Physical Activity Pyramid:

Level 2 Activities

Healthy People 2010 Goals
- Increase regular vigorous physical activity of teens.
- Improve cardiovascular fitness.
- Reduce risk of a variety of heart diseases.

Unit Activities
- Aerobic Dance Routine
- Cardiovascular Fitness: How Much Activity Is Enough?
- Step Aerobics
- Jogging: Biomechanical Principles and Guidelines
- Orienteering
- The Sports Stars Program
Aerobic Dance Routine

Aerobic dance is a type of exercise routine that is also a form of aerobic exercise. Aerobic dance routines are developed by combining a variety of steps and arm movements performed to music. The key to getting a good aerobic workout during the routine is to keep moving at a regular pace. Many young people enjoy aerobic dance because they can get a good workout while listening to music they enjoy.
Lesson 7.1

Cardiovascular Fitness Facts

Lesson Objectives
After reading this lesson, you should be able to
1. Describe the benefits of cardiovascular fitness to health and wellness.
2. Explain the relationship between physical activity and good cardiovascular fitness.
3. Describe and demonstrate some methods you can use to assess your cardiovascular fitness.
4. Determine how much cardiovascular fitness is enough.

Lesson Vocabulary
artery (p. 104), cardiovascular system (p. 103), cholesterol (p. 104), fibrin (p. 104), high-density lipoprotein (HDL) (p. 104), lipoproteins (p. 104), low-density lipoprotein (LDL) (p. 104), respiratory system (p. 103), vein (p. 106)

Benefits of Physical Activity and Cardiovascular Fitness

Of the 11 parts of fitness, cardiovascular fitness is the most important because those who have it receive many health and wellness benefits, including a chance for a longer life. The activity that you do to improve your cardiovascular fitness will make you look better, too. The boy in the figure can run a long distance because he has good cardiovascular fitness. When doing regular physical activity, to improve your cardiovascular fitness requires fitness of the heart, lungs, blood, blood vessels, and muscles, as shown in the figure. In this lesson you will learn how proper physical activity improves cardiovascular fitness. You will also learn how to assess your own cardiovascular fitness.

Looking good is important to most people, and you most likely are one of them. Doing regular physical activity can help you look better by controlling your weight, building muscle, and developing good posture. In addition, regular physical activity produces changes in body organs such as making your heart muscle stronger and your blood vessels healthier. These changes result in improved cardiovascular fitness and wellness, as well as a reduction in risk of hypokinetic diseases.

Regular physical activity benefits two vital body systems. Your cardiovascular system is made up of your heart, blood vessels, and your blood. Your respiratory system is made up of your lungs and the air passages that bring air, including oxygen, from outside of the body into the lungs. In your lungs, oxygen enters your blood while carbon dioxide is eliminated. The cardiovascular and respiratory systems work together to bring your body cells the materials they need to function and to rid the cells of waste. Exercise helps these systems function more effectively (with the most benefits possible) and efficiently (with the least amount of effort).

Heart

Because your heart is a muscle, it benefits from exercise and activities such as jogging, swimming, or long-distance hiking. Your heart acts as a pump to supply...
blood to your body cells. When you do vigorous physical activity, your muscle cells need more oxygen and they produce more waste products. Your heart must pump more blood to supply the increased amount of oxygen and to remove the waste products. If your heart is unable to pump enough blood, your muscles will be less able to contract and they will become fatigued more quickly.

Your heart’s ability to pump blood is very important when doing physical activity, especially for an extended length of time. Your heart has two ways to get more blood to your muscles—by beating faster or by sending more blood with each beat.

You might recall from the self-assessment in chapter 1 that your resting heart rate is the number of heartbeats per minute when you are relatively inactive. A person who does regular physical activity might have a resting heart rate of 55 to 60 beats per minute, while a person who does not exercise regularly might have a resting heart rate of 70 or more beats per minute. A very fit person’s heart beats approximately 9.5 million times less each year than that of the average person. As you can see in table 7.1, a fit person’s heart works more efficiently by pumping more blood with fewer beats.

**Blood**

Although your body needs a certain amount of fat, excessive amounts trigger formation of fatty deposits along artery walls. Cholesterol, a fatlike substance found in meats, dairy products, and egg yolks, can be dangerous because high levels can build in your body without you noticing.

Cholesterol is carried through the bloodstream by particles called lipoproteins. One kind, low-density lipoprotein (LDL), is often referred to as bad cholesterol because LDLs carry excess LDLs out of the bloodstream and into the liver for elimination from the body. Therefore, HDLs appear to help prevent atherosclerosis. An HDL level above 60 is considered optimal for good health. For more information on HDL and LDL consult the Internet address listed in the Web icon.

An LDL lower than 100 is considered optimal for good health. Another kind, high-density lipoprotein (HDL), is often referred to as good cholesterol; HDLs help carry excess LDLs out of the bloodstream. Therefore, HDL levels are important. Regular physical activity helps improve your cardiovascular fitness by reducing LDL (bad cholesterol) levels and increasing HDL (good cholesterol) levels. Also, exercise can help prevent blood clots from forming by reducing the amount of fibrin in the blood. Fibrin is a substance involved in making your blood clot. High amounts of fibrin can contribute to the development of atherosclerosis.

**Arteries**

Each artery carries blood away from your heart to another part of your body. Blood is forced through your arteries by the beating of your heart. A strong heart and healthy lungs are not very helpful if your arteries are not clear and open. You know that fatty deposits on the inner walls of an artery lead to atherosclerosis. An extreme case of atherosclerosis can totally block the blood flow in an artery. Also, the hardened deposits allow blood clots to form, severely blocking blood flow. In either case, the heart muscle does not get enough oxygen and a heart attack occurs.

Regular physical activity has other cardiovascular benefits. Scientists have found that people who exercise regularly develop more branching of the arteries in the heart. In the drawing on page 106 you can see that the heart muscle has its own arteries (coronary arteries) that supply it with blood and oxygen. People who exercise regularly develop extra coronary arteries. The importance of a richer network of blood vessels can be shown in this example. After astronaut Ed White died in a fire in 1967 while training for a mission, an autopsy was performed. Doctors found that one of the major arteries in his heart was completely blocked due to atherosclerosis. Because of all the physical training astronauts do, scientists think White’s body had developed an extra branching of arteries in his heart muscle. Therefore, he didn’t die of a heart attack when a main artery was blocked. White had been able to continue a high level of physical fitness training without signs of heart trouble.
Table 7.1  
Benefits of Physical Activity on the Cardiovascular and Respiratory Systems

<table>
<thead>
<tr>
<th>Organ</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| Heart                  | • Heart muscle gets stronger  
                          • Pumps more blood with each beat  
                          • Beats slower  
                          • Gets more rest  
                          • Works more efficiently |
| Blood vessels          | • Healthy elastic arteries allow more blood flow  
                          • Less risk of atherosclerosis  
                          • Lower blood pressure  
                          • Less risk of a blood clot leading to heart attack  
                          • Development of extra blood vessels  
                          • Healthy veins with healthy valves |
| Blood                  | • Less bad cholesterol (LDL) and other fats in the blood  
                          • More good cholesterol (HDL) in the blood  
                          • Fewer substances in the blood that cause clots |
| Nerves of the heart    | Regular exercise helps the nerves slow your heart rate at rest.         |
| Lungs                  | • Lungs work more efficiently  
                          • Deliver more oxygen to the blood  
                          • Healthy lungs allow deeper and less frequent breathing |
| Cells                  | • Use oxygen efficiently  
                          • Get rid of more wastes  
                          • Use blood sugars and insulin more effectively to produce energy |
Veins
Each vein carries blood filled with waste products from the muscle cells back to the heart. One-way valves in your veins keep the blood from flowing backward. Your muscles squeeze the veins to pump the blood back to your heart. Regular cardiovascular exercise helps make your muscles squeeze your veins efficiently. A lack of physical activity can cause the valves, especially those in the legs, to stop working efficiently, thereby reducing circulation in your legs.

Nerves of Your Heart
Your heart muscle is not like your arm and leg muscles. When your arm and leg muscles contract, nerves in the muscles are responding to a message sent by the conscious part of your brain. In contrast, your heart is not controlled voluntarily; it beats regularly without you telling it to do so. Your heart rate is controlled by a part of the heart called a pacemaker. It sends out an electrical current telling the heart to beat regularly. People who do regular cardiovascular exercise often develop a slower heart rate because the heart pumps more blood with each beat and so it can beat less often. As a result your heart works more efficiently because each heartbeat supplies more blood and oxygen to your body than if you did not exercise. In addition, a person with a slower heart rate can function more effectively during an emergency or during vigorous physical activity.

Muscle Cells
For you to be able to do physical activity for a long time without getting tired, your muscle cells must function efficiently and effectively. Regular physical activity helps cells use oxygen and get rid of waste materials effectively. Physical activity also helps the muscle cells use blood sugar, with the aid of the hormone insulin, to produce energy. This function is important to good cardiovascular health.

Cardiovascular Assessment
You might be curious about your cardiovascular fitness—how good is it? Special tests can assess your cardiovascular fitness. The maximal oxygen uptake test is considered the best test of cardiovascular fitness. It is done in a laboratory using special equipment, including a gas meter and a treadmill or a stationary bicycle (see photo on page 107). Another type of lab test of cardiovascular fitness is the graded exercise test, sometimes called the exercise stress test. This test also requires a treadmill or stationary bicycle and a special heart rate monitor.
Self-Assessment
The tests just described are often quite expensive because of the need for special equipment and fitness experts. For this reason several self-assessments have been developed to allow you to conveniently assess your own cardiovascular fitness with a minimum of equipment and expense. You will get an opportunity to try several self-assessments in this class.

Interpreting Self-Assessment Results
It is wise to do more than one self-assessment for cardiovascular fitness. Self-assessments are not as accurate as laboratory tests of fitness. However, they do give a good estimate of your fitness level. Each assessment has its own strengths and weaknesses. For example, the results of the PACER (chapter 8) and one-mile run (this chapter) are influenced by your motivation; if you don’t try very hard, you won’t get an accurate score. The walking test (chapter 6) is a good indicator of fitness for most people but is not best for assessing high-level fitness. The step test (this chapter) uses heart rate; therefore, motivation does not influence the results as much as in some other assessments. But results on the step test can be distorted if you have done other exercise that might elevate the heart rate before doing the assessment. The test also can be influenced by emotional factors that cause the heart rate to be higher than normal. Finally, your results may vary depending on the time of day the assessment is done.

FIT FACTS
Cardiovascular fitness is sometimes referred to by other names including aerobic fitness, aerobic capacity, cardiovascular endurance, and cardiorespiratory fitness.

Because you may get different ratings on different tests of cardiovascular fitness, consider the strengths and weaknesses of each test when making decisions about which score is most indicative of your fitness.

How Much Cardiovascular Fitness Is Enough?
To get the health and wellness benefits associated with cardiovascular fitness, you should achieve the good fitness zone in the rating charts that accompany each self-assessment in this book. It is important to know that benefits are associated with moving out of the low fitness zone. Risk of hypokinetic diseases is greatest for those in the low fitness zone. Because cardiovascular fitness is a requirement for high-level performance in many sports, if you aspire to be an athlete you may want to train harder than most people to achieve the high performance zone. Achieving this level is not necessary to get most of the health and wellness benefits, and it may be difficult for some people.

Lesson Review
1. What are some benefits of cardiovascular fitness to health and wellness?
2. What is the relationship between physical activity and cardiovascular fitness?
3. What are some methods for assessing cardiovascular fitness and how are they performed?
4. How much cardiovascular fitness is enough?
As you learned in the previous lesson, several tests of cardiovascular fitness can be done in physical-fitness laboratories by trained technicians. But if you want a quicker, easier, and less expensive test, try the step test or the one-mile run. You might do either of these assessments to see how fit you are. After you have done regular exercise over a period of time, test yourself again to see how much you have improved.

### Step Test

1. Use a 12-inch-high bench. Step up with your right foot. Step up with your left foot.
2. Step down with your right foot. Step down with your left foot. Repeat this 4-count (up, up, down, down). Step 24 times each minute for 3 minutes.

**Note:** The height of the bench and the rate of stepping are both very important to getting an accurate test result. You should sit calmly for several minutes before the test to assure that your resting heart rate is normal.

3. Immediately after stepping for 3 minutes, sit and use the procedure you learned in the self-assessment in chapter 1 to count your own pulse. Begin counting within 5 seconds. Count for 1 minute.
4. Record your results on your worksheet. Check your cardiovascular rating in table 7.2 and write it on your record sheet.

### Table 7.2

**Rating Chart: Step Test (Beats per Minute)**

<table>
<thead>
<tr>
<th>Males</th>
<th>Females</th>
<th>Males</th>
<th>Females</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>13 YEARS AND YOUNGER</strong></td>
<td><strong>14 TO 16 YEARS OLD</strong></td>
<td><strong>17 YEARS AND OLDER</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High performance</td>
<td>90 or less</td>
<td>100 or less</td>
<td>85 or less</td>
<td>95 or less</td>
<td>80 or less</td>
</tr>
<tr>
<td>Good fitness</td>
<td>91-98</td>
<td>101-110</td>
<td>86-95</td>
<td>96-105</td>
<td>81-90</td>
</tr>
<tr>
<td>Marginal fitness</td>
<td>99-120</td>
<td>111-130</td>
<td>96-115</td>
<td>106-125</td>
<td>91-110</td>
</tr>
<tr>
<td>Low fitness</td>
<td>above 120</td>
<td>above 130</td>
<td>above 115</td>
<td>above 125</td>
<td>above 110</td>
</tr>
</tbody>
</table>

Those who cannot step for 3 minutes receive a low fitness rating.
One-Mile Run

The one-mile run is an alternative test of cardiovascular fitness. Remember that this test is for your own information; it is not a race. Your goal is a good fitness rating. Once you achieve this rating, a faster time does not necessarily improve your health. However, it might help you perform better in a sport or other activity.

1. Run or jog for 1 mile in the shortest possible time. Try to set a pace that you can keep up for the full mile. A steady pace is best. If you start too fast and then have to slow down at the end, you will probably not be able to run for the entire distance.

2. Your score is the amount of time it takes you to run the mile. Record this score on your record sheet.

3. Find your rating in table 7.3 and write it on your record sheet.

Note: The one-mile run can be included in your FITNESSGRAM report if you choose.

Table 7.3
Rating Chart: One-Mile Run (Minutes:Seconds)

<table>
<thead>
<tr>
<th></th>
<th>13 YEARS AND YOUNGER</th>
<th>14 YEARS OLD</th>
<th>15 YEARS OLD</th>
<th>16 YEARS AND OLDER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
<td>Males</td>
<td>Females</td>
</tr>
<tr>
<td>High performance</td>
<td>7:30 or less</td>
<td>9:00 or less</td>
<td>7:00 or less</td>
<td>8:30 or less</td>
</tr>
<tr>
<td>Good fitness</td>
<td>7:31-9:00</td>
<td>9:01-10:30</td>
<td>7:01-8:30</td>
<td>8:31-10:00</td>
</tr>
<tr>
<td>Marginal fitness</td>
<td>9:01-10:00</td>
<td>10:31-11:30</td>
<td>8:31-9:30</td>
<td>10:01-11:00</td>
</tr>
<tr>
<td>Low fitness</td>
<td>above 10:00</td>
<td>above 11:30</td>
<td>above 9:30</td>
<td>above 11:00</td>
</tr>
</tbody>
</table>
Lesson 7.2

Building Cardiovascular Fitness

Lesson Objectives
After reading this lesson, you should be able to
1. Explain the difference between aerobic activity and anaerobic activity.
2. Describe the FIT formula for developing cardiovascular fitness.
3. Explain how to determine a threshold of training and a target zone for building cardiovascular fitness using two different heart rate methods.

Lesson Vocabulary
active aerobic activity (p. 110), aerobic activity (p. 110), anaerobic activity (p. 111)

www.fitnessforlife.org/student/7/6

You now know that physical activity is important to your cardiovascular fitness. But how much physical activity do you have to do to improve your cardiovascular fitness? In this lesson you will learn about the best types of activity for building cardiovascular fitness. You will also learn to determine how much physical activity you need to build cardiovascular fitness.

Physical Activity and Cardiovascular Fitness

In chapter 6 you learned that aerobic physical activities of moderate intensity can provide many health benefits. The term aerobic means "with oxygen." Aerobic activity is activity that is steady enough to allow the heart to supply all the oxygen your muscles need. Moderate lifestyle physical activities are considered to be aerobic because you can do them for long periods without stopping, but they may not be intense enough to produce cardiovascular fitness. Active aerobic activity (or active aerobics) is a more vigorous type of aerobic activity that elevates the heart rate high enough to build cardiovascular fitness. Vigorous physical activity such as active aerobics can provide health benefits similar to lifestyle physical activity and have the added advantage of helping you improve your cardiovascular fitness. In this chapter active aerobics will refer to physical activities that are more vigorous than lifestyle activities and that elevate the heart rate above the cardiovascular heart rate threshold of training. Later in this chapter you will learn more about the threshold of training and target zone for building cardiovascular fitness using active aerobics. In chapter 8, you will learn more about active aerobics as well as about sports and active recreation. All of these activities can build cardiovascular fitness.

How Much Cardiovascular Activity Is Enough?

In the previous chapter you learned that every American, including teens, should accumulate 30 minutes or more of moderate intensity physical activity on most, preferably all, days of the week. As you learned in chapter 6, moderate or lifestyle activity is as intense as moderate walking but can include activities such as working in the yard or riding a bicycle at a leisurely pace. This amount of activity is the minimum each person should do to get health and wellness benefits. But experts also indicate that teens should do vigorous physical activity such as active aerobics. Vigorous activity that increases

Exercise equipment such as the treadmill shown in the photo can help you keep active and build your cardiovascular fitness.
Cardiovascular Fitness

Your heart rate above a threshold level is important to building good levels of cardiovascular fitness and building extra health benefits in addition to those resulting from lifestyle physical activity. Table 7.4 describes the threshold of training.

Table 7.4

<table>
<thead>
<tr>
<th>Threshold of training</th>
<th>Target zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>3 days/week</td>
</tr>
<tr>
<td>Intensity</td>
<td>50% HRR</td>
</tr>
<tr>
<td></td>
<td>65% maxHR</td>
</tr>
<tr>
<td>Time</td>
<td>20 continuous min</td>
</tr>
</tbody>
</table>

Note: The values in this table are for those with good cardiovascular fitness. Those with low fitness should use 40% of heart rate range or 55% for the maximal heart rate to calculate threshold values. See activity 2 in this chapter.

To achieve cardiovascular fitness, your heart rate must be elevated above the threshold of training heart rate and into the target fitness zone. At a minimum you must be active three times a week for 20 minutes each time. For best results you should be active five or six days a week for up to 60 minutes each day. Experts have learned that you need one or two days of rest from this higher intensity physical activity. If you exercise more often, you risk getting injured. More details concerning the FIT formula for cardiovascular fitness are shown in Table 7.4.

**The FIT Formula for Building Cardiovascular Fitness**

National guidelines suggest that teenagers should do regular vigorous physical activity. The guidelines state that teenagers should engage in three or more sessions per week of activities that last 20 or more minutes at a time and that require moderate to vigorous levels of exertion. To achieve cardiovascular fitness, your heart rate must be

**Anaerobic Physical Activity**

The sprinters in the picture are doing anaerobic activity. Anaerobic activity is activity that is so intense that your body cannot supply adequate oxygen to sustain it for long periods of time. For this reason, it is frequently done in short bursts. Anaerobic activities include sprinting, swimming very fast, and bursts of activity in sports.
Taking Charge: Learning to Self-Monitor

An activity log is a written account of the physical activities that you participate in during a specified time. It’s a way to keep track of what you do so that you can tell whether you are meeting your activity goals.

Mark enjoyed playing tennis on the weekends. He would start out full of energy but lacked the endurance to play well for a complete match. His instructor suggested that he do some daily activities to improve his endurance. For several weeks Mark reported that he faithfully engaged in the activities. But Mark’s instructor was a little skeptical based on his level of improvement. Finally, she suggested that Mark keep a log of all the times he actually did the activities. “Boy, was I surprised. I rarely spent as much time as I thought on each activity. I really thought I was doing well until I actually saw the results written down.”

Erica’s situation was different. She had knee surgery and was ordered to limit the kinds and amount of activity she engaged in and follow a schedule of rehabilitation exercises. She was also supposed to elevate her leg whenever possible. Erica’s leg was often swollen and sore at the end of the day. Her physical therapist suggested that she keep a daily log. Erica discovered that she spent much more time on her feet than she realized. She knew that she had to curtail more activities for her knee to heal yet still continue to do her rehabilitation exercises.

For Discussion

How did the logs help both Mark and Erica? What are some other ways in which a log could help people? What are some good suggestions that can help people keep up with their activity logs? Set a one-week physical activity goal for yourself. Use a weekly log to keep track of how well you meet your goal (available from your teacher). Consider the guidelines on page 113.

Lesson Review

1. What is the difference between aerobic activity and anaerobic activity?
2. What is the FIT formula for developing cardiovascular fitness?
3. How do you determine a threshold of training and a target zone for building cardiovascular fitness? Use two different heart rate methods.

If you are interested in doing anaerobic activity, you should perform it three to six days a week. The intensity of your activity should be at the upper level of the target zone because your exercise bouts are short. Keep your heart rate high for 10 to 40 seconds, then walk or jog slowly. This slow pace should last three times the length of the exercise. Alternate fast and slow exercise bouts. The total exercise time should be at least 15 minutes. Consult your teacher, coach, or the Web site listed above for more information on this type of activity.
Self-Management Skill

Learning to Self-Monitor

One of the truths of human nature is that adults tend to underestimate how much they eat and overestimate how much physical activity they get. We make other errors in estimating what we do. For example, people often underestimate how much television they watch and how much money they spend on non-essential items. Self-monitoring is another name for keeping track of what you do. We all self-monitor our behavior in informal ways, but sometimes it is necessary to make formal assessments if we want accuracy. You can self-monitor current behaviors to help you set goals and plan. You can also use self-monitoring to help you determine whether you are meeting your goals and fulfilling your plans. Self-monitoring of physical activity is sometimes referred to as record keeping or keeping activity logs. Follow these guidelines to effectively monitor your physical activity:

► Keep a written log. Make a formal record of the physical activities you perform by using the activity log provided by your instructor or a computer program such as ACTIVITYGRAM (see Fitness Technology in chapter 4, page 65).

► Record information as frequently as possible. The longer you wait before you write down what you do, the more likely you are to make an error. Write things down as soon after you do them as possible.

► Start by self-monitoring your current activity patterns. Use the activity log or ACTIVITYGRAM computer program to determine your current activity level. To get an accurate picture of your true activity level you should monitor for at least three days, at least one of which should be a weekend day. For most people, activity patterns are different on weekends than on weekdays.

► Use your current activity patterns to help you to determine your future goals and plans. People who are already active can set higher goals than those who are less active (just beginning).

► Determine how much activity you do in each area of the Physical Activity Pyramid. For each of the different types of activity in the pyramid, you can determine the frequency, intensity, and time for each.

► Write down your goals and plans and then keep records to see whether you fulfill them. In chapter 5 you learned to set goals and develop plans for different types of activity. Putting your goals and plans in writing can help you self-monitor. Keep records to see whether you did what you planned to do. Keep a diary or an activity chart. A sample of a written plan is included in chapter 18, page 309. Also you can ask your teacher for a record-keeping worksheet.

► Consider using an activity monitor to monitor your activity. Pedometers and heart rate watches are examples of activity monitors. You learned about pedometers in chapter 6 and about heart rate monitors earlier in this chapter.

► Use these guidelines to self-monitor other behaviors such as eating patterns.
PART 1: Calculating Target Heart Rate Zone

In chapter 1 you learned how to count your radial and carotid pulse at rest and after exercise. In this activity you will learn how to use heart rate counting to determine whether you are doing enough physical activity to build cardiovascular fitness. As you learned earlier in this chapter, if you have a heart rate watch you can use it to count your heart rate.

To build cardiovascular fitness you must elevate the heart rate above the threshold of training and into the target zone (see table 7.4 on page 111). Two methods exist to determine your target heart rate zone. They are explained next. Use your record sheet to calculate your target heart rate zone using both methods.

Finding Your Maximal Heart Rate

For both methods of determining your target heart rate zone you will need to know your maximal heart rate, the highest your heart rate ever gets. A formula can be used to estimate your maximal heart rate:

Maximal heart rate = 208 – (.70 × your age)

For a 16-year-old the estimated maximal heart rate would be 208 – (.70 × 16) or 208 – 11 = 197. This formula was recently developed by researchers to replace a formula that made estimates that were too high for young people. You can calculate your own maximal heart rate using the formula or using table 7.5.

Table 7.5

<table>
<thead>
<tr>
<th>Your age</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
</tr>
</thead>
<tbody>
<tr>
<td>MaxHR</td>
<td>200</td>
<td>199</td>
<td>198</td>
<td>197</td>
<td>197</td>
<td>196</td>
<td>195</td>
<td>195</td>
</tr>
</tbody>
</table>
Heart Rate Range Method

This method is considered the most accurate, but it is a bit more difficult to calculate. To use this method you must know both your maximal and your resting heart rates. Table 7.6 provides an example of this calculation for a 16-year-old person.

1. Begin by estimating your maximal heart rate using the information provided earlier. The maximal heart rate in the example is 197.
2. Next, determine your heart rate range by subtracting your resting heart rate from your maximal heart rate. The resting heart rate in the example is 67 and the heart rate range is 130.
3. To calculate your threshold heart rate, multiply your heart rate range by 50 percent (0.5). Then add your resting heart rate. In the example the threshold would be 132.
4. Calculate your target ceiling rate by repeating steps 1 through 3, but in step 3 multiply by 85 percent, not 50 percent. In the example the target ceiling heart rate is 178.
5. The target heart rate zone for the 16-year-old person in this example is 132 to 178.

<table>
<thead>
<tr>
<th>Threshold HR</th>
<th>Step 1</th>
<th>197 (maxHR)*</th>
<th>Step 2</th>
<th>– 67 (resting HR)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Step 3</td>
<td>130 (HRR)</td>
<td>× .50</td>
<td>(threshold %)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>65</td>
<td>+ 67</td>
<td>(resting HR)</td>
</tr>
<tr>
<td>Target ceiling rate</td>
<td>132</td>
<td>(threshold HR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Target HR zone</td>
<td>132-178</td>
<td>beats/min</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Percent of Maximal Heart Rate Method

This method is not quite as accurate as the heart rate range method but it is easier to calculate. In this method you do not use your resting heart rate.

1. Estimate your maximal heart rate. The maximal heart rate in the example is 197.
2. To find your threshold heart rate, multiply this number by 65 percent (0.65). For the example in table 7.7, the threshold would be 128.
3. To calculate your target ceiling rate, repeat steps 1 and 2, but in step 2 multiply by 90 percent. For the example in table 7.7, the ceiling rate would be 177.
4. The target heart rate zone for the 16-year-old person in this example is 128 to 177. The numbers are slightly lower than for the HRR method.

<table>
<thead>
<tr>
<th>Threshold HR</th>
<th>Step 1</th>
<th>197 (maxHR)*</th>
<th>Step 2</th>
<th>× .65 (threshold %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>128 (threshold HR)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Target ceiling rate</td>
<td>197</td>
<td>(maxHR)*</td>
<td>× .90</td>
<td>(target ceiling %)</td>
</tr>
<tr>
<td>Target HR zone</td>
<td>128</td>
<td>(target ceiling rate)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Target HR zone</td>
<td>128-177</td>
<td>beats/min</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PART 2: Walking and Jogging

When using the heart rate counting method for determining how much activity you need, it is important to be able to continue to exercise in your target heart rate zone. In this part of the activity you will walk and jog in your target heart rate zone.

Walking

1. Walk briskly for 5 minutes.
2. At the end of your walk, immediately count your one-minute heart rate. Record your heart rate on your record sheet.
3. Determine whether your heart rate reached your heart rate threshold of training (lower limit of your target heart rate zone). You can use the zone you calculated with either method discussed earlier.
4. Check to see that your heart rate did not exceed your target ceiling heart rate (the upper limit of your target heart rate zone).

Jogging

1. Jog at a steady pace for 5 minutes.
2. At the end of your jog, immediately count your one-minute heart rate. Record your heart rate on your record sheet.
3. Determine whether your heart rate reached your heart rate threshold of training (lower limit of your target heart rate zone). You can use the zone you calculated with either method discussed earlier.
4. Check to see that your heart rate did not exceed your target ceiling heart rate (the upper limit of your target heart rate zone).

Additional Activity

Use the remainder of the class performing an activity of your choice. Choose an activity that keeps your heart rate above the threshold heart rate and in the target zone. Try to get 20 minutes of total activity above the threshold, including the 5-minute jog that you performed. Count your heart rate at least twice in this part of the activity to see whether you are in your target heart rate zone.
Project

Investigate the heart rates of people of different fitness levels. Check the pulse rates of athletes who do activities requiring a lot of cardiovascular fitness such as cross-country running and distance swimming. Compare these heart rates to heart rates of nonathletes.

Chapter Review

Reviewing Concepts and Vocabulary

Number your paper from 1 to 5. Next to each number, write the word (or words) that correctly completes the sentence.

1. Vessels that carry blood to the heart are called ________.
2. Walking, jogging, and bicycling are examples of ________ activity.
3. The body system that includes your heart, blood vessels, and blood is the ________.
4. Carriers of cholesterol in the blood are called ________.
5. The body system that includes your lungs and air passages is the ________.

Number your paper from 6 to 10. Next to each number, choose the letter of the best answer.

<table>
<thead>
<tr>
<th>Column I</th>
<th>Column II</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. aerobic activity</td>
<td>a. fatlike substance in the blood</td>
</tr>
<tr>
<td>7. cholesterol</td>
<td>b. heart can supply necessary oxygen to muscles</td>
</tr>
<tr>
<td>8. high-density lipoprotein</td>
<td>c. bad cholesterol</td>
</tr>
<tr>
<td>9. low-density lipoprotein</td>
<td>d. heart cannot supply necessary oxygen to muscles</td>
</tr>
<tr>
<td>10. anaerobic activity</td>
<td>e. carries cholesterol out of the bloodstream</td>
</tr>
</tbody>
</table>

Number your paper from 11 to 15. Write a short answer for each statement or question.

11. Describe the two different methods of determining your heart rate target zone.
12. Why is it important to monitor your heart rate to make sure that it is in the target heart rate zone?
13. Explain how cardiovascular fitness helps your cardiovascular system work more efficiently and helps prevent cardiovascular diseases.
14. Explain why cholesterol can be dangerous to your health.
15. Why should you do more than one self-assessment for determining cardiovascular fitness?

Thinking Critically

Write a paragraph to answer the following question.

You decide that you need to develop a program to improve your cardiovascular fitness. What are some lifelong changes that you should incorporate into your program? Explain.