

6

Flexibility Exercises



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Lesson 6.1

Flexibility Exercises: Level 3 of the Physical Activity Pyramid

Lesson Vocabulary

ballistic stretching, gravity, joint, ligaments, muscles, PNF (proprioceptive neuromuscular facilitation), range of motion, static stretching, strain, strategy, tactics, tendons

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One of the types of activities in the Physical Activity Pyramid is flexibility exercise. Do you know what flexibility is? Do you know the best way to stretch your muscles to build flexibility? When you finish this lesson, you'll know the answers to these questions. You'll also know some guidelines that will help people to feel comfortable in physical activity and to make it more fun.

What Is Flexibility?

Flexibility is the ability of your joints to move as they're supposed to move. Each **joint** (location where your bones join together) in your body is designed to move in a certain way. The amount of movement in a joint is called its **range of motion**. Some joints, such as the hip and the shoulder, allow a large range of motion because they can move in many directions (see Biomechanical Principles on pages 73-74). Other joints, such as the knee and the elbow, bend in only one direction. So the amount of flexibility you have is affected by your joints.

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Flexibility is also affected by other factors such as your age, your gender, and the structure of your bones. Most parts of health-related physical fitness improve with age. However, flexibility is the one part of physical fitness that decreases with age. Children are more flexible than most teens, and teens are typically more flexible than adults. Very old people are the least flexible of all. Girls and women typically have better flexibility than boys and men, though that's not always true. Other factors, such as the structure of your bones and the way the joints fit together, can affect flexibility. Some people have a joint structure that allows more range of motion than in other people who have joints with a tighter bone structure.

No matter how old you are, whether you're a male or a female, or what types of bones and joints you inherit, you can improve your flexibility by doing regular stretching exercises. All physical activities require some flexibility. For example, basketball requires long and fit **muscles**, especially in the legs. The girls in the photos below do regular stretching exercises, so they have good flexibility and good range of motion.



Regular stretching lengthens muscles that are used in physical activities.

How Do I Build Flexibility?

Some degree of stretching occurs naturally during lifestyle activities, sports, aerobic activities, and recreational activities. But often, it's not enough to build the flexibility you need for good health. Performing regular stretching exercises from level 3 of the Physical Activity Pyramid is the best way to build flexibility. It's important to know that you can have good flexibility in one part of your body without having it in another. For example, you could have long muscles and good flexibility in the lower part of your body but short muscles and poor flexibility in the upper part of your body. You should also know that incorrect stretching can be harmful and can result in joint or muscle injury (see Biomechanical Principles on page 73-74).

FIT FACT

People who can move their body parts into odd positions might say they're double-jointed, but there's no such thing. Their joints allow a large range of motion and are surrounded by very long muscles and tissues.

When you stretch your muscles, you also stretch your tendons. **Tendons** are the bands of tissue that connect muscles to bones. Both muscles and tendons are elastic, so stretching doesn't harm them if done properly. **Ligaments** attach bones to bones, but they're not elastic, so it's not good to overstretch them. Good stretching exercises, such as the ones described in this book, stretch muscles and tendons but don't stretch ligaments.

The most common type of stretching is **static stretching**. *Static* means "stationary" (without movement). When you perform static

stretches, you stretch the muscle until it's longer than normal and then hold the stretch. Table 6.1 shows several ways to do static stretching.

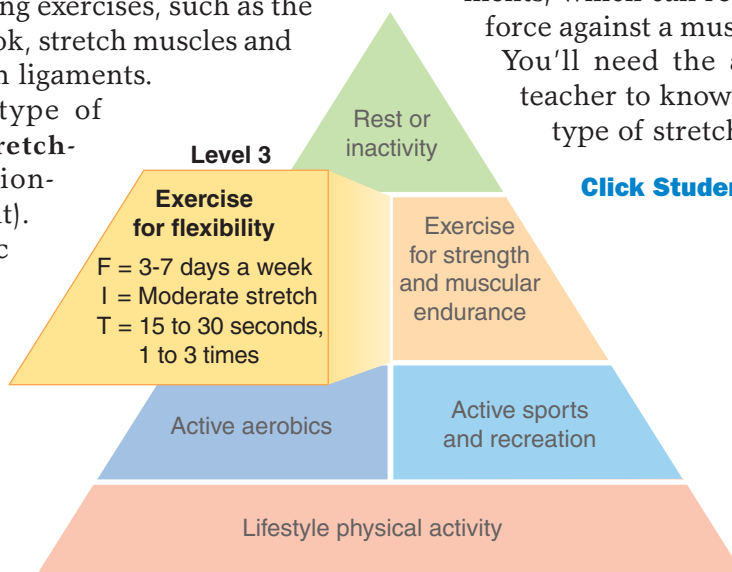
Stretching is most effective when the muscles are warm. This is why a general warm-up (see page 6 in chapter 1) should be done before a stretching warm-up. Your regular stretching exercises that aren't part of a stretching warm-up should be done after a general warm-up or after you have done activities that get your body warm.

Another way to build flexibility is called **PNF (proprioceptive neuromuscular facilitation)**. When doing PNF, you contract your muscles before you statically stretch them. The contraction before the stretch helps the muscles relax so they can be stretched more easily. For example, before performing the second calf stretch exercise in table 6.1, contract your calf muscle by pushing your toes against the towel. Then pull on the towel to stretch the calf muscle. Visit the *Fitness for Life: Middle School* Web site for basic exercises for building flexibility using static stretching and PNF.

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A third way to build good flexibility is **ballistic stretching**, a type of stretching used by athletes and very fit people. Instead of statically stretching the muscle, you bob or bounce to cause the muscles to stretch. Ballistic stretching isn't recommended for beginners. It's hard to control ballistic movements, which can result in applying too much force against a muscle and can lead to injury. You'll need the assistance of a coach or teacher to know when and how to do this type of stretching.

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Flexibility exercises are at level 3 of the Physical Activity Pyramid.

Table 6.1

Types of Static Stretches



Self-assisted stretch with opposing muscles.

Contract the muscles of your shins to pull your toes forward and stretch your calf muscle.



Self-assisted stretch with the use of arms and hands.

Loop a towel behind your toes and pull gently with your hands and arms to stretch your calf muscle.



Gravity-assisted stretch.

Stand on a box or curb and let **gravity** force your heels lower than your toes, stretching your calf muscles.

Body-weight assisted stretch.

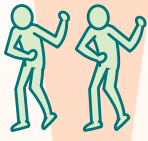
Lean forward, keeping your heel on the ground and stretching your calf muscle.



Partner-assisted stretch.

Have a partner push gently on your toes, causing your calf muscle to stretch. Partners need to communicate to avoid overstretching.

Note: Static stretches can be performed as PNF stretches by contracting a muscle or muscle group before you stretch it. For example, the girl doing the self-assisted stretch with the towel can push against the towel with her toes (contracting her calf muscles) before pulling with the towel to stretch her calf muscles.



Moving Together: Feeling Comfortable in Physical Activity

There are many reasons why teens sometimes avoid participating in physical activity with others. They might be afraid of making a mistake and looking bad. They might want to avoid being teased by others who'd put down the activity by saying, "That's just for girls" or "That's just for boys." They might have missed the beginning of the activity and think it's too late to join in. Do you sometimes feel uncomfortable in certain activities? Do your friends sometimes seem uncomfortable in activities that you enjoy? What can be done to make activities more comfortable for different people?

Tenzin, Sam, José, and Jasmine have learned a lot since they started the Fitness for Life program. They've learned about the many different parts of physical fitness and the different kinds of physical activity. They've begun to learn how to use practice to build the skills they need to do physical activities that they enjoy. But recently they became involved in a situation that made them uncomfortable.

On a weekend they planned to go to the park with friends from school. The four met at Tenzin's house so that they could walk to the park together. However, José said that he was going to go home because he didn't have what he called "fancy sports clothes" like some of the other teens who would be at the park. José's friends encouraged him to go with them.

The plan was to play a competitive game of volleyball. But before the game started, several problems occurred. Two boys started choosing teams, and many of the girls said they didn't want to play—they just wanted to watch. Some of the boys who were waiting to be picked said that they didn't want to play, either. Tenzin and Jasmine really wanted to play volleyball, but they decided to watch because so many other girls were watching.



Discussion Questions

1. What should Sam, Tenzin, and Jasmine say to José to encourage him to go with them? How might they help José feel OK when he arrives at the park?
2. What could the friends say to encourage all of the teens to participate in the game? How might Tenzin and Jasmine get involved? How might they help other girls get involved? How could the friends help José to get involved?
3. Are there actions other than talking that could be taken to help everyone get involved in the activity? What might these be?

Guidelines for Feeling Comfortable in Physical Activity

- ▶ **Talk about the activities you all enjoy.** Before you plan an activity, talk with all members of your group to learn which activities they enjoy.
- ▶ **Vary your activities.** If possible, choose an activity that everyone enjoys. That's not always possible, but you can agree to do different activities so that you'll eventually do an activity for everyone in the group.
- ▶ **Modify games.** Change the rules and equipment to make the game more fun for your group. For example, try using a larger, softer ball in place of an official volleyball. Or play two games with smaller teams rather than one big game. Forming new teams from time to time allows people to be team members with many different people.
- ▶ **Consider cooperative rather than competitive games.** Competitive activities can be fun if all people have similar skills. But if some members of the group don't have good skills, noncompetitive activities can be more fun. For example, play a game of volleyball in which the goal is to see how many hits in a row both teams can make together.

- ▶ **Avoid choosing sides in a way that causes some people to feel bad.** Having two people choose teams can cause hurt feelings, especially among those who get picked last. Check with your teacher about ways to choose sides so that teams are even without hurting anyone's feelings.
- ▶ **Practice some of the skills before playing the game.** If some group members have good skills, they can teach other group members and help them practice the skills. If all group members develop their skills, the activity will be more fun for everyone.
- ▶ **Choose an activity location where not many people are watching.** Some people are self-conscious when others watch them play. The activity might be more fun for everyone if you find a play area where other people aren't watching and commenting on your performance.
- ▶ **Do something after each activity to make group members want to try again.** Sitting down and talking in a social way can make people feel a part of the group. Even if someone isn't especially good at the current activity, he or she might stay in the group if being in the group is fun. Think of other things you can do to include all people in the group.
- ▶ **Encourage others, but don't overdo it.** Give words of encouragement to everyone in your group, but especially to those who don't have as much skill. But don't overdo it. If you give certain people too much encouragement, they might think that you feel sorry for them because of their skills.
- ▶ **Consider the way you dress.** If some members of the group are unable to dress in special clothing, especially if that clothing is expensive, you might want to dress down a bit. This can help others feel more comfortable in the group.



Give all players a chance to develop their skills.



Modifying games can be a way to make them fun for everyone.

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How Much Stretching Is Enough?

You already know that a muscle must be stretched beyond its normal length for it to get longer. But how far should you stretch a muscle? If you stretch it too little, it won't grow longer. If you stretch the muscle too far, you could injure it. For example, athletes sometimes stretch a muscle too much, causing a muscle injury called a **strain**. For best results you should follow the FIT formula for flexibility.

The FIT formula for static stretching and PNF is shown in table 6.2.

Before you stretch specific muscles, it's important to get the muscles warm. To get warm, you can do a general warm-up as described in chapter 1 (page 6) or start your workout with moderate activities before doing the stretching part of your workout. It's also important to cool down after your workout by doing moderate activities and stretching.

Table 6.2

The FIT Formula for Muscle Fitness for Teens

Flexibility exercises	Static stretching	PNF
Frequency	Stretch daily if possible; if not, at least three days a week.	Daily if possible; if not, at least three days a week.
Intensity	Stretch so that you feel tension in the muscle and even a slight burning sensation, but you should not feel pain.	Contract the muscle to be stretched (10 seconds), and then stretch as described for static stretching.
Time	Hold each stretch 15 to 30 seconds. Perform one to three times. Rest at least 10 seconds after each stretch.	Hold each stretch 15 to 30 seconds. Perform one to three times. Rest at least 10 seconds after each stretch.



Take It Home

TEAM (Together, Everyone Achieves More)

"We did it!" Team members made this statement after they had just finished playing in a community sports tournament. They didn't win the tournament, but they got the team together, entered the tournament, and played several games. They developed a team **strategy** (an overall team plan) and **tactics** (specific methods to reach the team goal) that are necessary to work together as a team.

Being part of a team that works together and supports each other is a lot of fun. Maybe you've already experienced this, but if not, look for the opportunity. Sometimes teamwork brings the thrill of victory when your team wins. But you don't have to win to experience the fun of being part of a team that works hard together, pursues a goal, and does its best.

Team members don't all need to have the same abilities and interests. Teams gain strength when different people contribute

different things. You've learned about physical flexibility in this chapter, but that's not the only type of flexibility. Flexibility also means the ability to change. Being able to adapt to different situations is an important part of teamwork.

Use the worksheet supplied by your teacher to develop a strategy for being active with people on your support team. Build good teamwork by giving each person a special role in the group.

Lesson Review

- ▶ What is flexibility?
- ▶ How do you build flexibility?
- ▶ Describe some guidelines for feeling comfortable in physical activity.
- ▶ How much stretching is enough?

Lesson 6.2

Benefits of Flexibility

Lesson Vocabulary

cramp, flexion, hypermobility, joint, muscles, range of motion

[Click Student Info](#) ← Topic 6.6

When you do flexibility exercises, you get health, wellness, and fitness benefits. Can you describe some of the benefits of stretching and good flexibility? Do you have good flexibility? How can you tell whether you have good flexibility? When you finish this lesson, you'll know the answers to these questions. You'll also understand the importance of range of motion to your performance in physical activity.

What Are the Benefits of Flexibility?

There are many benefits to being flexible, including good health, good posture, reduced risk of injury, and improved performance. One of the health benefits of good flexibility is the prevention of back pain. Back pain is a major cause of missed work and results in millions of dollars in medical expenses each year. As many as 80 percent of American adults will experience back pain at some time in their lives. But back pain isn't just a problem for adults. Nearly one third of preteen children have experienced some type of back pain, and the incidence of back problems among teens is nearly as high as for adults. Having good muscle fitness and flexibility in the back, chest, shoulder, neck, and upper leg muscles can reduce the risk of back problems.

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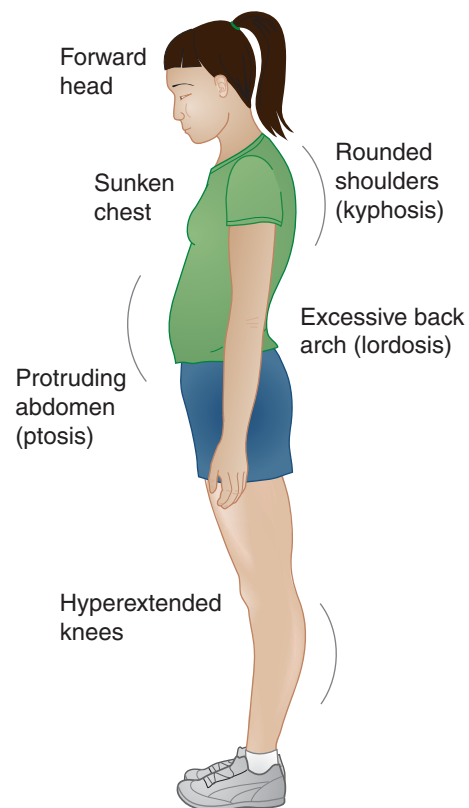
Poor flexibility can also contribute to poor posture. Short muscles in the chest can lead to rounded shoulders and can cause the head to lean forward. Short muscles in the back and the back of the leg can cause a curve in the lower back that can result in muscle soreness and pain. Regular stretching can help you maintain good posture.

If a muscle is too short, it's at risk of injury. Frequently injured muscles include the hamstrings (the back of the upper leg), the calf (the back of the lower leg), the quadriceps (the front of the upper leg), and the muscles of the lower back. Regular stretching can lengthen these muscles and reduce the risk of injury. Also, these muscles may **cramp** during exercise. Statically stretching a muscle that has a cramp can cause the cramp to go away. For example, the calf stretch in lesson 6.1 can be used to stop a cramp in the calf muscle.

Good flexibility can also enhance performance in sports and in daily life. A gymnast or a diver must have good flexibility to perform well. The same is true for skateboarding and playing hacky sack. Without good flexibility, you can't perform at your best. Good flexibility is also necessary to perform tasks in your daily life. For example, a person with

FIT FACT

Muscle cramps are often caused by dehydration (not drinking enough water). Replacing water lost when you sweat can help prevent cramps.



Poor flexibility can contribute to poor posture.

poor range of motion in his neck would have difficulty backing up in a car because he couldn't turn around well. A person with short hamstring muscles would have a hard time bending over to pick up an object from the ground or tie her shoe.

How Do I Know if I Have Good Flexibility?

To be healthy and to perform effectively, you need good flexibility and full range of motion in all joints. There are many tests of flexibility for many parts of the body. The back-saver sit-and-reach is

one of the most common tests and is included in Fitnessgram (see table 6.3). This test assesses hip and back flexibility. The scoring for the back-saver sit-and-reach test is different from that of other fitness tests. If you meet the healthy fitness score for your age and gender, you pass the test. To pass the test and have a score in the healthy fitness zone, you must have long muscles in the back of your legs and in your back. Because you might have good flexibility on one side of your body and not on the other, you must do the back-saver sit-and-reach test on both sides.

The Back-Saver Sit-and-Reach Test of Flexibility

The back-saver sit-and-reach test measures the flexibility of your lower back and the muscles on the back of your thigh (hamstrings). As you take the test, use the worksheet supplied by your teacher to record your results and answer the questions about stretching.

1. Place a measuring stick such as a yardstick on top of a 12-inch-high (31 centimeters) box. Have the stick extend 9 inches (23 centimeters) over the box with the lower numbers toward you.
2. To measure flexibility of your right leg, fully extend it and place your right foot flat against the box. Bend your left leg with the knee turned out and your left foot 2 to 3 inches (5 to 8 centimeters) to the side of your straight right leg.
3. Extend your arms forward over the measuring stick. Place your hands on the stick, one on top of the other, with the palms facing down. The middle fingers should be together with the tips of one finger exactly on top of the other.
4. Lean forward and reach with the arms and fingers four times. On the fourth reach, hold the position for 3 seconds and observe the inch mark below your fingertips. Then record your score to the nearest inch.
5. Repeat the test with the left leg straight. Consult table 6.3 to see if you're in the healthy fitness zone, and write the results on your worksheet.

Note: Warm up before performing this test.

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Table 6.3

Healthy Fitness Zone for Flexibility (Back-Saver Sit-and-Reach)

Age	Needs improvement	Healthy fitness (pass)
MALES		
10	Less than 8 inches	8 inches
11	Less than 8 inches	8 inches
12	Less than 8 inches	8 inches
13	Less than 8 inches	8 inches
14	Less than 8 inches	8 inches
15+	Less than 8 inches	8 inches
FEMALES		
10	Less than 9 inches	9 inches
11	Less than 10 inches	10 inches
12	Less than 10 inches	10 inches
13	Less than 10 inches	10 inches
14	Less than 10 inches	10 inches
15+	Less than 12 inches	12 inches

8 inches = 20 centimeters; 9 inches = 23 centimeters; 10 inches = 25 centimeters; 12 inches = 31 centimeters





Biomechanical Principles: Range of Motion

Your body joints allow a certain amount of motion in each possible direction, and exceeding that limit can cause injury.

A **joint** is the location where your bones (your body's levers) join together. Each joint allows motion in certain directions, and in each direction there is a range of motion. The amount of movement that a joint allows is called **range of motion**. Some joints allow movement in more directions than others. For example, the hip joint is where the bones of the pelvis join with the bones of the thigh. The hip joint allows forward and backward movement (see photo below left). The thigh can also be moved to the side or rotated (moved in a circle) around the hip joint. The upper arm can be moved in similar ways around the shoulder joint (see photo below right).

The knees and elbows have more limited directions of motion (see the photos on page 74). They can flex and extend, but they don't bend sideways or twist. In other words, these joints have no range of motion in certain directions. You should know how much range of motion a joint will allow when doing flexibility and muscle fitness exercises. Forcing a joint to move beyond a safe range of motion in any direction can result in injury to ligaments, tendons, and **muscles**. For example, when you do a full squat such as a catcher does in baseball, the weight of the body on the levers of your legs can

cause your knee to bend too much. Doing an exercise such as a full squat with weight on your shoulders is bad because it can cause injury to the knee.

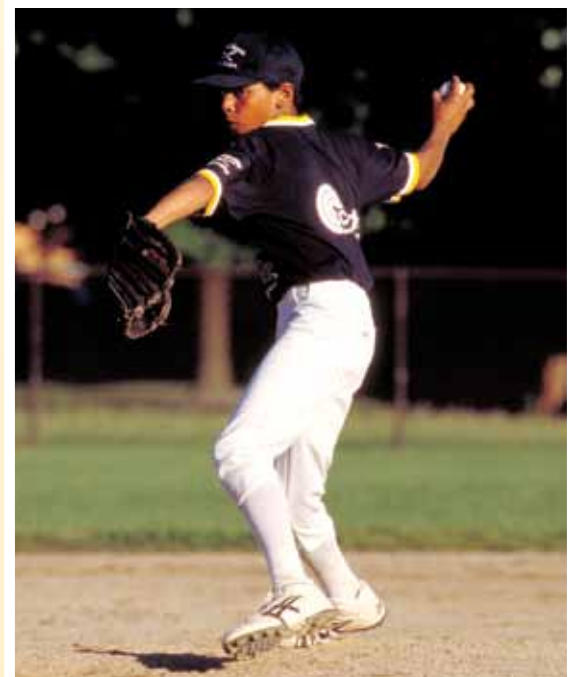
If you know about the normal range of motion of your joints, you can avoid exercises and movements that can cause injury. Stretching to increase flexibility can increase range of motion by lengthening tendons and muscles. However, stretching beyond the normal range of motion is dangerous, because it can leave a joint too loose to provide needed stability for the body. **Hypermobility** is a term used to describe joints that lack stability and have too much range of motion. When stretching to increase flexibility, don't force joints to move in directions where they have no range of motion. For instance, twisting or bending sideways at the knee can cause damage to the knee ligaments, which hold the joint together.

Applying the Principle

As you learned earlier, each joint has its own range of motion in each possible direction. Movements that cause a joint to move beyond its normal range of motion in a particular direction can cause small injuries in the joint that can lead to bigger injuries later in life. An example of movements that cause too much range of motion in joints is too much bending (**flexion**) of the



Running hurdles requires good range of motion in the hips.



Pitching in baseball requires good range of motion in the shoulders.

(continued)

Biomechanical Principles: Range of Motion *(continued)*

knee by a catcher in baseball. That's why catchers wear special pads on the backs of their legs to stop them from doing a full squat. It's also dangerous to bend the knee to the side, bend too far forward while standing (as in the standing toe touch), or bend too far backward (as in the back arch exercise).

In which direction(s) is it appropriate to move each of these joints? In which direction(s) is it not appropriate? Describe an activity that uses each of these joints in the best range of motion.

- ▶ Hip
- ▶ Shoulder
- ▶ Knee
- ▶ Elbow

Principles in Practice

It's important to know how to move joints through a normal range of motion to prevent injury. Move each of the following joints through its comfortable range of motion in each direction to determine your current range of motion: shoulders, elbows, wrists, hips, knees, ankles, and neck. Do you have the same range of motion on both sides of your body?

Always avoid exercises and activities that require unsafe ranges of motion, and practice only the exercises that have a safe range of motion. All of the exercises in this book have a safe range of motion except those that are shown to describe unsafe exercises. The purpose of exercise is to improve your ability to move, not to damage your joints, muscles, or bones.



The hip allows motion in several directions, while the knee only allows motion in flexion or extension.



The elbow only allows flexion and extension, while the shoulder allows motion in several directions.

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You can have flexibility in one part of the body and not have it in another. The back-saver sit-and-reach test assesses range of motion in the lower body. The shoulder stretch test assesses shoulder flexibility and is sometimes included in Fitnessgram. You can learn more about this test and other flexibility assessments by visiting the *Fitness for Life: Middle School* Web site.

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Once you've taken a flexibility test, you'll need to determine if your score is in the healthy fitness zone. Use table 6.3 on page 72 to see if you're in the healthy fitness zone for the back-saver sit-and-reach test. If you fall below the healthy fitness zone, you should improve your flexibility. If you're in the healthy fitness zone, you might want to do regular stretching exercises to become even more flexible. Scores above the healthy



Stretching exercises are important for all teens, whether you play sports or not.



Even if you're already in the healthy fitness zone, regular stretching exercises can help you become more flexible.

fitness zone may be beneficial to those interested in athletic and specific types of performance, but they're not necessary to achieve the other benefits described earlier in this chapter. In some cases, too much stretching or too much flexibility can increase the chance of injury (see Biomechanical Principles on pages 73-74).

Stretching exercises are an important part of a complete physical activity program for teens. When performed regularly, stretching exercises build flexibility that provides the benefits described in this chapter.

Lesson Review

- ▶ How does good flexibility improve your health, wellness, and fitness?
- ▶ How do you know if you have good flexibility?
- ▶ How is range of motion important to performance in physical activity?

6

Chapter Review



Number your paper from 1 to 5. Read each question. After the number for the question, write a word or a phrase that best answers the question. The page number where you can find the answer is listed after the question.

1. What term describes the amount of movement in a joint? (page 65)
2. What word describes tissue that connects bone to bone? (page 66)
3. What is another word used in this chapter to describe static or nonmoving? (page 66)
4. How many seconds should you hold each static stretch of a muscle to get the best benefits? (page 70)
5. What health problem associated with poor flexibility occurs in 80 percent of adults at some time in their lives? (page 71)

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

- | | |
|-----------------------------|--|
| 6. gravity | a. one aid in producing a static stretch |
| 7. tendon | b. an injury to a muscle |
| 8. back-saver sit-and-reach | c. tissue that connects muscle to bone |
| 9. strain | d. a test of flexibility |
| 10. hypermobility | e. too much range of motion |

Number your paper from 11 to 15. Follow the directions to answer each question or statement.

11. Explain the difference between a static stretch and PNF stretch.
12. Give three or more examples of static stretching exercises for building flexibility.
13. Give three or more examples of guidelines for feeling more comfortable in physical activity.
14. Give three or more examples of the health benefits of good flexibility.
15. Give examples of the normal range of motion for two different joints.

Ask the Authors

When is the best time to do stretching exercises to improve flexibility?

Get the answer and ask your own questions at the *Fitness for Life: Middle School* Web site.

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Unit Review on the Web

You can find unit II review materials on the *Fitness for Life: Middle School* Web site.

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