. During the last 2 years, however, she has participated only minimally in physical activity. She was not taught the principles for exercise prescription and has not participated in regular exercise to improve and maintain the various health-related components of fitness.

Mary became interested in fitness and contemplated signing up for a fitness and wellness course. As she was preparing her class schedule for the semester, she noted a “Lifetime Fitness and Wellness” course. In registering for the course, Mary anticipated some type of structured aerobic exercise. She knew that good fitness was impor-
tant to health and weight management, but she didn’t quite know how to plan and implement a program.

Once the new course started, she and her classmates received the “Stages of Change Questionnaire.” Mary learned that she was in the Preparation stage for cardiorespiratory endurance, the Precontemplation stage for muscular strength and endurance, the Maintenance stage for flexibility, and the Preparation stage for body composition (see the discussion of the Transtheoretical model in Chapter 2, pages 53–56). Various fitness assessments determined that her cardiorespiratory endurance level was fair, her muscular strength and endurance were poor, her flexibility was good, and her percent body fat was 25 (Moderate category).

**Critical Thinking**

In your own experience with personal fitness programs throughout the years, what factors have motivated you and helped you the most to stay with a program? • What factors have kept you from being physically active and what can you do to change these factors?

**Cardiorespiratory Endurance**

At the beginning of the semester, the instructor informed the students that the course would require self-monitored participation in activities outside the regularly scheduled class hours. Thus, Mary was in the Preparation stage for cardiorespiratory endurance. She knew she would be starting exercise in the next couple of weeks.

While in this Preparation stage, Mary chose three processes of change to help her implement her program (see Chapter 2, Table 2.1, page 54). She thought she could adopt an aerobic exercise program (Positive Outlook process of change) and set a realistic goal to reach the “Good” category for cardiorespiratory endurance by the end of the semester (Goal Setting). By staying in this course, she committed to go through with exercise (Commitment). She prepared a 12-week Personalized Cardiorespiratory Exercise Prescription, wrote down her goal, signed the prescription (now a contract), and shared the program with her instructor and roommates.

As her exercise modalities, Mary selected walking/jogging and aerobics. Initially she walked/jogged twice a week and did aerobics once a week. By the 10th week of the program, she was jogging three times per week and participating in aerobics twice a week. She also selected Self-Monitoring, Self-Reevaluation, and Countering as techniques of change (see Chapter 2, Table 2.2, page 60). Using the exercise log in Activity 6.5 in Chapter 6 (page 218), she monitored her exercise program. At the end of six weeks, she scheduled a follow-up cardiorespiratory assessment test (Self-Reevaluation process of change), and she replaced her evening television hour with aerobic training (Countering).

Mary also decided to increase her daily physical activity. She chose to walk 10 minutes to and from school, take the stairs instead of elevators whenever possible, and add 5-minute walks every hour during study time. On Saturdays, she cleaned her apartment and went to a school-sponsored dance at night. On Sundays, she opted to walk to and from church and took a 30-minute leisurely walk after the dinner meal. Mary now was fully in the Action stage of change for cardiorespiratory endurance.

**Muscular Strength and Endurance**

After Mary had started her fitness and wellness course, she wasn’t yet convinced that she wanted to strength train. Still, she contemplated strength training because a small part of her grade depended on it. When she read the information on the effect of lean body mass on basal metabolic rate and weight maintenance (Consciousness-Raising process of change), she thought that perhaps it would be good to add strength training to her program. She also was contemplating the long-term consequences of loss of lean body mass, its effect on her personal appearance, and the potential for decreased independence and quality of life (Emotional Arousal process of change).

Mary visited her course instructor for additional guidance. Following this meeting, Mary committed herself to strength-train. While yet in the Preparation stage, she outlined a 10-week periodized training program (see Figure 9.2) and opted to aim for the “Good” strength category by the end of the program.

Because this was the first time Mary had lifted weights, the course instructor introduced her to two other students who were already lifting (Helping Relationships process of change). She also monitored her program with the form provided in Chapter 7, Activity 7.3. Mary promised herself a movie and dinner out if she completed the first 5 weeks of strength training, and a new blouse if she made it through 10 weeks (Rewards process and technique for change).

**Muscular Flexibility**

Good flexibility is not a problem for Mary because she regularly stretched 15 to 30 minutes while watching the evening news on television. She had developed this habit during the last 2 years of high school to maintain flexibility as a member of the dance-drill team (Environment Control—as a team member, she needed good flexibility).

Because Mary had been stretching regularly for more than 3 years, she was in the Maintenance stage for flexibility. The flexibility fitness tests revealed that she had good flexibility. These results allowed her to pursue her stretching program because she thought that she would be excellent for this fitness component (Self-Evaluation process of change).

To gain greater improvements in flexibility, Mary chose slow-sustained stretching and proprioceptive neu-
romuscular facilitation (PNF). She would need help to carry out the PNF technique. She spoke to one of her lifting classmates; together they decided to allocate 20 minutes at the end of strength training to stretching (Helping Relationships process of change), and they chose the sequence of exercises presented in Chapter 8, Activity 8.1 (Consciousness-Raising and Goal Setting).

Body Composition

One of the motivational factors to enroll in a fitness course was Mary’s desire to learn how to better manage her weight. She had gained a few pounds since entering college. To prevent further weight gain, she thought that it was time to learn sound principles for weight management (Behavior Analysis process of change). She was in the Preparation stage of change because she was planning to start a diet and exercise program but wasn’t sure how to get it done. All Mary needed was a little consciousness raising to get her into the Action stage.

With the knowledge she had now gained, Mary planned her program. At 25 percent body fat and 140 pounds, she decided to aim for 23 percent body fat so she would be in the “Good” category for body composition (Goal Setting). This meant that she would have to lose about 4 pounds (see Chapter 4, Activity 4.1).

Mary’s daily estimated energy requirement was about 2,027 calories (see Chapter 5, Table 5.3). Mary also figured out that she was expending an additional 400 calories per day through her newly adopted exercise program and increased level of daily physical activity. Thus, her total daily energy intake would be around 2,427 calories (2,027 + 400).

To lose weight, Mary could decrease her caloric intake by 700 calories per day (body weight × 5) (see Chapter 5, Activity 5.1), yielding a target daily intake of 1,727 calories. By decreasing the intake by 700 calories daily, Mary should achieve her target weight in about 20 days (4 pounds of fat × 3,500 calories per pound of fat ÷ 700 fewer calories per day = 20 days). Mary picked the 1,800-calorie diet and eliminated one daily serving of grains (80 calories) to avoid exceeding her target 1,727 daily calorie intake.

The processes of change that will help Mary in the Action stage for weight management are Goal Setting, Countering (exercising instead of watching television), Monitoring, Environment Control, and Rewards. To monitor her daily caloric intake, Mary uses the 1,800-calorie diet plan in Chapter 5, Activity 5.3. To further exert control over her environment, she gave away all of her junk food. She determined that she would not eat out while on the diet, and she bought only low- to moderate-fat/complex carbohydrate foods during the 3 weeks. As her reward, she achieved her target body weight of 136 pounds.

You Can Get It Done

Once they understand the proper exercise, nutrition, and behavior modification guidelines, people find that implementing a fitness lifestyle program is not as difficult as
they thought. With adequate preparation and a personal behavioral analysis, you are now ready to design, implement, evaluate, and adhere to a lifetime fitness program that can enhance your functional capacity and zest for life.

Using the concepts provided thus far in this book and the exercise prescription principles that you have learned, you should now update your personal fitness program in Activity 9.1. You also have an opportunity to revise your current stage of change, fitness category for each health-related component of physical fitness, and number of daily steps taken. You have the tools—the rest is up to you!

### Assess Your Behavior

1. Do you participate in recreational sports as a means to further improve your fitness and add enjoyment to training?

2. Have you been able to meet your cardiorespiratory endurance, muscular strength, muscular flexibility, and recommended body composition goals?

### Assess Your Knowledge

Evaluate how well you understand the concepts presented in this chapter using the chapter-specific quizzing available in the online materials at www.cengagebrain.com.

1. Using a combination of aerobic activities to develop overall fitness is known as
   a. health-related fitness.
   b. circuit training.
   c. plyometric exercises.
   d. cross-training.
   e. skill-related fitness.

2. Which of the following is not a basic movement in spinning?
   a. seated running
   b. standing hill climb
   c. seated flat
   d. jumping
   e. All of the above are exercise movements in spinning

3. To help elevate the exercise heart rate during low-impact aerobics, a person should
   a. include jumping exercises during the routine.
   b. accentuate all arm movements.
   c. allow both feet to leave the ground momentarily.
   d. add bench stepping to the routine.
   e. follow all four guidelines above.

4. Diabetics should
   a. not exercise alone.
   b. wear a bracelet that identifies their condition.
   c. exercise at a light-to-moderate intensity.
   d. check blood glucose levels before and after exercise.
   e. follow all four guidelines above.

5. During pregnancy a woman should
   a. accumulate 30 minutes of moderate-intensity activity on most days of the week.
   b. exercise between “low” and “somewhat hard.”
   c. avoid exercising at an altitude above 6,000 feet.
   d. All of the above choices are correct.
   e. None of the choices is correct.

6. During exercise in the heat, drinking about a cup of cool water every ______ minutes seems to be ideal to prevent dehydration.
   a. 5
   b. 15 to 20
   c. 30
   d. 30 to 45
   e. 60

7. One of the most common causes of activity-related injuries is
   a. high impact.
   b. low level of fitness.
   c. exercising without stretching.
   d. improper warm-up.
   e. All choices cause about an equal number of injuries.

8. Improvements in maximal oxygen uptake in older adults (as compared with younger adults) as a result of cardiorespiratory endurance training are
   a. lower.
   b. higher.
   c. difficult to determine.
   d. nonexistent.
   e. similar.

9. To participate in sports, it is recommended that you have
   a. base fitness and sport-specific conditioning.
   b. at least a good rating on skill fitness.
   c. good-to-excellent agility.
   d. basic speed.
   e. all of the above.

10. Periodization is a training approach that
    a. uses a systematic variation in intensity and volume.
    b. helps enhance fitness and performance.
    c. is commonly used by athletes.
    d. helps prevent staleness and overtraining.
    e. All are correct choices.

Correct answers can be found at the back of the book.
Personal Fitness Plan

Name: ____________________________ Date: ______________

Course: ____________________ Section: ____________ Gender: ________ Age: ________

Instructions

Update your personal fitness plan according to the ACSM guidelines provided in Chapters 6–8 and define your stage of change according to the stages of change model in Chapter 2. Also, reevaluate your fitness goals and write down your new goal to achieve by the end of the term. This activity should be carried out as a homework assignment to be completed over the next 7 days.

I. Exercise Clearance

Is it safe for you to participate in an exercise program?

- [ ] Yes
- [ ] No

II. Fitness Evaluation

<table>
<thead>
<tr>
<th>Component</th>
<th>Test Results</th>
<th>Fitness Category</th>
<th>Training Frequency per Week</th>
<th>Stage of Change</th>
<th>Fitness Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiorespiratory endurance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muscular strength and endurance</td>
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<td></td>
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<td></td>
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<tr>
<td>Muscular flexibility</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body composition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NA</td>
</tr>
</tbody>
</table>
Personal Fitness Plan (continued)

III. Cardiorespiratory Endurance
Outline your cardiorespiratory endurance program according to ACSM guidelines. Include intensity, frequency, duration, aerobic activities, time of day for training, facility where you will perform the training, and reward for accomplishing your goal.

IV. Muscular Strength and Endurance
Using ACSM guidelines, outline your muscular strength/endurance training program. List the exercises used, sets and repetitions, amount of resistance to be used, frequency per week, training facility, and reward for accomplishing your goal.
Personal Fitness Plan (continued)

V. Muscular Flexibility
Design your flexibility training program to include the selected exercises, technique used, number of repetitions for each exercise, length of final hold, site for training, and reward for accomplishing your goal.

VI. Recreational Activities
List any other sports or recreational activities in which you participate and include how often and how long you participate. Indicate also the primary reason for participation in these activities (physical activity, fitness, competition, skill development, recreation, stress management) and your future goals for these activities.

VII. Daily Physical Activity
Indicate the efforts that you are making to increase daily physical activity, your feelings about your choice of activities, and what future goals you have regarding daily physical activities.

Total number of daily steps: ___
Personal Fitness Plan (continued)

VIII. Body Composition and Fitness Benefits
List all of the activities in which you participate regularly and rate the respective contribution to body composition and other fitness components. Use the following rating scale: 1 = low, 2 = fair, 3 = average, 4 = good, and 5 = excellent.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Body Composition</th>
<th>Cardiorespiratory</th>
<th>Musc. Strength</th>
<th>Musc. Flexibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example: Jogging</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

IX. Contract
I hereby commit to carry out the above described fitness plan and complete my goals by

Upon completion of all my fitness goals I will present my results to and will reward myself with

My signature ______________________________________________________________________
Date ____________

Witness signature ______________________________________________________________________
Date ____________
Chapter 9:

Notes


10. See note 7.

Suggested Readings


Answer Key

This page contains answers for this chapter only

Chapter 9
1. d  2. a  3. b  4. e  5. d  6. b  7. a  8. e  9. a  10. e
Stop exercise and seek medical advice if you experience any of the following symptoms:

- Unusual pain or discomfort, especially in the chest or abdominal area
- Cramping, primarily in the pelvic or lower back areas
- Muscle weakness, excessive fatigue, or shortness of breath
- Abnormally high heart rate or a pounding (palpitations) heart rate
- Decreased fetal movement
- Insufficient weight gain
- Amniotic fluid leakage
- Nausea, dizziness, or headaches
- Persistent uterine contractions
- Vaginal bleeding or rupture of the membranes
- Swelling of ankles, calves, hands, or face