



A Fit Way of Life

Second Edition

GWEN ROBBINS / DEBBIE POWERS / SHARON BURGESS

Ball State University



Higher Education

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Preface

This book is your guide to developing or improving your physical fitness. Three in four American adults do not get the recommended level of physical exercise despite the common knowledge that inactivity increases the risk of several chronic diseases such as heart disease, diabetes, certain cancers, obesity, and osteoporosis. In fact almost 24 percent of Americans are totally sedentary. We congratulate you on your decision to *not* be included in these unhealthy statistics.

The purpose of *A Fit Way of Life* is to help you reach your fitness potential. This process focuses on a balanced approach involving the health-related components of physical fitness—cardiorespiratory endurance, muscular strength, muscular endurance, flexibility, and body composition. Information on a variety of lifetime aerobic activities is provided in this book to help you reach a high level of cardiorespiratory fitness. These activities are aerobic dance, bicycling, fitness swimming, fitness walking, indoor cardio exercise equipment, in-line skating, jogging, and water exercise/aqua aerobics. An activity-specific cardiorespiratory endurance test and a step-by-step progression for each activity are provided. Separate chapters are devoted to developing muscular strength and endurance and flexibility. Both chapters include specific assessments and guidelines for improving these fitness components. Do you want to know what really counts? Do you want straightforward strategies on how to reach your fitness goals? This book is the road map for this exciting journey.

It is vitally important to have accurate, up-to-date information about fitness, nutrition, heart disease, weight management, and other health topics. We have sorted through a myriad of confusing and sometimes contradictory health reports in order to provide information in this book based on solid research. We have minimized technical jargon and have tried to present the material in consumer-friendly language. As you may know, merely having knowledge is not enough. Many people know what

to do, but just don't do it! This is why we have included a separate chapter on changing behavior, a unique feature in this fitness book.

Remember the statistics on how few people get adequate exercise? The number one reason people give for not exercising is . . . "I don't have the time." Granted, life in the 21st century is fast-paced, full of obligations, and work/school commitments. There never seems to be enough time to get everything done. You will learn that minimal levels of fitness can be achieved in workouts of 20 to 30 minutes, three times per week! Of course, greater fitness and health benefits can be achieved with longer, more frequent workouts. Is there anyone who cannot afford to replace an hour of TV with 60 minutes a week of healthful exercise?

A Fit Way of Life introduces the concept of wellness and the seven dimensions of wellness. The text will help you learn what is involved in each of the dimensions and enable you to assess how you are doing in each dimension. You will gain a better understanding of the importance of fitness in a wellness lifestyle.

In each chapter of *A Fit Way of Life*, you will find self-assessments, behavior-change strategies, and tips for making daily decisions that can lead to enhanced fitness. We hope these practical suggestions will guide and motivate you. We have been successful in teaching and guiding thousands of college students and colleagues on how to become physically fit. We can help you too. Are you ready? Let's go!

INTRODUCTION

Wellness is a word that is sometimes associated with fitness centers, spas, hospitals, mental health clinics, weight loss centers, chiropractors' and massage therapists' offices, and even college residence halls. But what really is "wellness"? Wellness is defined as *an integrated and dynamic level of functioning oriented toward maximizing potential, dependent on self-responsibility*. Still confused?

Wellness is a broad term that is actually a way of thinking or an attitude in the way you approach life. This approach involves actively, consciously, and continually striving for excellence in seven dimensions of your life—*every day*. The seven dimensions of wellness are physical, emotional, social, environmental, occupational, spiritual, and intellectual. Some assume wellness only refers to your physical well-being (i.e., exercising, eating healthy, controlling weight, not smoking, etc.). In actuality, physical fitness falls under the physical dimension of wellness. Fitness is defined as *the ability of the body to function at optimal efficiency*. While it is true that high-level wellness involves practicing a variety of preventive health behaviors, it also includes adopting a take-charge mind-set of trying to be the best you can be in *all* areas of your life. It means approaching life with a feeling of empowerment over personal circumstances, societal barriers, and cultural norms. Being physically fit is one key area in which you have an opportunity to take charge. As a result, you can experience remarkable benefits within the physical dimension. And, since wellness is *integrated*, the physical aspect carries over into other dimensions (e.g., emotional, social, intellectual).

The following activity will help you learn what is involved in *all* seven dimensions of wellness and allows you to assess how you are doing in each dimension. Once you have an understanding of what is involved in each dimension, you can work to grow in each one. It is not necessary to be perfect in all seven dimensions to benefit, so don't get discouraged. In seeking high-level wellness, you will find that the joy is in the *journey*. It becomes an exciting lifetime pursuit of excellence—truly a way of life!

As you read *A Fit Way of Life*, you will see several references to the word “wellness” and the dimensions of wellness. Completing the following wellness assessment will help you have a better understanding of those references.

ASSESSING YOUR WELLNESS

This assessment is designed to give you a general idea of the types of decisions involved within each dimension. Read each statement carefully and respond honestly by using the following scoring:

Almost always = 2 points

Sometimes/occasionally = 1 point

Very seldom = 0 points

Physical Dimension

- _____ 1. I engage in vigorous exercise (examples include jogging, brisk walking, swimming, cycling) for 20–60 minutes at least four times per week.

- _____ 2. I eat fruits, vegetables, and whole grains every day.
 _____ 3. I avoid tobacco products.
 _____ 4. I have adequate coping mechanisms for dealing with stress.
 _____ 5. I maintain a healthy weight, avoiding extremes of overweight and underweight.
 _____ 6. I deliberately minimize my intake of dietary fats, cholesterol, and trans fats.

Physical total

Emotional Dimension

- _____ 1. I am able to recognize and appropriately express my feelings.
 _____ 2. I see challenges and change as opportunities for growth.
 _____ 3. I accept responsibility for my actions.
 _____ 4. I feel I have considerable control over my life.
 _____ 5. I relax and enjoy life without the use of alcohol or drugs.
 _____ 6. I am able to develop and maintain close relationships.

Emotional total

Social Dimension

- _____ 1. I exhibit fairness and justice when dealing with people.
 _____ 2. I am able to communicate with and get along with a wide variety of people.
 _____ 3. I am committed to a lifetime of volunteerism.
 _____ 4. I am interested in others, including those with backgrounds different from my own.
 _____ 5. I contribute time and/or money to social and community projects.
 _____ 6. I am a compassionate person and try to help others when I can.

Social total

Environmental Dimension

- _____ 1. I consciously conserve energy (electricity, heat, light, water, etc.) in my place of residence and work.
 _____ 2. I practice recycling (glass, paper, plastic, etc.).
 _____ 3. I do not litter.
 _____ 4. I purchase recycled items when possible, even if they cost more.
 _____ 5. I volunteer my time for environmental conservation projects.
 _____ 6. I feel strongly about doing *my* part to preserve the environment.

Environmental total

Occupational Dimension

- _____ 1. I am happy with my career choice.
- _____ 2. I look forward to working in my career area.
- _____ 3. The job responsibilities and payoffs/advantages of my career choice are consistent with my values.
- _____ 4. My work/career choice gives me personal satisfaction.
- _____ 5. I am happy with the balance between my work/career choice time commitment and leisure time.
- _____ 6. I feel my job/career choice allows me to make a difference in the world.

_____ **Occupational total**

Spiritual Dimension

- _____ 1. Life is meaningful to me, and I feel a purpose in life.
- _____ 2. I have a strong sense of hope and optimism in my life and use my thoughts and attitudes in life-affirming ways.
- _____ 3. There is a direct relationship between my personal values and my daily actions.
- _____ 4. When I get depressed or frustrated by problems, my spiritual beliefs and values give me direction.
- _____ 5. I am able to speak comfortably about my personal values and beliefs.
- _____ 6. I am consistently striving to grow spiritually, and I see that as a lifelong process.

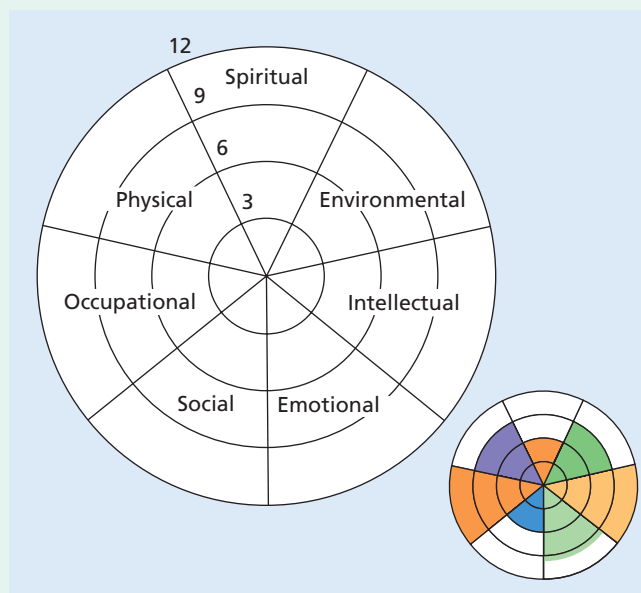
_____ **Spiritual total**

Intellectual Dimension

- _____ 1. I seek opportunities to learn new things.
- _____ 2. I try to keep abreast of current affairs—local, national, and international.
- _____ 3. I enjoy attending special lectures, plays, musical performances, museums, galleries, and/or libraries.
- _____ 4. I enjoy watching educational programs on TV.
- _____ 5. I enjoy engaging in intellectual discussions.
- _____ 6. A continuing education program is/will be important to me in my career.

_____ **Intellectual total**

SCORING: Take your total points in each dimension of wellness and shade in the accompanying wheel according to how many points you scored. How smoothly does your wellness wheel roll? A smooth ride indicates *balanced* wellness, and the *larger* the wheel, the better! Look again at each dimension and challenge yourself to begin taking steps toward improvement.



HIGHLIGHTS OF THE NEW EDITION

Based on the idea of self-responsibility and self-empowerment, *A Fit Way of Life* gives students practical information about how to make good decisions that will positively affect their well-being throughout their lives. It is action-based and presents wellness as a dynamic, lifelong process. Here are highlights of this second edition:

- ✓ Each chapter now begins with Study Questions that provide an overview of the chapter's content. Students can use these questions to study for quizzes and exams.
- ✓ New "What Stage of Change Are You In?" boxes are included in most chapters, which help students internalize behavior change as they progress through the text.
- ✓ New American College of Sports Medicine (ACSM)/American Heart Association recommendations for exercise are included.
- ✓ Chapter 8, Maximizing Heart Health, has recategorized primary and secondary risk factors for cardiovascular disease based on the latest information from the American Heart Association and other leaders in health science. There are now 10 primary risk factors—6 controllable and 4 uncontrollable—and 6 secondary risk factors—all controllable.
- ✓ Additional new Frequently Asked Questions are included in many chapters.
- ✓ Overall text content has been updated, including statistics, bibliography, and Internet resources.

NEW AND EXPANDED TOPICS

Chapter 1: Developing and Assessing Physical Fitness

- ✓ New information on the American College of Sports Medicine/American Heart Association's recommendations for exercise
- ✓ Streamlined Cardiorespiratory Endurance Tests and Muscular Strength and Endurance Tests sections
- ✓ 3.0-Mile Bicycling Test now included in Lab Activity 1-4
- ✓ Sit and Reach Wall Test now included in Lab Activity 1-9

Chapter 2: Maximizing Cardiorespiratory Fitness

- ✓ Revised Rate of Perceived Exertion chart
- ✓ Updated discussion of the beneficial effect of exercise on the mind
- ✓ New box comparing the FITT exercise guidelines to those of the ACSM/AHA
- ✓ Three new Frequently Asked Questions
- ✓ New Lab Activity: "I Have No Time . . .": Overcoming Obstacles to Exercise
- ✓ Exercise Across the U.S.A. Lab Activity moved from online to book
- ✓ 30-Minute Treadmill Workouts Lab Activity moved online

Chapter 3: Developing Flexibility

- ✓ Repetitive material removed from the Contraindicated Exercises section
- ✓ New Internet resources
- ✓ New questions added to Lab Activity 3-1, Introductory Flexibility Session (formerly Sample Flexibility Program)

Chapter 4: Developing Muscular Fitness

- ✓ Redesigned figures for free weight, hip and thigh, upper body, and elastic resistance exercises
- ✓ Larger boxes for writing in the Resistance Training Log

Chapter 5: Changing Behavior

- ✓ Redesigned algorithm for determining stage of change
- ✓ Redesigned Lab Activity 5-2: Behavior Change Contract
- ✓ Behavior Change Log/Journal featuring larger boxes for students to record information

Chapter 6: Exploring Special Exercise Considerations

- ✓ Expanded list of ACOG guidelines for exercise during pregnancy and postpartum
- ✓ New section, "Drugs Affecting Physical Performance"
- ✓ New section on ACSM/AHA exercise guidelines for older adults
- ✓ Two new Frequently Asked Questions

Chapter 7: Preventing Common Injuries and Caring for the Lower Back

- ✓ New Internet resources
- ✓ New tips on avoiding overuse, promoting recovery, and the importance of muscle strength in injury prevention
- ✓ Condensed Top 10 List, Tips for preventing injuries

Chapter 8: Maximizing Heart Health

- ✓ Heart disease risk factors recategorized according to the latest information from the American Heart Association and the Cleveland Heart Institute
- ✓ New box on the S.T.R. approach to stroke awareness
- ✓ New information on women and heart attacks and postmenopausal women and CVD
- ✓ New information on visceral (abdominal) fat in the obesity section
- ✓ New Frequently Asked Questions at the end of the chapter

Chapter 9: Eating for Wellness

- ✓ New section on the Mediterranean diet and its health benefits
- ✓ Bigger boxes for writing in Lab Activity 9-1 (Food Log)
- ✓ Lab 9-6, Select and Analyze a Food Label, has been moved from the book's Web site to the text
- ✓ New information on the importance of vitamin D in the diet

Chapter 10: Achieving a Healthy Weight

- ✓ Updated statistics throughout the chapter, including percentages of adults who are overweight and obese
- ✓ New and updated diet information in Table 10-5
- ✓ Updated data concerning weight differences among ethnic groups
- ✓ New Frequently Asked Question on weight loss plateaus

- ✓ Lab 10-1, Analyzing Your Food and Exercise Habits (formerly titled Why Do You Eat?) revised to include exercise analysis in addition to food analysis

WHY THE PROCHASKA TRANSTHEORETICAL MODEL OF BEHAVIOR CHANGE?

The Prochaska transtheoretical model of behavior change is included in this text because of its proven effectiveness in changing behavior. This easy-to-use model presents concrete strategies rather than vague resolutions to help people make permanent lifestyle changes. Psychologists James Prochaska, John Norcross, and Carlo DiClemente studied individuals who had successfully changed health-related behaviors on their own. What these researchers discovered during their years of studying behavior change is that individuals progress through distinct stages of change on their way to improved well-being. Their initial research was done on people who quit smoking but has expanded to cover other health behaviors. The stages of change are as follows:

1. *Precontemplation.* People at this stage see no problem with their behavior and have no intention of changing it.
2. *Contemplation.* In this stage, people come to understand their problem and its causes, and they start to think about taking action to solve it.
3. *Preparation.* In the preparation stage, people are planning to take action within the next month and are putting together a plan of action.
4. *Action.* A person in the action stage has taken the leap and is actively making behavior changes.
5. *Maintenance.* Even after action has been taken successfully, it must be maintained to prevent relapse.

Prochaska and his colleagues noted that certain behavioral change techniques work better than others in some stages of change. This model has received a great deal of attention in the popular press and among health educators. We hope this method assists you in your wellness journey.

SUCCESSFUL FEATURES

A Fit Way of Life includes a number of features that make learning easy, and they continue to be included in this new edition:

Key Terms

Important terms are highlighted in boldface to capture students' attention, increase retention, and identify those terms found in the Glossary.

Top 10 Lists

Appearing in each chapter, the Top 10 boxes offer additional insight into chapter topics. Examples include ways to exercise if you have diabetes and tips for having a safer party.

The Numbers

These boxes showcase thought-provoking statistics of interest to the chapter content.

Diversity Issues

This feature addresses fitness and wellness issues for various cultures and ethnic backgrounds. Sample topics include health disparities among Americans, the nutritional value of different ethnic foods, and weight differences in various ethnic groups.

Prescription for Action

These boxes, located at the end of each chapter, offer practical ideas for behavior change. Each “self-prescription” includes a selection of daily actions that are small in themselves—such as walking an extra 2,000 steps, stretching while watching TV, or getting an extra hour of sleep—but targeted toward a larger goal.

Frequently Asked Questions

This popular feature highlights the questions about fitness and wellness that seem to be on everyone's mind. It addresses myths and offers practical approaches to fitness and wellness.

Chapter Summary

Each chapter includes a summary at the end that reinforces learning and helps students review for exams.

Internet Resources

This end-of-chapter list offers suggestions for further exploration of chapter-related topics.

Lab Activities

Conveniently located at the end of each chapter, these labs help students apply their learning to their everyday life.

Bibliography

A bibliography is located at the end of the book that includes the sources used as references for each chapter.

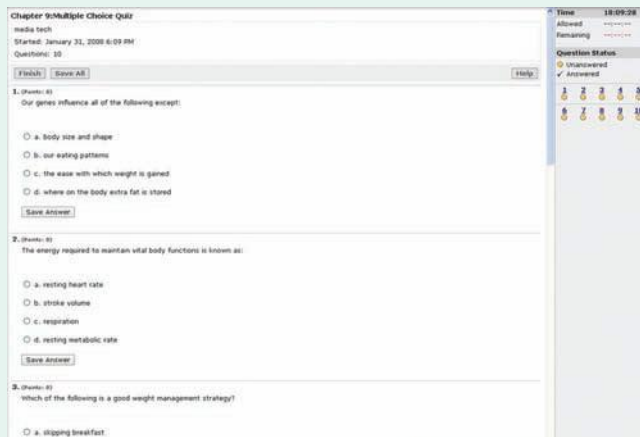
SUPPLEMENTS

Online Interactive Workbook

The new Online Interactive Workbook for *A Fit Way of Life* can be used when the course is taught online. Instructors can assign interactive versions of the online labs, as well as interactive versions of the rest of the labs in the text, to students. Students complete the labs online and submit them directly to the instructor's grade book. Features include

- ✓ Interactive fitness labs
- ✓ Quizzes and practices activities
- ✓ Online Daily Fitness and Nutrition Journal
- ✓ Online Behavior Change Workbook
- ✓ Videos and animations
- ✓ Links to additional Internet Resources

The Online Interactive Workbook is compatible with most major course management platforms (BlackBoard, WebCT). Contact your McGraw-Hill sales representative to learn more about this feature and how to use it for your course. (Find your sales rep at www.mhhe.com.)



The videos for *A Fit Way of Life*, ranging from student interviews to historical clips, help instructors increase student engagement and promote critical thinking about fitness and wellness topics.

Instructor's Media DVD-ROM

(ISBN: 978-0-07723852-0)

Organized by chapter, this instructor DVD-ROM includes all the resources you need to help teach your course and works in both Windows and Macintosh environments. It offers the following resources:

- ✓ High-definition videos
- ✓ PowerPoint presentations
- ✓ Computerized Test Bank
- ✓ Course Integrator Guide
- ✓ Downloadable quizzes and polling questions (for use with CPS)
- ✓ Image Bank

Online Learning Center

www.mhhe.com/robbinsfit2e

The Online Learning Center to accompany *A Fit Way of Life* offers a number of special resources for instructors:

- ✓ PowerPoint Presentations
- ✓ Test Bank Questions
- ✓ Instructor Course Integrator Guide
- ✓ Classroom Performance System (CPS) quizzes and polling questions
- ✓ Links to professional resources
- ✓ Image Bank

Students will find these study tools on the Online Learning Center:

- ✓ Self-scoring practice quizzes
- ✓ Flashcards
- ✓ Key terms
- ✓ Learning objectives
- ✓ HealthQuest activities
- ✓ Web links
- ✓ Links to professional resources
- ✓ Additional resources

ADDITIONAL SUPPLEMENTS FOR INSTRUCTORS AND STUDENTS

Exercise Band

(ISBN: 978-0-07039473-5)

The elastic exercise band (Thera-Band™) packaged with each new copy of *A Fit Way of Life*, which is lightweight and portable, can be used to add resistance when performing exercises. A comprehensive exercise program with instructions for using the exercise band is described and illustrated in Chapter 4. This program also appears conveniently on the inside and outside back cover of this text.

Pedometer

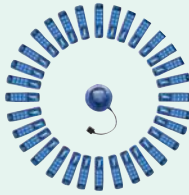
(ISBN: 978-0-07726426-0)

An electronic digital pedometer (step counter) can be packaged with *A Fit Way of Life*. This pedometer is useful in tracking walking steps, miles/kilometers, and kilocalories.

Classroom Performance System

www.einstruction.com

CPS is a revolutionary system that brings ultimate interactivity to the lecture hall or classroom. CPS is a wireless response system that gives you immediate feedback from every student in the class. CPS units include easy-to-use software for creating and delivering questions and assessments to your class, and are compatible with Macintosh or PC systems. With CPS you can ask subjective and objective questions. Then each student simply responds with his or her individual, wireless response pad, providing instant results. CPS is the perfect tool for engaging students while gathering important assessment data.



Daily Fitness and Nutrition Journal

(ISBN: 978-0-07-332567-5)

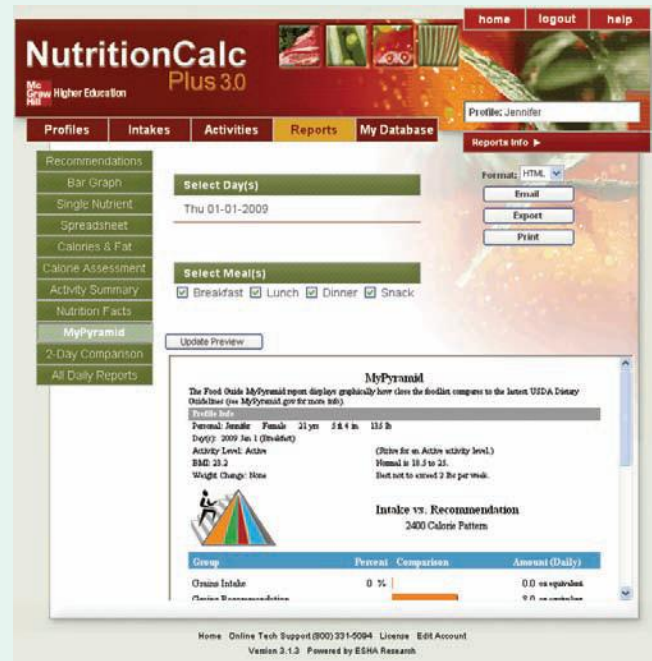
This logbook helps students track their diet and exercise programs. It can be packaged with any McGraw-Hill textbook for a small additional fee. An online version of the Daily Fitness and Nutrition Journal is also available with the new Online Interactive Workbook.

NutritionCalc Plus

(Online 3.0 ISBN: 978-0-07-337552-6)

(CD-ROM 3.0 ISBN: 978-0-07-332865-2)

NutritionCalc Plus 3.0 is a suite of powerful dietary self-assessment tools. Students can use it to analyze and



monitor their personal diet and health goals. The program is based on the reliable ESHA database and has an easy-to-use interface.

Wellness Worksheets

(ISBN: 978-0-07-352372-9)

This collection of 120 assessments is designed to evaluate health behaviors and knowledge. Categories of topics include General Wellness and Behavior Change, Stress Management, Psychological and Spiritual Wellness, Intimate Relationships and Communication, Sexuality, Addictive Behaviors and Drug Dependence, Nutrition, Physical Activity and Exercises, Weight Management, and Consumer Health.

Primis Online

www.mhhe.com/primis/online

Primis Online is a database-driven publishing system that allows instructors to create content-rich textbooks, lab manuals, or readers for their courses directly from the Primis website. The customized text can be delivered in print or electronic (eBook) form. A Primis eBook is a digital version of the customized text (sold directly to students as a file downloadable to their computer or accessed online by a password). *A Fit Way of Life* is included in the database.

ACKNOWLEDGMENTS

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We dedicate this second edition to the students—past, present, and future. We wish you a lifetime of wellness.

Gwen Robbins

Debbie Powers

Sharon Burgess



Developing and Assessing Physical Fitness

1

Our medicines are no further away than the shelves of the grocery and the sidewalks that we can use for a brisk walk.
—Tommy Thompson, former Secretary of Health and Human Services

Study Questions

You will have successfully mastered this chapter if you can answer the following:

1. What are the benefits of physical fitness?
2. What are the five health-related fitness components?
3. What are the purpose, content, and time of the three parts of a workout?
4. What are the principles of fitness development?
5. What is cross training? Give one example.
6. What are one or more tests for each component of health-related fitness?

You will find the answers as you read this chapter.



Visit the Online Learning Center for *A Fit Way of Life*, www.mhhe.com/robbsfit2e, where you will find additional quizzes and study aids.

Terms

- ballistic stretching
- body composition
- cardiorespiratory endurance (CRE)
- conditioning bout
- cool-down
- cross training
- exercise tolerance test
- fat-free tissue
- flexibility
- hypokinetic disease
- lean body mass
- muscular endurance
- muscular strength
- physical fitness
- principle of individual differences
- principle of reversibility
- principle of specificity
- progressive overload
- skinfold calipers
- static stretching
- subcutaneous fat
- task-specific activity
- warm-up

If there was a magic potion that you could take to increase your energy and help you manage weight, decrease stress, feel better, and decrease the risk of heart disease, cancer, and diabetes, would you be interested? The benefits of regular physical activity include these and many more. It is perhaps our cheapest preventive medicine. To live a wellness lifestyle, you must be physically active. While moderate levels of activity produce improvements in health, physical fitness requires higher-intensity activity and produces greater benefits. Physical fitness is an important component of wellness, because what affects the body ultimately affects the mind. Physical fitness enables you to function at the peak of your capacity physically and mentally—to enjoy life more fully—to be all that you can be.

You want to become more physically fit. How do you begin? This chapter discusses the benefits of physical activity and how much activity is needed to maintain health. It reviews basic principles of developing physical fitness, gives guidelines for health benefits, and details methods of assessing the health-related physical fitness components. This enables you to measure your current fitness levels, set goals, and develop a plan for working toward those goals. It will provide you with the information you need to begin a fitness program so that you can reap the benefits for life!

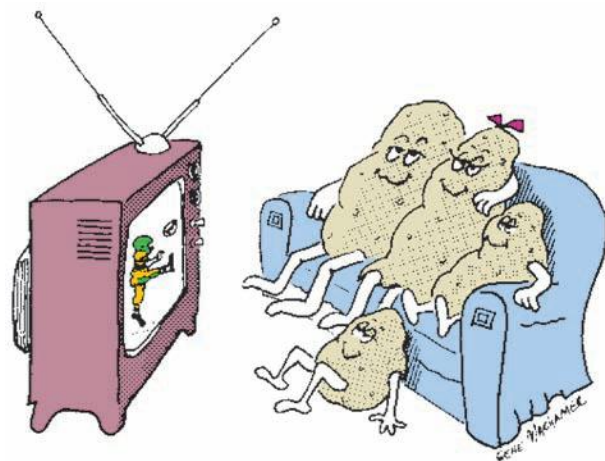
IMPORTANCE OF EXERCISE

The natural peak of fitness occurs at physiological maturity, in the late teens to early twenties. After this, life becomes a slide down the aging curve for sedentary individuals, who gradually lose 1 to 3 percent per year of their cardiorespiratory endurance, muscle mass, flexibility, and so on. If you have observed friends who are older, you have seen that many of them are beginning to show physical deterioration due to lack of exercise: decreasing energy levels, increasing body fat, loss of muscle tone. Our bodies were designed for physical activity, but few occupations provide enough to maintain health or fitness. Homemakers, office workers, and students have busy, stressful lives and may feel tired at the end of the day, but they often lack the physical activity vital to tone muscles, stimulate the heart and lungs, or produce a training effect. This has resulted in an epi-

demic of **hypokinetic diseases** related to an inactive lifestyle, such as obesity, coronary heart disease, cancer, osteoporosis, and diabetes. Older adults are sometimes erroneously told to “slow down” and “take it easy,” resulting in increasing weakness and accelerated physical decline. Unfortunately, too many people feel that they don’t have time for exercise and are satisfied with minimal exertion in their lives. Approximately 250,000 premature deaths per year in the United States can be attributed to lack of exercise. According to Dr. Steven Blair, epidemiologist for the Cooper Institute for Aerobics Research, a sedentary lifestyle is as much a risk factor for disease as are smoking, obesity, and high blood pressure, but inactivity is more prevalent.

Inactivity also contributes to the problem of obesity in our country. Over 60 percent of American adults are overweight, and nearly a third are obese. In the last 10 years, adults have shown an average weight gain of nearly 8 pounds per person. Our nation’s children are fatter, too, and about half are not physically active enough for aerobic benefit; this increases their risk of heart disease. Consuming too many calories and not getting enough exercise are to blame. The problem is compounded by the abundance of labor-saving devices, such as remote controls, computers, and riding lawn mowers. Children’s playtime often consists of watching television; surfing the Internet; or sports lessons where sitting, standing, or watching consumes a major portion of the time. To make matters worse, although childhood is the best time to develop a lifelong habit of physical activity, many physical education programs face elimination because they are considered a frill when educational budgets are crunched. In a world filled with labor-saving devices, it is more important than ever to build exercise into our lives for optimal health and well-being.

For young people, levels of physical activity decline sharply through adolescence. Many college students show early signs of hypokinetic disease. If you are



We have become a nation of spectators.

concerned about slowly gaining weight from pizza, shakes, and fries, a good fitness program can reverse the trend. If normal daily activities leave you feeling worn out, you can boost your energy with regular exercise 3 to 5 days a week. Because routine activities such as sitting in class, watching TV, and walking across campus seldom require the physical effort needed to develop fitness, we must plan for daily vigorous exercise. The old saying “Use it or lose it” has never been more true.

PHYSICAL ACTIVITY AND HEALTH

We know that many people can improve their health and the quality of their lives with lifelong physical activity, yet about 60 percent of adult Americans are not regularly active and nearly 90 percent need more physical activity to improve their health. Almost half our young people are not vigorously active. To encourage Americans to get moving and reverse the increasing toll of health-care costs related to chronic diseases, the American College of Sports Medicine and the American Heart Association issued a joint recommendation for the quantity of physical activity needed by healthy adults to improve and maintain health:

1. To promote and maintain health, all healthy adults ages 18 to 65 should maintain an active lifestyle.
2. Include moderately intense aerobic exercise 30 minutes a day, 5 days a week, or vigorously intense aerobic exercise 20 minutes a day, 3 days a week.
3. The 30 minutes of moderate-intensity exercise can be accumulated in bouts of 10 minutes or more. Examples of moderate-intensity exercise are given in Figure 1-1. Combinations of moderate- and vigorous-intensity exercise can be done, such as 30 minutes of brisk walking 2 days during the week and 20 minutes of jogging another 2 days.
4. Also do 8–10 strength-training exercises, 8–12 repetitions of each, twice a week on nonconsecutive days. This can include lifting weights, calisthenics, elastic bands, etc., using major muscle groups.
5. “More is better.” Because greater amounts of physical activity (longer duration or greater intensity) can provide additional health benefits, people who wish to further improve their fitness, reduce risk for chronic disease, or prevent weight gain may benefit by exceeding the minimum recommended amounts of exercise.
6. Aerobic activity is needed in addition to the routine light-intensity activities of daily life, such as shopping, mopping, or taking out the trash. However, moderate to vigorous activities

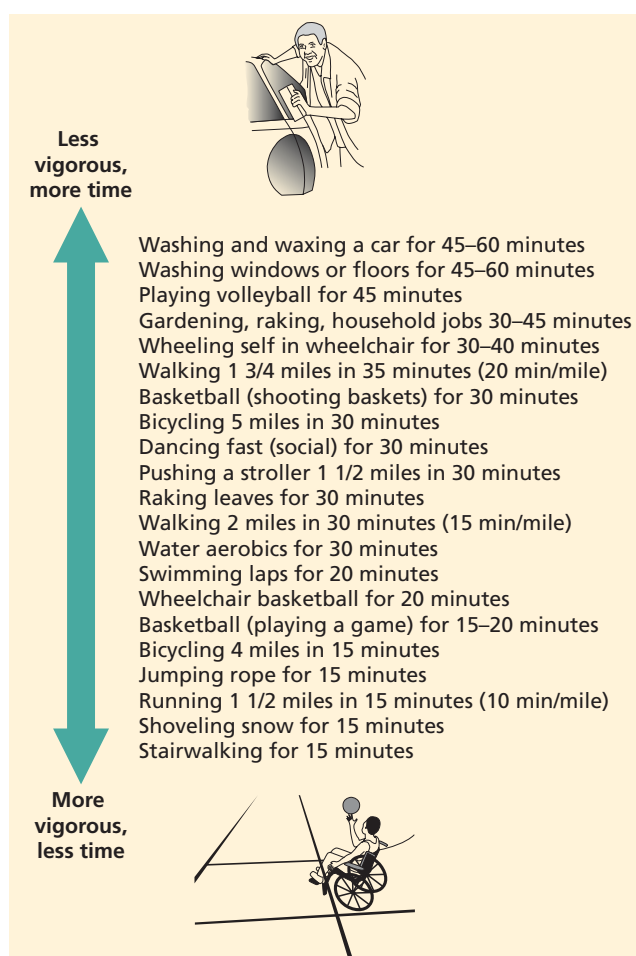


FIGURE 1-1

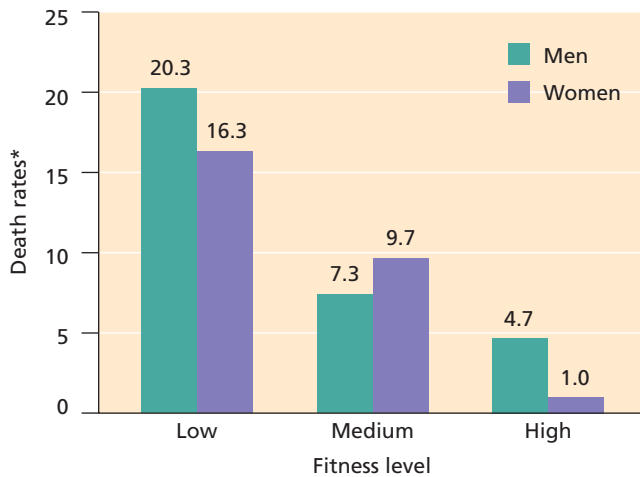
Moderate amounts of physical activity. SOURCE: U.S. Department of

Health and Human Services Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion. *Physical Activity and Health: A Report of the Surgeon General*. Atlanta: USDHHS (1996).

performed for more than 10 minutes, such as shoveling snow or walking to work, can count toward the goal.

If you are in the contemplation stage of change, weighing the benefits and costs of an exercise program can help you move to the next stage. If lack of time is a concern, note that a minimum of 1 hour of exercise (20 minutes $\times$ 3 days) out of 168 hours in your week pays big health dividends:

- ✓ Reduces risk of premature death.
- ✓ Reduces risk of dying from coronary heart disease and developing high blood pressure, cancer, and diabetes.
- ✓ Helps reduce body fat and control weight.
- ✓ Helps reduce blood pressure in some people who already have high blood pressure.
- ✓ Helps build and maintain healthy bones, muscles, and joints.

**FIGURE 1-2**

Effects of physical fitness on mortality rates.

*Age-adjusted per 10,000 person-years at follow-up.

- ✓ Reduces the risk of developing metabolic syndrome, a deadly combination of three or more of abdominal obesity, insulin resistance, elevated triglycerides, low HDL, and elevated blood pressure.
- ✓ Prevents cognitive decline in older individuals and may improve cognitive performance in people of all ages.
- ✓ Reduces anxiety and depression and improves mood.
- ✓ Promotes psychological well-being.

A landmark study conducted at the Institute for Aerobics Research in Dallas by Steven Blair et al. provides evidence that physical fitness is associated with longevity (Figure 1-2). In this 8-year study, physical fitness was quantified by using an exercise tolerance test on a treadmill. The subjects were categorized into physical fitness levels based on the treadmill test. The greatest reduction in risk of death occurred between the low and medium levels of fitness. Therefore, a modest improvement in fitness among the most unfit can bring about substantial health benefits.

Healthy People 2010 also contains exercise objectives, which include the following:

- ✓ To reduce to 20 percent the proportion of adults who engage in no leisure-time physical activity.
- ✓ To increase to 30 percent the proportion of adults who engage regularly in moderate physical activity for at least 30 minutes or more.

Accomplishing these objectives would greatly reduce premature mortality rates. Then, perhaps, these individuals will enjoy a new active lifestyle and begin to see and feel the health benefits of exercise. Eventually, they may invest additional time and energy, increasing the

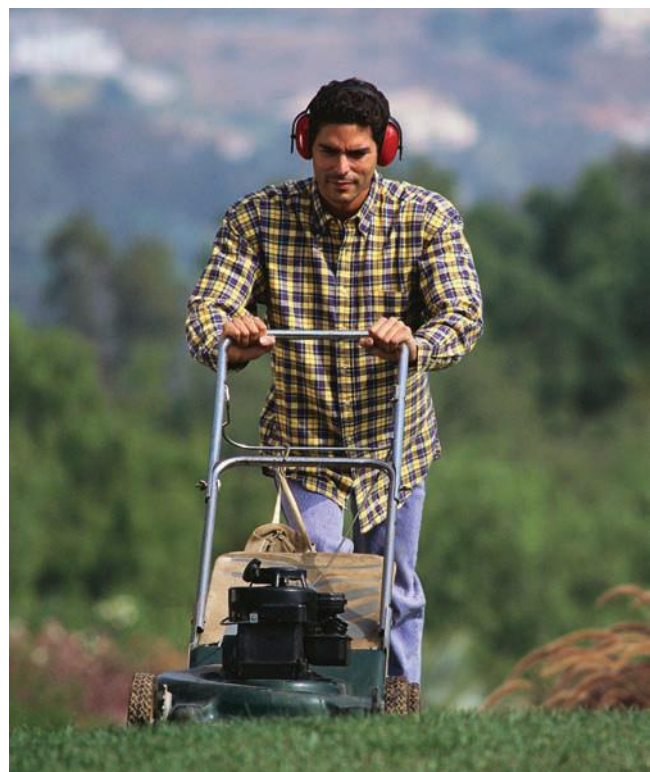
potential to acquire greater benefits from increased levels of activity.

Moderate Physical Activity for Health Promotion

There are differences in the intensity and duration of physical activity needed for health, for physical fitness, and for performance, such as in athletics. What is involved in adopting a moderately active lifestyle?

First, realize that physical activity does not have to be punishing to be beneficial. The emphasis should be on activity of *moderate* intensity. This would be equivalent to walking approximately 2 miles at a pace of 15 minutes per mile. You don't have to be soaked with sweat for improvements in health to occur.

Second, exercise does not have to be done all at one time. We know that 20 minutes or more of vigorous exercise is recommended for high-level fitness (full cardiorespiratory benefit), but all activity is beneficial to our health. Something is better than nothing. Incorporate bits of activity every day whenever and wherever you can. For example: Ride your bike to mail a letter; play racquetball, walk, swim, or run at noon; take a walk after dinner; walk to the grocery when you need only a few items. *Look* for opportunities to add daily activity—get up earlier, use TV commercial time, when working out a problem, when visiting a friend, and so on.



Just 30 minutes of moderate activity can provide many health benefits.



THE NUMBERS

250,000	Premature deaths per year in the United States attributable to lack of exercise.
89%	Adults who need more physical activity to improve their health.
60%	Adults who are not regularly active.
29%	Adults who are not active at all.
30	Minutes of daily moderate activity needed to gain health benefits.

How Much Exercise Is Needed for Health—30, 60, or 90 Minutes?

The amount of daily physical activity recommended depends on your goal. To lower the risk of chronic diseases, 30 minutes of moderate activity is recommended on 5 days of the week. This is important for reducing risk of coronary heart disease, diabetes, and cancer. Walking 2 miles in 30 minutes, or mowing the lawn with a push mower for 30 minutes, would meet the goal. However, this may not be enough to prevent weight gain. People can get greater health and fitness benefits from more vigorous activity or longer duration. Studies of people who have lost weight and kept it off for several years show that 60 minutes of moderate-intensity

activity, or lesser amounts of vigorous activity, are needed to lose weight. For those who have lost weight and are trying to keep it off, 60 to 90 minutes of physical activity are recommended to prevent gaining it back.

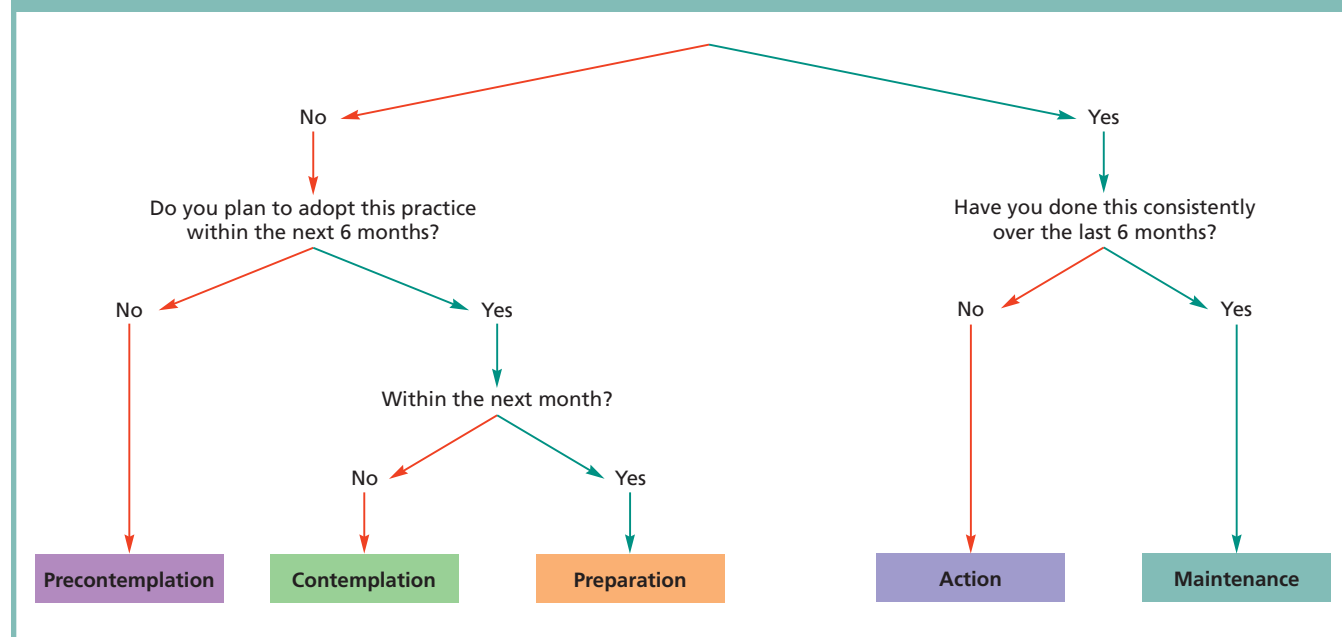
Most people declare lack of time as a reason for not exercising, but the average person spends 15 to 20 hours watching television. For the time-crunched, Figure 1-1 has some suggestions for working exercise into your day.

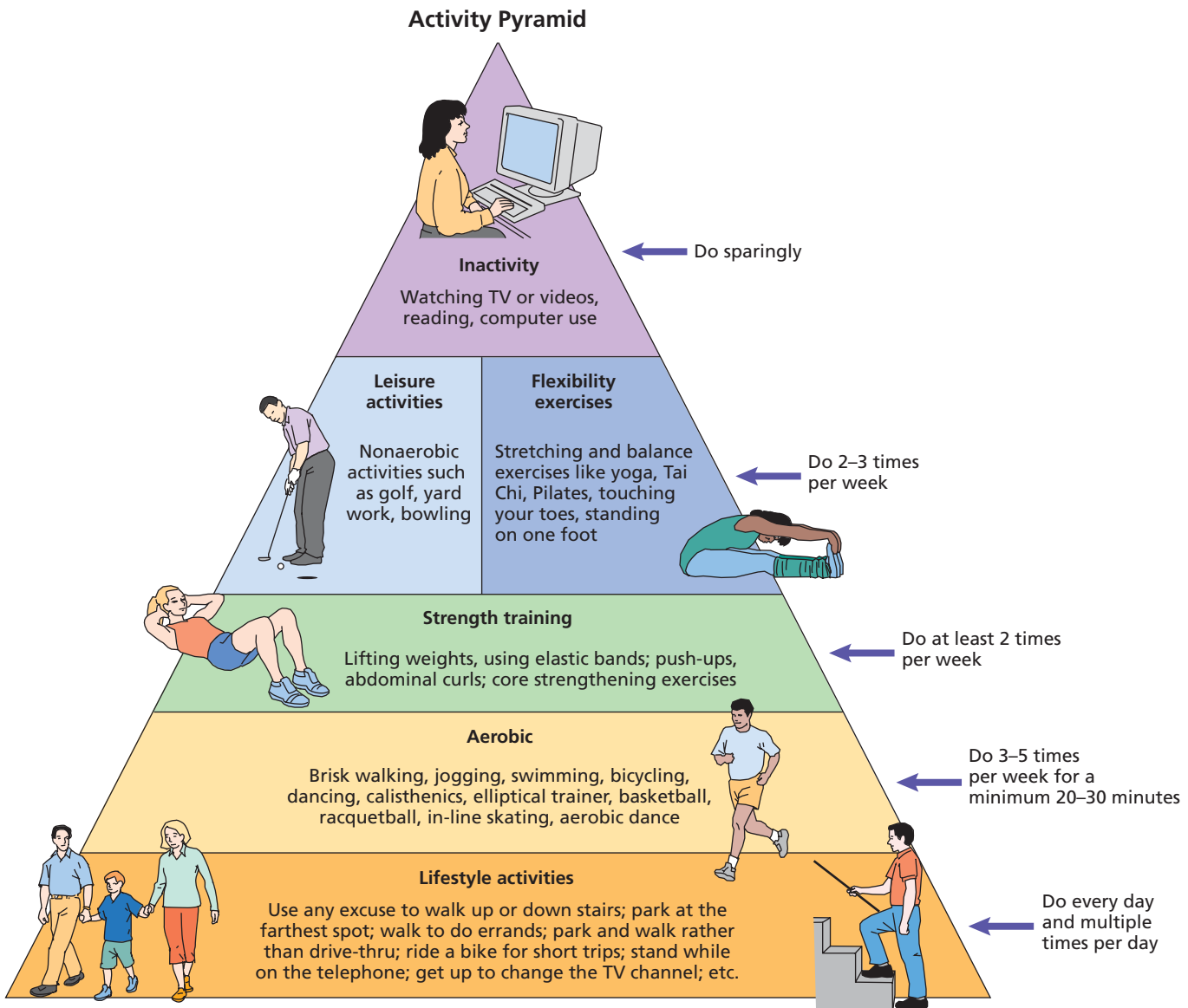
The Activity Pyramid

The Activity Pyramid (Figure 1-3), like the Food Guide Pyramid (see Chapter 9), is a guide to help you choose activities to improve your health and fitness level. The activities at the base of the pyramid, such as walking the dog

What Stage of Change Are You In?

Do you occasionally find ways to add physical activity into your daily life?
(e.g., taking the stairs instead of the elevator)





Activity pyramid.

FIGURE 1-3

and using the stairs more often, can be built into your everyday life. If you are currently sedentary, this is the place to start. If you are already moderately active, begin a formal exercise program (the second level of the pyramid) at least three times per week. Aerobic exercise is the most beneficial in promoting health benefits and cardiorespiratory fitness. Vigorous recreational sports also promote cardiorespiratory fitness. Extra healthful benefits can be achieved at the third level, which recommends strength exercises at least twice per week to build balanced fitness, especially if you already do aerobic exercise regularly. The fourth level adds flexibility and leisure activities two or three times per week. The top of the pyramid suggests what to do *least*, including sitting and watching TV.

You are faced with a tremendous challenge. Because you are our nation's future homemakers, parents, and leaders, the responsibility for the health and well-being of the next generation rests in your hands. You can make an enormous impact on the activity patterns of your children, family, friends, and neighbors by setting a good example. So go to it: Get up off the sofa, turn off the TV, and accept the challenge to enjoy exercise daily.

Encourage your friends and neighbors to get out and work in the garden, walk around the block, mow the lawn, walk the dog, participate in recreational sports (bowling, tennis, golf, softball), and go dancing. Anyone can begin the journey toward wellness with a single step and begin reaping health benefits immediately.

TOP 10 LIST

Ways to Exercise on the Go

When you travel for business or pleasure, fitting in exercise presents a special challenge. As much as possible, plan ahead when/where you will fit in exercise during your trip. Pack your exercise clothes and a small towel so that you will be ready to go. Here are some suggestions for incorporating exercise into your travel plans.

1. Pack an exercise band and instructions (see the back cover of this book). Exercise bands are lightweight and take very little space in the suitcase. They are inexpensive and allow a wide variety of exercises for different muscle groups.
2. Lace up your shoes and walk for both sightseeing and exercise. You can often get route directions and maps from hotel personnel or a city guidebook. Walk wherever and whenever possible, avoiding cars and cabs. If the weather is extreme and you would rather walk indoors, combine a trip to a mall with a 30-minute walk. Try to go early when the mall is least crowded.
3. Before you leave home, check the Internet for a list of gyms close to your destination and call or check online for classes (yoga, spinning, kickboxing) that you would like to try.
4. Use the Internet or a guidebook to check out local activities that you can incorporate into your trip like kayaking, climbing, swimming, and horseback riding.
5. With a laptop or portable DVD player, you can work out with an exercise DVD. A morning exercise program on TV may also be an option.
6. Pack two large empty plastic water bottles. When at your destination, fill the bottles with water to use as hand weights for upper-body exercises.
7. An inexpensive exercise mat is easy to pack and can be used for stretching and calisthenics as shown in Chapters 3 and 4.
8. If you have a few hours between flights, use them to walk the airport, stretch, or do a few exercises with your exercise band. Some airports have a fitness facility that you can use for a small fee. You can also stretch and use the exercise band for sitting exercises while on the plane.
9. If you would rather exercise indoors, take a jump rope. It can provide you with a way to do an aerobic workout in a small area.
10. If you are spending time on the beach, take a Frisbee and plan to be active rather than lying in the sand all day.

While moderate activity can improve health, physical fitness requires more vigorous exercise to cause long-term beneficial physiological changes. Specific

activity examples are given in Figure 1-1. Next, we look at the components of physical fitness and basic principles of fitness development.

WHAT IS PHYSICAL FITNESS?

Physical fitness is the ability of the body to function at optimal efficiency. The fit individual is able to complete the normal routine for the day and still have ample reserve energy to meet the other demands of daily life—recreational sports and other leisure activities—and to handle life's emergency situations. Physical fitness involves skill-related and health-related components, which are listed below. The *skill-related* components of fitness are important to athletic success and are not crucial for health. The five *health-related* components of fitness are important for health and performance of daily functional activities.

Skill-Related

- ✓ Speed
- ✓ Power
- ✓ Agility
- ✓ Balance
- ✓ Reaction time
- ✓ Coordination

Health-Related

- ✓ Cardiorespiratory endurance
- ✓ Muscular strength
- ✓ Muscular endurance
- ✓ Flexibility
- ✓ Body composition

HEALTH-RELATED COMPONENTS OF FITNESS

Cardiorespiratory Endurance

Probably the most important fitness component is **cardiorespiratory endurance (CRE)**, the ability of the heart, blood vessels, and lungs to deliver oxygen and essential nutrients to the working muscles and remove waste products during vigorous physical activity. Your life depends on the efficient functioning of your cardiorespiratory system. Research shows that vigorous exercise is needed to keep your heart healthy and prevent heart disease. Good CRE is also needed if you want to enjoy running, swimming, cycling, and other vigorous activities to live at the peak of health and enjoy a full life. For more information on CRE, see Chapter 2.

Muscular Strength

Muscular strength is the ability of a muscle to exert one maximal force against resistance. Short-duration, high-intensity efforts such as moving furniture, lifting a heavy suitcase, and lifting a 100-pound weight one time are examples. Strength is important in sports whether you are hitting a tennis ball, running, jumping, or

throwing. Weight training (Chapter 4) is the best way to enhance strength and provides health benefits needed across the life span.

Muscular Endurance

Muscular endurance is the ability of a muscle to exert repeated force against resistance or to sustain muscular contraction. It is characterized by activities of long duration but low intensity, such as doing repetitions of push-ups or sit-ups. Muscular endurance is essential in everyday activities such as housework, yard work, and recreational sports. Muscular strength and endurance tend to decline with age along with activity levels, making it difficult to perform daily activities such as getting in and out of a car and standing up from the floor. This loss can be delayed and muscular fitness can be maintained by participating in a resistance training program.

Flexibility

Flexibility is movement of a joint through a full range of motion. Flexibility is essential to smooth, efficient movement and may help prevent muscle strains. It is specific to each joint; you may have flexible shoulders but tight hip flexors or vice versa. Can you sit and touch your toes without bending your knees? This requires hamstring flexibility. You need arm and shoulder flexibility to scratch your back. Women usually have more joint flexibility than men because men have bulkier skeletal muscles. Older adults may have trouble performing routine tasks such as turning to watch traffic while driving and dressing when clothes fasten at the back because flexibility diminishes with age. This loss can be countered if stretching is part of your lifetime exercise program. Chapter 3 has more information about flexibility.

Body Composition

Body composition is the amount of body fat in proportion to fat-free weight. The ratio between body fat and fat-free weight is a better gauge of fatness than is body weight alone. There are various ways to measure body composition, and all are superior to the height/weight chart method. For instance, a height/weight chart may label a 6-foot, 210-pound football player as overweight, when in reality he has only 10 percent body fat, as measured with skinfold calipers. On the other hand, a sedentary person may look okay, but when body composition is analyzed, it is calculated to be 30 percent body fat. Have your body composition analyzed by a professional. Obesity is both unhealthy and uncomfortable and is associated with increased risk for heart disease, diabetes, high blood pressure, cancer, and joint and lower back problems.

PHYSICAL FITNESS AND WELLNESS

Becoming physically fit is a positive health habit that has a major impact on all dimensions of wellness (Table 1-1). It is one area where you can assume control of your lifestyle.

THREE-PART WORKOUT

An exercise session includes three parts: a warm-up, a conditioning bout, and a cool-down.

TABLE 1-1 *Benefits of Physical Fitness on Wellness Dimensions*

Physical	Slows the aging process; increases energy; improves posture and physical appearance; helps control weight; improves flexibility; improves muscular strength and endurance; strengthens bones and reduces osteoporosis; reduces risk for coronary heart disease.
Emotional	Relieves tension; aids in stress management; improves self-image; evens emotional swings; provides time for adult play; promotes psychological well-being.
Social	Enhances relationships with family and friends; increases opportunity for social contacts.
Intellectual	Develops concepts of mind and body oneness; increases alertness; enhances concentration; motivates toward improved personal habits (smoking cessation, reducing drug and alcohol use, better nutrition); stimulates creative thoughts.
Occupational	Decreases absenteeism; increases productivity; decreases disability days; lowers medical-care costs; lowers job turnover rate; increases networking possibilities.
Spiritual	Develops appreciation of body-mind connection; enhances appreciation for healthy environment; builds compassion for those less able.
Environmental	Develops appreciation for healthy air and water; increases concern for recycling and preservation of natural resources; increases interest in eliminating toxins and chemicals from food chain.

Warm-Up

The **warm-up** is an important beginning to an exercise session. Two important physiological changes occur during the warm-up. The internal temperature of the muscles increases, enhancing their elasticity. Heart rate and respiration increase, thus providing greater blood flow to the exercising muscles. The warm-up prepares the body physically and mentally for the conditioning bout and may reduce the chance of injury while exercising. There is no set length of time for the warm-up, although 5 to 15 minutes is adequate. On cold days or when you feel sluggish, the warm-up may take longer. When you're feeling energetic or when the temperature is warm, the warm-up period may be shorter. A good method of gauging whether you have had an adequate warm-up is to pay attention to how you feel. Do you feel ready to exercise vigorously? If you still feel stiff and sluggish, you need a longer warm-up. A slight sweat, reflecting an increase in deep muscle temperature, is a good indication of an adequate warm-up.

Three activities may be included in the warm-up: calisthenics (such as jumping jacks), mild stretching exercises, and a short period of task-specific activity. Stretching during a warm-up is mainly preparation for the activity, not for flexibility. Gentle **static stretching**, in which a stretch is held for 10 to 30 seconds, is best.



Everybody benefits from physical activity.

Ballistic stretching, with jerking and bouncing movements, should not be used because it can strain cold muscles. See Figures 3-1 and 3-2 for more information on types of stretching and specific exercises. Most experts agree that the best time to stretch for flexibility is during the cool-down phase because the muscles are warmer and more elastic.

The **task-specific activity** is an exercise using the same muscles that will be used in the conditioning bout but at a lowered intensity level (lower heart rate). For example, joggers should include a short period of walking or slow jogging before increasing to normal intensity.

Conditioning Bout

The **conditioning bout** is the main part of the workout: 20 to 30 minutes or more. It may include a variety of activities for building cardiorespiratory endurance, muscular strength and endurance, or flexibility, depending on your goals. Gradually increase the frequency, time, and intensity of your exercise sessions until you reach a maintenance level. Progress slowly and listen to your body. If the exercise is at an appropriate level, you should recover within an hour. If you are too tired afterward or if the fatigue lingers until the next day, ease back on the workout time, intensity, or frequency to find an appropriate level. Your goal is a lifetime of exercise. Select one or more activities you will enjoy. Depending on your age, current fitness level, and physical abilities, enjoy walking, cycling, weight training, or any other vigorous activity you prefer.

Cool-Down

The **cool-down** is the final segment of the exercise session. The purpose of the cool-down is to ease your body back to its resting state. It will usually take 5 to 15 minutes to reduce the intensity of exercise. It should begin with the same activity performed in the conditioning bout, but at a lowered intensity. For example, if you jog, reduce the pace and end with a period of walking. Failure to cool down may allow the muscles to tighten further, potentially causing soreness and stiffness. Another problem with an inadequate cool-down is the possibility of venous blood pooling in the lower extremities, resulting in faintness and dizziness. The cool-down should continue until the heart rate is approximately 100 to 110 beats per minute or less. In the cool-down, spend a few minutes stretching while the muscles are thoroughly warm and elastic. Use the stretching exercises illustrated in Figures 3-1 and 3-2. Greater flexibility is achieved when stretching occurs in the cool-down segment of the workout.

PRINCIPLES OF FITNESS DEVELOPMENT

When a person begins an exercise program, the body adapts over time to the demands placed on it. The beneficial long-term changes that occur with regular exercise depend on several factors. To put together an effective exercise program, it is important to understand several principles of fitness development, including overload, specificity, reversibility, and individual differences.

Progressive Overload

Progressive overload is a gradual increase in physical activity, working a muscle group or body system beyond accustomed levels. Overload is perhaps the most important factor in developing physical fitness. When the amount of exercise is gradually increased, the muscle group or system, such as the cardiorespiratory system, gradually adapts, resulting in improved physiological functioning. In addition, a decrease in the severity and a delay in the onset of fatigue occur. If there is insufficient overload, there is no fitness improvement, but too much overload can cause injury. The key to gradual overload is to increase slowly.

To progress in cardiorespiratory exercise, gradually increase the frequency of workouts, starting with three and progressing to five workouts per week, adding one workout each week. Second, increase time. Start with workouts of 20 minutes (or less, if your fitness is very low), and lengthen the workouts by no more than 10 percent per week. For example, if the conditioning bout is 20 minutes, the next week's workout can be 22 minutes. Third, increase the workout intensity by no more than 10 percent per week. See Chapter 2 for further information on developing cardiorespiratory fitness.

The old saying "No pain, no gain!" is inappropriate advice for fitness exercisers. To increase your level of fitness and minimize the risk of overuse injury, follow the prescription factors in the correct order and listen to your body. Don't rush to get into shape in a few weeks. Exercise is for a lifetime.

Specificity

The **principle of specificity** means that only the muscles or body systems being exercised will show beneficial changes. To improve the cardiorespiratory system, exercise the heart and lungs through aerobic activities; to improve flexibility, do stretching exercises; and to improve muscular strength, lift weights. You cannot strengthen the muscles of the arms by jogging or increase cardiorespiratory fitness by doing yoga. This principle also helps explain why you are "wiped out" after swimming 10 minutes even though you can run for 30 minutes.

Reversibility

The **principle of reversibility** states that changes occurring with exercise are reversible and that if a person stops exercising, the body will decondition and adapt to the decreased activity level. Rate of fitness loss varies, but if a person stops exercising, a gradual loss of fitness begins within 48 hours. All fitness improvements can be lost within 2 to 4 months. If a person must decrease activity, the greatest benefits can be retained by maintaining intensity while decreasing the frequency or time of exercise. For example, if a person is traveling for 2 weeks and doesn't have time for the regular 30-minute run, 5 days a week, dropping to 20 minutes or 3 days a week at the usual target heart rate (THR) will help maintain training effect benefits.

Individual Differences

The **principle of individual differences** states that people vary in their ability to develop fitness components. Some people find that it is relatively easy to build strength, but they have to work hard to maintain their desired body composition. Others find that it is easier to increase their cardiorespiratory endurance than their flexibility. We differ in our genetic endowment, and there are limits on our ability to improve any particular fitness component. Some have estimated that maximal oxygen uptake can be improved by only about 15 to 30 percent with aerobic exercise. Even that amount of increase can make a tremendous difference in quality of life. Within our genetic endowment, we have potential for improvement. You don't have to be an Olympic athlete to gain the health benefits of physical activity.

Cross Training

Cross training involves participating in two or more types of exercise in one session or in alternate sessions for balanced fitness. An easy way to start is to vary activities; for example, you could add one swimming session and two weight training days to a three-times-per-week jogging program and stretch daily. Or within one exercise bout you may spend a few minutes warming up on a treadmill, lift weights, do stationary cycling for 20 minutes, and finish with stretching. See Table 1-2 for cross-training activities. Cross training provides several advantages for the health/fitness exerciser:

- ✓ It adds variety to your exercise sessions, preventing boredom and making it easier to stick to an exercise program.
- ✓ It provides a greater variety of fitness benefits than does any single activity alone. For example, weight training improves muscular strength and endurance but does little for cardiorespiratory endurance or flexibility. Running increases

TABLE 1-2 *Activities for Cross Training*

Exercise Goal	Activity
Cardiorespiratory endurance	Running, fitness walking, aerobic dance, bench and stair stepping, rope jumping, cross-country skiing, swimming, cycling, water exercise, in-line skating, ice skating, full-court basketball, ultimate Frisbee, soccer
Flexibility	Stretching, yoga, Tai Chi, Pilates
Muscular strength	Resistance training with weight machines, free weights, elastic bands, gymnastics
Muscular endurance	Calisthenics (push-ups, pull-ups, abdominal curls), weight training with light weights and high repetitions
Body composition	Cardiorespiratory endurance exercises burn calories at the highest rate per minute. Resistance training builds muscle, which increases metabolic rate for a greater calorie burn 24 hours a day.

cardiorespiratory endurance but does little for upper-body strength. Cross training can be used to develop all five fitness components.

- ✓ It reduces the risk of injury because the bones, joints, and muscles are not subjected to the same repetitive stresses of one activity, which leads to overuse injuries (e.g., shin splints from excessive impact).
- ✓ Changing activities utilizes muscles differently, promoting muscle symmetry, a balance of strength, and flexibility in opposing muscle groups. Using only one activity tends to cause some muscles to grow strong and their opposing muscles to grow disproportionately weak.
- ✓ You may continue to train while allowing an injury to heal by using activities that do not stress the injured area.
- ✓ It develops balanced fitness, because optimal performance in any activity usually requires more than one fitness component. For example, a distance runner may benefit from greater strength and anaerobic fitness to run uphill or sprint to the finish line.

ASSESSING PHYSICAL FITNESS

Physical fitness tests are often divided into two categories: health-related and skill-related. Skill-related tests, such as a vertical jump or shuttle run, are

performance-based and are related to athletic ability. Health-related tests are related to functional well-being in the areas of cardiorespiratory endurance, muscular strength and endurance, flexibility, and body composition. These areas of physiological functioning can be improved or maintained through regular exercise and offer protection against the negative effects of a sedentary lifestyle.

Do you know how fit you are? We seem to have a natural curiosity about how we compare to others. The purpose of fitness testing is to help you identify your current fitness levels in several health-related categories. Such an evaluation should tell you whether your current lifestyle is effective in developing and maintaining a level of fitness conducive to optimal wellness. Your results can be used as a basis for setting personal fitness goals; for developing an appropriate individualized exercise prescription; and finally, for measuring the effectiveness of your fitness program in reaching your goals. *Note:* Many different tests are provided as options. Do one or more, but do not feel that you must do all of them!

The remainder of this chapter gives norms that enable you to compare your fitness levels with those of other students. Norms reflect achievements of thousands of people who have completed a 12- to 15-week fitness course. When evaluating your fitness and setting goals, keep in mind that scoring in the “low” category does not reflect negatively on you. People often score in this category if they have not previously been exercising. While “superior” is an attainable goal for some, relatively few people achieve this level in one or more areas of fitness. *Health-related fitness benefits can be experienced at the “average” fitness level.* Bodies are different. Your current fitness level does not indicate your potential. Physical capacity to achieve any particular level of fitness is partially genetically determined. You may find that you gain strength easily but must constantly work on flexibility or vice versa.

Also keep in mind that all tests are subject to some measurement variability. Results of tests of aerobic capacity and muscular fitness are influenced by a person’s level of motivation. If you don’t try hard, your fitness will be underestimated. Use these norms as guidelines. Finally, testing should not dominate your program but help you measure its effectiveness. You may wish to measure at the beginning of your program and remeasure 8 to 12 weeks into the program to see how you are progressing.

A *Personal Fitness Profile* is located in Lab Activity 1-3. When completed, it will indicate areas of fitness you can maintain and areas needing improvement. It will help you decide where to begin in your fitness program. Norms for fitness tests are given in Table 1-3 and detailed instructions are given in Labs 1-4 through 1-10 at the end of this chapter.

TABLE 1-3 *Fitness Test Norms**

1.5-Mile Run								
Age	18–29		30–39		40–49		50–59	
	F	M	F	M	F	M	F	M
Superior	<12:34	<8:26	<13:34	<9:10	<14:34	<9:55	<15:34	<10:40
Good	12:34–13:40	8:26–10:24	13:34–14:40	9:10–11:10	14:34–15:40	9:55–12:00	15:34–16:40	10:40–12:50
Average	13:41–14:45	10:25–12:31	14:41–15:45	11:11–13:45	15:41–16:45	12:01–14:55	16:41–17:45	12:51–16:05
Fair	14:46–16:00	12:32–14:49	15:46–17:00	13:46–16:00	16:46–18:00	14:56–17:15	17:46–19:00	16:06–18:30
Low	>16:00	>14:49	>17:00	>16:00	>18:00	>17:15	>19:00	>18:30
1.0-Mile Walk								
Age	18–29		30–39		40–49		50–59	
	F	M	F	M	F	M	F	M
Superior	<12:34	<11:39	<13:34	<12:40	<14:34	<13:40	<15:34	<14:10
Good	12:34–13:40	11:39–12:59	13:34–14:40	12:40–14:00	14:34–15:40	13:40–14:40	15:34–16:40	14:10–15:20
Average	13:41–14:45	13:00–14:21	14:41–15:45	14:01–15:20	15:41–16:45	14:41–15:55	16:41–17:45	15:21–16:25
Fair	14:46–16:00	14:22–15:43	15:46–17:00	15:21–16:15	16:46–18:00	15:56–16:45	17:46–19:00	16:26–17:25
Low	>16:00	>15:43	>17:00	>16:15	>18:00	>16:45	>19:00	>17:25
3.0-Mile Bicycle Ride								
Age	18–29		30–39		40–49		50–59	
	F	M	F	M	F	M	F	M
Superior	<9:18	<8:24	<9:54	<9:00	<10:30	<9:36	<11:06	<10:12
Good	9:18–10:06	8:24–9:12	9:54–10:42	9:00–9:42	10:30–11:06	9:36–10:12	11:06–11:36	10:12–10:42
Average	10:07–11:06	9:13–10:12	10:43–11:42	9:43–10:48	11:07–12:18	10:13–11:24	11:37–12:54	10:43–12:00
Fair	11:07–12:00	10:13–11:06	11:43–12:30	10:49–11:35	12:19–13:00	11:25–12:06	12:55–13:30	12:01–12:48
Low	>12:00	>11:06	>12:30	>11:35	>13:00	>12:06	>13:30	>12:48
500-Yard Swim								
Age	18–29		30–39		40–49		50–59	
	F	M	F	M	F	M	F	M
Superior	<7:05	<6:12	<7:35	<6:30	<8:05	<7:00	<8:35	<7:30
Good	7:05–8:49	6:12–7:44	7:35–9:19	6:30–8:14	8:05–9:49	7:00–8:44	8:35–10:19	7:30–9:14
Average	8:50–10:34	7:45–9:19	9:20–11:04	8:15–9:49	9:50–11:34	8:45–10:19	10:20–12:04	9:15–10:49
Fair	10:35–12:19	9:20–10:51	11:05–12:49	9:50–11:22	11:35–13:19	10:20–11:52	12:05–13:49	10:50–11:22
Low	>12:19	>10:52	>12:49	>11:22	>13:19	>11:52	>13:49	>11:22
500-Yard Water Run								
Age	18–29		30–39		40–49		50–59	
	F	M	F	M	F	M	F	M
Superior	<7:59	<6:53	<8:30	<7:20	<9:00	<7:50	<9:30	<8:20
Good	7:59–8:38	6:53–7:44	8:30–9:08	7:20–8:15	9:00–9:38	7:50–8:45	9:30–10:08	8:20–9:15
Average	8:39–9:18	7:45–8:38	9:09–9:48	8:16–9:05	9:39–10:18	8:46–9:35	10:09–10:48	9:16–10:05
Fair	9:19–9:58	8:39–9:32	9:49–10:28	9:06–10:00	10:19–10:58	9:36–10:30	10:49–11:28	10:06–11:00
Low	>9:58	>9:32	>10:28	>10:00	>10:58	>10:30	>11:28	>11:00

*Norms reflect the achievements of thousands of people who have completed a 12- to 15-week fitness course. Norms are revised yearly.

(continued)

GUIDELINES FOR MEDICAL CLEARANCE

According to American College of Sports Medicine guidelines, it is generally safe for men under age 40 and women under 50 to begin a vigorous exercise program if they are healthy and have had a satisfactory medical

checkup in the last 2 years. Also, if you have been exercising regularly, it is probably safe to continue progressing gradually from your current activity level. Prior to participation, you should complete the *Student Precourse Health Assessment* form found in Lab Activity 1-1 to identify any potential health concerns.

If you are over these age guidelines or if, regardless of age, you have had health concerns noted on the *Student*

TABLE 1-3 *Fitness Test Norms (continued)*

1-Minute Abdominal Curls								
Age	18–29		30–39		40–49		50–59	
	F	M	F	M	F	M	F	M
Superior	>88	>93	>70	>78	>56	>65	>45	>49
Good	75–88	79–93	60–70	62–78	48–56	53–65	38–45	42–49
Average	60–74	64–78	47–59	51–61	37–47	42–52	29–37	35–41
Fair	45–59	50–63	35–46	40–50	27–36	36–41	21–28	28–34
Low	<45	<50	<35	<40	<27	<36	<21	<28
1-Minute Push-Ups								
Age	18–29		30–39		40–49		50–59	
	F	M	F	M	F	M	F	M
Superior	>54	>64	>43	>54	>33	>43	>23	>33
Good	44–54	51–64	32–43	41–54	26–33	32–43	18–23	26–33
Average	32–43	37–50	22–31	27–40	17–25	22–31	11–17	17–25
Fair	20–31	23–36	13–21	18–26	8–16	13–21	6–10	8–16
Low	<20	<23	<13	<18	<8	<13	<6	<8
Sit and Reach (inches)								
Age	18–29		30–39		40–49		50–59	
	F	M	F	M	F	M	F	M
Superior	>8.5	>7.0	>8	>6	>7	>5	>6	>4
Good	6.5–8.5	4.0–7.0	5–8	3–6	4–7	2–5	3–6	1–4
Average	4.0–6.4	1.0–3.9	3–4.9	0–2.9	2–3.9	–1–1.9	1–2.9	–3–0
Fair	1.0–3.9	–2.0–0.9	0–2.9	–3––0.1	–1–1.9	–4––1.1	–2–0.9	–5––3.1
Low	<1.0	<–2.0	<0	<–3	<–1	<–4	<–2	<–5
Leg Press (max/body weight)								
Age	18–29		30–39		40–49		50–59	
	F	M	F	M	F	M	F	M
Superior	>1.97	>2.39	>1.67	>2.19	>1.56	>2.01	>1.42	>1.89
Good	1.68–1.97	2.13–2.39	1.47–1.67	1.93–2.19	1.37–1.56	1.82–2.01	1.25–1.42	1.71–1.89
Average	1.50–1.67	1.97–2.12	1.33–1.46	1.77–1.92	1.23–1.36	1.68–1.81	1.10–1.24	1.58–1.70
Fair	1.37–1.49	1.83–1.96	1.21–1.32	1.65–1.76	1.13–1.22	1.57–1.67	.99–1.09	1.46–1.57
Low	<1.37	<1.83	<1.21	<1.65	<1.13	<1.57	<0.99	<1.46
Bench Press (max/body weight)								
Age	18–29		30–39		40–49		50–59	
	F	M	F	M	F	M	F	M
Superior	>1.00	>1.62	>.79	>1.34	>.76	>1.19	>.67	>1.04
Good	.80–1.00	1.32–1.62	.70–.79	1.12–1.34	.62–.76	1.00–1.19	.55–.67	.90–1.04
Average	.70–.79	1.14–1.31	.60–.69	.98–1.11	.54–.61	.88–.99	.48–.54	.79–.89
Fair	.59–.69	.99–1.13	.53–.59	.88–.97	.50–.53	.80–.87	.44–.47	.71–.78
Low	<.59	<.99	<.53	<.88	<.50	<.80	<.44	<.71

SOURCES: For norms in 1.5-mile run, 1.0-mile walk, 3.0-mile bicycle ride, 500-yard swim, 500-yard water run, 1-minute abdominal curls, 1-minute push-ups, and sit and reach: E. Keener et al. "Undergraduate Student Physical Fitness Assessment," Muncie, IN: Ball State University (originally published Spring 1989; latest compiled data shown here); source for norms in leg press and bench press: based on norms from the Cooper Institute for Aerobics Research, Dallas, TX, revised 2000, used with permission.

Precourse Health Assessment form, it is important to check with your physician before taking a cardiorespiratory fitness test or participating in vigorous exercise. The *Physician-Approved Exercise Clearance Form* in Lab Activity 1-2 is designed for individuals with special health concerns to assist your instructor in individualizing your fitness

program according to your physician's recommendations. You may need to have a medical checkup and a diagnostic exercise test. If you smoke cigarettes, have been sedentary over the last several months, are pregnant, have diabetes, are 20 or more pounds overweight, or have family members who have positive risk factors for heart disease, it is

particularly important that you see your physician and ask him or her to fill out the *Physician-Approved Exercise Clearance Form*. Also, check with your physician if you are unsure or have concerns about your health.

CARDIORESPIRATORY ENDURANCE TESTS

High-level wellness is inextricably tied to a physically active lifestyle. If you want to be an active participant in life—not just a spectator—cardiorespiratory fitness is essential. A person with a high level of cardiorespiratory fitness can do more work with less fatigue than can a person with low cardiorespiratory fitness. Increased cardiorespiratory fitness can enhance quality of life by increasing the rate of energy production during physical activity. Low levels of cardiorespiratory fitness may result in a limited lifestyle due to low energy reserves, quick exhaustion after moderate exertion, and resulting inability to participate in vigorous, oxygen-demanding activities. The ability of your heart and lungs to supply oxygen during activity is one of the best indicators of overall physical fitness. There are several ways to measure your body's ability to use oxygen. The most accurate method is an **exercise tolerance test** on a treadmill or on a bicycle ergometer in a laboratory (see Figure 1-4). In an exercise tolerance test, a person exercises strenuously while heart rate and oxygen consumption are measured. This, however, is complex, expensive, and time-consuming and requires elaborate equipment and trained personnel. It is impractical for testing large numbers of people.

Cardiorespiratory fitness can also be measured in field tests conducted out of the laboratory setting. What these tests lose in accuracy they make up in the practicality of self-testing or testing many people at the same time. Field tests of cardiorespiratory endurance are generally based on physiological performance (distance or time tests) or a parameter such as pulse rate (step test).

A field test used to estimate oxygen consumption measures the time it takes you to jog 1.5 miles. Studies have shown that time on the 1.5-mile run correlates well with your maximal ability to utilize oxygen. The faster you cover the distance, the more efficient your heart and lungs are at their job of supplying oxygenated blood and nutrients to the working muscles. Field tests make it easy for you to measure your fitness and detect progress as you train. Keep in mind that if you retest within a few weeks, early improvements may be due to a “learning effect” rather than true cardiovascular changes. That is, you will learn to pace yourself better throughout the distance. It will take 8 to 12 weeks for significant cardiovascular improvement to occur. You should take the *1.5-Mile Run Test* only if you are conditioned for it. It is best if you have been building up to the distance gradually



FIGURE 1-4

Exercise tolerance test on a bicycle ergometer.

for several weeks prior to taking the test. Other field tests that measure cardiorespiratory endurance are the *1-Mile Walk Test*, the *3-Mile Bicycling Test*, the *500-Yard Swim Test*, the *500-Yard Water Run Test*, and the *3-Minute Step Test*. You can choose the test most appropriate for your chosen physical conditioning activity. Detailed instructions for these tests are in Labs 1-4 through 1-6.

Pretest Instructions

For any of the cardiorespiratory endurance tests, you will need comfortable clothes appropriate for the activity and a stopwatch or a watch with a second hand.

- ✓ If possible, avoid taking the test under conditions of extreme heat or cold, particularly if you are not accustomed to exercising under those conditions.

- ✓ Do not eat a heavy meal, consume alcohol, take caffeine, or smoke for up to 3 hours prior to the test.
- ✓ Drink plenty of fluids the day before testing.
- ✓ Rest from vigorous exercise at least 1 day prior to taking the test.
- ✓ Get adequate sleep (7 to 9 hours) the night before testing.
- ✓ Warm up and stretch before taking the test and then cool down and restretch afterward.
- ✓ If at any point during the test you begin to feel ill, dizzy, faint, or extremely short of breath, stop! Your body is telling you that you are not ready for this level of exertion.

Do not be ashamed of stopping before completing the test, especially if you are unfit. Test performance may be limited by local muscular endurance or by aerobic capacity. You may record the amount of time in the test you were able to complete and work toward a fitness level that will enable you to complete the test.

1.5-Mile Run Test

The *1.5-Mile Run Test* requires six laps around a standard quarter-mile track, or it can be done on a measured section of road that has few stoplights. Consider taking this test only if you have been exercising previously. The *1-Mile Walk Test* may be more appropriate for you if you are over 35 years of age or 20 or more pounds overweight or if you have been out of shape for some time but are otherwise in good health. See Lab 1-4 for detailed instructions.

1-Mile Walk Test

For those who are starting a walking program or for whom the *1.5-Mile Run Test* may be too vigorous, the *1-Mile Walk Test* is an option. You will need a 1-mile measured course (four laps of a quarter-mile track), your walking shoes, and a watch with a second hand. See Lab 1-4 for detailed instructions.

3-Mile Bicycling Test

If your main fitness activity is bicycling, you can test your cardiorespiratory fitness with a timed 3-mile bicycle ride. This test can be done on a bike track or on a measured section of road with few stoplights or stop signs. See Lab 1-4 for detailed instructions.

500-Yard Swim Test

If your fitness program consists primarily of swimming, you will find a swimming endurance test useful. A regulation 25-yard pool is recommended, and you will need a friend to time you. You may swim any stroke, although best results will be obtained with the front crawl. See Lab 1-5 for detailed instructions.

500-Yard Water Run Test

The *500-Yard Water Run Test* was designed for those involved in aerobic water exercise programs in which swimming skills are not required. It can be done lengthwise in a pool of constant depth or widthwise across the shallow end of a pool of variable depth. It helps to work in pairs, with one partner on deck counting completed laps for the other. For the most accurate results, runners should carve their own paths through the water and avoid drafting in the wake of other runners. Runners should use their arms to pull as they run but must maintain a vertical body position. No swimming is allowed. See Lab 1-5 for detailed instructions.

3-Minute Step Test

A variety of step tests are useful for testing cardiorespiratory fitness indoors. They involve stepping on and off a bench for a 3- to 5-minute period and measuring the heart rate recovery. The step test is based on the fact that the heart rate of a person who is physically fit is lower at any workload and recovers faster than does the heart rate of a person who is unfit. Although it is not the best measure of cardiorespiratory fitness, it is a quick and simple way to evaluate the heart's response to exercise. It is easy to administer to an individual or to large groups, requires no special skill to perform, and requires little equipment. See Lab 1-6 for detailed instructions.

MUSCULAR STRENGTH AND ENDURANCE TESTS

Muscular strength and endurance are assets in the ability to perform daily activities—lifting, carrying, pushing, pulling—without strain or undue fatigue. Strength and endurance of the abdominal muscles are particularly important for good posture and lower back health. Muscular fitness activities add shape and firmness to muscles, resulting in a trim, well-toned appearance.

Muscular strength and muscular endurance tests have been used as a measure of physical fitness for years. Physical conditioning activities require and can develop both components. Strength is best developed by weight training and is often measured by one maximal lift with weights. Muscular endurance can be measured without special equipment by using the tests provided in Lab 1-7.

Muscular strength and muscular endurance are measured by different tests. You can assess the strength of major muscle groups by taking the *Leg Press Strength Test* and the *Bench Press Strength Test* using the guidelines provided in Lab 1-8.

Abdominal Curls and Push-Ups

Abdominal curls are perhaps the best way to assess the endurance of the abdominal muscles. The traditional *Bent-Knee Sit-Up Test* requires use of the thighs and hip flexors as well as abdominals and may put the back at risk. Abdominal curls isolate and test only abdominal muscles, decreasing risk to the lower back. Push-ups test the muscular endurance of the arms and upper-body muscles. Directions and norms for abdominal curls and push-ups are given in Lab 1-7.

Leg Press Strength Test

The best measure of strength is one single maximal lift (one-rep max). This should be attempted only after several sessions of weight training, emphasizing proper lifting form for safety, as the risk of injury is high for an inexperienced lifter. If you have knee, ankle, or lower back problems, check with your physician before attempting a maximal lift. As there is no industry standard for resistance levels on weight machines, “70 pounds” will give a slightly different resistance level on a Universal, Cybex, or Nautilus. Strength testing using a machine is encouraged as it is safer than using free weights. You will need a leg press machine and a weight scale. Detailed instructions are given in Lab 1-8.

Bench Press Strength Test

If you have shoulder problems, check with your physician before attempting a maximal lift. While free weights may be used, strength testing using a machine is encouraged because it is safer than using free weights. You will need a bench press machine and a weight scale. See Lab 1-8 for detailed instructions.

FLEXIBILITY TESTS

Flexibility is a valuable asset in daily activities or in any type of vigorous exercise program. The ability to move joints through a full range of motion without stiffness or tightness makes exercise more comfortable and may decrease the risk of injury. The tests included in this section will indicate whether you have a normal range of motion in the lower back and other important areas.

Quick Checks for Flexibility

The quick checks for flexibility in Lab 1-9 are easy ways of measuring the flexibility of major muscle groups often shortened and tightened in daily activities. Each quick check is also a stretch, so if your range of motion is limited or if you feel excessive tightness in a joint or muscle group, use the same position to improve flexibility in

that area (see Chapter 3 for basic fitness flexibility guidelines). Note that the hamstring flexibility test (Lab 1-9) eliminates the problem of arm-leg length discrepancy found in the traditional sit and reach test.

Sit and Reach Test

The *Sit and Reach Test* (Lab 1-9), which measures back and hamstring flexibility, can be done with a flex box. If you do not have a flex box, the test can be performed with a ruler on a bench or on the ground with feet flexed. Norms are given using the soles of the feet as the 0 inches mark.

Sit and Reach Wall Test

The *Sit and Reach Wall Test* is a self-check for flexibility and can quickly be performed by a large number of people. All you need is a wall. See Lab 1-9 for detailed instructions.

BODY COMPOSITION TESTS

A certain amount of body fat is essential to good health. Fat acts as an insulator, conserving body heat. It pads bones and cushions internal organs, and it stores and supplies energy for later use.

In a diet-obsessed society in which both obesity and eating disorders abound, few people realize that excessive leanness can be as unhealthy as excessive fatness. For young adults, an average range of body fat for women is 21 to 24 percent, and for men it is 14 to 17 percent (Table 1-4). Keep in mind that each of us has inherited a certain body build and fat distribution; it is natural for some bodies to carry more fat than others do. It is also natural to increase body fat slightly as we age.

While weight scales can tell you how much you weigh, they cannot tell you how much of your body is composed of fat or lean tissue. A sedentary individual may maintain a normal weight for height but increase fat and lose **lean body mass** (muscle tissue) over time. A body builder may be “overweight” according to height-weight charts, but this is due to the development of muscle and bone rather than fat. Being overweight due to having a substantial amount of lean muscle tissue is not the same as being overweight due to excess fat tissue. People who have a muscular build may think they are too heavy when the weight is mainly lean tissue. They could jeopardize their health trying to lose weight unnecessarily. On the other hand, sedentary people who are satisfied with their weight may be shocked to discover that their body fat percentage is over 30 percent, high enough to pose a health risk. In the early stages of a fitness program, excess fat will often be lost and lean muscle weight will increase as fitness improves. Even if no significant weight change occurs, the exerciser

is leaner and appears trimmer because a pound of muscle is denser than a pound of fat.

Body fat is measured by using several different techniques. Laboratory tests include DEXA and hydrostatic weighing. Nonlaboratory tests that use indirect techniques to estimate body composition include bioelectrical impedance, skinfold assessment, and measurements of circumference. While these tests are not 100 percent accurate, they are useful for assessing change in body composition.

Dual energy X-ray absorptiometry (DEXA) is a laboratory test that uses very low-dose X-ray energy to measure body fat, muscle, and bone mineral. It is considered to be more accurate and valid than underwater weighing. When having the scan done, a person lies still on the DEXA table for about 12 minutes as the computer produces an estimate of body fat, muscle, and bone mineral. Two drawbacks are that it is an expensive test and is not readily available to fitness participants.

Underwater (hydrostatic) weighing is based on Archimedes' principle, which states that when a body is submerged in water, there is a buoyant counterforce equal to the weight of the water that is displaced. A person's weight on land and weight in water are compared. Because bone and muscle are denser than water, a person with a larger percentage of **fat-free tissue** is heavier in the water and records a lower percentage of body fat. However, fat floats, and so a large amount of fat mass will weigh less in the water. This technique reports an accuracy of ± 2 percent and has been used by research laboratories to assess body composition for decades. The drawbacks are that it requires elaborate equipment, trained personnel, and about 30 minutes to test each person. Also, emptying the lungs of air (since air makes the body float) and repeatedly submerging underwater may be difficult for some individuals.

Bioelectrical impedance analysis (BIA) is based on the principle that an electrical current travels through fat-free tissue (all parts of the body except fat) with its high water and electrolyte content more readily than it does through fat. By measuring resistance to the current (which is too mild to be felt), the machine estimates body fat. Machines are inexpensive, are easy to use, and include handheld devices and weight scales with built-in electrodes (see Figure 1-5). However, the results vary with differences in hydration, placement of electrodes, and type of machine. BIA tends to overestimate lean individuals and underestimate those who are obese. Hydration plays an important role in BIA and can cause inaccurate results. Dehydration, which can be caused by exercising before testing, not drinking enough fluids, diuretics, illness, and drinking alcohol or caffeine, will cause overestimation of fat percentage. If these variables are controlled, BIA gives a fairly good estimate of body fat, with accuracy reported as ± 2 to 5 percent.



FIGURE 1-5

Bioelectrical impedance devices estimate body fat percentage.

Another technique for measuring body composition involves the use of **skinfold calipers**. A caliper is a device that compresses the skin at a pressure determined by a spring. Skinfold measurements can be used to assess your proportion of fat to lean tissue because about 50 percent of your fat is **subcutaneous fat**—located directly under the skin between the skin and the underlying muscle. The amount of subcutaneous fat you have correlates highly with total body fat. An experienced measurer can assess body fat with skinfold calipers to within a range of plus or minus 2 to 5 percent. An inexperienced tester may be less accurate. Two or more body sites may be measured, and accuracy increases with the number of sites sampled. Accuracy diminishes at the ends of the scale—for the very obese and the very lean—but for the average individual, skinfolds are reliable.

A self-test of body composition, though considerably less accurate than skinfold caliper measurements, involves body girth measures of body fat. Keep in mind that greater fitness is not guaranteed by low body fat, and what constitutes a healthy fat percentage for you is an individual matter.

Body Composition Assessment Using Skinfold Calipers

Goal: To measure subcutaneous body fat accurately.

Directions: Have a person trained in the use of skinfold calipers perform the following steps.

1. Measure skinfolds on the right side of the body by using a skinfold caliper.
2. Grasp a fold of skin between thumb and forefinger, pulling it away from the underlying muscle.



Skinfold measuring technique.

3. Apply the calipers about 0.25 inch below the fingers holding the skinfold.
4. For men, take triceps and thigh measurements on a vertical skinfold. For women, take subscapular and suprailiac measures on a slight lateral slant along the natural fold of the skin.
5. Measure twice. Take readings to the nearest half millimeter. If the readings do not match, take a third measurement and average the closest two measurements.
6. Skinfold sites for women are the following:
 - a. Triceps. Measure a vertical skinfold on the back of the arm midway between the shoulder and the elbow.
 - b. Suprailiac. Measure a slightly lateral fold at the middle of the side of the body just above the hip bone (iliac crest).
7. Skinfold sites for men are the following:
 - a. Subscapular. Measure a diagonal fold just under the right shoulder blade (scapula).
 - b. Thigh. Measure a vertical fold on the front of the thigh midway between the inguinal fold (where the hip bends in front) and the top of the patella (knee cap).
8. Mark your two skinfold measurements on the *Percent Body Fat Nomogram* (Figure 1-7) and connect the marks with a straight line. Read your percent of fat on the center scale. See Table 1-4 for your body composition evaluation. If your body fat is not on the nomogram, use the following formula (Sloan-Weir):

Female (percent body fat formula)

$$\% \text{ Body fat} = [(4.57 \div (1.0764 - (0.00081 \times \text{suprailiac skinfold, mm}) - (0.00088 \times \text{triceps skinfold, mm}))) - 4.142] \times 100$$



Triceps.



Suprailiac.



Subscapular.



Thigh.

Male (percent body fat formula)

$$\text{Percent body fat} = [(4.57 \div (1.1043 - (0.00133 \times \text{thigh skinfold, mm}) - (0.00131 \times \text{subscapula skinfold, mm}))) - 4.142] \times 100$$

Example: A male with thigh skinfold = **10 mm** and subscapular skinfold = **10 mm**

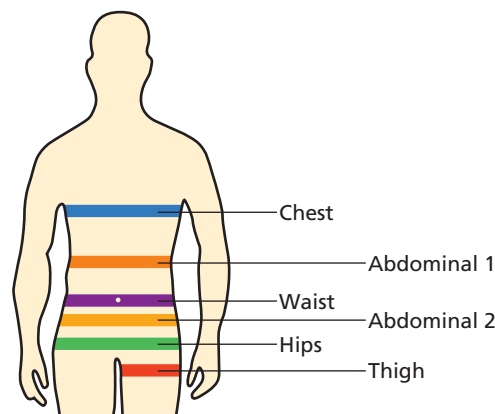
$$\begin{aligned} \text{Percent body fat} &= [(4.57 \div (1.1043 - (0.00133 \times 10 \text{ mm}) - (0.00131 \times 10 \text{ mm}))) - 4.142] \times 100 \\ &= [(4.57 \div (1.1043 - 0.0133 - 0.0131)) - 4.142] \times 100 \\ &= [(4.57 \div 1.0779) - 4.142] \times 100 \\ &= .0977 \times 100 \\ &= 9.77\% \text{ body fat} \end{aligned}$$

Body Girth Measures

Many people begin a fitness program because they are concerned about their physical appearance. Basic body build is an inherited characteristic, and less than 5 percent of the population can aspire to the current cultural “ideal” of model-like proportions. Take a look at your parents and grandparents to get an idea of your genetic endowment and what is realistic for you. While your basic structure cannot be altered, as fitness improves, fat may be lost from deposit areas and muscles will become firmer, enhancing body contours. You may notice a loss of unwanted inches from the waist, hips, or thighs or a desirable reshaping of body contours before noticing any weight change. Body girth measures will help you set goals to work for a trim, healthy body shape.

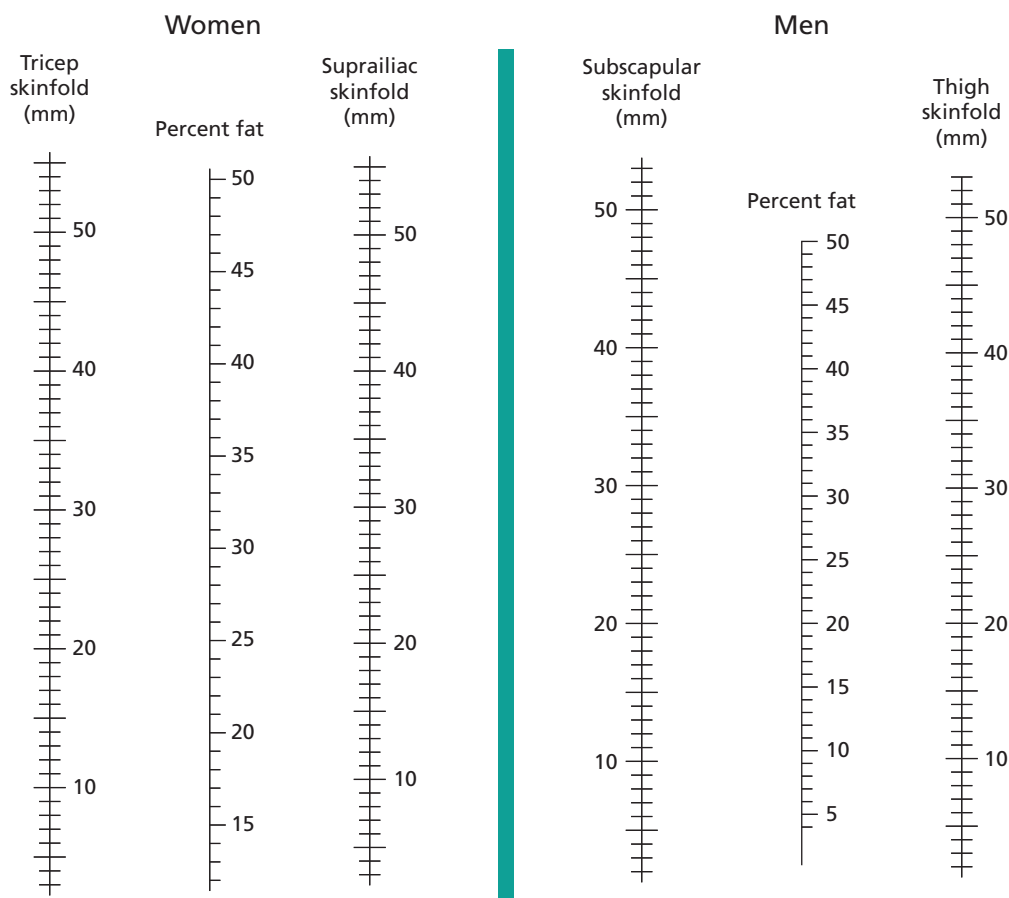
Goal: To measure body girths.

Directions: Recruit a partner to measure you. You will need a measuring tape. For each measurement, pull the tape snugly, but do not indent the flesh. Take the measurements at the following sites (Figure 1-6):



Body girth measurement sites.

FIGURE 1-6

**FIGURE 1-7**

Percent body fat nomogram. SOURCE: A. W. Sloan and J. Weir, "Nomograms for Prediction of Body Density and Total Body Fat from Skinfold Measurements."

Journal of Applied Physiology 28:2 (1970): 221–222. Reprinted by permission of the American Physiological Society.

TABLE 1-4 *Body Fat Norm Percentages*

Ages	18–29		30–39		40–49		50+	
	F	M	F	M	F	M	F	M
Very low fat	<17	<10	<18	<11	<19	<13	<20	<15
Low fat (trim)	17–20	10–13	18–20	11–16	19–21	13–18	20–22	15–19
Average	21–24	14–17	21–24	17–19	22–24	19–21	23–25	20–22
Above average (fat)	25–27	18–20	25–27	20–22	25–27	22–23	26–28	23–24
High fat	28–30	21–25	28–30	23–25	28–30	24–25	29–31	25–26
Obese	>30	>25	>30	>25	>30	>25	>31	>26

SOURCE: E. Keener et al. "Undergraduate Student Physical Fitness Assessment." Muncie, IN: Ball State University (originally published Spring 1997; latest compiled data shown here).

- ✓ *Chest*: across the nipple line at the midpoint of a normal breath
- ✓ *Abdominal 1*: across the floating ribs, halfway between the chest and waist, at the midpoint of a normal breath
- ✓ *Waist*: the narrowest point, across the navel
- ✓ *Abdominal 2*: across the iliac crest (hip bones), midway between waist and hips
- ✓ *Hips*: with feet together, across the pubic bone in front and across the widest part in back
- ✓ *Thigh*: right side, widest part, 1 inch below the crotch

TABLE 1-5 *Waist-to-Hip Ratio, Waist Girth, and Health Risk**

Waist-to-Hip Ratio	High Risk	Waist Circumference	High Risk
Men	.95 or greater	Men	over 40 inches
Women	.80 or greater	Women	over 35 inches

*Risk of cardiovascular disease, hypertension, and type 2 diabetes

Body Girth Measures of Body Fat

Body girth measures of fatness have greater variability than do other measures of body fat, such as skinfolds. However, their advantage is that they do not require special equipment or training and can be done with a measuring tape at home.

Directions:

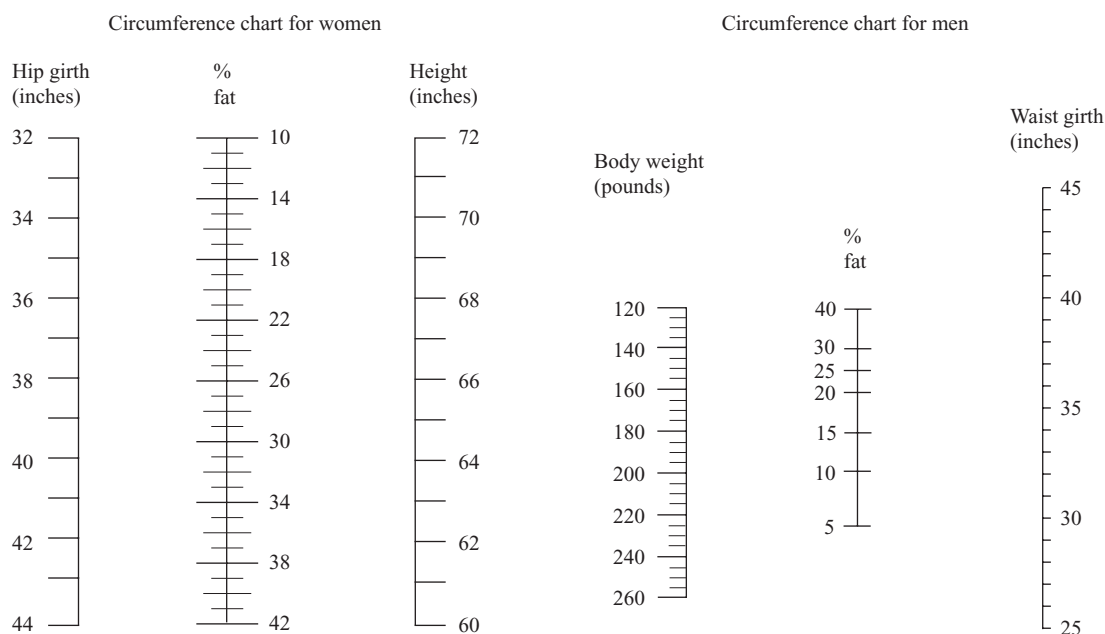
1. Men should measure waist girth at the navel, and women should measure hips at the widest point. Pull the tape so it is snug but does not indent the skin.
2. Remove shoes. Men should measure their weight without clothing. Women should measure their height.
3. Mark the measurements on the appropriate circumference chart and connect them with a straight line (Figure 1-8).

Waist-to-Hip Ratio and Waist Girth

Investigations have begun pointing to the location of excess fat as a risk factor for heart disease and certain cancers. Fat distributed in the abdominal area is linked to increased health risks; hip/thigh fat is not as risky. As a result, the waist-to-hip ratio has become a common assessment for health-risk identification. To compute this ratio, divide the waist measurement by the hip measurement.

$$\frac{29 \text{ in. waist}}{38 \text{ in. hip}} = 0.76 \quad \frac{42 \text{ in. waist}}{36 \text{ in. hip}} = 1.17$$

Studies indicate that health problems are increased for women whose ratio is 0.80 or higher and for men whose ratio is 0.95 or higher. You may also use waist girth alone. Health risks are higher for women with a waist measurement over 35 inches, and for men with one over 40 inches. (See Chapter 10 for more information on waist-to-hip ratio as a health-risk factor.)

**FIGURE 1-8**

Circumference charts. SOURCE: Nomograms developed by Jack Wilmore, University of Texas. Used by permission.



Waist-to-hip ratio or waist girth alone can identify health risk.



PRESCRIPTION FOR ACTION

You've read the chapter. Now go do one or more of these.

- ✓ Write down three reasons your last exercise program did not work and a solution for each.
- ✓ Schedule exercise on your calendar for a specific time 3 to 5 days this week.
- ✓ Take a 15-minute study break and go for a walk.
- ✓ Get to your job 30 minutes earlier and walk before starting work.
- ✓ Pack a sack lunch and take a 30-minute walk on your lunch break.
- ✓ Call a friend and make a date to bicycle or play tennis.
- ✓ Jump rope or use a stationary cycle while watching the news.



Frequently Asked Questions

Q. I want to exercise, but after a full day of work and classes I feel too tired, plus exercise makes me more tired. What should I do?

- A. Schedule a time that works for you. Some people have more energy in the morning and get up a half hour early for a brisk walk. Others take time during their lunch hour. Still others schedule a class (like aerobics or spinning) at the end of the day. Whatever time you choose, schedule it in like an appointment. Some days you will start with more energy, and other days less, but generally, if the intensity is appropriate, you will find yourself invigorated rather than exhausted at the end of the workout. Use the “talk test” to judge if you are exercising at the correct intensity. It may also help if you exercise with a friend; that way it will seem more like fun and less like work. Review the Top 10 “Ways to Stick with Exercise” in Chapter 2 for more tips on maintaining your exercise program.

Q. How many calories do I burn while walking or jogging a mile?

- A. Caloric expenditure is based on body weight. You burn about 62 calories per 100 pounds per mile whether walking or jogging. It's a principle of physics. It takes a certain amount of energy to move weight a certain distance. If you weigh 150 pounds, you burn $62 \times 1.50 = 93$ calories per mile.

Q. I want to lose weight. Is it better to exercise for a longer time at a lower intensity or for a shorter time at a higher intensity?

- A. If your main goal is weight control, the most important factor, besides a low-fat, nutritious diet, is to be consistent about working aerobic exercise—of any length and intensity—into your daily schedule. Work out at least 5 days per week. Total calories expended is more important than intensity of activity in maximizing weight loss. One or two weight-training sessions per week also lead to weight control. Moderate-intensity exercise is recommended because it allows you to exercise longer, accumulate more total work, and thus burn more calories, and it is less likely to cause discomfort or injury. Moderate-intensity activity can also help you keep off lost weight. If your goal is high-level fitness, exercise at a higher intensity is necessary.

Q. I swim/cycle regularly and feel like I'm in pretty good shape. Why did I score only “average” on the 1.5-mile walk/run?

- A. It's the rule of specificity. Your aerobic fitness will show best if you use the test specific to your activity. Swimmers should use the 500-yard swim, cyclists the 3-mile ride, for results that better reflect their aerobic fitness level. Likewise, someone who usually runs for exercise would find a cycling or swimming test more difficult.

Q. I had my body fat tested by skinfold calipers and bioelectrical impedance. They gave different results. Which is more accurate?

- A. Both are reasonably accurate when used by an experienced tester, with average errors of 2 to 5 percent. Skinfold calipers are more accurate if

multiple sites are measured to get a better picture of total fat distribution. Bioelectrical impedance can overestimate fat percentage if you are dehydrated,

and results vary depending on where the electrodes are placed and the type of machine used.

Summary

The sedentary lifestyle of most Americans is seriously undermining the health and welfare of our nation. We are fast becoming overfat and underfit, resulting in reduced levels of well-being. From the information you have acquired in this chapter, you now have the necessary tools to develop a personalized physical fitness program, based on sound scientific principles and using your age, resting heart rate, interests, and abilities. You have also gained a better understanding of the health benefits that can be achieved by incorporating moderate levels of physical activity into your daily life. By applying the concept of a three-segment workout and finding ways to increase daily activity, you can be on your way to a lifetime of improved health, fitness, and wellness.

Assessment is a critical tool in developing any dimension of wellness. It helps you understand your

strengths and weaknesses and decide whether your current levels of cardiorespiratory endurance, muscular endurance, flexibility, and body fat are conducive to optimal wellness. With this knowledge, you can set reasonable fitness goals, establish a starting point for a fitness program, and develop a plan of action. Specific workout programs for different aerobic activities can be found in Chapter 2. A *Student Precourse Health Assessment* form and a *Personal Fitness Profile* are also available in the Lab Activities section of this chapter.

As you progress in your fitness program, it may be useful to retest occasionally. While testing should not dominate your program, it will allow you to monitor your progress and can give you additional motivation to continue regular exercise.



Internet Resources

American Academy of Family Physicians

www.familydoctor.org

Promotes healthy behaviors with fact sheets on many health topics, including exercise and fitness.

American College of Sports Medicine

www.acsm.org/sportsmed

Information on sports research, health and fitness, and aerobic exercise guidelines, along with a quarterly fitness newsletter. "Current Comments" gives information on a variety of exercise topics of recent interest.

American Council on Exercise

www.acefitness.org/fitfacts/

Features 100 fitness fact sheets, free e-newsletters, and a variety of different fitness activities from bicycling to swimming.

American Heart Association

www.americanheart.org

Health tools include an exercise diary and body mass calculator. Information includes exercise and fitness promotion for women, children, seniors; information on how exercise affects heart health; exercise tips; and a healthy heart workout quiz.

Centers for Disease Control and Prevention

www.cdc.gov/nccdphp/dnpa/

Information on getting started in physical activity, exercise tips, links to other fitness resources, and health promotion

for increasing physical activity in your school or community.

Medline Plus

www.nlm.nih.gov/medlineplus

Consumer site with comprehensive information on many health topics, including physical fitness benefits, health, weight management, and fitness at any age.

National Center for Chronic Disease Prevention and Health Promotion

www.cdc.gov/nccdphp

Information on nutrition, physical fitness, and preventing chronic diseases such as diabetes and cancer.

National Institutes of Health

www.nhlbisupport.com/bmi

Calculate your body mass index, assess your risk, and find information and recipes for weight control.

President's Council on Physical Fitness and Sports

www.fitness.gov

Information on fitness and health, weight control, exercise for kids and seniors, videos, and sports and fitness awards, along with fact sheets on fitness and health.

Shape Up America!

www.shapeup.org

Information and guidance on fitness, the 10,000 step program, weight management, plus a body fat lab.

LAB Activity

1-1

Name _____ Class/Activity Section _____ Date _____

Student Precourse Health Assessment

Student ID# _____ Age _____ Date of last medical checkup _____

Please answer all of the questions completely and honestly. This document is confidential between the student, instructor, and administration. This form is used to help you stay safe in courses that have physical activities. If at any time you do not feel well or experience an injury, please tell your instructor immediately. If you must leave the activity area to get water or use the restroom take a classmate with you. While your participation in this course may enhance your health and well-being, you are advised that participation in some activities may be extremely vigorous and have potential risks. Some sports have inherent risks associated with them. If you have any questions about the course or activities, please talk to your instructor. If you are over age 40 (for men) or 50 (for women), it is highly recommended that you see your personal physician before you begin this class. The presence of some of the following conditions may affect your performance. Please check any conditions listed that pertain to you.

___ Cardiac/respiratory problems ___ Asthma (any) ___ High blood pressure (140/90 or above)
___ Chest pain or discomfort ___ Epilepsy (seizures/grand mal, 3+ min.) ___ Pregnancy
___ Severe allergic reactions ___ Diabetes ___ Severe headaches
___ Fainting spells/sudden unconsciousness ___ Family history of heart disease
___ Other life-threatening conditions (please list): _____

___ Knee injuries ___ Shoulder injuries ___ Ankle injuries
___ Back injuries ___ Neck/spinal injuries ___ Foot injuries
___ Scoliosis ___ Smoker ___ Allergies
___ Epilepsy (seizures/petit mal) ___ Other, please list below

Please list any other medical conditions or information you think should be brought to the attention of your instructor.

Please list all medications that you take regularly.

If during this class/course your physical health changes in regard to any of the listed or other conditions, please notify your instructor immediately. If you have concerns about your health, are sedentary, diabetic, pregnant, 20 or more pounds overweight, smoke, or have a family history of heart disease, it is important that you complete the *Physician-Approved Exercise Clearance Form*.

By signing this form I understand my responsibility toward staying safe in this course and informing my instructor that I am not withholding any information regarding my health status. (Please sign, date, and return this form to your instructor.)

Student Signature _____ Date _____

Student Phone Number _____

LAB Activity

1-2

Name _____ Class/Activity Section _____ Date _____

Physician-Approved Exercise Clearance Form

Student ID# _____ Age _____ Date of last medical checkup _____

This form is designed for individuals with special health concerns to assist your instructor in individualizing your fitness program according to your physician's recommendations.

This section is to be completed by the Lab Instructor:

(Name of student) _____ is presently enrolled in (name of course) _____
and he/she has identified the following health problems on the Student Precourse Health Assessment Form that may affect participation in the activities of this course.

This class/course will include the following activities:

The above information was provided by (**instructor's name**) _____ Date _____

This section is to be completed by the Physician:

NOTE TO PHYSICIAN: PLEASE REVIEW THE STUDENT PRECOURSE HEALTH ASSESSMENT FORM.

After reviewing the form, I recommend the following level of participation:

_____ Full participation _____ Modified participation as indicated _____ No participation*
(Please indicate below):

*If the student may not participate in this class, list the activities in which the student may participate:

Signature of Physician

Date (mm/dd/yy)

Physician's Printed Name

Physician's Fax Number

Physician's Phone Number

LAB Activity 1-3

Name _____ Class/Activity Section _____ Date _____

Personal Fitness Profile

	Pretest Date: _____	Posttest Date: _____
1. Resting heart rate	_____	_____
2. Cardiorespiratory endurance (Labs 1-4, 1-5, 1-6)		
1.5-mile run	_____	_____
1.0-mile walk	_____	_____
500-yard swim or water run	_____	_____
Other _____	_____	_____
Exercise pulse	_____	_____
3. Muscular endurance (Lab 1-7)		
Abdominal curls	_____	_____
Push-ups	_____	_____
4. Muscular strength (Lab 1-8)		
Leg press	_____	_____
Bench press	_____	_____
5. Flexibility (Lab 1-9)		
Sit and reach	_____	_____
6. Body girth measurements (Figure 1-6)		
Hips—biggest part	_____	_____
Thigh—1 inch below crotch	_____	_____
Chest—nipple line	_____	_____
Waist—smallest part	_____	_____
Abdominal 1—halfway between chest and navel	_____	_____
Abdominal 2—halfway between navel and pubic bone	_____	_____
7. Waist-to-hip ratio (Lab 1-10)	_____	_____
8. Body composition		
<i>Female</i> <i>Male</i>		
Triceps Subscapula	_____	_____
Iliac Thigh	_____	_____
Percent body fat (see nomogram in Figure 1-7)		
9. Weight	_____	_____
10. Height	_____	_____
Quick checks (pass or fail) (Figures 1-11 to 1-15)	P/F	P/F
a. Erector spinae	_____	_____
b. Iliopsoas	_____	_____
c. Quadriceps	_____	_____
d. Hamstrings	_____	_____
e. Gastrocnemius	_____	_____

LAB Activity 1-4

Name _____ Class/Activity Section _____ Date _____

Evaluating Your Cardiorespiratory Fitness: 1.5-Mile Run Test, 1.0-Mile Walk Test, and 3.0-Mile Bicycling Test

1.5-MILE RUN TEST

Equipment Needed:

A track or premeasured course of 1.5 miles
Stopwatch or a watch with a second hand

Procedure

1. Before taking the test, warm up with walking, stretching, and a slow jog.
2. This is a test of maximum capacity, so push yourself to cover the distance as quickly as possible without overdoing it. Try to maintain a continuous, even pace. Run as long as you can and then walk if necessary. When you complete the 1.5-mile distance, record your time.

Running time: _____

3. Cool down by walking slowly for several minutes and stretching.
4. Check the table below for your fitness rating.

Cardiorespiratory fitness rating: _____

1.5-Mile Run								
Age	18–29		30–39		40–49		50–59	
	F	M	F	M	F	M	F	M
Superior	<12:34	<8:26	<13:34	<9:10	<14:34	<9:55	<15:34	<10:40
Good	12:34–13:40	8:26–10:24	13:34–14:40	9:10–11:10	14:34–15:40	9:55–12:00	15:34–16:40	10:40–12:50
Average	13:41–14:45	10:25–12:31	14:41–15:45	11:11–13:45	15:41–16:45	12:01–14:55	16:41–17:45	12:51–16:05
Fair	14:46–16:00	12:32–14:49	15:46–17:00	13:46–16:00	16:46–18:00	14:56–17:15	17:46–19:00	16:06–18:30
Low	>16:00	>14:49	>17:00	>16:00	>18:00	>17:15	>19:00	>18:30

1.0-MILE WALK TEST

Equipment Needed:

A track or premeasured course of 1.0 miles
Stopwatch

Procedure

1. Before taking the test, warm up with walking and stretching.
2. This is a test of maximum capacity, so push yourself to walk the mile as quickly as possible without overdoing it. Try to maintain a continuous, even pace. When you complete the 1-mile distance, record your time.

Walking time: _____

3. Cool down by walking slowly for several minutes and stretching.
4. Check the table below for your fitness rating.

Cardiorespiratory fitness rating: _____

1.0-Mile Walk

Age	18–29		30–39		40–49		50–59	
	F	M	F	M	F	M	F	M
Superior	<12:34	<11:39	<13:34	<12:40	<14:34	<13:40	<15:34	<14:10
Good	12:34–13:40	11:39–12:59	13:34–14:40	12:40–14:00	14:34–15:40	13:40–14:40	15:34–16:40	14:10–15:20
Average	13:41–14:45	13:00–14:21	14:41–15:45	14:01–15:20	15:41–16:45	14:41–15:55	16:41–17:45	15:21–16:25
Fair	14:46–16:00	14:22–15:43	15:46–17:00	15:21–16:15	16:46–18:00	15:56–16:45	17:46–19:00	16:26–17:25
Low	>16:00	>15:43	>17:00	>16:15	>18:00	>16:45	>19:00	>17:25

3.0-MILE BICYCLING TEST

If your main fitness activity is bicycling, you can test your cardiorespiratory fitness with a timed 3-mile bicycle ride.

Equipment Needed:

Bicycle

Stopwatch

A measured section of road with few stoplights or stop signs

Procedure

1. Warm up by riding for a few minutes and stretching.
2. Cycle 3 miles as quickly as you can. If you are doing this on the road, be careful to obey traffic rules.
3. Try to pace evenly. Time the ride with a stopwatch or a watch with a second hand. Record the time. Record your exercise pulse.
4. Cool down and stretch.
5. Check the table below for your fitness rating.

Cardiorespiratory fitness rating: _____

3.0-Mile Bicycle Ride

Age	18–29		30–39		40–49		50–59	
	F	M	F	M	F	M	F	M
Superior	<9:18	<8:24	<9:54	<9:00	<10:30	<9:36	<11:06	<10:12
Good	9:18–10:06	8:24–9:12	9:54–10:42	9:00–9:42	10:30–11:06	9:36–10:12	11:06–11:36	10:12–10:42
Average	10:07–11:06	9:13–10:12	10:43–11:42	9:43–10:48	11:07–12:18	10:13–11:24	11:37–12:54	10:43–12:00
Fair	11:07–12:00	10:13–11:06	11:43–12:30	10:49–11:35	12:19–13:00	11:25–12:06	12:55–13:30	12:01–12:48
Low	>12:00	>11:06	>12:30	>11:35	>13:00	>12:06	>13:30	>12:48

LAB Activity 1-5

Name _____ Class/Activity Section _____ Date _____

Evaluating Your Cardiorespiratory Fitness: 500-Yard Water Run Test and 500-Yard Swim Test

500-YARD WATER RUN TEST

Equipment Needed:

A regulation 25-yard pool
Stopwatch
Partner to time you
Measuring tape to measure width of pool

Procedure

1. Measure pool width and calculate the number of widths required to cover 500 yards.
2. Have a partner on the deck to count laps and keep the time.
3. Before taking the test, warm up with a couple minutes of easy jogging in the water.
4. Select a starting point along the wall where the water level is at a midpoint between the runner's navel and nipple. Shorter runners will start in shallower water, taller runners in deeper water.
5. This is a test of maximum capacity, so push yourself to cover the distance as quickly as possible without overdoing it. Try to maintain a continuous, even pace. Run the necessary number of widths and record your time to the nearest second.

500-yard water run time: _____

6. Cool down by walking in the water for several minutes and stretching.
7. Check the table for your fitness rating.

Cardiorespiratory fitness rating: _____



500-Yard Water Run

Age	18-29		30-39		40-49		50-59	
	F	M	F	M	F	M	F	M
Superior	<7:59	<6:53	<8:30	<7:20	<9:00	<7:50	<9:30	<8:20
Good	7:59-8:38	6:53-7:44	8:30-9:08	7:20-8:15	9:00-9:38	7:50-8:45	9:30-10:08	8:20-9:15
Average	8:39-9:18	7:45-8:38	9:09-9:48	8:16-9:05	9:39-10:18	8:46-9:35	10:09-10:48	9:16-10:05
Fair	9:19-9:58	8:39-9:32	9:49-10:28	9:06-10:00	10:19-10:58	9:36-10:30	10:49-11:28	10:06-11:00
Low	>9:58	>9:32	>10:28	>10:00	>10:58	>10:30	>11:28	>11:00

500-YARD SWIM TEST**Equipment Needed:**

A regulation 25-yard pool

Stopwatch

Partner to time you

Procedure

1. Have a partner on the deck to count laps and keep the time. In a 25-yard pool, 500 yards is 20 lengths.
2. Before taking the test, warm up with a couple of easy laps.
3. This is a test of maximum capacity, so push yourself to cover the distance as quickly as possible without overdoing it. Try to maintain a continuous, even pace. Record your time to the nearest second.

500-yard swim time: _____

4. Cool down and stretch.
5. Check the table for your fitness rating.

Cardiorespiratory fitness rating: _____

500-Yard Swim

Age	18–29		30–39		40–49		50–59	
	F	M	F	M	F	M	F	M
Superior	<7:05	<6:12	<7:35	<6:30	<8:05	<7:00	<8:35	<7:30
Good	7:05–8:49	6:12–7:44	7:35–9:19	6:30–8:14	8:05–9:49	7:00–8:44	8:35–10:19	7:30–9:14
Average	8:50–10:34	7:45–9:19	9:20–11:04	8:15–9:49	9:50–11:34	8:45–10:19	10:20–12:04	9:15–10:49
Fair	10:35–12:19	9:20–10:51	11:05–12:49	9:50–11:22	11:35–13:19	10:20–11:52	12:05–13:49	10:50–11:22
Low	>12:19	>10:52	>12:49	>11:22	>13:19	>11:52	>13:49	>11:22

LAB Activity 1-6

Name _____ Class/Activity Section _____ Date _____

Evaluating Your Cardiorespiratory Fitness: 3-Minute Step Test

Equipment Needed:

A 15-inch bench or 16-inch roll-out bleacher step
Stopwatch
Metronome or recorded music at a tempo of 96 beats per minute

Procedure

1. Before taking the test, warm up with easy stepping and stretching.
2. You will need to step up and down at a tempo of 96 counts per minute (24 cycles of up-up-down-down). Step up with your right foot, and then your left foot, and then step down with your right and then your left. Continue for 3 minutes. Straighten your knees as you step up on the bench. To prevent leg soreness, you may want to switch lead legs about halfway through the test.

Pulse rate: _____

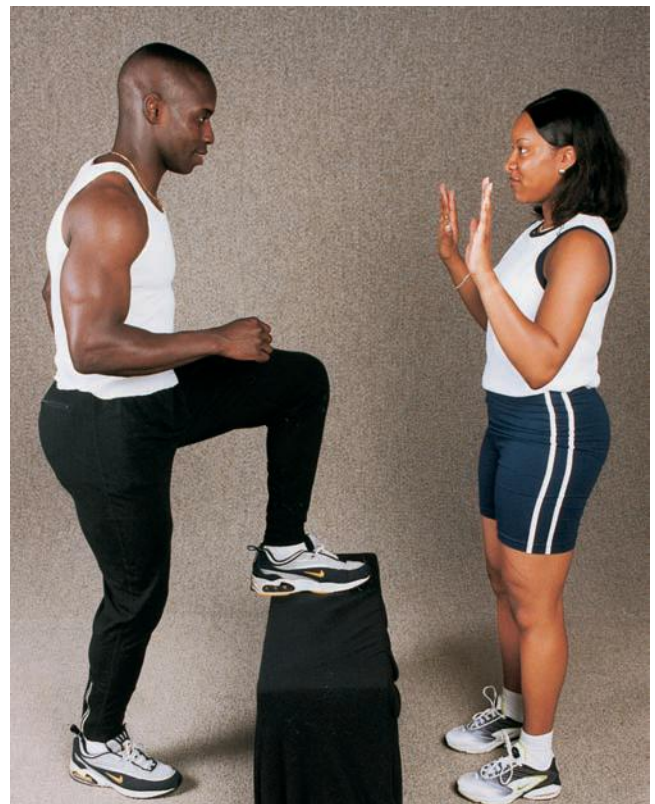
3. Stop at the end of 3 minutes and sit down. Five seconds after completing the test, the tester should count the partner's pulse for 15 seconds. The tester can check the partner's carotid pulse by lightly pressing against the neck under the jawbone. The partner being tested can double-check his or her own pulse at the radial artery, located on the thumb side of the wrist. The partners' pulse counts should not vary more than one or two beats if counting is accurate.
4. Record the pulse.
5. Cool down by walking slowly for several minutes and stretching.
6. Check the table below for your fitness rating.

Cardiorespiratory fitness rating: _____

3-Minute Step Test Norms

	Men	Women
Superior	<31	<37
Good	31–37	37–41
Average	38–41	42–44
Fair	42–45	45–49
Low	>45	>49

SOURCE: F. W. Kasch and J. L. Boyer. *Adult Fitness: Principles and Practices*. Mountain View, CA: Mayfield, 1968. Used by permission.



LAB Activity 1-7

Name _____ Class/Activity Section _____ Date _____

Evaluating Your Muscular Endurance: The Abdominal Curls Test and Push-Ups Test

THE ABDOMINAL CURLS TEST

Equipment Needed:

Ruler
Adhesive tape
Mat
Stopwatch or watch with a second hand

Procedure

1. Tape a 3-inch-wide strip on a mat or the floor and lie on your back with your fingertips at the edge of the strip. Bend your knees, and bring your heels as close as possible to your buttocks.
2. Curl forward until your fingertips have moved forward across the 3-inch strip and then curl back until your shoulder blades touch the floor. Your shoulders should lift from the floor with each curl, but the lower back should stay on the ground.
3. Complete as many curls as possible in 1 minute, then check the results in the table below.

Number of abdominal curls: _____

Muscular endurance rating: _____



1-Minute Abdominal Curls

Age	18-29		30-39		40-49		50-59	
	F	M	F	M	F	M	F	M
Superior	>88	>93	>70	>78	>56	>65	>45	>49
Good	75-88	79-93	60-70	62-78	48-56	53-65	38-45	42-49
Average	60-74	64-78	47-59	51-61	37-47	42-52	29-37	35-41
Fair	45-59	50-63	35-46	40-50	27-36	36-41	21-28	28-34
Low	<45	<50	<35	<40	<27	<36	<21	<28

THE PUSH-UPS TEST

Equipment Needed:

Mat
Stopwatch or watch with a second hand

Procedure

- 1. Start in an “up” position with your weight on your hands and toes (men) (Figure 1-9) or knees (women) (Figure 1-10).
- 2. Lower yourself until your elbows form a right angle and your upper arms are parallel to the floor. Be sure to keep your abdominals tight, hips slightly piked, and your back straight to protect your lower back.
- 3. Complete as many push-ups as possible in 1 minute; record, then check the results in the table below.

Number of push-ups: _____
Muscular endurance rating: _____

Age	1-Minute Push-Ups							
	18–29		30–39		40–49		50–59	
	F	M	F	M	F	M	F	M
Superior	>54	>64	>43	>54	>33	>43	>23	>33
Good	44–54	51–64	32–43	41–54	26–33	32–43	18–23	26–33
Average	32–43	37–50	22–31	27–40	17–25	22–31	11–17	17–25
Fair	20–31	23–36	13–21	18–26	8–16	13–21	6–10	8–16
Low	<20	<23	<13	<18	<8	<13	<6	<8



FIGURE 1-9 Push-up—standard position. (Note the 90-degree elbow angle.)



FIGURE 1-10 Push-up—modified position.

LAB Activity 1-8

Name _____ Class/Activity Section _____ Date _____

Evaluating Your Muscular Strength: Leg Press Strength Test and Bench Press Strength Test

LEG PRESS STRENGTH TEST

Equipment Needed:

Leg press machine If free weights are used, the following equipment is needed:
 Weight scale Weight scale Barbell
 Squat rack Assorted weight plates
 One or two spotters

Procedure

1. If you have a history of ankle, knee, hip, or lower back injuries, check with your physician before doing this test.
2. Before taking the test, warm up with several light lifts and stretching.
3. Set the leg press machine for a weight that is lighter than the amount you think you can press one time. Press to full extension. If you can press the weight to extension, add more weight and try again. Rest a few minutes between attempts. It may take several attempts to find your maximum lift.
4. Stop when you reach a weight that you cannot move through a full range of motion. The heaviest weight that you can move through a full range of motion is your max.
5. Divide your max by your body weight.
 Max: _____ Body weight: _____
 Max / Body weight = _____

Check the table below for your fitness rating.
 Muscular strength rating: _____

Age	Leg Press (max/body weight)							
	18–29		30–39		40–49		50–59	
	F	M	F	M	F	M	F	M
Superior	>1.97	>2.39	>1.67	>2.19	>1.56	>2.01	>1.42	>1.89
Good	1.68–1.97	2.13–2.39	1.47–1.67	1.93–2.19	1.37–1.56	1.82–2.01	1.25–1.42	1.71–1.89
Average	1.50–1.67	1.97–2.12	1.33–1.46	1.77–1.92	1.23–1.36	1.68–1.81	1.10–1.24	1.58–1.70
Fair	1.37–1.49	1.83–1.96	1.21–1.32	1.65–1.76	1.13–1.22	1.57–1.67	0.99–1.09	1.46–1.57
Low	<1.37	<1.83	<1.21	<1.65	<1.13	<1.57	<0.99	<1.46

SOURCE: Based on norms from the Cooper Institute for Aerobics Research, Dallas, Texas, revised 2000, used with permission.

BENCH PRESS STRENGTH TEST

Equipment Needed:

Bench press machine	If free weights are used, the following equipment is needed:		
Weight scale	Weight scale	Barbell	
	Flat bench	Assorted weight plates	
	One or two spotters	Weight scale	

Procedure

1. If you have a history of shoulder, wrist, or lower back injuries, check with your physician before doing this test.
2. Before taking the test, warm up with several light lifts and stretching.
3. Set the bench press machine for a weight that is lighter than the amount you think you can press one time. Press to full extension. If you can press the weight to extension, add more weight and try again. Rest a few minutes between attempts. It may take several attempts to find your maximum lift.
4. Stop when you reach a weight that you cannot move through a full range of motion. The heaviest weight that you can move through a full range of motion is your max.
5. Divide your max by your body weight.

Max: _____ Body weight: _____

Max / Body weight = _____

Check the table below for your fitness rating.

Muscular strength rating: _____

Age	Bench Press (max/body weight)							
	20–29		30–39		40–49		50–59	
	F	M	F	M	F	M	F	M
Superior	>1.00	>1.62	>.79	>1.34	>.76	>1.19	>.67	>1.04
Good	.80–1.00	1.32–1.62	.70–.79	1.12–1.34	.62–.76	1.00–1.19	.55–.67	.90–1.04
Average	.70–.79	1.14–1.31	.60–.69	.98–1.11	.54–.61	.88–.99	.48–.54	.79–.89
Fair	.59–.69	.99–1.13	.53–.59	.88–.97	.50–.53	.80–.87	.44–.47	.71–.78
Low	<.59	<.99	<.53	<.88	<.50	<.80	<.44	<.71

SOURCE: Based on norms from the Cooper Institute for Aerobics Research, Dallas, Texas, revised 2000, used with permission.

LAB Activity 1-9

Name _____ Class/Activity Section _____ Date _____

Evaluating Your Flexibility: Sit and Reach, Sit and Reach Wall Test, and Flexibility Quick Checks

SIT AND REACH

Equipment Needed:

Flex box
Mat

Procedure

1. Warm up with walking or light calisthenics.
2. Sit with your feet flat against the flex box about 5 inches apart.
3. Place your hands together. Without bending your knees, reach as far forward as possible, extending fingertips along the box. Hold the position for 3 seconds.

Sit and reach score: _____ inches

4. Check the table below for your flexibility rating.

Flexibility rating: _____



Sit and Reach (inches)

Age	18–29		30–39		40–49		50–59	
	F	M	F	M	F	M	F	M
Superior	>8.5	>7.0	>8	>6	>7	>5	>6	>4
Good	6.5–8.5	4.0–7.0	5–8	3–6	4–7	2–5	3–6	1–4
Average	4.0–6.4	1.0–3.9	3–4.9	0–2.9	2–3.9	–1–1.9	1–2.9	–3–0
Fair	1.0–3.9	–2.0–0.9	0–2.9	–3––0.1	–1–1.9	–4––1.1	–2–0.9	–5––3.1
Low	<1.0	<–2.0	<0	<–3	<–1	<–4	<–2	<–5

SIT AND REACH WALL TEST

Equipment Needed:

Wall
Mat

Procedure

1. Warm up by walking and static stretching.
2. Remove shoes, sit facing a wall, and keep your feet flat against the wall and your knees straight.
3. Reach forward as far as possible to touch your fingertips, knuckles, or palms to the wall and hold the position for 3 seconds.

Result: _____

4. Check your flexibility evaluation in the accompanying table.

SIT AND REACH WALL TEST SCORES

Result	Flexibility
Cannot touch wall	Low
Fingertips touch wall	Average
Knuckles touch wall	Good
Palms touch wall	Superior

FLEXIBILITY QUICK CHECKS

Equipment Needed:

Mat

Procedure

1. Warm up with walking or light calisthenics.
2. Complete the flexibility quick checks shown in Figures 1-11 through 1-15.
Record the results (*pass* or *fail*).

	Pass	Fail
Low back flexibility test	_____	_____
Hip flexor flexibility test	_____	_____
Quadriceps flexibility test	_____	_____
Hamstring flexibility test	_____	_____
Calf flexibility test	_____	_____



FIGURE 1-11

Low back flexibility test.

Muscle: Erector spinae (lower back)

Test: Lying on your back, pull one knee to chest, keeping other leg fully extended on the floor.

Passing: Thighs should touch chest.

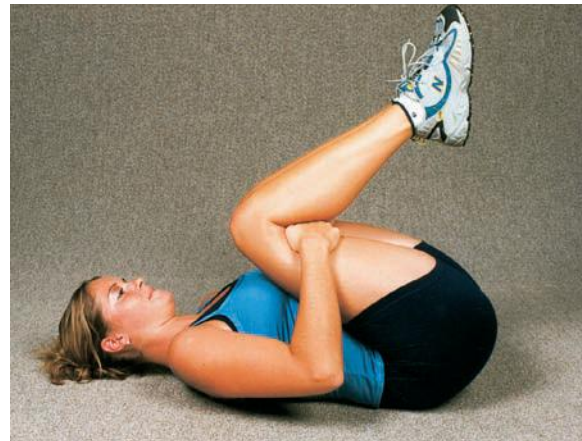


FIGURE 1-12

Hip flexor flexibility test.

Muscle: Iliopsoas (hip flexor)

Test: Lying on your back, pull one knee to chest, keeping other leg fully extended on the floor.

Passing: Calf of extended leg must remain on the floor; knee must not bend.



FIGURE 1-13

Quadriceps flexibility test. Caution: Avoid if you have or experience knee problems.

Muscle: Quadriceps (front of thigh)

Test: Lying face down with knees together, pull heel toward buttocks.

Passing: Heel should comfortably touch buttocks.



FIGURE 1-14

Hamstring flexibility test.

Muscle: Hamstring (back of thigh)

Test: Lying on your back, lift one leg, keeping other leg straight on the floor without bending either knee.

Passing: The raised leg must be vertical (90 degrees).



FIGURE 1-15

Calf flexibility test.

Muscle: Gastrocnemius (calf)

Test: Standing without shoes, raise one forefoot off floor, keeping knees relaxed and heels down.

Passing: Ball of foot should clear floor by height equal to width of two fingers.

LAB Activity 1-10

Name _____ Class/Activity Section _____ Date _____

Body Composition Assessment

Equipment Needed:

Measuring tape
Skinfold calipers
Height/weight scales

Read about body composition tests in Chapter 1 for more information about these assessments.

WAIST-TO-HIP RATIO

1. Measure your waist at the smallest circumference and hips at the greatest circumference. Record the results.

Hips: _____ inches Waist: _____ inches

2. Divide your waist measurement by your hip measurement and check your rating.

Waist/Hip = _____ Rating: _____

Waist-to-Hip Ratio

Men

Women

High Risk

.95 or higher

.80 or higher

WAIST GIRTH

Measure your waist at the smallest circumference and record the results.

Waist: _____ inches Rating: _____

Waist Circumference

Men

Women

High Risk

over 40 inches

over 35 inches

BODY MASS INDEX

1. Measure your height and weight and record the results.

Height: _____ feet _____ inches Weight: _____ pounds

2. Check your BMI using Table 10.1 on page 323.

BMI: _____ Rating: _____

BODY FAT PERCENTAGE

1. Read the section in Chapter 1 on body composition assessment using skinfold calipers.
2. Measure skinfolds on the right side of the body using a skinfold caliper and record the results.
3. Check the results on the nomogram in Figure 1-7 and Table 1-4.

Female: Triceps _____
 Suprailiac _____
 Percent body fat _____

Male: Subscapula _____
 Thigh _____
 Percent body fat _____

DESIRABLE WEIGHT

1. Percent body fat $\times$ weight (lbs) = Fat weight (lbs)

_____ $\times$ _____ = _____ lbs

2. Weight (lbs) – fat weight = lean body weight (lbs)

_____ – _____ = _____ lbs

3. Desirable weight for females (at 18%):
lean body weight $\div .82$ = desirable weight
_____ $\div .82$ = _____ lbs

4. Desirable weight for males (at 12%):
lean body weight $\div .88$ = desirable weight
_____ $\div .88$ = _____ lbs

LAB Activity 1-11

Name _____ Class/Activity Section _____ Date _____

Fitness Goals

Looking at the results of your fitness tests, evaluate yourself and set some realistic, personal goals.

	Test score time/number	Date of test	Fitness rating	Goal time/number	Fitness rating	By what date?
Cardiorespiratory Tests						
1.0-mile walk	_____	_____	_____	_____	_____	_____
1.5-mile run	_____	_____	_____	_____	_____	_____
500-yard swim	_____	_____	_____	_____	_____	_____
Other _____	_____	_____	_____	_____	_____	_____
Muscular Fitness Tests						
1-minute abdominal curls	_____	_____	_____	_____	_____	_____
1-minute push-ups	_____	_____	_____	_____	_____	_____
Sit and reach	_____	_____	_____	_____	_____	_____
Leg press	_____	_____	_____	_____	_____	_____
Bench press	_____	_____	_____	_____	_____	_____
Other Tests						
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

Comments (i.e., Was this your best effort? Is this a realistic assessment of your abilities?

Any surprises?) _____

Maximizing Cardiorespiratory Fitness

2

*A journey of a thousand miles starts
with a single step.*
—Lao Tse

Study Questions

You will have successfully mastered this chapter if you can answer the following:

1. What are the benefits of cardiorespiratory fitness?
2. How are the FITT prescription factors for developing physical fitness defined and applied?
3. How is training heart rate calculated using the Karvonen formula?
4. How is the Rate of Perceived Exertion Scale used to measure workout intensity?
5. How is the progressive overload principle applied to a cardiorespiratory exercise program?
6. What are specific goals for the FITT, ACSM/AHA, and 60- to 90-minute duration of exercise guidelines?
7. Which aerobic exercise activity (of the eight found in this chapter) would you be most interested in to develop cardiorespiratory endurance (CRE)? (The eight activities include aerobic dance, bicycling, fitness swimming, fitness walking, indoor exercise equipment, in-line skating, jogging, and water exercise/aqua aerobics.)
8. What are the guidelines for beginning the aerobic activity (of the eight in the chapter) you selected?
9. How would you describe the 10,000 steps per day wellness goal? How would you initiate it?

You will find the answers as you read this chapter.



Visit the Online Learning Center for *A Fit Way of Life*, www.mhhe.com/robbinsfit2e, where you will find additional quizzes and other study aids.

Terms

- aerobic
- aerobic capacity
- anaerobic
- cardiac output
- FITT factors
- heart rate reserve (HRR)
- Karvonen equation
- maximal heart rate (HR_{max})
- maximal oxygen uptake (VO_{2max})
- rate of perceived exertion (RPE)
- talk test
- target heart rate (THR)
- training effect

The number one reason people begin exercising is to improve their physical appearance—to decrease body fat and develop firm, well-toned muscles. They find that these benefits are only the beginning.

Would you be interested in a prescription for a medicine that does all of the following: lowers blood pressure, blood sugar, and weight; improves cholesterol, sleep, and bone and heart health; decreases the risk of cancer; and increases fitness? Imagine, one prescription that could do all these things and more. Well, that prescription really exists. There's just one catch: You'll need 20–60 minutes each day to take it. The “medicine” is *exercise*. Cardiorespiratory endurance plays an important role in developing physical fitness and wellness. A number of physiological (cardiorespiratory, body composition, and metabolic) and psychological (mental and emotional) health benefits are yours in return for a small investment of time and effort.

A variety of exercise programs and recreational activities can enhance health and fitness. Nearly everyone can find one or two activities that are satisfying and enjoyable. This chapter focuses on the many benefits that can be gained from cardiorespiratory endurance, the prescription factors for fitness, and information about a variety of lifetime exercise activities to get you started on the path to a richly enjoyable health span.

CARDIORESPIRATORY ENDURANCE AND MAXIMAL OXYGEN UPTAKE

Cardiorespiratory endurance is often expressed in terms of **maximal oxygen uptake** ($\text{VO}_{2\text{max}}$ or **aerobic capacity**), the greatest amount of oxygen that can be taken in and used by the body during high-intensity exercise. You can live several days without water, several weeks without food, but only minutes without oxygen. Most fitness experts agree that $\text{VO}_{2\text{max}}$ is the best measure of cardiorespiratory fitness. Energy for physical activity and body processes is produced by burning fuel in the presence of oxygen. For muscles to use oxygen, the

lungs must take in air and transfer it to the blood. The blood must then be pumped to the muscles. Finally, the muscles must take the oxygen from the blood and use it. During exercise, the ability of the body to utilize oxygen and remove waste products depends on the efficient functioning of the cardiorespiratory system, which includes the heart, blood vessels, lungs, and muscles. When a person exercises, the working muscles demand more oxygen and nutrients and the heart must work harder to keep up with the demand. The demand for oxygen increases in direct proportion to the intensity of exercise.

$\text{VO}_{2\text{max}}$ is determined partly by genetics and partly by training. As fitness improves, many factors contribute to greater $\text{VO}_{2\text{max}}$. The heart is a muscle and, like any muscle, grows stronger with training. A fit, trained heart can pump more oxygenated blood to exercising muscles than an unfit heart can. Cardiorespiratory training increases both stroke volume, the volume of blood pumped per heartbeat, and **cardiac output**, the volume of blood pumped per minute. Similarly, trained skeletal muscles can utilize oxygen and nutrients delivered by the blood to produce energy more efficiently than untrained muscles can. Ventilation and blood flow to the lungs improve. Blood flow of the muscles improves. Muscle cells become more efficient at extracting oxygen and producing energy for muscular contraction. Waste products are removed more efficiently. $\text{VO}_{2\text{max}}$ determines how intensely and how long you can perform aerobic exercise and is considered one of the best overall indicators of physiological well-being.

While natural cardiorespiratory endowment may vary among individuals, with training, maximal oxygen uptake can improve 20 to 30 percent, depending on pre-training status and the frequency, intensity, and duration of training. Beneficial physiological changes persist as long as aerobic training continues, but inactivity produces physical decline. If training stops, $\text{VO}_{2\text{max}}$ returns to pretraining levels within a few months. With aging, aerobic capacity decreases about 1 percent per year after age 25. This decline is related closely to decreasing levels of activity rather than to growing older. Declines in $\text{VO}_{2\text{max}}$ may be slowed dramatically by those who exercise across the lifetime. See the section on aging in Chapter 6 for more information on the effects of exercise on aging.

The ability to utilize oxygen during exercise can be measured in a laboratory on a treadmill or in a field test. Several tests in Chapter 1 can be used to assess your cardiorespiratory endurance. They include the 1.5-mile run, the 1-mile walk, the 500-yard water run, the 500-yard swim, the 3-mile bicycling test, and the 3-minute step test. *Norms were developed by testing thousands of college students at the end of 12 to 15 weeks of aerobic fitness classes*, so you can compare your results with the standards for your selected activity.

Benefits of Aerobic Exercise

Exercise has both short- and long-term effects. The immediate effects of vigorous exercise, regardless of fitness level, are an increase in the respiration rate, an increase in the heart rate, and an increase in body temperature. After a few weeks of regular, vigorous exercise, the body begins to adapt to meeting the demands. These physiological adaptations to exercise (the total beneficial changes) are called the **training effect** and are detailed in the following lists. The benefits of flexibility and muscular fitness are discussed in Chapters 3 and 4.

Cardiorespiratory Benefits

1. Lower resting heart rate
2. Increased stroke volume (the amount of blood pumped out of the heart with each beat), improving heart efficiency
3. Increased rest for the heart between beats due to slower resting heart rate and increased stroke volume
4. Increased oxygen-carrying capacity of the blood due to the greater supply of red blood cells and hemoglobin; greater endurance in exercising muscles due to increased energy and improved elimination of waste products
5. Improved exercise performance on timed tests due to more efficient use of oxygen
6. Reduced blood pressure
7. Improved blood lipid profile by increasing the number of protective high-density lipoproteins (HDLs)
8. Quicker recovery to resting heart rate after vigorous exercise due to improved cardiac efficiency
9. Possible regression of atherosclerosis
10. Fewer illnesses and deaths due to coronary heart disease

Body Composition/Physical Appearance Benefits

1. Reduced body fat percentage
2. Increased lean body mass
3. Firmer, more toned muscles
4. More positive body image

Psychological, Mental, and Emotional Benefits

1. Enhanced sense of well-being and self-esteem, resulting in increased energy, alertness, and vitality
2. Increased sense of self-discipline due to the determination needed to stick to an exercise program
3. Reduced state of anxiety and mental tension, thereby increasing stress coping ability
4. Improved quality of sleep; sleep soundly and wake up refreshed



The American Medical Association and the American College of Sports Medicine are encouraging doctors to prescribe the medicine that aids more ills than any other: Exercise!

5. Decreased level of mild to moderate depression
6. Improved mental acuity, learning, memory, and other higher thought processes
7. Feeling of relaxation
8. Improved mood
9. Reduced cognitive decline and dementia

The psychological benefits are very rewarding and are often the main reason people keep exercising. More detail on these and other benefits of cardiorespiratory fitness follows.

Improved Mental Health

People who exercise regularly report improved mood, higher self-confidence and self-esteem, and less stress compared with nonexercisers. Research indicates that aerobic exercise can also enhance psychological well-being by reducing depression and anxiety. The best results were obtained after several weeks of regular exercise, with more vigorous exercise, and in those who were high in anxiety or depression to begin with. While it may not work for everyone and we can't say exactly how much exercise is needed, for many individuals being able to say "exercise makes me feel better" is a significant benefit.

Improved Cognitive Function

Recent research reveals that exercise also makes us smarter! For children, even a few games of kickball can boost the brain in widespread, long-lasting ways. This is why many teachers are lobbying for more time in physical education class.

It has been confirmed that aerobic exercise helps the heart pump more blood to the brain, as well as to the rest of the body. More blood means more oxygen and better-nourished brain cells. Science has now demonstrated a link between exercise and cognition, or neurogenesis, the scientific term for new brain cell growth. The mental effects of exercise are far more profound than once thought. Exercised muscles send out chemicals that travel through the bloodstream and into the brain itself. There, these chemicals ramp up production of several brain chemicals that fuel almost all the activities that lead to higher thought. With regular exercise, the body builds up its levels of chemicals, and the brain's nerve cells start to branch out, join together, and communicate with each other in new ways. This is the process that underlies learning. Brains with more of these specific chemicals have a greater capacity for knowledge. On the other hand, a brain that is low on these chemicals shuts itself off to new information. These new findings have a profound impact on learning, memory, and many other processes of higher thought for the young, the college student, and the elderly.

The human brain gradually loses tissue from age 30 onward, and this is reflected in gradual declines in cognitive function. Cardiorespiratory fitness has been associated with preservation of cognitive function in healthy adults. One study that followed subjects for 10 years indicated that middle-aged aerobic exercisers compared with sedentary individuals have a significantly slower rate of memory decline and better memory performance. In subjects over 55, the positive effect of exercise was greatest on the "executive control" functions of judgment, planning, and the coordination of actions to achieve a goal. In elderly subjects age 60 to 76, 2 months of aerobic training significantly improved cognitive test scores, and the effect was equal to 2 months of mental training.

Improved Sleep

Many studies support the positive effects of exercise on sleep. In studies of individuals who exercised aerobically, exercisers went to sleep more quickly, slept longer, and had a more restful sleep than did those who did not exercise.

Immune System Function

Those who participate in regular moderate exercise enjoy enhanced levels of well-being, including fewer colds and minor respiratory infections compared with sedentary peers. Avoid overtraining, however, as exercising to exhaustion can weaken immune system function.

Improved Body Composition and Weight Management

Regular endurance exercise burns excess calories and can help maintain muscle mass and reduce excess body fat. Increasing levels of overweight and obesity in the United States at all age levels may be due as much to decreased physical activity as to increased caloric intake. For this reason, at least 60 minutes of vigorous physical activity daily is recommended for weight management. Even if exercise does not reduce body fat significantly, research indicates that those who exercise regularly significantly reduce the risk of chronic diseases compared with sedentary individuals.

Reduced Risk of Chronic Diseases

Cardiorespiratory fitness can reduce the risk of developing several chronic diseases. For those who already have one of these diseases, a carefully monitored aerobic program is often recommended as a part of treatment to improve health and physiological resilience.

Cardiovascular Disease Cardiorespiratory exercise reduces the risk of having cardiovascular disease and the risk of dying from it. Cardiovascular disease does not

develop suddenly in middle age. It begins much earlier, in childhood and the teens and twenties, and continues to progress silently for many years. Young adults can reduce the risk of cardiovascular disease by developing a habit of regular exercise and managing the other risk factors described in Chapter 8.

High Blood Pressure Exercise prevents or delays the development of high blood pressure. High blood pressure is associated with the risk of stroke, kidney failure, and coronary heart disease. People with high blood pressure can reduce it by improving cardiorespiratory fitness, particularly if they lose weight as a result of exercise.

Type 2 Diabetes Regular aerobic exercise is associated with a lower risk of developing type 2 diabetes. Type 2 diabetes is associated with the risk of several chronic diseases that can make one's life miserable and shorten one's life span. Exercise helps prevent obesity, which is related to the onset of diabetes. It burns excess blood sugar and increases cells' sensitivity to insulin, which helps regulate blood sugar. For those with diabetes, exercise is an important adjunct to other treatments. Additionally, regular exercise dramatically reduces the risk of metabolic syndrome, a dangerous group of risk factors that have been shown to raise the risk of diabetes and heart disease. See Chapter 8.

Cancer Exercise is associated with a lower risk of certain types of cancer, including colon cancer. This may be due to increased intestinal motility, which decreases contact time between potential carcinogens and the intestinal wall. It also may be due in part to improved immune system function.

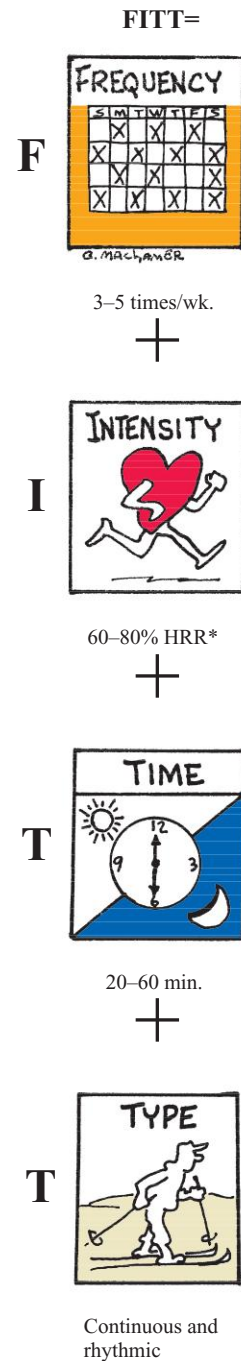
Osteoarthritis Regular exercise may prevent or delay osteoarthritis. Osteoarthritis is most common at weight-bearing joints such as the hips, knees, and ankles and is exacerbated by increased weight on those joints. Exercise maintains the strength of the muscles that surround and support the joints and helps maintain normal joint function. For those who have osteoarthritis, regular exercise such as walking is recommended for maintenance of normal joint function and reduction of excess body fat.

Osteoporosis Osteoporosis is another disease that has its beginning in the teens and twenties with inadequate exercise and eating habits. Weight-bearing exercise such as running, walking, and aerobics can decrease the risk of osteoporosis by building optimal bone mass in young adults and in slowing its loss with age (see Chapter 6).

The benefits of aerobic fitness can enhance health and well-being across the life span. They can be gained by following the FITT prescription for cardiorespiratory fitness.

THE FITT PRESCRIPTION FOR CARDIORESPIRATORY FITNESS

Cardiorespiratory fitness development involves four **FITT factors**: **F**requency, **I**ntensity, **T**ime, and **T**ype of exercise. The prescription for cardiorespiratory fitness for healthy adults is given in Figure 2-1. The prescription



*HRR = Heart rate reserve

FIGURE 2-1

The FITT formula for cardiorespiratory fitness.

may be adjusted for older and sedentary individuals, who can begin with shorter times and lower intensity. While athletes may use this prescription to maintain fitness in the off-season, a greater investment of time and effort may be needed for in-season training.

“F” Equals Frequency

How often should you exercise? Exercise three to five times per week with no more than 48 hours between workouts. After 48 hours, the body starts to decondition and lose some of the benefits gained in the last workout. It is not necessary to exercise every day to develop fitness, although 5-day-a-week programs produce greater improvements than do 3-day-a-week programs. Working out three times per week is the *minimum* and appropriate only for beginners or those recovering from an injury or illness. If your goal is to lose weight or reduce stress, at least 5 days of exercise a week is recommended. However, time for recovery is important, especially if you are just beginning a fitness program. The body needs time to adapt, so start slowly, working out every other day, gradually increasing the frequency as your fitness improves.

“I” Equals Intensity

How hard should you exercise? In athletics, a coach may ask you to give 100 percent effort, but this level of intensity is not needed to develop health-related fitness. Depending on the initial fitness level, about half to over three-quarters effort allows adequate stimulation of the cardiorespiratory system to produce training effect benefits. The American College of Sports Medicine (ACSM) recommends a workout intensity of 60 to 80 percent of your heart rate reserve for healthy, active individuals. For low fit, deconditioned, or older adults, intensities as low as 40 to 50 percent may be adequate for cardiorespiratory improvement. While this intensity will not produce excellent cardiorespiratory fitness, it does provide health benefits and reduces the risk for chronic diseases. Intensity of effort is directly reflected by exercise pulse rate and is perhaps the most important factor in gaining training effect benefits from your exercise program. You must put in enough effort to force the body to adapt and produce fitness improvements. If intensity is too low, there will still be health benefits but no increase in physical fitness. There are three ways to judge intensity: target heart rate, rate of perceived exertion, and the talk test.

Target Heart Rate: Karvonen Equation

To determine your **target heart rate (THR)** range for cardiorespiratory exercise, we will use the **Karvonen equation**, which takes into account your age and resting

heart rate (RHR). Karvonen, a Finnish researcher, discovered that the heart rate during exercise must be raised by at least 60 percent of the difference between resting and maximal heart rates (called the **heart rate reserve, HRR**) to gain cardiorespiratory fitness. An adequate upper intensity is 80 percent of HRR.

It is necessary to know your **maximal heart rate (HR_{max})** to calculate your target heart rate range. The HR_{max} is your highest possible heart rate. It can be directly determined during a treadmill exercise tolerance test in a laboratory or can be predicted based on your age. The maximal heart rate ranges from 180 to 200 beats per minute (bpm) in young people and decreases with age. Most people can estimate their HR_{max} by subtracting their age from 220. For example, if you are 23 years old, your estimated HR_{max} is $220 - 23 = 197$.

Next, you will need to know your RHR for 1 minute. Check it by using a stopwatch or a watch with a second hand. The best time to check it is in the morning before you get out of bed. You also may check it after you have been sitting quietly for 20 minutes or more. Ideally, you should check it several times over a few days. You can find the pulse with your fingertips (not the thumb) at the carotid artery in the neck or on the thumb side of the wrist (Figures 2-2 and 2-3). Be careful not to apply too much pressure at the carotid artery site because the body's natural response is to suppress the heart rate when this occurs. Count the number of beats for 30 seconds and multiply by two to calculate your 1-minute pulse. By using your age and your RHR, you can calculate your target heart rate range (Table 2-1). There is also a target heart rate worksheet in Lab Activity 2-1.

Now that you know your target heart rate range, you will be able to measure the intensity of every exercise session. Count your pulse during exercise and

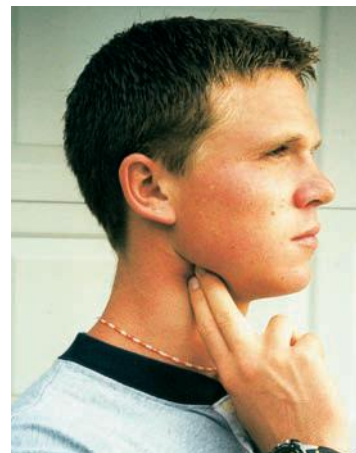


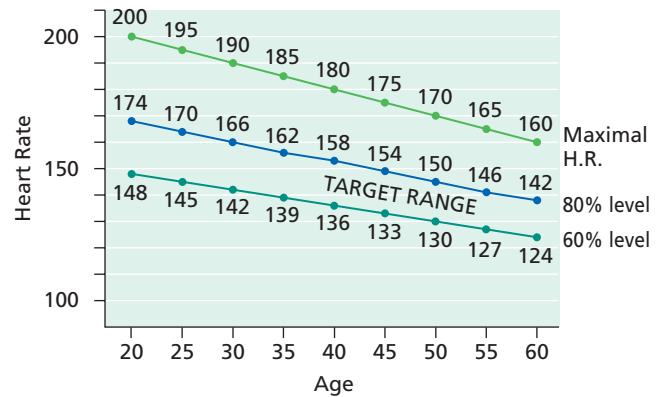
FIGURE 2-2

Pulse at carotid artery.

**FIGURE 2-3**

Pulse at the thumb side of wrist.

immediately after a conditioning bout. Because your pulse drops rapidly when you stop exercising, rather than counting your pulse for a full minute, you may find it easier to count for 6 seconds (e.g., if you count 15 beats in 6 seconds, your pulse is 150). It will take

**FIGURE 2-4**

Estimated target heart rate range (based on RHR of 70 bpm).

some practice, but in time you will become accurate at checking your heart rate.

Exercise heart rates differ by age (Figure 2-4). For most young adults, a THR is in the range of 140 to 170 beats per minute, but for older adults, a rate of 120 to

TABLE 2-1**Calculating Target Heart Rate Range Using the Karvonen Formula**

This example shows a 23-year-old with a resting heart rate (HR_{rest}) of 72 bpm:

- Estimation of $HR_{max} = 220 - 23 = 197$
- HR_{rest} = pulse at complete rest for 1 minute
- Intensity = range of 60% to 80%

$$THR = (HR_{max} - HR_{rest}) \times \text{intensity} + HR_{rest}$$

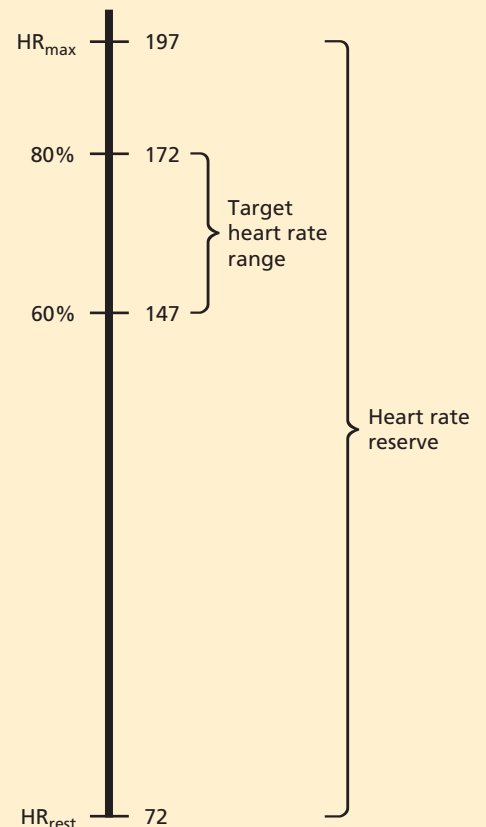
$$a. \quad \begin{array}{ccc} 220 & - & 23 \\ (HR_{max}) & (age) & \end{array} = \begin{array}{c} 197 \\ \text{(estimated maximal} \\ \text{heart rate [MHR])} \end{array}$$

$$b. \quad \begin{array}{ccc} 197 & - & 72 \\ (MHR) & (\text{resting} \\ & \text{HR}) & \end{array} = \begin{array}{c} 125 \\ \text{(heart rate} \\ \text{reserve)} \end{array}$$

$$c. \quad \begin{array}{ccc} 125 & \times & .60 \\ (HR \text{ reserve}) & (\text{lower} \\ & \text{intensity}) & \end{array} = 75 + \begin{array}{ccc} 72 & & \\ (\text{resting HR}) & & \end{array} = \begin{array}{c} 147 \\ \text{(lower target} \\ \text{heart rate)} \end{array}$$

$$d. \quad \begin{array}{ccc} 125 & \times & .80 \\ (HR \text{ reserve}) & (\text{higher} \\ & \text{intensity}) & \end{array} = 100 + \begin{array}{ccc} 72 & & \\ (\text{resting HR}) & & \end{array} = \begin{array}{c} 172 \\ \text{(higher target} \\ \text{heart rate)} \end{array}$$

Target heart rate is **147** to **172** beats per minute.



140 beats per minute may be adequate. Exercising at a heart rate above your THR is not necessary for fitness, does not increase health benefits, but may increase the risk of injury. Keep in mind that because the maximal heart rate is estimated, any error in that estimate is carried over into the THR calculation. Actual THR can vary plus or minus 10 beats. A general rule is to apply the **talk test** and/or the rate of perceived exertion (RPE).

Talk Test

The **talk test** is another way to gauge the intensity of exercise. You should be able to carry on a conversation with a companion while exercising. If you are too breathless to talk, you are exercising too hard. Research has confirmed that at the point where speech is just becoming difficult, the exercise intensity is almost exactly equivalent to the target heart rate. When speech is not comfortable, exercise intensity is consistently above target heart rate. Listen to your body and adjust exercise intensity accordingly.

Rate of Perceived Exertion (RPE)

Many people do not check their heart rate during exercise and judge intensity of exercise by **rate of perceived exertion (RPE)**, sensing how hard or easy a workout feels. This method uses a scale developed by Gunnar Borg (an easy way to use an adaptation of Borg's scale is found in Table 2-2). Borg discovered that exercisers are able to "sense" their exercise intensity levels. He found that the RPE scale correlated with heart rate. Borg found that the descriptive words in the right column closely paralleled the heart rate of the exerciser, which is illustrated by the numbers in the left column. To develop fitness, exercisers should feel the effort is "Moder-

ate" to "Hard," or 4–6 on the RPE chart. It is helpful to cross-check your heart rate with your perceived rating when you first begin to use this method. Experienced exercisers can use RPE to determine if they are in their target HR zone and adjust the exercise intensity accordingly. Younger, more fit exercisers may workout in the 7–8 RPE range for a more vigorous exercise bout. This is a safe and accurate way to monitor exercise intensity anywhere, anytime without using a stopwatch.

THR During Non-Weight-Bearing Activities When you swim, bike, or water run, an adequate target pulse rate is lower than it is when you are running. Weight-bearing activities, such as running and walking, use more oxygen and make your heart beat faster than it does when you exercise by cycling or swimming—at the same perceived level of effort. As a general rule, reduce cycling THR by 5 percent and swimming THR by 10 percent. In any case, you should be able to pass the talk test. For example, if your THR for running/walking is 150–170 bpm, your swimming THR will be

1. $150 \times .10 = 15$; $170 \times .10 = 17$
2. $150 - 15 = 135$; $170 - 17 = 153$
3. $\text{THR} = 135 - 153 \text{ bpm}$

Also remember to set different goals for cross training. A good way to achieve an effective workout is to monitor your rate of perceived exertion (RPE).

Target Heart Rate: Percentage of Maximal Heart Rate

An old method of determining the target heart rate used a straight percentage of the maximal heart rate. The ACSM recommends using 70 to 90 percent of an individual's maximal heart rate to set exercise intensity. For example, if a person's estimated maximal pulse was 200, the target heart rate range would be 140 ($200 \times .7$) to 180 ($200 \times .90$) beats per minute. The advantage of this method is that it is simple to compute. Its drawback is that it does not take resting pulse into account.

"T" Equals Time

How long should each workout be? The ACSM recommends a conditioning bout of 20 to 60 minutes at an intensity of 60 to 80 percent, not including warm-up and cool-down. The 20 to 60 minutes does not have to be completed in one workout. It is acceptable to accumulate the time in 10-minute bouts of exercise throughout the day—for example, 10 minutes in the morning, 10 more minutes at lunchtime, and 10 minutes (or more) after work or school.

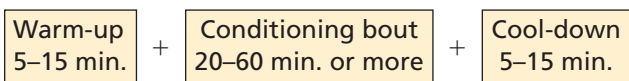
Duration is inversely related to the intensity of the activity. A similar exercise volume may be obtained at a low intensity and a longer time (60 percent

TABLE 2-2 *Rate of Perceived Exertion (RPE)*

RPE Chart		
0	Nothing at all (resting)	
1	Very, very easy effort	Warm-up/Cool-down zone
2	Very easy effort	
3	Easy	
4	Moderate effort	
5	Somewhat hard effort	Target zone
6	Hard effort	
7	Very hard	
8	Very, very hard	Working too hard zone
9		
10	Maximal effort	

SOURCE: Adapted from G. Borg's Perceived Rate of Exertion.

intensity, 30 to 60 minutes) or a higher intensity and a shorter time (80 percent intensity, 20 minutes). See Figure 1-1 in Chapter 1 for a comparison of exercise intensities and times. However, risk of injury does increase at higher intensities. Because many traditional-aged college students (18 to 24 years) have difficulty reaching their THR during some fitness activities (such as fitness walking), or find it is always at the low end of the THR range, they may wish to extend the time of the workout to 60 minutes or more. If time permits and the exercise session is enjoyable, if weight management is a goal, or if you are training for a long-distance event (e.g., mini-marathon), exercising for longer than 60 minutes is fine, but it is not necessary for cardiorespiratory fitness benefits. A typical exercise session would be as follows:



When beginning a fitness program, it is best to limit your conditioning periods to 20 minutes or less (e.g., four 5-minute bouts with a rest in between if needed), then progress slowly until you can comfortably work out for 20 to 60 minutes or more in your target heart rate range. If you wish to progress beyond a basic level,

you should apply the progressive overload principle discussed in Chapter 1.

Many people think they don't have time to exercise, but if you do the minimum 20 minutes, 3 days per week, it takes only 1 hour out of 168 hours in your week—a small investment that pays big dividends.

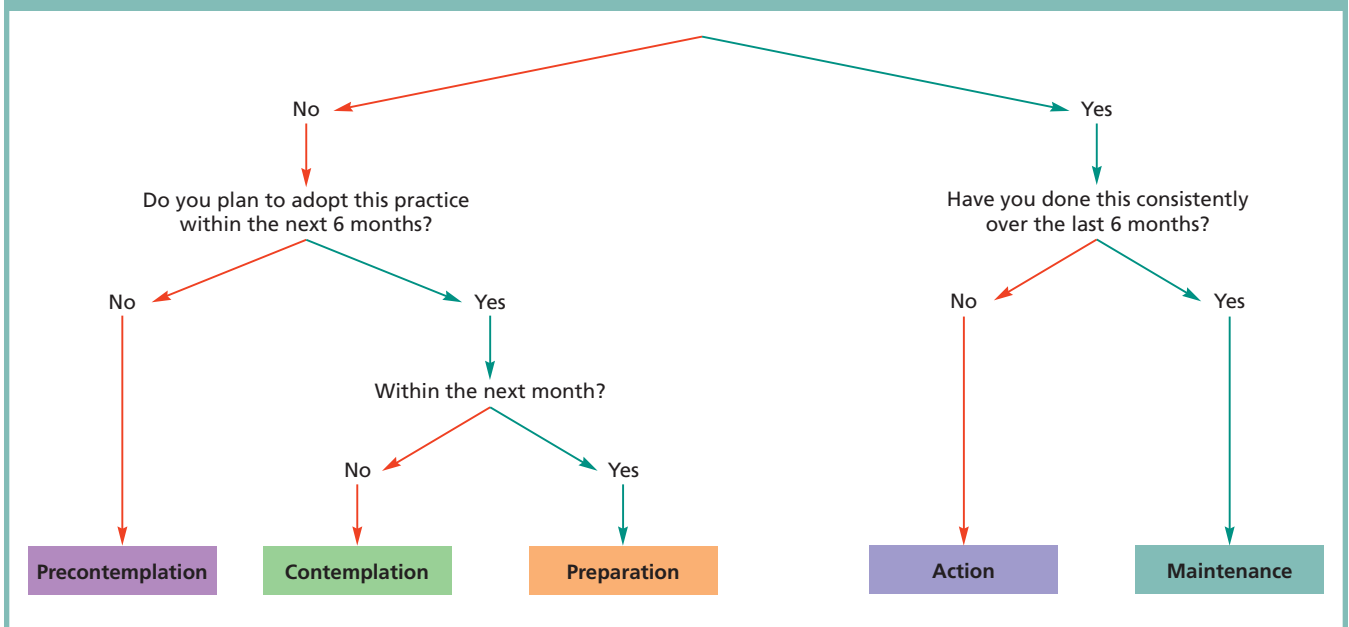
“T” Equals Type

What type of exercise promotes aerobic fitness? The term **aerobic** means “with oxygen.” Aerobic activities are ones that demand large amounts of oxygen and improve cardiorespiratory endurance. They are vigorous, continuous, and rhythmic. Aerobic dancing, swimming, cycling, and jogging are all good, as are other vigorous activities that sustain a target heart rate. However, riding a bike a short distance across campus is not adequate in intensity or time to develop fitness. Ask, “Did I keep my heart rate in the target heart range for 20 to 60 minutes or more?” In contrast, rope jumping or even stair climbing can be an aerobic activity as long as the FITT prescription factors are met. Bowling, golf, and softball, although enjoyable recreational activities, are not aerobic. What other activities meet the FITT prescription?

Anaerobic exercise means “without oxygen.” Anaerobic activities are of high intensity and short

What Stage of Change Are You In?

Do you do aerobic exercise at least three to five times a week?



duration, such as sprinting. This type of activity demands more oxygen than the body can supply while exercising, causing an oxygen debt. Anaerobic exercise causes waste products (lactic acid) to accumulate in muscles, which, along with the depletion of stored energy, leads to exhaustion. Many activities—tennis, volleyball, and weight training—are anaerobic. They aid in the development of agility, eye-hand coordination, and muscular strength and endurance, as well as flexibility, but they are not aerobic and are not an efficient way to increase cardiorespiratory fitness unless they follow the FITT formula.

How Long Before Results Become Apparent?

This varies with the individual. Within the first few exercise sessions, many people report that they feel better. Measurable differences such as decreased heart rate and improved aerobic fitness can occur within 8 to 12 weeks. The key is staying with the exercise program. Studies indicate that over 50 percent of adults who start an exercise program quit within the first 3 to 6 months. Regular exercisers focus on the positive benefits of exercise, reminding themselves how good they feel after exercise, and pat themselves on the back for making progress. So how do you stay with an exercise program long enough to experience the benefits of the training effect? See the Top 10 “Ways to Stick with Exercise” on page 56 for examples of ways to keep a commitment to a healthy lifestyle.

FITT vs. American College of Sports Medicine (ACSM) and American Heart Association (AHA) Exercise Guidelines

You have learned that to develop aerobic fitness you should follow the FITT prescription. Does this conflict with the new Physical Activity and Public Health Guidelines issued by the ACSM and AHA? Not really. The new guidelines parallel the FITT prescription somewhat; they are a health recommendation designed to improve health by warding off chronic diseases (diabetes, heart disease, etc.) and are backed by solid scientific evidence. The goal is health. The FITT prescription is also designed to improve health by reducing risk of chronic disease and is backed by science. However, the FITT prescription’s primary goal is cardiorespiratory endurance, or aerobic fitness, which is the most important component of fitness. As you recall, there are five components of health-related fitness, and a balance among the five is important for complete health and fitness. See Chapter 1.

Look at the exercise guidelines box to see how the FITT and ACSM/AHA guidelines compare. Notice that

Exercise Guidelines	
For aerobic fitness	• 20 to 60 minutes (minimum of 20–30 minutes) • Moderate to vigorous intensity: 60%–80% HRR (Example: walking 4.0–4.5 mph, jogging 5 mph, biking 10 mph) • 3–5 days per week
For health benefits (ACSM/AHA)	• 30 minutes • Moderately intense exercise: 40%–60% HRR (Example: walking 3.5 mph) • 5 days per week - Or • 20 minutes • Vigorously intense exercise: 60%–80% HRR • 3 days per week - And • 8–10 strength training exercises, 8–12 repetitions of each exercise • Twice a week
For weight loss, to prevent weight gain, or for weight loss maintenance (in previously overweight individuals)	• 60–90 minutes • Moderate intensity: 40%–60% HRR • Most days of the week

both stress a longer duration of exercise if the goal is weight loss or weight loss maintenance. What is the recommendation for duration and intensity of exercise if you wish to lose weight?

10,000 STEPS: A DAILY LIFESTYLE GOAL

Many fitness experts believe that we could manage weight control and enhance fitness if we would accumulate 10,000 steps in our activity each day. The goal of this new recommendation is to increase the activity levels of the American public by encouraging more people to move about at least 10,000 steps per day—the equivalent of about 5 miles. A mile can be anywhere from 1,800 to 2,000 steps, depending on stride length and pace. Sedentary individuals typically move about (or walk) less than 5,000 steps in a day, moderately active people take 5,000 to 7,500 steps per day, and active people take at least 10,000 steps per day. The goal of 10,000 steps per day is applicable regardless of how much a person weighs or what his or her cardiorespiratory endurance fitness level is. A young person could accumulate steps through jogging, playing basketball, or other activities, while an older person could meet the recommendation by walking.

How do you measure the number of steps taken per day? A basic pedometer, by detecting vertical movement of the hips, is an inexpensive and simple way to monitor



Use a pedometer to motivate you to get more activity every day. People who wear a pedometer walk about 2,500 steps more—or about another mile—than those who don't. How many steps are you getting each day?

the total volume of physical activity performed on a daily basis. See the Internet Resources section for information on pedometers. Pedometers are motivational, fitness experts contend. By keeping track of how many steps have been taken, one can check quickly to see how many more steps must be taken to reach the goal of 10,000 steps that day. You will probably discover that it is nearly impossible to take 10,000 steps in a day without intentionally adding some type of fitness workout such as a jog, a walk, or a game of tennis or basketball, etc.

Pedometers accurately measure any form of physical activity that involves the vertical movement at the hip, such as walking, jogging, tennis, basketball, some cardio-machines, and even climbing stairs, shoveling, gardening, and raking. It is important to note that there are some activities and factors in which the pedometer will not accurately register movement counts at the hip:

- ✓ cross-country skiing
- ✓ activities on wheels (e.g., bicycling, skateboarding, and in-line skating)

- ✓ swimming activity (most pedometers are not waterproof)
- ✓ moving slowly (less than 2.5 miles per hour)
- ✓ walking with an uneven gait or scuffing the feet
- ✓ walking on thick carpet
- ✓ wearing the pedometer on a flimsy waistband (this forces it out of the vertical position)

A good pedometer need not be expensive or have multiple functions in order to be reliable and valid. Pedometers requiring the calculation of the step-stride distance are not necessary either. Keep it simple but do get one with a safety strap. This protects against loss or damage if it should fall off the waistband.

Here are guidelines for using pedometers correctly:

- ✓ Pedometers can be worn on either the right or the left side of the body.
- ✓ Place the pedometer on the waistband (or belt) in line with the midpoint of the thigh and kneecap. Reset it to zero. The pedometer will register counts only when the lid is closed (if the brand you have has a lid).
- ✓ Perform the 20-Step Accuracy Check before use to ensure the pedometer is in the correct spot on the waistband.
 - Begin walking at a normal cadence while counting the number of steps taken. Stop immediately when 20 steps are reached. Check the pedometer's step count reading. If the step count reads 19–21, the placement is accurate.
 - If the step count is not accurate; move the pedometer slightly to the right or left. Reset, take 20 steps, and recheck for accuracy as previously described. Continue with the 20-Step Accuracy Check until proper placement is reached.
- ✓ Attach a safety strap to clip the pedometer to your waistband, or simply use a safety pin to keep it from falling off.
- ✓ Pedometers *must remain in the upright vertical position to measure steps accurately*. Undercounting errors may occur for individuals who are overweight because the pedometer may be turned away from the vertical plane and moved toward the horizontal plane by the excess body fat around the waist. Wearing loose-fitting clothing may also affect the accuracy of the pedometer because it absorbs slight vertical force that occurs with each step. In these cases, placement at waist level behind the hip on the back is often accurate. Check the accuracy as described previously.

The 10,000-step goal may be too high for some people at first. Follow the five steps outlined in Table 2-3 for guidelines to safely reach your 10,000-step goal and for tips on how to incorporate more physical activity, fun, and variety into your daily life.

TABLE 2-3 *Five Steps to Reach 10,000 Steps a Day*

To avoid injury, you need to work up to 10,000 steps slowly. If you have any concerns about your joints (ankles, knees, hips), discuss your exercise plans with your physician. Check with your physician if you experience any pain or discomfort that concerns you. The goal is to be active for the rest of your life. Don't go overboard at the beginning and develop an injury that will prevent you from having an active lifestyle.

Step Conversion

1 step	=	2.64 feet
1 mile	=	2,000 steps
5 miles	=	10,000 steps
10 miles	=	20,000 steps
25 miles	=	50,000 steps

1. Week 1: Start by wearing the pedometer for one full "normal" or typical week. Record the number of steps taken each day. Use the log sheet in Lab Activity 2-2. Calculate a daily average for 1 week. This is your Baseline Activity Level and a reference point for setting a personal, realistic, and progressive goal.
2. Weeks 2 and 3: Establish your personal goal by taking the Baseline Activity Level and adding 10 percent more steps to that level.

For example: If your baseline is 6,000 steps per day, your personal goal would be 6,000 steps plus 600 (10 percent) more steps for a total of 6,600 steps. This will be your personal goal for the next 2 weeks. If the goal is reached for a majority of days during this period, another 10 percent (600 steps) is added to the baseline and the process is repeated each 2-week period thereafter until you reach the goal of 10,000 steps a day. (Example: Weeks 4–5 your goal will be 7,200 steps; weeks 6–7 your goal will be 7,800 steps, and so on.)

Alternate Method: After the baseline is determined, establish progressive step goals based on the premise that approximately 100 steps are taken every minute. If you wish to increase your activity level by 5 minutes a day, then 500 steps should be added as a goal. One thousand steps should be added for an additional 10 minutes, and so on. Continue adding 500 steps per day (or 1,000 steps per day) to your daily goal until you reach the 10,000-step goal. (Example: If your Baseline Activity Level is 6,000 steps per day, your step goal for weeks 2–3 will be 6,500 steps; for weeks 4–5 your

step goal will be 7,000 steps per day; and for weeks 6–7 your step goal will be 7,500 steps per day, and so on.)

3. Decrease your goal or stay at the same goal for longer if you wish or if you are not ready to increase.
4. Pedometers are accurate for walking, running, tennis, and so on, but not for bicycling, swimming, activities on wheels, and some cardio equipment in the fitness center. Use the 1-Mile Equivalent Chart in Lab Activity 2-3 to estimate your steps if you enjoy those activities. They can count toward the 10,000-step goal.
5. Use "Exercise Across the U.S.A." to have fun adding activity to your daily life. Pick a state and exercise/walk across it (see Lab Activity 2-3). At 10,000 steps per day, how many days would it take you to travel the length of the Mississippi River, the Grand Canyon, the circumference of Earth, or go to the moon, or cross the state of Illinois? Or, use the "Activity Step Equivalents" below if you enjoy these activities.

Activity Step Equivalents

Activity	Steps per Minute
Aerobic dance	150–200
Basketball	200–220
Bicycling (6 mph)	70–100
Bicycling (10 mph)	130–140
Gardening	100–130
Housework	80–100
Jumping rope	230–250
In-line skating	135–200
Rowing machine	170–200
Snow shoveling	140–180
Stair climbing	200–230
Swimming	200–300
Tennis (doubles)	100–150
Tennis (singles)	160–200
Weight training	100–130
Yoga	70–100

Example: A 30-minute aerobic dance workout would equate to 4,500–6,000 steps (or between 2.25 miles and 3 miles).

Use the 1-Mile Equivalent Chart in Lab Activity 2-3 for additional ideas on how to add more steps to your lifestyle. How many steps are you getting on most days of the week? Check "The Numbers" to see how modern society compares to ancient people and to the Amish lifestyle.

LIFETIME EXERCISE ACTIVITIES

Physical activity is touted as the single most effective lifestyle behavior for promoting better health. It has been identified as a major health indicator in *Healthy People 2010*, with specific objectives to increase the

number of adults engaging in regular, preferably daily, moderate-intensity physical activity for at least 30 minutes. Only 25 percent of Americans achieve this. See "The Numbers" for the number of Americans who don't engage in sufficient exercise. What impact does this have on our nation's health?

You can do your part to help improve the health of our nation by selecting and participating in one of the eight exercise activities in this chapter. Select the activity you wish to pursue to reach your fitness goals and then follow the FITT prescription factors. Next, thoroughly read the activity unit of your choice. This will provide you with the helpful guidelines necessary to assist you in reaching these goals.



THE NUMBERS

3 in 4	Adults do not engage in sufficient exercise despite the common knowledge that inactivity is related to specific chronic diseases (such as heart disease, certain types of cancer, diabetes, obesity, and osteoporosis), leaving only 25% of Americans who do get the recommended amount.
18,000	Average number of steps that men in an Old Order Amish community in Ontario, Canada, took per day. On average, women in the same community took 14,000 steps per day. (Data from a University of Tennessee study.)
2,000–4,000	Number of steps the average American takes per day.
30,000	Number of steps per day that ancient people took just to survive and hunt for food.
3.4 times	Increased risk of early death attributed to the least fit men compared to the most fit men (according to studies conducted at The Aerobics Center, Dallas, Texas).
4.6 times	Increased risk of early death attributed to the least fit women compared to the most fit women (according to the same studies noted above).
11.5	Calories per minute burned in deep-water running, about the same rate as a 9-minute-per-mile road run. (Data from University of New Mexico researchers.)
100–125	Number of steps per minute that meet the ACSM/CDC fitness guidelines for moderate-intensity exercise. This equals approximately 3,000 steps in 30 minutes.
88%	Reduction in risk of brain injury associated with wearing a helmet while bicycling.
18%	Number of cyclists who wear a helmet all or most of the time while bicycling.

As you begin your exercise program, let the thoughtful words of the Reverend Jesse Jackson inspire you: “Both tears and sweat are salty, but they render a different result. Tears will get you sympathy, sweat will get you change.”

AEROBIC DANCE

(Including Step Aerobics and Spinning)

Advantages/Disadvantages

Aerobic dancing is a popular fitness activity. Usually performed under the leadership of an instructor, it combines the cardiovascular benefits of jogging with the joy of dancing. The variety of movements not only strengthens the cardiorespiratory system but also increases flexibility, tones muscles, and enhances body composition. It is a total body workout. The upbeat music tempo creates an atmosphere of excitement; exercising in a group is fun and emotionally stimulating.

The popular music and group camaraderie help prevent boredom and can keep you motivated. Aerobic dancing can be so much fun, you often forget you are exercising. Because the participants focus on the instructor, aerobic dance classes are good for the beginning or self-conscious exerciser. Aerobic dance allows for individualization of a workout. The same movement sequence or exercise can be done by a well-conditioned participant and a beginning exerciser with variation in the intensity or the number of repetitions. Because aerobic dance is done indoors, the environment provides security and comfort.

Aerobic dance has excellent potential for developing all components of physical fitness, but it can have some drawbacks. Although participants are urged by instructors to work at their own pace, some exercisers overdo it. These exercisers try to keep up with the group or work as hard as the instructor even though they may not be ready for this intensity. Many times the result is excessive soreness or fatigue. Performing aerobic dance on a hard, unyielding surface (such as

TOP 10 LIST

Ways to Stick with Exercise

1. *Pick an activity you enjoy.* Exercise should be fun, not merely work. Try different activities until you find one or two you like.
2. *Make exercise social.* Exercising with a partner or a group of friends is more fun than working out alone. Friends rely on each other for moral support and help each other stay committed to the fitness program. An “exercise date” once or twice a week can keep you going.
3. *Take lessons.* Join an aerobic dance class or a health club. Start slowly and progress gradually to avoid injuries. If exercise is too difficult or too intense, you are not likely to want to stay on the program.
4. *Make it convenient.* Develop a home gym or purchase a couple of exercise videos. Keep your exercise gear available so that you can squeeze in a quick workout.
5. *Treat exercise like an appointment.* Schedule a time that works best for you, whether morning, noon, or evening.
6. *Keep a chart to monitor your progress.* It's rewarding to see how much you have progressed.
7. *Add variety.* To keep your program fresh, walk or jog different routes or exercise in a park or around a golf course. Alternate swimming, walking, and bicycling. While pedaling a stationary bike, read, listen to music, or watch TV. (But don't wear headphones when exercising outside near traffic.)
8. *Have a backup plan in case of bad weather or conflicts.*
9. *Be patient with yourself.* Expect ups and downs. Some days you will be more energetic, some days less. If you're not feeling like a workout, tell yourself you will do a little and you may find that after a few minutes you perk up. If you have been doing too much, a rest may do you more good than another workout.
10. *Finally, don't stop!* It's difficult to get going again. Remember to plan for changes in your schedule (for example, pack your exercise equipment when you travel). However, don't feel guilty if you miss an exercise session. Taking a few days off due to illness or injury isn't a disaster. Consider this a lifetime commitment and resume exercising as soon as possible.

cement) or while wearing inappropriate shoes also increases the risk of injury. Some overzealous aerobics participants attend classes one or more times a day, leading to overuse. Excessive impact may cause leg and foot problems. Also, not all aerobic dance instructors

have had training in exercise instruction and safety and may teach improper technique. Unless good body mechanics and reasonable progressions are emphasized in a class, the result can be discomfort rather than exhilaration and a desire to continue exercising. Having to join or travel to a fitness facility to take an aerobics class may be viewed as a disadvantage by some exercisers. Others find it motivating to have a set time, to have made a financial investment, and to have a group of friends to exercise with. Aerobic dance DVDs are available for the home exerciser. They allow exercising in private but lack the spontaneity, instruction, and enthusiasm available in a live class.

What to Wear

Although some aerobic dancers have color-coordinated fancy exercise apparel, any loose-fitting and comfortable clothing will do. T-shirts and shorts are fine. More important than the clothing are supportive shoes. Shoes specially designed for the impact and movement of aerobic dance are recommended. A good aerobic shoe has a well-cushioned, resilient midsole to aid in shock dispersion and a sturdy heel counter to hold the foot in place. The shoe should allow for lateral movement and, as a result, not have the wide heel flair that is often seen in a jogging shoe. Like the jogger, the aerobic participant should replace old shoes when their cushioning ability has decreased.

Techniques and Safety Tips

Many injuries and much discomfort can be avoided in aerobic dance with proper shoes, gradual progression, and exercising on a resilient surface. Chapter 7 gives several general suggestions for preventing injury in fitness activities. In aerobic dance, careful attention to technique and body mechanics further eliminates chance for injury and heightens the enjoyment of the activity.

1. *Always warm up with low-intensity, whole-body movements.* Your warm-up should include slow, full-range-of-motion joint movements. Static stretching should also be included in the warm-up.
2. *Keep abdominals pulled in and buttocks tucked under.*
3. *Avoid twisting the spinal column excessively* (windmill toe touches, elbow-to-knee lunges, etc.).
4. *Limit the hopping on one foot* to a maximum of four consecutive times.
5. *Soften your jumps and bounces by maintaining a slightly bent-knee landing position.*
6. *Try to make your heels go all the way to the floor when landing from jumps.*
7. *Never fling or throw your arms or legs.* Maintain control of limbs throughout movements.

8. *Avoid hyperextending your elbows, knees, or lower back.*
9. *Listen to your body.* If a stretch, exercise, or position causes pain or a burning sensation, do not do it.

The amount of concern for technique and safety in the class depends on your instructor. A wise wellness consumer chooses a knowledgeable, trained instructor. The popularity of aerobic dance has skyrocketed, and the number of qualified instructors has not kept pace. While standards and certification programs have been established, it is up to you to select a class. Do not be shy. Check the instructor's qualifications. Is she or he

- ✓ Certified by a national fitness organization?
- ✓ Knowledgeable in anatomy, exercise physiology, kinesiology, and first aid?
- ✓ Currently certified in CPR (cardiopulmonary resuscitation)?
- ✓ Doing some health screening or fitness assessment of students?
- ✓ Supervising the class effectively?
- ✓ Monitoring the intensity of the workout with periodic heart-rate checks?
- ✓ Beginning with a good warm-up and ending with a cool-down period?
- ✓ Giving corrective cues and technique suggestions throughout the workout?
- ✓ Considering the variances in fitness levels in the class by showing how to modify the intensity of the workout?
- ✓ Easy to follow?
- ✓ Educating the participants on injury prevention and signs of fatigue?

Looking good in a leotard and being a fluid dancer are not requirements for being a quality aerobic dance instructor. Most important is the ability to conduct a safe yet invigorating workout from which all participants can benefit.

How to Begin and Progress

As with any other fitness activity, begin slowly. Attend no more than three classes per week for several weeks. Start with 5 to 10 minutes of the aerobic phase and progress gradually. If the aerobic portion of the class is 30 minutes, do low-impact moves or walk in place while the experienced exercisers continue. Monitor your pulse and stay within your target heart-rate range. You should be able to talk or sing with the music throughout the entire workout. Gradually add a few minutes weekly to the aerobic phase until you can exercise aerobically for 20 to 60 minutes.

Some exercisers prefer low-impact aerobics to high-impact aerobics. Low-impact aerobics reduces the strain on knees and ankles by minimizing jumping and bouncing movements. In low-impact aerobics, one foot



Working out in a class setting is social and fun.

is in contact with the ground at all times. *Low impact* does not necessarily mean *low intensity*. To maintain a training heart rate, move your arms vigorously and travel along the floor by wide-stride walking, sliding, and sidestepping. Beginners and well-trained exercisers with joint problems can benefit from low-impact aerobics. You may want to combine low-impact and high-impact moves. Most jumps and steps can be modified to become low-impact steps.

Most aerobic dance classes incorporate in the workout a body toning segment. Once again, use common sense. Do not try to do as many repetitions as the teacher unless you are equally fit. Stop and stretch if you feel pain or a burning sensation in the muscle. Aerobic dance participants often tend to compare themselves or compete with others in the class. Avoid falling into this trap. Work to be the best you can be without shame or guilt.

Variety

It is easy to add variety to aerobic dance. Vary the music. Use pop, jazz, country, or classical music. Try some holiday or theme music when appropriate. Vary the routines or steps. Aerobics can be taught by using set routines (repetitive movements in a programmed format) or in a freestyle format (participants mimic the instructor and change accordingly). Varying between learned routines and a freestyle approach helps keep interest high. Try circuit aerobic dance. Set up exercise stations around the room. Do different aerobic movements for 1 to 2 minutes per station and then jog to the next station to sustain your training heart rate. There are many other ways to add variety to aerobic dance. One- to 2-pound hand weights can be used during aerobic routines to increase upper-body endurance and maintain a training heart rate. Heavier hand weights are often used during stationary power moves to tone arms and legs. To prevent knee injuries, do not wear ankle

weights while doing aerobic dance steps. Weights are, however, an effective way to add resistance while doing floor toning. Thick rubber bands and elastic tubing can also be used to increase the efficiency of body toning exercises.

Step Aerobics

Also known as *bench/step training*, step aerobics is an innovative activity that involves stepping up and down on a 4- to 12-inch platform. Combining a variety of stepping patterns with kicks, turns, and upper-body movements results in a brisk workout. Step aerobics appeals to a wide range of exercisers for several reasons: It can be a high-intensity workout with low-impact force; it is adaptable to different fitness levels by adjusting the bench height, adding jumps, varying arm gestures, and adding light hand weights; and it is easy to do. Step aerobics has become especially popular with men, who may be put off by “dancelike” aerobics classes. As with all aerobic exercise activities, proper form and technique are necessary to prevent injury.

To prevent injury while stepping:

1. As much as possible, keep your shoulders aligned over your hips.
2. Step up lightly, making sure the whole foot lands on the platform.
3. Keep your knees aligned over your feet when they're pulling your body weight onto the platform.
4. At the top, straighten your legs but don't lock your knees.
5. Do not pivot a bent, supporting knee.
6. As you step down, stay close to the platform.

If you are a beginner at step aerobics, start with the lowest bench and keep your eyes on the bench until you adjust to the activity. Once you learn the stepping patterns, you can add arm movements and light hand weights or challenge yourself by raising the height of the bench. (However, never use a height that flexes your knees to an angle less than 90 degrees.)

Step aerobics is a great workout for the lower body and, when combined with a variety of arm movements, an exciting variation in aerobic exercise.

Indoor Cycling Classes (Spinning or Fit Ride)

Indoor cycling class is a stationary cycling workout that uses motivational techniques. The instructor leads a group of riders on a scenic stationary trail ride by using visualization techniques, motivational strategies, and videotapes and music. The instructor prompts you on when to crank up or loosen the tension and when to



Indoor cycling class is a popular indoor fitness activity and can be quite challenging. The optimal pace is 60 to 80 rpm. A racer's pace is 80 to 100 rpm or more.

pedal faster. The indoor cycling class allows people of all ages and fitness levels to take a stationary bike and transform it into a powerful workout. Participants vary the workout by making changes in the speed and resistance of the bike. Indoor cycling classes allow participants to experience road cycling without the associated dangers. The program is also a great choice for the cyclist who wants to take his or her outdoor program inside during inclement weather.

A drawback to this excellent aerobic exercise program is the necessity to join a class that provides the certified trained instructor and appropriate bikes. Access to a health/fitness club or university fitness class is usually required for this activity.

For added comfort and enjoyment while Spinning, follow these guidelines:

1. Adjust the seat high enough so that the leg fully extends at the bottom of each pedal stroke with a slight bend in the knee.
2. If possible, move the seat forward or back so that the bent knee, at the top of the stroke, rests just above midfoot.
3. Attach toe clips to help prevent foot fatigue.

4. Tilt the seat slightly downward to avoid crotch numbness.
5. For added comfort, buy a cover to pad the seat (or a gel cover) and invest in cycling shorts.
6. Adjust handlebar height to reduce hand/wrist pressure.
7. Add resistance when pedals (instead of your thigh muscles) are propelling your foot or the instructor advises you to do so.
8. Always warm up and cool down properly. Don't try to compete with class members; ride at your fitness level. Use your THR or PRE as a guide.
9. Listen to your body and stop before you feel fatigued.

Common Discomforts

As in most fitness activities, mild soreness can be anticipated by the beginning exerciser. Some discomfort may be avoided by emphasizing stretching and toning the first 3 to 4 weeks to condition muscles and connective tissue for the stress of impact and the new movements. Veteran exercisers can suffer pain or injury by increasing frequency, time, or intensity too rapidly. Most aerobic dance discomfort is found in the legs, so be sure to warm up and stretch this area. Exercise fatigue can also occur due to dehydration or lack of sleep/rest. Refer to Chapter 7 for further information about prevention and treatment of injuries. If you use hand weights, elbow and shoulder strain can be avoided by not flinging the weights. Always move the weights with control. Having a towel or exercise mat with you provides additional comfort and padding for floor exercises.

BICYCLING

Advantages/Disadvantages

Cycling is a popular choice for people of all ages. You can fit in a cycling workout while running errands, while going to work, or at home in front of the TV (on rollers or a stationary bike). You can cycle alone, with family, or with friends. If you have a small child, you can take him or her along in a bike seat instead of having to hire a sitter while you get a workout. It is non-impact exercise, minimizing stress to the back, shins, and ankles.

There are a few drawbacks, though. You must have a bicycle, keep it in good working condition, and store it securely to prevent theft. Cycling in traffic requires alertness and the use of defensive driving skills to prevent accidents. Cycling in rain, snow, or icy conditions is uncomfortable and hazardous. Also, bicycles are so

efficient that they can do most of the work for you. Cycling to class or for short distances is fine for transportation, but if you want to get in shape, you will need to put in more effort. Nevertheless, cycling produces cardiorespiratory benefits without impact, making it the third most popular activity in the United States. It can be enjoyed throughout a lifetime.

What to Wear

To be clearly visible to vehicles, wear bright-colored clothing during the day and light-colored clothing at night. Fancy bicycling gear is not necessary, although if you really get into cycling, you might find that a pair of bicycling shorts makes long rides more comfortable. Hard-soled, athletic, or bicycling shoes are fine.

Equipment

There are plenty of bike-pedestrian and bike-car accidents, and the bicyclist is usually at fault. Always wear a helmet even if you're going only a short distance.



Bicycling is a great fitness activity across the life span. Always wear a helmet.

The sidewalk is a hard surface. You may lose some skin in a slide or break some bones, but they will heal. Your brain won't. Head injuries account for over 75 percent of deaths and permanent disabilities in cycling crashes. If you hit something and go flying headfirst, wearing a good helmet is the best way to prevent serious injury.

When you are choosing a helmet, make sure that it has the following characteristics:

- ✓ Outer shell or cover that is brightly colored (i.e., yellow, white, or red) so that you are easily visible to drivers
- ✓ Hard shell lined with polystyrene or polystyrene alone
- ✓ Secure chin strap
- ✓ Label indicating that the helmet is Consumer Product Safety Commission, American Society of Testing and Materials (ASTM), or Snell Memorial Foundation approved

Helmets are single-use devices designed to crush and absorb shock upon impact. You should replace a helmet that has been in a significant crash.

A water bottle is essential for workouts, particularly in the heat. Because sweat evaporates so quickly while you are riding, you may not realize how quickly water is lost. Dehydration, leading to heat illness, can easily occur. Drinking regularly from a water bottle to maintain an adequate level of hydration during a workout is a necessity, not a luxury.

Recumbent bicycles have recently become popular, especially for riders with back problems. Because they are low to the ground, they are not as visible to motorists. Be sure to use a warning flag on the bike.

It doesn't matter what type of bike you ride, but it does matter that you keep it in good working order. If you are not mechanically inclined, your local bicycle shop can help. Most people ride with the bike seat too low, which is inefficient and can make the knees hurt. The bike seat should be high enough that when you sit centered on the seat with your heel on the pedal at its lowest point, your knee is only slightly bent. That way, when you move the ball of your foot to its proper position on the pedal, your knee will be almost fully extended at the bottom of the stroke. If the seat is too high, you'll tend to rock from side to side with each footstroke and may develop a sore crotch. A sore crotch also can be caused by improper seat tilt. Start with the nose of the seat level. If it bothers you, tilt it down slightly. Pedals, wheels, and steering should turn or spin freely with no binding, catch, or click. The derailleur should shift smoothly. Brakes should close and release easily. Brake shoes should be $\frac{1}{8}$ inch or less from and level with the rim of the bike. If they are badly worn, replace them. The air in the tires usually needs to be topped off weekly to keep them hard and

rolling smoothly, but use caution when filling them. The air pumps at service stations are designed for cars, and it's easy to explode a bicycle tire by overfilling it. If a bike wheel is badly out of true and wobbles, it may hit the brake shoe with each revolution. A bike shop can true a wheel; lubricate sticky brake cables; adjust the derailleur; and show you how to keep your machine running smoothly, which makes riding safe and enjoyable.

Technique and Safety Tips

Shifting On multispeeds, the gears overlap slightly and you have to shift by feel. To shift, continue pedaling but ease up on the pedal pressure. Shifting without pedaling can cause a bent or broken chain or gear teeth. As you shift, you should not hear a loud clunk or a constant rubbing sound if you are shifting smoothly and getting it into gear correctly.

Most beginners gear too high and pedal too slowly. They feel like they're not getting any exercise unless they're pushing against resistance. This is inefficient and can increase fatigue and cause knees to ache. It is better to pedal quickly against light resistance. An optimal pedal rate is 60 to 80 rpm, with a range of 80 to 100 rpm. Racers and experienced tourists often cycle at 90 to 110 rpm.

If your bike has several gears, practice using them. Gearing is a matter of maintaining an even cadence regardless of terrain, weather, or wind conditions. If you're going uphill, shift before you have to slow your cadence so that you can go up smoothly. Also practice down-shifting before stop signs so that you don't have to stand on the pedals to get going again.

Pedaling Ride with the ball of your foot on the pedal. If you have toe clips, you can try anking—pulling up as well as pushing down on the pedal with each stroke—which doubles your efficiency.

Braking Look ahead, signal, slow down, and learn to anticipate problems instead of simply reacting to them. Be careful not to jam on the brakes too suddenly or you can pitch headfirst over the handlebars. The front brake is the most powerful because as you decelerate, your weight shifts forward, lessening the weight over the back tire. For the most efficient stop, keep your body weight back, gradually increase pressure on the front brake, and hold pressure on the back brake just below the point where the wheel will skid. In wet conditions, brakes lose up to 90 percent of their braking ability. It is good to frequently apply the brakes lightly to wipe water off the rims and allow extra stopping distance. When going downhill, pump the brakes to avoid overheating the wheel rims or brake shoes. When in doubt, favor the rear brake.

Bumps When you come up to bumps, holes, and railroad tracks, shift your weight to pedals and handlebars to absorb the shock. It's better for you and for your bike.

Safety Tips

1. Wear brightly colored clothing, wear a helmet, and carry water.
2. Keep to the right side of the road and ride in a straight line. Always ride in single file with traffic.
3. Do not make sudden turns or swerves. Signal turns and stops. Try to make eye contact with drivers when you are turning so you know they have seen you.
4. Stay alert. Look out for cars pulling out into traffic or turning. Listen constantly for traffic approaching out of your line of vision.
5. Observe traffic regulations as if you were driving a car—red and green lights, one-way streets, stop signs. Slow down at all street intersections and look right and left before crossing.
6. Be sure the brakes are operating efficiently and keep your bicycle in perfect running condition. Keep your hands on or near the brakes at all times.
7. Keep speed under control, especially on long downhill runs. Speed should be low enough that you can stop quickly.
8. In rainy weather, allow much more distance for stopping and don't take corners too fast.
9. Watch for sudden door openings from parked cars. Ride at least 3 feet away from them.
10. Avoid sewer grates that parallel your direction.
11. If railroad tracks are rough, walk your bike across them (to prevent a blowout or other damage to the bicycle). If you choose to ride over the tracks, cross them at a 90-degree angle.
12. Make sure you are at least 3 feet off the traveled portion of the road when you stop or park.
13. Hug the right-hand shoulder of the road on all curves.
14. Give pedestrians the right-of-way. Avoid sidewalks.
15. Watch out for child cyclists. Children on bicycles usually weave from side to side and turn unpredictably without signaling and can run into you when you are passing them.
16. Dogs are potential adversaries. If a dog is far enough away, you can probably outrun it. Water from your bottle or a bike pump may scare the dog off. If you stop, keep the bike between you and the dog. Walk slowly away. Usually a dog will leave you alone, but watch the dog carefully before you get under way again. You can also buy a small can of "dog repellent," which will shoot a thin stream of chemical about 10 feet. Although the effects are potent, no permanent damage is done to the animal. Don't try to run down or kick at a dog—this can cause a crash. If you are scared, you can yell "Out" at the dog, mimicking a noise made by mother dogs when disciplining their puppies. This will usually startle a dog enough to give you a chance to escape.
17. Don't wear headphones—they block out street sounds that enable you to anticipate traffic.
18. Don't wear a heavy backpack. It can throw off your balance. Carry packages in baskets or bags attached to the cycle.
19. Learn to shift gears while keeping your eyes on the road.
20. If you use toe clips, practice getting in and out of them in a safe area.
21. Tuck in your shoelaces.
22. Don't drink and cycle.

How to Begin and Progress

First, measure your fitness level by using the 3-mile timed ride test in Chapter 1. Remember that your *current* fitness level does not indicate your potential. Allow yourself several weeks to show significant improvement. Begin at the step indicated by your current fitness level. If you cannot complete the test, begin at level 1. Exercise 3 to 5 days a week at your training pulse. (An appropriate pulse for bicycling appears to be about 5 percent lower than that for other exercise, so subtract 5 percent to adjust for this difference.) It is also appropriate to use the RPE. You may work at one level until you can comfortably handle the recommended distance and intensity; then move to the next step. To develop balanced fitness, add 25 to 30 push-ups, a minute of abdominal curls, and 5 to 15 minutes of stretching to each workout.

Bicycling Program

Fitness Category		Starting Level
Low		1 or 2
Fair		3
Average		4
Good		5
Superior		6
Level	Cycling	Total Distance
1	20–30 min. (8–10 mph)	3–5 miles
2	20–30 min. (10–12 mph)	4–6 miles
3	30–45 min. (10–12 mph)	4–8 miles
4	30–60 min. (10–15 mph)	7–15 miles
5	40–75 min. (10–15 mph)	10–18 miles
6	40–90 min. (10–15 mph)	10–22 miles

Variety

Part of the appeal of bicycling is being able to explore an area and see things you normally wouldn't notice as you whizzed past in a car. Try cycling to a park, a lake, or a scenic spot or just go exploring on a bicycle. Plan an outing with a picnic or refreshment break halfway. Ride to a nearby small town and back. Plan a bike rally, similar to a car rally with checkpoints, or a bike scavenger hunt in which you gather bits of information from locations (e.g., what is the name of the store at 21 Oak Street?). If you are interested in more alternatives, consult your local bicycle shop for bicycling organizations in your area and find out what rides and tours are planned.

Common Discomforts

Bicyclists beginning a conditioning program often experience a sore crotch the first week or two. As you and your saddle adjust to each other, the syndrome should disappear. Check to see that the seat is not too high. An overly high seat causes you to rock from side to side with each pedal stroke, and the constant rubbing will prolong soreness. It may help to tilt the nose of the saddle down a bit (not so much that you slide off!), to try a different saddle, one with padding under the "sit bones," or to consider padded cycling shorts. See the section "Males and Exercise" in Chapter 6.

Sore knees? A seat that is too low so that your knees are excessively bent throughout the pedal stroke is one cause. Riding with excessive resistance at too low a cadence increases pressure on the knees and is another easily remedied cause. A relatively high cadence against light resistance reduces the frequency of overuse injuries.

If your fingers feel numb after cycling, you need to change hand position more frequently and ride with the elbows slightly bent, not locked. The ulnar nerve runs across the palm, and constant pressure on the hands can temporarily cut off sensation to the area. Wearing padded cycling gloves or cushioning your handlebars with foam grips may also help.

Neck or back soreness usually disappears in a week or so once you grow accustomed to riding. If it does not, try changing hand positions frequently, riding with the elbows slightly bent, moving the seat forward a little, or perhaps switching to upright handlebars.

Do your toes tend to go numb on long rides? If you are using toe clips, it may be that pedaling tends to push your foot forward into your shoes until your toes touch the end, reducing blood flow to the area. Try lacing your shoes snugly enough so that they hold your foot back in the heel of the shoe but not so tightly that circulation is hindered. Also, try loosening your toe clips.

FITNESS SWIMMING

Advantages/Disadvantages

Swimming is a superb form of exercise. It is a total body workout that uses the major muscle groups of both the upper and lower body. Other forms of aerobic exercise, jogging, for example, use mainly large muscles of the lower body. In addition, water exercise is a natural form of strength training. Resistance of the water against the body's movements enhances muscle strength. Swimmers are also subject to fewer injuries than are participants in many other activities. Joint and muscle injuries are not common among swimmers because of water buoyancy. Water supports the body, alleviating the jarring effects of weight-bearing exercise such as aerobics or jogging. Swimming is ideal for the overweight, the arthritic, the injured, the elderly, and those prone to joint problems.

Another advantage of swimming is that participants rarely experience heat exhaustion and heat stroke. This can be a concern when exercising in hot, humid weather. If you don't like to sweat, you will probably prefer to exercise in water.

Swimming does have drawbacks. You must have some swimming ability and have access to a pool at a time convenient for you. That first plunge into the water may be difficult for some, but after a brief warm-up period, the cool water temperature will be invigorating. Warm water quickly becomes uncomfortable during a vigorous workout.

Although the injury rate is low, you may experience some minor annoyances as you train in water.



Swimming is one of the best whole-body workouts. It builds heart and lung capacity, tones all major muscles (arms, shoulders, waist, hips, and legs), improves flexibility, and reduces stress.

Eye irritations and “swimmer’s ear” are the most common.

The inconvenience of having to redo makeup and hair is minor when you measure the positive outcomes of aquatic exercise. After the workout, an efficient hair and makeup routine develops quickly.

What to Wear

Swimming is an inexpensive sport because the only equipment needed is a comfortable swim suit. Many swimmers wear goggles to protect their eyes, and for added comfort, you may wish to use ear plugs and a swim cap. Swimmers can exercise indoors or outside, making this a year-round sport.

Technique and Safety Tips

Learn to swim the following five basic strokes efficiently: sidestroke, elementary backstroke, breaststroke, back crawl, and front crawl. Incorporate stroke mechanics sessions on these strokes into each workout. The butterfly stroke is too strenuous for most fitness swimmers.

Learn and practice the front crawl and back crawl turns. These will make lap swimming more enjoyable. Construct your daily training program to include a water warm-up, conditioning bout, and water cool-down. Monitor your heart rate (or use the RPE) and do not allow it to exceed your swimming target zone. Use hand paddles, kickboards, pull buoys, and swim fins to increase muscular strength and stroke efficiency. Hyperextension of the lower back (arching) is natural in water exercise. It is important to strengthen the abdominal muscles and always stretch the lower back area to counteract this tendency.

Here are other safety tips:

1. *Never swim alone.* A lifeguard should be present. Safety equipment, such as a ring buoy and a reaching pole, should also be available.
2. *Do not dive into the pool at the shallow end.* The risk is too great. Even experienced swimmers have misjudged the depth of the water and hit the bottom, resulting in serious injuries.
3. *Stay to the right of the lane and make your turns counterclockwise.*
4. *If resting at the pool edge, keep to one side of the lane to allow other swimmers to turn easily.*
5. *Be careful with electrical equipment around the pool* (radios, pace clocks, etc.). Make sure electrical outlets are grounded.
6. *Keep telephone and emergency rescue numbers in the pool area.*
7. *Keep all doors going into the pool area locked unless there is a lifeguard on duty.*

How to Begin and Progress

Assess your aerobic swimming fitness on the 500-yard swim test as described in Chapter 1. Based on your fitness category, begin at the appropriate starting S.W.I.M. level. Progress through each level, one step at a time. Do not skip steps and stay on each one as long as necessary to adapt to that workload. Remember to monitor your pulse and do not exceed your swimming target heart rate range. When you have completed level M, you may want to swim continuously for distance or time or continue with the routine of four lengths and a brief rest for the measured distance or time. Keep in mind the THR for swimming is 10 percent less than for weight-bearing activities. You may also use the RPE.

In this program, swim the number of lengths suggested, but if the workout feels too hard, rest a few seconds by climbing out of the pool and walking back to the starting point or rest at the end of the pool for a few seconds before continuing the workout. Swim the front crawl, if possible, or any stroke that allows you to reach the prescribed swimming target heart rate. Consult the pool distance table.

Variety

To add variety to your swimming workouts, practice stroke mechanics on the five basic strokes. This will allow you to use a variety of strokes in your workouts instead of being limited to one or two. Swim for time instead of distance for a change or vice versa. Use equipment: a kickboard is good for practicing kicks and for strengthening your legs; swim fins help you develop leg and abdominal muscles and increase ankle flexibility; hand paddles give your shoulders, chest, arms, and back an extra workout. Webbed gloves or a tethering system add interest to your workouts and improve strength and stroke efficiency. Use a waterproof CD player or digital music player if you find swimming monotonous. For a complete change of pace, try an aquacircuiting or water running session in shallow water or a deepwater jogging workout using some type of flotation device. See the section on water exercise/aqua aerobics later in this chapter.

Discomforts

While swimmers are less susceptible to injuries, they may experience a few minor discomforts. Eye irritations are caused by an imbalance in the pH of the water (balance of acidity and alkalinity) or excessive amounts of chlorine. Wear goggles and you will have no problem. Swimmer’s ear refers to a rashlike inflammation of the ear canal that is caused by frequent exposure to moisture. Dry your ears thoroughly with a towel to prevent this nuisance. If you have frequent

Pool Distance

Most standard pools are 25 yards in length.

One length = 25 yards

One lap = two lengths (50 yards)

18 lengths = 1/4 mile	(approx. 450 yds.)
35 lengths = 1/2 mile	(approx. 875 yds.)
53 lengths = 3/4 mile	(approx. 1325 yds.)
70 lengths = 1 mile	(approx. 1750 yds.)

25 Meter Pools

16 lengths = 1/4 mile	(approx. 402.25 m)
32 lengths = 1/2 mile	(approx. 804.50 m)
48 lengths = 3/4 mile	(approx. 1206.75 m)
64 lengths = 1 mile	(approx. 1609 m)

FITNESS S.W.I.M. PROGRAM

Fitness Category	Starting Level
Low	S
Fair	S
Average	W
Good	I
Superior	M

S.W.I.M. Program

Level S			Level W		
Lengths	Repeats	Distance	Lengths	Repeats	Distance
1	×	4 = 100 yds./m	2	×	4 = 200 yds./m
1	×	6 = 150 yds./m	2	×	5 = 250 yds./m
1	×	8 = 200 yds./m	2	×	6 = 300 yds./m
1	×	10 = 250 yds./m	2	×	7 = 350 yds./m
			2	×	8 = 400 yds./m
			2	×	9 = 450 yds./m
			2	×	10 = 500 yds./m
			2	×	11 = 550 yds./m

Level I			Level M		
Lengths	Repeats	Distance	Lengths	Repeats	Distance
3	×	7 = 525 yds./m	4	×	7 = 700 yds./m
3	×	8 = 600 yds./m	4	×	8 = 800 yds./m
3	×	9 = 675 yds./m	4	×	9 = 900 yds./m
3	×	10 = 750 yds./m	4	×	10 = 1000 yds./m
3	×	11 = 825 yds./m	4	×	11 = 1100 yds./m
3	×	12 = 900 yds./m	4	×	12 = 1200 yds./m
3	×	13 = 975 yds./m			
3	×	14 = 1050 yds./m			

ear infections, it would be wise to purchase a pair of ear plugs. See a specialist to get a good fit; those purchased over the counter do not fit well enough to keep water out of the ear canal. A few swimmers complain of sore shoulders. A certain amount of soreness is normal during the first weeks of training. But if pain persists, you may be developing tendinitis. Shoulder

tendinitis may be caused by an inherent structural shoulder problem, the use of hand paddles, or improper stroke mechanics. See an orthopedic specialist if shoulder pain persists, and use strokes with an underwater recovery (i.e., breaststroke, sidestroke, and elementary backstroke). Some swimmers experience knee pain, especially along the inner borders of the knees, when swimming the breaststroke and elementary backstroke. This is caused by the kick used in these strokes. Do not swim the breaststroke or elementary backstroke until the pain subsides, or avoid them altogether. It is a common myth that you are more susceptible to colds if you participate in aquatic activities, especially during the winter. Colds and respiratory infections are caused by viruses and are spread by contact with infected individuals. You are more likely to catch a cold in a warm, dry, crowded room than in a swimming pool. Another myth is that swimming during menstruation is prohibited. Minor discomfort during this time may be alleviated by exercise. If cramps are severe, use your judgment.

FITNESS WALKING

Advantages/Disadvantages

Walking is simple, enjoyable, and probably the safest form of aerobic exercise known. It is inexpensive and can be done by almost anyone, anyplace, anytime. There is no need to join a club or find partners or opponents. It is a wise exercise choice for the overweight, the older adult, the very out of shape, the postsurgical patient, and the individual in a cardiac rehabilitation program. Appropriate shoes and comfortable clothes are the only equipment you need. Walking is excellent for weight control. You use as many calories walking a mile as you would jogging the same distance. The difference is that walking takes longer. Even though the injury rate is low, some walkers who try to increase distance and pace too quickly may experience sore muscles and knees or other types of discomfort. Another disadvantage to walking is that the already physically fit may not be able to elevate the heart rate into the target zone. In this case, try one of the advanced forms of fitness walking, such as power walking (with hand weights or walking poles) or race walking. Dogs and inclement weather present other problems to the walker. Many shopping malls have opened their doors for early morning walking and also to provide a safe, weather-controlled environment year-round.

What to Wear

You don't have to buy special clothes; anything loose and comfortable will do. It is a good idea to have a

TOP 10 LIST

Reasons to Pursue Lifetime Exercise

In addition to helping maintain healthy weight, reducing unhealthy abdominal fat, and increasing energy, lifetime exercise

1. Improves heart health by reducing heart disease.
2. Lowers blood pressure and risk of stroke.
3. Reduces risk of diabetes.
4. Increases bone density, reducing osteoporosis.
5. Lowers risk of some cancers, especially of the colon and breast.
6. Improves sleep.
7. Reduces joint pain in people with arthritis.
8. Reduces likelihood of gallstone surgery.
9. Reduces stress, anxiety, depression, and cognitive decline.
10. Increases HDL ("good") cholesterol and lowers triglycerides.



Walking poles safely increase the intensity of a fitness walking workout.

pocket for carrying identification, keys, and a handkerchief. For suggestions on dealing with weather, read the tips for hot and cold weather dressing provided in the section on jogging.

Studies show that walking generates a downward force of about one and one-half times your body weight, so wearing appropriate shoes is important in helping you progress smoothly and injury-free. You may save a few dollars on inexpensive shoes, but a good pair of shoes will help protect your feet, legs, and back. When purchasing new shoes, go to a reputable store and ask for a trained salesperson. Look for shoes with a cushioned heel, a flexible sole, firm heel support, and arch supports that fit your feet. The toe box must provide room for the toes to work to prevent blisters. Several companies manufacture shoes designed for the sport of walking. Try one of these or one made for cross training or jogging, but be sure it fits your foot. The shoe should never feel like it needs to be broken in. It should feel comfortable from day one.

Do you replace your worn-out shoes soon enough? A study at Tulane University found that all shoes, regardless of brand, price, or type of construction, lose most of their shock absorbency after 500 miles of use. This is a good reason for keeping records of your mileage. Take your old shoes with you when shopping for a new pair so that a knowledgeable salesperson can evaluate the wear pattern to help you choose a suitable shoe.

Technique and Safety Tips

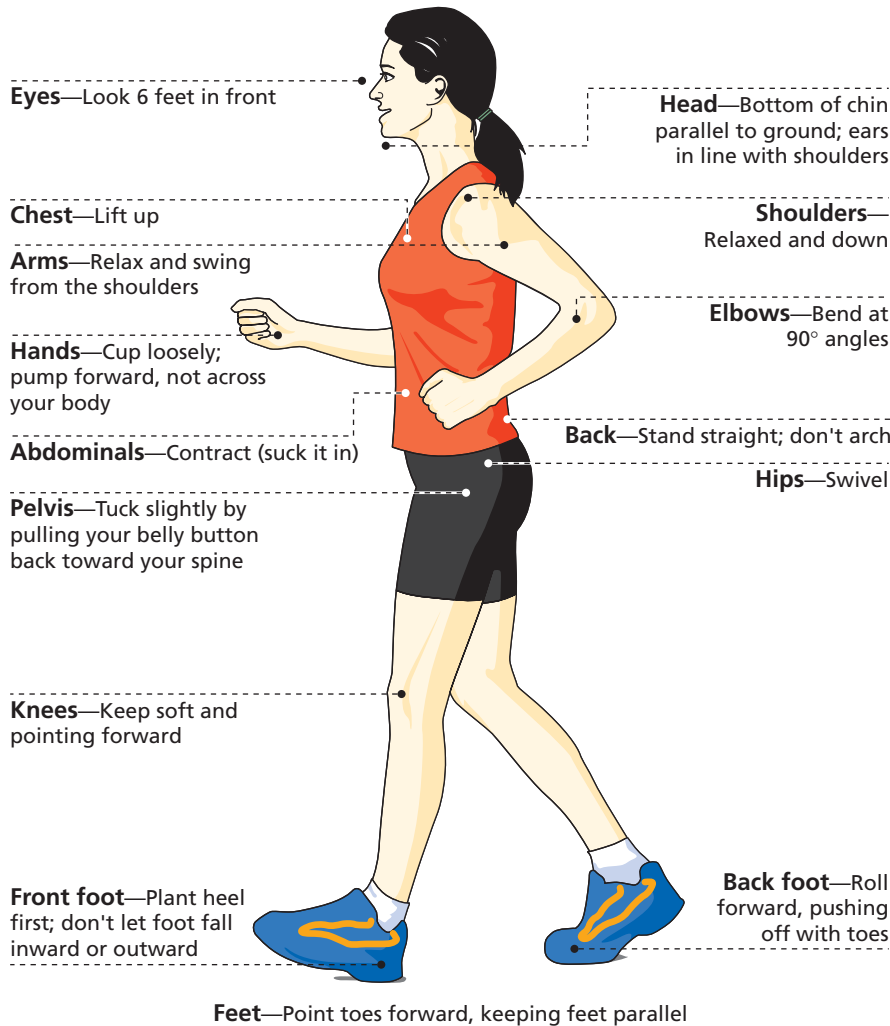
Walking posture is erect but relaxed. To alleviate tension, the abdomen should be pulled in, the rib cage lifted, and the shoulders pulled down. This will help you keep relaxed and increase your endurance. Your arms should be bent at about a 90-degree angle, and your hands (loose fist) should swing slightly above your waist. Your arms counterbalance your leg motion. You may discover during your walk that your arms have dropped, resulting in a slower pace. Do you ever see joggers with their arms at their sides? Visualize that you are walking in a straight line. Hold your head up with the eyes focused ahead, watching the ground but not your feet. Your foot contact should be a heel roll to the ball of the foot and toes for pushing off. Resist the tendency to lean forward at the waist.

While you are walking, keep in mind these tips for a safe workout:

1. *Always carry some form of identification* (include pertinent medical information).
2. *Choose a safe time and place to exercise.* Take keys with you, and lock the car and/or house.
3. *Plan your route carefully.* Use well-populated, well-lit areas. Avoid areas that are dark and have dense shrubs and alleys.

Correct Walking Form

To check your form, have a friend watch you walk, or walk on a treadmill in front of a mirror. Here are the key points for good walking posture.



4. *Know where you can get help along your route.*
5. *Use sidewalks or walk facing oncoming traffic and walk in single file.*
6. *Obey traffic signals and signs.* Do not jaywalk.
7. *Keep alert at all times.* Give the right-of-way to cars. Don't assume the driver sees you.
8. *Wear bright, reflective clothing at dusk or night.*
9. *Tell someone where you are going and when you think you will return.* Better yet, use the buddy system. It's more fun to walk with someone.
10. *Avoid dogs by selecting routes that are free of them.* The best advice is to ignore a barking dog and never walk between a barking dog and its human, especially if the human is a child.
11. *For the cleanest air, walk in the morning.* The air is more polluted at midday or later.
12. *Don't wear a headset;* you would be losing one of your most valuable sensory aids. If you wear a headset, keep volume low so that you can hear traffic or approaching strangers.
13. *Avoid peak traffic hours* unless you can use a jogging path or a sidewalk.

Tips for Increasing Walking Pace

What is your current walking pace? If you do not know, here is how you can measure your effort. Go to a quarter-mile track or measure 1 mile on a road with your car odometer. Time yourself walking for 1 mile. If it takes you 20 minutes, you are walking at 3 mph; if it takes you 15 minutes, you are walking a 4 mph pace; if it takes you about 13 minutes, you are walking

at a 4.5 mph pace; if you do it in 12 minutes, you have reached a 5 mph pace. You can also calculate your speed by counting how many steps you take in 1 minute:

- ✓ 115 steps = 2.5–3.5 mph
- ✓ 125 steps = 3.0–4.0 mph
- ✓ 135 steps = 3.5–4.5 mph
- ✓ 150 steps = 5.0 mph

If you would like to increase your fitness walking pace, try the Top 10 “Techniques for Increasing Walking Pace.”

Carrying hand weights and using walking poles, Powerbelts, and the like while fitness walking will increase the intensity of your workouts. Pumping your arms will accomplish the same effects. While the majority of healthy men and women can achieve a training heart rate with unaided walking, there are some people who may be too fit to achieve this threshold (e.g., young college students). Research shows that adding external weight to the body or involving the upper extremities during exercise can increase the intensity of walking.

For people who want to increase the overall intensity of their workout or make walking more of a total body workout, there are a variety of reasonably priced adjuncts to consider, such as weighted belts, gloves, vests, and walking poles (a.k.a. Nordic walking). They are safe and effective and can increase CRE and weight control benefits of a regular walking program. See Table 2-4.

When using the walking equipment described in Table 2-5, be aware that 50 to 70 percent of the increase in oxygen consumption and caloric expenditure comes from swinging the arms to a greater degree. In one study, for example, participants walked on a treadmill at 3.0 mph, $\text{VO}_{2\text{max}}$ was 15.9 ml/kg/min. Walking at the same speed while swinging the arms to chin height required 17.8 ml/kg/min. The addition of 2-pound weights further increased the oxygen cost to 18.9 ml/kg/min. Thus 63 percent of the increase above normal walking was attributed to the exaggerated arm swing. Swinging the arms may serve as a good intermediate step for increasing walking intensity without being encumbered with extra equipment.

How to Begin and Progress

Test your fitness using the 1-mile walk test described in Chapter 1. Then follow the appropriate level on the W.A.L.K.S. Program. After completing the “S” level, continue on the W.A.L.K.S. Maintenance Program for a lifetime of fitness.

Warm up for 5 to 10 minutes before starting the conditioning segment of your workout. The warm-up

TOP 10 LIST

Techniques for Increasing Walking Pace

1. *Pump your arms.* When your arms drag, the tendency is to slow down. Resist this. Keep your arms pumping and your legs will be forced to keep pace. Bend the arms to a full 90-degree angle; keep the shoulders low and relaxed (not raised).
2. *Heel walks.* Walk on your heels, with your toes off the ground. This stretches and strengthens your calves and especially your shins, training that puts power in your stride by helping you develop a stronger push-off and prevents the development of shin splints.
3. *Crossovers.* On a track, road, or sidewalk, practice walking along an imaginary straight line. Engage your hips by crossing your foot across the line with each step. This forces you to adopt the signature race-walking wiggle. Plus, extending your legs from your hips allows your pelvis to rotate forward so you can cover more ground with each step without overstriding.
4. *Use interval training.* Walk as fast as you can for 1 minute, then slow the pace for 4 minutes. Gradually increase the intervals by 1 minute every 2 weeks until you can do intense 4-minute intervals with only 1 minute at the slower pace.
5. *Simultaneously begin using the hard/easy system of training.* Go hard one day—either by taking a long walk or by doing intervals or hills—and easy the next. Practice at least 2 training days per week.
6. *Streamline your form.* Alter your strike to a straight-leg landing. When your heel touches the ground, the front leg should be straight. Your forefoot is flexed momentarily to land on the heel rather than the sole of the foot.
7. *Set “walk-to” targets.* Set a “walk-to” target a short distance in front of you (about 30 yards). Walk quickly to the target, reset the target, and walk fast to the new target. Keep resetting the walk-to targets throughout the route. Use mailboxes, driveways, road signs, and trees for targets. This technique helps keep you mentally involved in your fitness walking workout and helps you resist the tendency to stroll.
8. *Add bends and straightaways.* On a track, warm up for 10 minutes and then go your fastest on the straightaways, using the curves for slow recovery walks. Start with 6 to 8 laps, building to 15.
9. *Count steps.* Accelerate 100 steps five times in 30 minutes. This will teach your legs to move faster.
10. *Don’t overdo it.* Limit speed workouts to twice a week so that sore muscles won’t sideline you for the next day’s walk.

TABLE 2-4 *Pros and Cons of Walking Equipment*

Walking Equipment	Pros	Cons
Weighted Vests	• Form-fitting • Comfortable	• Minimal aerobic benefit • Expensive (compared with other equipment)
Wrist/Hand Weights	• Inexpensive • Easy to use • Moderate increase in intensity	• May elicit exaggerated blood pressure responses • No place to put the weight if you get tired • May increase incidence of overuse injuries
Walking Poles	• Excellent increases in intensity/caloric expenditure • Upper-body muscular endurance increases • Puts less stress on knees	• May elicit a pressor response due to gripping poles • Not adjustable; different height people need different poles • No place to put poles if you get tired
Powerbelts	• Excellent potential aerobic benefit • May increase muscular strength • Good for interval training • Resistance cords retract when not in use	• Higher levels may be too difficult to maintain • May elicit exaggerated blood pressure responses due to high degree of muscular effort

TABLE 2-5 *Heart Rate Increase, Oxygen Consumption, and Calorie Expenditures of Various Walking Equipment*

Walking Equipment	Heart Rate Increases (bpm)	Oxygen Consumption (ml/kg/min)	Calorie Expenditures (% of increase)
Weighted Vests (5–10% of Body Wt)	3–7	1.3–2.5	3–10
Hand Weights/Weighted Gloves (1–3 lb.)	6–13	1.5–4.0	5–15
Walking Poles	10–15	4.5–5.5	20–25
Powerbelts			
Base unit	25–30	6.3–6.7	40–45
Powerpack 1	30–35	6.7–7.0	45–50
Powerpack 2	35–40	7.0–8.0	50–60
Powerpack 3	40–45	8.0–9.5	60–65

should be activity-specific, so for fitness walking begin gradually increasing the pace to that at your conditioning level. During the conditioning bout, always check your heart rate to be sure it stays within the target zone. Also use the RPE or talk test. Listen to your body, and progress slowly for optimal results.

Cool down for 5 to 10 minutes after the conditioning bout. As in the warm-up, the cool-down should be activity-specific. Thus, reduce your pace, finishing with 5 to 10 minutes of slow walking.

For total fitness, stretch for flexibility. Improved flexibility is best achieved if it occurs at the end of the cool-down, when the muscles and joints are thoroughly warmed and pliable. Use flexibility exercises for your stretching routine.

Take each step on the chart and don't skip ahead. If the increase is too difficult, go back to the preceding level for a while. You should feel energized after your workout, not exhausted.

Variety

Adding variety to your walking workouts can keep you enthused about the activity for many years. Varying your walking routes gives you a change of scenery. Drive the car to a new area, park, and explore the surroundings during your workout. Mailing a letter, walking an errand, taking window shopping walks, and doing shopping mall workouts can be fun. Walk with a friend, in a group, or by yourself for a change. Dogs are excellent

W.A.L.K.S. Program

Fitness Category	Starting Program
Low	W Level
Fair	A Level
Average	L Level
Good	K Level
Superior	S Level

W Level							
Week	1-2	3-4	5-6	7-8	9-10	11-12	13-14
Warm-up (min.)	5-10	5-10	5-10	5-10	5-10	5-10	5-10
Conditioning bout (mileage)	1.00	1.25	1.50	1.75	2.00	2.25	2.50
Intensity % (target heart rate)	60-80	60-80	60-80	60-80	60-80	60-80	60-80
Cool-down (min.)	5-10	5-10	5-10	5-10	5-10	5-10	5-10
Frequency	3	3	3	3	4	4	4

A Level							
Week	1-2	3-4	5-6	7-8	9-10	11-12	13-14
Warm-up (min.)	5-10	5-10	5-10	5-10	5-10	5-10	5-10
Conditioning bout (mileage)	2.00	2.25	2.50	2.75	3.00	3.25	3.50
Intensity % (target heart rate)	60-80	60-80	60-80	60-80	60-80	60-80	60-80
Cool-down (min.)	5-10	5-10	5-10	5-10	5-10	5-10	5-10
Frequency	3	3	3	4	4	4	4

L Level							
Week	1-2	3-4	5-6	7-8	9-10	11-12	13-14
Warm-up (min.)	5-10	5-10	5-10	5-10	5-10	5-10	5-10
Conditioning bout (mileage)	3.00	3.25	3.50	3.70	3.75	4.00	
Intensity % (target heart rate)	60-80	60-80	60-80	60-80	60-80	60-80	60-80
Cool-down (min.)	5-10	5-10	5-10	5-10	5-10	5-10	5-10
Frequency	3	3	4	4	4	4	4

K Level							
Week	1-2	3-4	5-6	7-8	9-10	11-12	13-14
Warm-up (min.)	5-10	5-10	5-10	5-10	5-10	5-10	5-10
Conditioning bout (mileage)	3.50	3.75	3.75	4.00	4.00	4.00	4.00
Intensity % (target heart rate)	60-80	60-80	60-80	60-80	60-80	60-80	60-80
Cool-down (min.)	5-10	5-10	5-10	5-10	5-10	5-10	5-10
Frequency	4	4	4	4	5	5	5

S Level

Week	1-2	3-4	5-6	7-8	9-10	11-12	13-14
Warm-up (min.)	5-10	5-10	5-10	5-10	5-10	5-10	5-10
Conditioning bout (mileage)	4.00	4.00	4.00	4.25	4.25	4.50	4.50
Intensity % (target heart rate)	60-80	60-80	60-80	60-80	60-80	60-80	60-80
Cool-down (min.)	5-10	5-10	5-10	5-10	5-10	5-10	5-10
Frequency	5	5	5	5	5	5	5

**W.A.L.K.S. Maintenance Program
(for a lifetime of fitness)**

Warm-up:	5-10 min.
Conditioning bout:	3-5 miles per workout
Intensity %:	60-80
Cool-down:	5-10 min.
Frequency:	3-5 times per week
Weekly mileage:	9-25 miles

walking companions. For a challenge, try an advanced exercise walking technique such as race walking, power walking, hill walking, or walking a fitness trail. Participate in a volksmarch, a competitive walking event, or join a Hashing Club (described in the Jogging section). Water walking (walking in waist-deep water) is popular in many areas; give it a try. Some people enjoy listening to music while exercising in a traffic-free area. Schedule walking meetings with coworkers. Train for a half-marathon (mini); see sample training program in the Jogging section. Try "Exercise Across the U.S.A." (Lab Activity 2-3) for added incentives to keep walking. You won't become stale or bored with exercise if you vary your workouts.

Common Discomforts

As in running, most aches, pains, and injuries from walking occur from overuse. Listen to your body. Don't attempt to work through an injury. It will only aggravate the condition. The two most common walking complaints are shin splints and back-of-the-knee soreness. Refer to Chapter 7 for information about shin splints. Cut back on pace and distance until soreness subsides. Comfortable, well-fitting shoes will help prevent blisters. Consult a sports podiatrist if you suffer from foot problems such as calluses, bunions, heel spurs, ingrown toenails, high arches, flat feet, and an overly pronated foot. These conditions can be remedied, but if not corrected, they may prevent you from fully enjoying your walking program.

INDOOR EXERCISE EQUIPMENT

(Including Stationary Bikes, Steppers, Treadmills, Rowing Machines, and Elliptical Trainers)

Advantages/Disadvantages

When winter's plummeting temperatures, ice, snow, and chilly winds make outdoor exercise difficult, indoor exercise equipment may be for you. If it is too rainy, too hot, too dark, or unsafe to exercise outside, you can work out in the relative comfort and safety of a health club or your home. Indoor exercise equipment allows you to alternate indoor and outdoor workouts according to the weather, your schedule, and your mood. Be aware: The "calories expended" feature on most cardio-exercise machines is not accurate.

Indoor workouts can be done on either your equipment at home or equipment in a health club. If you like working out with others, don't want to deal with equipment maintenance, and enjoy a variety of different types of exercise, a health club is a good place to start. At a club, you can try different types of equipment—bicycles, steppers, treadmills, rowers, and elliptical trainers—and see what you like best. If you can't seem to make time to get to the health club, with exercise equipment at home you don't have to go anywhere. You can exercise before or after work, be with your family, and read or watch TV at the same time. If you have children, you can keep an eye on them and won't have to hire a sitter while you work out. The main advantage to working out at home is the convenience.

Disadvantages of home exercise equipment are that you have to decide what type of equipment and features you want, purchase it, make room for it in your house, perform your own maintenance, and find someone to repair it (or fix it yourself) if it breaks. You will probably be working out alone and may get bored with the same workout day after day. Also, if your enthusiasm wanes, the equipment may become a constant reminder of failed resolutions. However, working out in private is very appealing to many people. You know who used the equipment last, and for what you pay for a 1-year club membership, you can have your own equipment at home.

Advantages of working out at a health club include that you can switch from one type of equipment to another to avoid boredom or work different muscle groups; you can meet a lot of people; professionals are readily available to answer your questions; you don't have to buy, maintain, and repair the equipment; and you don't have to make space at home for it year-round.

Disadvantages of working out at a health club include that you will have to pay membership fees,

schedule it in your day, have transportation, and at popular workout times possibly wait to get on some equipment.

What to Wear

You are working out indoors, so any comfortable workout gear will be fine—a T-shirt and shorts, supportive shoes, a water bottle, and a towel to wipe off sweat and you are ready to go.

Equipment

Equipment comes in two main types: aerobic and strength machines. Strength training information is covered in Chapter 4. This section focuses on aerobic equipment. Prices range from a couple of hundred to several thousand dollars, depending on quality and options desired, but indoor exercise equipment need not be expensive. A jump rope, an exercise mat, elastic resistance bands, a step or a slide mat, and an aerobics video are low-budget. More costly exercise machines include steppers, climbers, treadmills, exercise bicycles, rowers, and elliptical trainers.

If you would like to work out at home and are not familiar with the variety of equipment available, join a health club for a 1- to 3-month trial period to try out and compare the different types. Then you will know what type of equipment you want to purchase and will be more familiar with the features available. Do not, however, expect a \$200 home unit to function like a \$2,000 health club model. Shop informed. Ask friends and family about equipment and features they like.

Be choosy. Avoid cheap equipment, which may be flimsy, noisy, unstable, or jerky and can make the whole workout experience so unpleasant that you'll soon use the machine as a coat rack. Shop for well-designed exercise equipment from a specialty retailer rather than from a TV infomercial or chain department store. The quality and durability will be worth the cost in terms of ease of use and maintenance. Think compact. Unless you have a lot of space, you probably will not want equipment that takes up a whole room. Steppers and exercise bicycles have the smallest "footprint" and are easily moved to the side when not being used. Think simple. Not much can go wrong with a jump rope, but plenty can go wrong with a flimsy treadmill. The more complicated a piece of equipment is to use and adjust, the more maintenance it needs. Many devices have timers, heart rate monitors, and ergometers that calculate your work output in calories.

Before you invest in home exercise equipment, try out several models and ask these questions:

1. How much will I use this? Do I enjoy this type of exercise?
2. Does the sales staff ask about my needs and fitness goals before helping me select equipment,

or do they automatically recommend the most expensive machine?

3. Does it have the features I want?
4. Is it easy to assemble?
5. If it breaks, how will I get it repaired? Can it be fixed locally?
6. What kind of warranty comes with it? What is the store's return policy?
7. Is it well constructed of steel or alloy to last 10 or more years?
8. What kind of maintenance is needed, according to the manual?
9. Are the seats and grips comfortable, durable, and easily adjustable?
10. Does it work smoothly? How stable is it? Is it relatively quiet? Is it safe?
11. Where will I put it? How much space does it require?
12. Does the manual show how to use the equipment correctly and how to reach my target heart rate?
13. Do I need all the fancy gadgets, or will a more simple model do?
14. Can I get a workout with this machine that is intense enough for my current and future fitness levels?

Stationary Bikes

Advantages/Disadvantages

Most models work the lower body—primarily legs, hips, and buttocks—but some models have handlebars for exercising arms and shoulders. Some of the more expensive electronic models have programmed workouts such as interval training or hills to add variety. Upright models make efficient use of space, and you can read or watch TV as you exercise. They give you a good nonimpact workout that is easier on the joints than treadmills are. They are particularly good for overweight people who need to avoid extra stress on the back, knees, and ankles. Both upright and recumbent models are effective. Recumbent bikes, in which you sit back on a seat and pedal in front of the body, tend to be more expensive and need at least 6 to 7 feet of space but are easier on the back. Bicycle trainers, which put your regular bicycle on a stand with resistance to the rear wheel, require balance but are less expensive than stationary bicycles. Another model, popularized by Health Rider, does not involve pedaling; rather, you push on both pedals simultaneously as you pull on handlebars, exercising both upper- and lower-body muscles.

How to Select

A good machine is easy to adjust, moves smoothly, and feels stable. The seat should be comfortable and should adjust to your height. In many models, handlebars are

also adjustable. The controls should be within easy reach, and the workload should adjust smoothly and easily. Look for a smooth, quiet ride; a sturdy frame; a wide, comfortable, adjustable seat; and an easy-to-read instrument panel. Cheaper models are made of flimsier metal; the resistance mechanism may be grabby, the seat less comfortable, and the whole device more “tippy.”

Technique and Safety Tips

Proper seat height and pedaling cadence are the keys to avoiding knee problems. Seat height should be adjusted so that when you sit on the seat, your knee is almost fully extended on the downstroke. Also, keep the resistance moderate so that you maintain a cadence of about 60 to 100 rpm. Racers cycle at 80 to 100 rpm.

Steppers

Advantages/Disadvantages

Steppers primarily work the legs, hips, and buttocks and do not work the upper body. They take relatively little space and allow you to read or watch TV as you exercise. They may aggravate some knee problems. They tend to work the calves more than other types of equipment do.

How to Select

Steppers come with either dependent or independent pedals. With dependent pedals, as one goes down, the other goes up. The machine does some of the work for you because you are exercising one foot at a time. Independent pedal models, in which both feet have to be working at the same time, take a little more work to get the rhythm and coordination but give you a better workout. Hydraulic resistance mechanisms provide a fluid feel at an affordable price. High-end models have computerized interval resistance programs that can increase and decrease the workload through the exercise bout. Self-leveling pedals are a nice feature. Make sure pedals are big enough for you to balance on them comfortably. Some also come with poles for working the arms. Less expensive models are manually adjustable, so if you want to change resistance in the middle of a workout, you will have to get off and turn knobs or slide levers. They still give you a good workout, however, and so the lower price may be worth the minor inconvenience.

Technique and Safety Tips

Rest your hands lightly on the handlebars or railings for balance and take small steps at first. Stand tall and gradually begin to take deeper steps after you warm up. Do not lean on the railings because you will decrease the effectiveness of the workout.

Treadmills

Advantages/Disadvantages

Treadmills are popular and easy to use, giving you a good cardiovascular and lower-body workout. They also tend to be used more than other types of equipment. However, they are noisy and more prone to breakdowns than other types of equipment. They also require a large space, about 6 by 4 feet, though you can purchase models that fold for storage. See Lab Activity 2-7 on the book's website for sample workouts.

How to Select

- ✓ A motorized treadmill should have at least a 1.5-horsepower continuous-duty motor to be strong enough to maintain even speed. Two horsepower is even better.
- ✓ It should have a running belt that is at least 20 to 24 inches wide and a length of at least 48 inches.
- ✓ Look for a machine that will reach a top speed of at least 9 miles per hour. Even if you don't walk/run at this speed, higher speeds are useful for interval training.
- ✓ Ability to simulate at least a 10 percent incline is important for you to always be able to reach your target pulse.
- ✓ Look for a safety lock so a child cannot accidentally start the treadmill and an emergency shut-off button to cut power immediately.
- ✓ You need at least one handrail, preferably two for balance, and wide footrails. Also look for a wide 2-ply rubber belt for durability on the running surface and some flexibility so that it gives a little with each stride.

Decide if you want a motorized or hand-crank incline and what other computerized features you desire, such as heart rate or calorie counting. Less expensive machines tend to have a shorter, narrower bed, lower horsepower, a faster starting speed, a lower top speed, a less durable 1-ply belt, and fewer computerized features. They are also noisier, wear out faster, and may not keep the belt speed as consistent as the higher-end models do.

Nonmotorized treadmills are cheaper but move only with the pull of your feet on the belt, and they slow down if you do. They are better for walking than for running and may be harder on the joints than motorized treadmills, which move continuously at a preset speed.

Investigate the warranty. Ask what's covered in the agreement, including parts and labor; who will service the treadmill; and length of coverage (average is 3 years).

Technique and Safety Tips

Start the machine at a slow pace. Straddle the belt, step with one foot a few times to get a feel for the speed, and

then begin. Increase to normal speed as you warm up. Keep near the front of the belt at all times.

Rowing Machines

Advantages/Disadvantages

Rowers provide an excellent upper- as well as lower-body workout, toning the shoulders, back, arms, and legs. They do, however, require a lot of space, up to 8 feet by 3 feet. They can also be noisy, and you cannot read while working out.

How to Select

They come in piston and flywheel models. The piston models are cheaper and more compact, but flywheel models have smoother action. Some models give strokes per minute, total distance, time, and power output per stroke.

Technique and Safety Tips

Correct rowing technique takes practice to master and is important to avoid back injury. Do not lean into the pull but keep upright throughout the range of motion. Your legs, arms, and shoulders, not your back, should do much of the work, and your arms should move forward before you bend your knees. With a flywheel model, pull the bar into your abdomen, not your chin. The workout can be intense.

Elliptical Trainers

Advantages/Disadvantages

This machine simulates a combination of walking, running, and stair climbing in one motion. The workout is weight-bearing, but there is none of the jarring impact that occurs when you are exercising on pavement, a track, or a treadmill. The motion is even smoother than that of step machines. Physical therapists and athletic trainers love these machines because they allow athletes to continue their training regimen even while rehabilitating an overuse injury, such as Achilles tendinitis, runner's knee, shin splints, and even a stress fracture. Elliptical trainers offer the cardiorespiratory endurance and muscular benefits of running as well as a refuge from nature's wrath and the dangers of dodging traffic.

Like all exercise machines, elliptical trainers have some drawbacks, though they are minimal. Because the muscles do not have to adjust for landing on the ground with each stride as they do with actual running, the overall muscle action (and thus, the overall workout) is not quite as intense on an elliptical trainer. The estimated overall workout benefit on an elliptical trainer is anywhere from 75 to 90 percent of that of a running workout. Ellipticals require minimal use of the arms and



You will burn more calories if you let go of the handrails of treadmills and elliptical trainers and swing your arms.

shoulders, and so they do not offer a total body workout. Elliptical trainers with arm-pole attachments reduce this drawback.

Ellipticals tend to be rather large machines, so they do not offer the mobility and ease of storage offered by some other indoor exercise machines. Cost may be a drawback unless you can comfortably afford the \$300 to \$3,000 (health club model) price tag. Keep in mind that you get what you pay for.

How to Select

The elliptical trainer you select should have tension control that allows you to adjust and vary the resistance against the running ramps. The ramp elevation option on some machines is nice but not essential. You can get the same effect by running faster and/or adjusting the ramp resistance control to a higher tension setting. You may select a machine with arm poles similar to those on cross-country ski machines, thus allowing you to use them for an upper-body workout. These are nice but not essential.

Experts recommend selecting a machine that has a readout screen that shows information such as calories burned, time and distance run, and strides per minute.

A final piece of advice if you plan on buying an elliptical trainer: Try out a number of models before making a final decision.

Technique and Safety Tips

When you exercise on an elliptical trainer, you stand on two platforms, or ramps, “suspended” between wheel-gear and roller mechanisms. When you move your legs in a running motion, one ramp moves forward and slightly upward while the other ramp moves backward and slightly downward. You will leave your arms free (as in running) or hold on to the handrails on the side of the machine.

Stand upright. Elliptical trainers can put pressure on the lower back if you lean forward or lean on the handrails while exercising. If you feel low back discomfort during or after the workout, check your posture. Feet that are too far apart can cause the hips to shift excessively, putting strain on the lumbar region. To stabilize, bring your feet closer together on the pedals.

How to Begin and Progress

Consult your owner’s manual for guidelines on how to begin and progress. In general, treadmills and stationary bikes have the quickest learning curves, and steppers run third. Rowers require more balance and skill. But, for the time invested in the rower, you can get a better upper-body workout along with aerobic fitness, and so the time is well spent. Also, the rule of specificity applies, so if you are in great running shape but begin working out on a stepper or cycle, give yourself some time to build up to the same level of intensity and duration. If you are a beginner, start with 5 to 10 minutes, low intensity, 3 days the first week to get a feel for correct mechanics and how to use the equipment. Increase the workout by a couple of minutes each week. Pace your progress according to how you feel during and after the workout. If you feel tired and washed out, you are trying to progress too quickly and need to move back or maintain the same level until your endurance increases. If you feel good, you can continue to add a couple of minutes a week to each workout until you reach 20 to 30 minutes of continuous activity. To increase frequency, add an additional day each month until you are exercising up to 5 days a week at your target pulse. A suggested workout schedule follows:

Sample Beginning Program

Week	1–2	3–4	5–6	7–8	9–10	11–15
Warm-up (min.)	5–10	5–10	5–10	5–10	5–10	5–10
Conditioning bout (min.)	5–10	8–14	12–18	17–22	21–26	25–30
Intensity (target heart rate)	50–60	60–80	60–80	60–80	60–80	60–80
Cool-down (min.)	5–10	5–10	5–10	5–10	5–10	5–10
Frequency	3	3	3	3–4	3–4	3–5

IN-LINE SKATING

Advantages/Disadvantages

Modern skating has gone in-line. Instead of four wheels situated in box formation under the skate, the new skating gear has four urethane wheels positioned down the center of a supportive boot complete with brake pads. Skaters also need protective pads and a helmet to lower injury risk, which can be substantial.

Ice hockey players in Minnesota designed the first prototype for today's in-line skates. They enjoyed their dryland workouts so much that they began skating out of season for fun! The popularity of in-line skating exploded in the 1990s primarily because it is so easy to learn and convenient. People are no longer intimidated by the misconception that only the supercoordinated can skate on a single row of wheels.

In-line skating can be a competitive sport involving speed or fancy tricks, known as freestyle skating. Other sports, such as basketball and hockey, can be played on in-line skates, and skiers may cross train on in-line skates in the off-season. But the majority of in-line skaters do it primarily for fitness, recreational, social, or transportation purposes. Thirty-five percent of in-line skaters report using skates as a mode of transportation.



Wear protective gear every time you skate.

In-line skating has excellent potential for developing physical fitness, especially cardiorespiratory endurance and muscular endurance, plus it is invigoratingly fun. Vigorous and continuous striding can burn as many calories as jogging or cycling does. Skating is one of the best activities for improving balance and is ideal for cross training for any fitness activity. Serious skating increases muscular strength and endurance. It strengthens the musculature in the entire upper leg, including the hamstrings and quadriceps as well as the buttocks, hips, and lower back muscles. If you swing and pump the arms vigorously during skating, the biceps, triceps, and shoulder muscles can be strengthened and toned.

In-line skaters reap all the benefits of other forms of exercise: improved physical fitness; increased energy levels; lower blood pressure; weight control; relaxation; and a reduced risk of cancer, heart disease, and stroke. Physiological responses measured during in-line skating indicate that individuals with average fitness levels can achieve appropriate exercise training effect on flat terrain, although the highly fit may need to skate uphill or skate fast to achieve the same benefit.

In-line skating does have a few drawbacks. This fun, aerobic, low-impact sport can be dangerous to skaters who don't wear helmets and protective pads or who do not learn safe starting and stopping techniques. If you have a fear of falling, suffer from osteoporosis, or have balance problems, in-line skating is not a good exercise choice. Another disadvantage with in-line skating is cost. In-line skates and the necessary safety gear can be expensive.

What to Wear

You can in-line skate in almost any kind of weather if you dress appropriately. Dress in layers when it's cool (removing outer garments as you warm up) and wear as little as decently possible when it's hot. You will be most comfortable skating in stretchy or loose-fitting clothes. The Lycra clothing worn by many runners is perfect. T-shirts are fine, and so are tights and bike shorts. Jeans are not usually comfortable and will bunch up under the knee pads or over the boot.

In-line skates are available in a spectrum of prices and styles. Before buying a pair, rent several types to see which one suits you. Talk to knowledgeable salespeople; tell them about your skating activity and the type of skating you are planning to do. The cost of a good pair of skates ranges from \$100 to \$400 or more. Add another \$50 to \$200 for the protective gear. To try on skates, bring a pair of absorbent socks that you plan to wear while skating. A sock that helps "wick" sweat away from the foot and aids in preventing blisters is a good choice. When you rent or buy your first pair of in-line skates, be sure to get a properly fitted helmet; knee and elbow pads; and wrist guards, specially designed gloves

with extra padding at the palms. Treat protective gear like your seat belt; wear it every time you skate.

Necessary Gear

- ✓ **Skates:** Good in-line skates are not cheap. Expect to pay \$100 to \$400. The rule to follow is to buy the best possible skates you can afford. Originally, the skate boot was made from molded polyurethane, a lightweight but extremely sturdy material. But since 1994, the soft-boot in-line design skate boot has been the industry standard. The new boot fits like a hiking boot instead of a plastic ski boot. The fit should not be too tight or too loose. It should be flexible from the ankle up. It should allow some room for the toes (about one-fourth inch from the end of the longest toe to the end of the boot). In-line boots use laces, buckles, Velcro straps, or a combination of laces and buckles to tighten and secure the boot. The most effective and popular style is a boot that laces on the lower part and buckles on the ankle for maximum support. Boots with vents to allow liberal air circulation are recommended. A foam liner, either built into the skate or an insert purchased separately, provides added comfort and helps prevent blisters. Look for liners with vents to aid breathability.
- ✓ **Helmet:** Select a helmet that provides a snug, comfortable fit. Look for approval by the two national helmet testing bodies, SNELL and ANSI.
- ✓ **Wrist Guards:** This is a fingerless glove with a hard plastic splint running down the front. The plastic is curved slightly—not enough to hinder wrist and hand movement but enough to act as a shock absorber in the event of a fall.
- ✓ **Knee and Elbow Pads:** These are designed to prevent scrapes and bruises. Use only the style that has a hard plastic shield over the pad. Do not use cloth-covered pads from other sports, such as volleyball.

Techniques and Safety Tips

Taking a few in-line skating lessons and studying an instructional video are the recommended methods for learning this sport. It is imperative to practice the following basic skills before you take to the street or trails: ready position, forward fall, forward stride and glide, basic turning, braking, and making emergency stops. Find a conveniently located paved area where you can go often to practice. It must be smooth and level with enough room to move about unobstructed. Empty parking lots and unused ball courts are ideal if they are free of pedestrians, debris, and bike traffic. Avoid hills until your skills are proficient. Table 2-6 lists some safety guidelines you need to follow.

TABLE 2-6 *Safety Guidelines for In-Line Skating*

1. Always wear full protective gear.
2. Achieve a basic skating level before taking to the road. Practice basic skills on a smooth, flat surface away from traffic.
3. Stay alert and courteous at all times.
4. Always skate under control.
5. Skate on the right side of paths, trails, and sidewalks.
6. Overtake pedestrians, cyclists, and other skaters on the left. Announce your intentions by saying, "Passing on your left."
7. Avoid water, oil, or debris on the trail and uneven, broken pavement.
8. Obey all traffic regulations.
9. Avoid areas with heavy automotive traffic.
10. Always yield to pedestrians.
11. Keep your gear in proper working order.

Skate Maintenance

In-line skates are relatively low-maintenance; that is one of the inviting aspects of the sport. You can put on your skates and get a good workout without much setup or cleanup time. However, your skates will need occasional attention.

Tools It's a good idea to put together a skate repair kit that can be carried in your skate bag. Be sure to choose components and tools that fit your particular model of skate. Your local skate shop can help you with the selection of components and tools.

Wheel Rotation or Replacement The most common maintenance activity is rotation of the wheels. Wheels wear down while skating; therefore, to get maximum mileage proper rotation is necessary. Rotation is changing the position of the wheels on the frame and turning the wheels over so the inside edges become the outside edges. To rotate your wheels, follow these directions:

Wheel in Position	Move to Position
1	3
2	4
3	1
4	2

Bearing Replacement Bearings allow the wheels to spin smoothly and have the greatest effect on the performance of the skate. Buy the best bearings you can afford. Each skate has two sets of bearings, one on each side of the wheel. ABEC bearings range from 1 to 7, with 1 creating the least amount of speed and 7 the greatest amount of speed. Fitness/recreation skaters usually use ABEC 3 bearings.

Brake Replacement Brakes should be replaced when you have to lift your toe too high to be stable when stopping or when the bolt holding the brake in place begins to rub the ground. Loosen the bolt, remove the brake, and attach the new brake.

How to Begin and Progress

First, assess your fitness level by using the 1.5-mile timed run test described in Chapter 1. Remember that your current fitness level does not indicate your potential. Based on your fitness category, begin at the appropriate starting level. Progress through each level, one step at a time. Do not skip steps, and stay on each as long as necessary to adapt to that workload. Remember to monitor your pulse, and do not exceed your target heart rate range. Or, if you prefer, use the RPE to monitor your intensity level during the workout. Keep in mind the FITT prescription factors. Don't forget to warm up and cool down during each workout. To develop balanced fitness add 25 to 30 push-ups, 1 minute of abdominal curls, and 5 to 15 minutes of stretching per workout.

<i>In-Line Skating Program</i>	
Fitness Category	Starting Level
Low	1 or 2
Fair	3
Average	4
Good	5
Superior	6
Level	Skating
1	10–15 min.
2	10–20 min.
3	15–25 min.
4	20–40 min.
5	30–45 min.
6	45–75 min.

Variety

Adding variety to your skating workouts can keep you enthused about the sport for many years. Varying your skating routes gives you a change of scenery. Drive the car to a new area, park, and explore the area. Find new trails, paths, sidewalks, and parking lots on which to skate. Use your skates for transportation to and from school or work several days a week. Keep your skates in the trunk of the car and strap them on for a spontaneous workout when you see an opportunity (e.g., at lunchtime). Be sociable; skate with a friend or join a skating club. Pack a backpack with a water bottle and a snack for a longer than usual workout. Try speed skating, amateur racing, or freestyle or artistic skating, which is similar to ice figure skating. Extreme skating involves tricks, jumps, and ramps that

might appeal to you. You won't become bored with exercise if you vary your workouts.

Common Discomforts

Each year more than 100,000 people are treated in hospital emergency rooms for in-line skating injuries. In-line skaters can reach speeds of 50 miles per hour or more, yet two-thirds do not wear protective clothing. Spontaneous loss of balance; falling due to debris or an irregularity on the skating surface; colliding with a fellow skater; and striking a stationary hazard, such as a tree, are the most common causes of falls by in-line skaters. Blisters, strains, sprains, and many other general complaints are addressed in Chapter 7.

Falling is the biggest concern when skating, so you won't be surprised to learn that the number one injury site is the wrist. One-fourth of all skating injuries are injuries to the wrist, and over 40 percent of all these injuries result in fractures. "Skitching" can be deadly and should never be attempted. This is a popular activity in which a skater hooks onto a motor vehicle and attempts to hang on while coasting behind or beside the vehicle. The U.S. Consumer Product Safety Commission (CPSC) and the International In-line Skating Association (IISA) recommend that a helmet, elbow and knee pads, and wrist guards with fingerless gloves be worn while skating to reduce the risk and severity of injuries, especially those involving the wrist.

JOGGING

Advantages/Disadvantages

Running is a simple way to develop cardiorespiratory endurance. You can do it alone, with a partner, or with a group. A good pair of running shoes is the only equipment you need. Finding a place to run is as simple as walking out your front door. Getting a full workout through running takes less time than do many other aerobic activities. It can be done in most types of weather, on vacation, or during a lunch break. As a weight-bearing exercise, jogging provides stress to the long bones, which aids in the maintenance of bone mineralization and decreases the risk of osteoporosis. Like other aerobic activities, jogging has positive benefits in terms of reducing obesity, stress, type 2 diabetes, and several heart disease risk factors.

Drawbacks to running include traffic, uneven pavement, and, occasionally, an aggressive dog. Trying to progress too quickly may cause impact problems such as shin splints and sore knees. Jogging is not for everyone. For individuals prone to musculoskeletal problems, low- or nonimpact activities such as bicycling and water exercise are less likely to precipitate injury. If you are



Vary your jogging workouts to avoid becoming bored and stale.

overweight or out of shape, it may be best to start with a less intense activity, such as walking. Nonetheless, a carefully planned program of progressive activity enables many people to enjoy running as part of a fitness program.

What to Wear

You can run in almost any kind of weather if you dress appropriately. On hot days, wear as little as decently possible—shoes, socks, shirt, and shorts. For cooler weather, add layers: a long-sleeved T-shirt and tights or long pants. In cold weather, add a jacket or a turtleneck sweater and, to protect the ears and hands, a stocking cap and mittens. In wet weather, wear a cap with a brim to keep rain out of your eyes and rain-repellent clothing, if desired. Keep in mind that when you are running, you generate a great deal of body heat. When you are warmed up, it will feel about 20 degrees warmer than the actual temperature. A hot day would be 70 degrees or higher, a warm day 50 to 60 degrees, a cool day 30 to 40 degrees, and a cold day below freezing. High humidity on hot days and the wind-chill factor on cold days should also be considered (see Chapter 6).

A good pair of properly fitted running shoes is important in preventing injuries. When running, your foot strikes the ground with an impact of approximately three times your body weight. A well-made running shoe fitted by a trained salesperson can absorb shock

and support the foot. A cheap pair of poor-quality shoes is no bargain if it leaves you with blisters or shin splints.

Technique and Safety Tips

Good running form is relaxed and mechanically efficient. Your energy goes into moving yourself forward and is not dissipated in extraneous movements. Maintain a relaxed, erect posture, head up, eyes looking ahead. Keep your shoulders relaxed and level, arms swinging freely from the shoulder, and hands unclenched, traveling between the hips and lower chest. Avoid hunching forward, your eyes watching your feet, your arms held stiffly or swinging across the midline of your body. Knees and feet should aim ahead, not to the center or side. Foot contact should be heel to ball or midfoot, not on the toes like a sprinter. Keep your stride length comfortable and effortless, with your foot landing under your center of gravity. Be careful not to overstride or bounce when you run. Stride length is a product of speed and leg strength. Unless you increase one of these elements, attempts to increase your stride length will waste energy. Breathe through your mouth and nose. It is hard to get enough air breathing through the nose alone.

While you are working on your running form, there are some safety guidelines you need to keep in mind:

1. *Before leaving home, let someone know your route and when you expect to return. Carry identification.*
2. *If you wear a headset, keep the volume low enough so that you can hear approaching traffic.*
3. *Keep alert.*
4. *If there is a sidewalk, jog on it.*
5. *If there is no sidewalk, run facing traffic on the extreme left edge or shoulder of the road.*
6. *Respect private property.* Do not run across lawns.
7. *Obey traffic signs and signals.* When crossing a street at the light, cross with the green light only.
8. *Maintain eye contact with motorists* whenever you cross in front of them.
9. *Give the right-of-way to cars.* Don't antagonize drivers even if they try your patience.
10. *If you run at night, wear light-colored clothing with reflective strips.*
11. *At night, do not run in unfamiliar areas.*
12. *Do not wear a vinyl sweat suit while exercising, ever!*

How to Begin and Progress

Begin at the level indicated by your cardiorespiratory fitness assessment (Chapter 1) and progress slowly. If you cannot complete a mile in 15 minutes, begin with walking briskly 15 to 30 minutes until your heart rate stays within the target range. When you can comfortably handle 2 miles in 30 minutes, you may begin the jog/walk program. As in all activities, follow the FITT guidelines.

Run/Walk Program

Fitness Category		Starting Level	
Low		1, 2, or 3	
Fair		4	
Average		5 or 6	
Good		7 or 8	
Superior		9 or 10	

Level	Run	Walk	Repeats
1	–	15–20 min.	1
2	–	20–30 min.	1
3	30 sec.	30 sec.	8–12 plus 10- to 15-min. walk
4	1 min.	30 sec.	6–10 plus 10-min. walk
5	2 min.	30 sec.	4–10 plus 5- to 10-min. walk
6	4 min.	1 min.	4–6
7	6 min.	1 min.	4–5
8	8 min.	1–2 min.	3–4
9	12 min.	2 min.	2
10	20–30 min.	5 min.	1
11	up to 60 min.	–	1

Start at the level appropriate for your fitness category. Remember that your starting level does not indicate your potential. For each run-walk interval, begin with the lowest number of repeats indicated, and with each successive workout, add one repeat. When you can do the maximum number of intervals at one level, move to the next level. A 5-minute warm-up and 5-minute cool-down should accompany each workout. You may stay at one level as long as you need to or even move back a step if the beginning level is too difficult. If the workout has been appropriate, you should feel refreshed and relaxed, not exhausted, after exercise.

Variety

Much of the variety in running comes from running different routes and observing the changing scenery and seasons. If you run alone, you may wish to run occasionally with a partner or a group. Instead of taking a long run at a continuous pace, you might try *fartlek*, a Swedish term for *speed-play*. Fartlek mixes fast-paced runs, brief all-out sprints, and slow-paced recovery intervals. It is best done on uneven or hilly terrain such as a park or golf course. Interval training done once or no more than twice a week can add a change of pace. This alternates a fast-paced run over a predetermined distance with walking or a slow recovery jog. An example might be running 220 yards four to six times in 40 to 50 seconds with a 220-yard walk after each run. With interval training, you may vary the distance run, recovery interval, number of repetitions, and time or pace of the run. These workouts are usually done on the track but

can be done on the road by running and then walking a set amount of time, running a certain number of telephone pole intervals, or selecting a long hill on your route and running up it several times. A fitness trail, or *parcour*, with exercise stations linked by a running trail, may be available at a local park or university or you can make your own. To simulate a *parcour* on a regular running route, stop every 2 to 4 minutes to do a stretching or toning exercise (e.g., hamstring stretch, run 2 minutes, calf stretch, run 3 minutes, push-ups, run 3 minutes, abdominal curls, . . .).

Some activities are suitable for a small group. You can take a tennis or foam ball along to toss among some friends. You'll get quite a workout because this mixes sprinting and upper-body exercise into the run. This is safer if your route has little traffic. Hashing is a popular club sport in the southern United States, Europe, and Russia. The idea is for a group to follow a marked course through an unfamiliar area. Elected group members meet at an earlier time to mark the route, usually with flour. Orienteering is popular in some areas. This is a cross-country type of activity in which participants navigate from point to point, using a map and compass, covering distances from 2 to 10 miles. Local fun-runs give you a chance to run with and meet other runners in a noncompetitive atmosphere. If you like competition, you can get information on road races from your local running club or athletic shoe store.

Common Discomforts

Most aches and pains in running do not occur suddenly. They are often from overuse—a long steady erosion that wears down the body. Many general complaints are addressed in Chapter 7. Specific to running, two additional discomforts, easily avoided, occasionally occur. If you run with shoes that are too short or don't fit well, in addition to developing blisters you could injure a toe. The toenail may turn black and possibly fall off. While painful, the condition is not permanent. The nail will grow back. If your thighs rub together when you run, you may suffer an abrasion. The solution is to apply petroleum jelly to the area and wear tights or shorts that cover your thighs.

WATER EXERCISE/AQUA AEROBICS

Advantages/Disadvantages

You don't have to know how to swim to get a vigorous workout in the water. You don't even have to get your head wet! As more people are discovering, exercising against water resistance in shallow water is a fine workout and great fun, especially with a group. Water exercise can



Nonswimming water workouts are one of the best forms of exercise because they build muscular strength and endurance as well as cardiorespiratory endurance. The faster you move, the harder your muscles work.

be a social activity because you can carry on a conversation while working out. It is low-impact, so joint problems are rare. The supportive effect of water buoyancy makes water exercise enjoyable and relaxing for individuals who have concerns about other forms of exercise. In chest-deep water, a person weighs only about a tenth of what he or she does on land. People who have arthritis or joint problems find that this buoyancy decreases stress to the joints, allowing a fuller range of motion than is possible on land. It is easy to individualize intensity levels so that you get a good workout, whatever your level of fitness.

Water has at least 12 times the resistance of air, and that number increases as movement speed increases. Thus, muscular conditioning improves, and in a time-efficient program as well. For example, biceps and triceps can be overloaded concentrically during the same exercise.

Hydrostatic (water) pressure pushes against the chest and body. This helps strengthen the breathing system and makes breathing on land easier. Hydrostatic pressure aids venous circulation and contributes to reduction in edema (swelling), which is especially helpful for expectant moms.

Water currents constantly challenge the trunk core muscles to maintain proper alignment when starting, stopping, and changing direction in the water. The abs have to work the entire time—a great plus.

Inclement weather is not a problem. Water exercise is cool even on the hottest summer days, so heat stress is eliminated. It is also a comfortable indoor workout for rainy or cold winter days. If you are overweight and sensitive about exercising in public, the water covers you up so that you don't feel so self-conscious. Water exercise is also beneficial during pregnancy because of

both decreased joint stress and decreased heat stress compared with other forms of exercise.

The drawbacks are few. You need access to a pool at a time when you can have a lane separate from lap swimmers. It is probably best to first join a class to learn the exercises and activities. Then you can work out on your own.

What to Wear

A comfortable swimsuit is all that is required. Some people also like to wear pool shoes to protect their feet when doing water running and walking workouts.

Technique and Safety Tips

Workouts may have a muscle toning emphasis or an aerobic emphasis or a combination of the two. In constructing workouts, maintain muscle balance by exercising all major muscle groups. Particularly emphasize stretching tight muscle groups (e.g., lower back, hamstrings, calves) and toning weak areas (e.g., abdominals, upper body). To overload, keep in mind that as in weight training, water adds resistance. The harder you push and pull, the more resistance you create and the more benefit you receive. In any activity, limit back hyperextension by keeping the abdominals firm while exercises are being performed. In the water, as on land, workouts must maintain a training heart rate for 20 to 30 minutes to produce aerobic benefit. Training heart rates for swimmers appear to be about 10 percent lower than those for land exercisers. This may also be true for other cardiorespiratory water exercise. To calculate an appropriate exercise intensity for water exercise, subtract 10 percent from your training pulse on land. Jogging in the water, aqua aerobics, and other vigorous activities can provide aerobic benefit if an adequate overload occurs. Several books that give examples of water exercises are available and are listed at the end of this chapter.

Whenever you exercise in the water, a few safety guidelines must be followed:

1. *Never work out in the water alone.* A lifeguard or workout partner, preferably one who can swim, should be present. Safety equipment, such as a life ring or a reaching pole, should also be available.
2. *Shower before entering the pool.*
3. *Do not go into the deep water unless you can swim.*
4. *Don't mix water and electricity.* If you like to exercise to music, keep electrical equipment away from the water and make sure that all electric outlets have ground-fault circuit interrupters that shut off the electricity if it contacts water. Better yet, use battery-powered equipment.
5. *Do not enter the pool if you have an open sore, infection, or rash.*

6. *Do all exercises through a full range of motion with slow, controlled movements.* Swinging or flinging movements can injure joints.
7. *Maintain good body alignment in walking and jogging.* Keep abdominals tight and hips tucked under and avoid excessive forward lean.

How to Begin and Progress

Water exercise workouts, like other aerobic programs, should incorporate a warm-up, conditioning period, and cool-down. The warm-up may be started on deck or in the water and may include a musculoskeletal (thermal) warm-up, stretching, and cardiorespiratory warm-up, transitioning smoothly into the conditioning bout. A thermal warm-up includes controlled movements using a gradually increasing range of motion and is designed to increase muscle temperature gradually. Prestretching exercises are designed to prepare muscles for activity and are generally held 5 to 10 seconds. A cardiorespiratory warm-up follows to transition the heart, lungs, and muscles gradually to an increased intensity level. Water exercise may involve many different activities—aerobic, muscle toning, and stretching. Recommendations on how to progress are given for the aerobic portion of the workout (e.g., water running) in terms of length of time at a training heart rate. Test your fitness by using the 500-yard water run test described in Chapter 1. Then follow the appropriate Water Exercise Program. Stay on each level as long as necessary; don't skip levels. Go back a level if the next feels too strenuous. Progress slowly, listen to your body, and follow the FITT factors. Monitor your THR or use the RPE.

Follow the conditioning bout with a 5- to 10-minute cool-down combining a period of gradually decreasing intensity exercise with stretching for flexibility.

Water Exercise Program

Fitness Category		Starting Level		
Low		1		
Fair		2		
Average		3		
Good		4		
Superior		5 or 6		
Level	Vigorous	Easy	Sets	Total Time
1	1 min.	30 secs.	8–12	10–18 mins.
2	2 mins.	30 secs.	6–8	15–20 mins.
3	4 mins.	30 secs.	4–6	18–27 mins.
4	6 mins.	30 secs.	3–4	19–26 mins.
5	8–10 mins.	1 min.	3	26–32 mins.
6	Continuous		1	30 mins. or more

Variety

Exercise with friends or with music. After mastering the exercises with only water resistance, you may wish to add kickboards, pull buoys, or other water exercise equipment to increase resistance. Vary the exercises and activities so that you don't do the same workout 2 days in a row. For example, an aerobic workout may involve, on different days, running or walking widths, aqua aerobics, step aerobics, water games, deepwater running, treading and kicking drills, or circuit training. There are so many different things to do in the water that it is easy to add variety. Some examples of different types of workouts follow.

Muscular strength and endurance are built by performing repeats of exercises against resistance: side leg swings to tone inner thigh and outer hip, straight arm raises to tone deltoids, back leg swings to strengthen hamstrings and gluteus. A series of 8 to 12 exercises covering all major muscle groups can be performed for 1 minute each and repeated two to three times for a thorough muscular workout.

Water walking involves walking in waist- to chest-deep water fast enough to produce a target heart rate. Good body alignment during walking and jogging is important. Walk tall with abdominals pulled in and buttocks tucked in to avoid leaning forward. It is also essential, for muscle balance, to vary the walking movements. Variations include walking forward, backward, or sideways and adding different arm variations, such as forward pulls, breaststroke, and backstroke.

Shallow water jogging is similar to water walking but is more intense, using a faster, bounding stride. A common error is running too much on the balls of the feet, which causes calf tightness. Try to press your heel to the pool bottom before pushing off on your toes.

Deepwater jogging is a nonimpact workout. Exercisers may wear a flotation vest or belt and run, varying directions and arm movements. Deepwater jogging without a flotation belt is strenuous. See the Guidelines for Deepwater Jogging on the next page.

Interval training alternates high- and low-intensity workout segments. This can allow even the most athletic exerciser to get a vigorous workout. For example, you might alternate four laps of shallow water running with two laps of water walking.

Water aerobics, like land aerobics, puts exercise to music. Workouts may be choreographed or freestyle. Bench step workouts have also made the transition into the aquatic environment, with benefits similar to those in land workouts.

Plyometrics are vigorous jumping and bounding exercises that increase muscle strength and power. They are also aerobic. Examples include high jumps in place, bounding across the pool, and a series of high 2-foot hops. Because these are impact exercises, they

GUIDELINES FOR DEEPWATER JOGGING

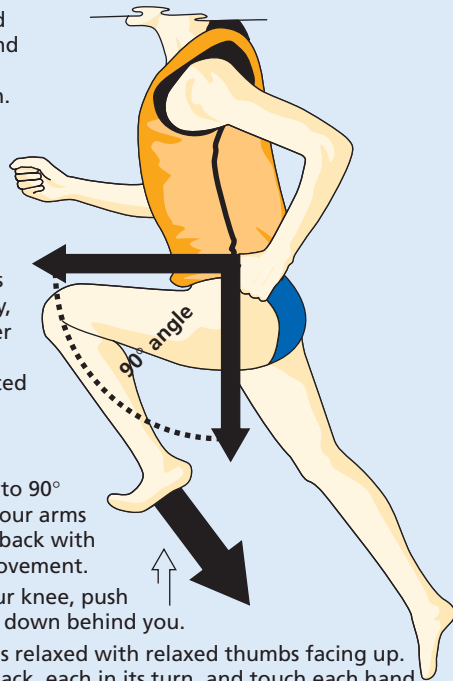
1. Keep your head and chest erect and your shoulders relaxed and down. Keep your eyes focused straight ahead to help keep your head level.

2. Keep your arms close to your body, legs straight under the hips and your toes slightly pointed as you begin walking/running motions.

3. Lift your knees to 90° at the hip while your arms pull forward and back with no side-to-side movement.

4. After lifting your knee, push your foot straight down behind you.

5. Keep your hands relaxed with relaxed thumbs facing up. Pull your elbows back, each in its turn, and touch each hand to an imaginary hip pocket.



6. Don't lean too far forward, or you'll soon be dog-paddling.



7. Don't lean back too far, or you'll end up in a bicycling motion.



Start slowly with a 3- to 5-minute warm-up, then begin jogging, keeping your body upright. Try jogging for 15–30 minutes, three times a week, increasing your pace over a few weeks.

can cause injury, are only for well-conditioned exercisers, and should be avoided if you have ankle, knee, or back problems. Water buoyancy lessens the risk of injury.

In circuit training, a series of exercises are performed for a certain number of repetitions or a given amount of time (e.g., 1 minute each of side leg circles, jumping jacks, push-ups, forward kicks, etc.). Exercises may be written on numbered cards placed around the pool edge, and as each exercise is completed, participants move quickly to the next exercise station. Exercises may stress one fitness component or several. A set of 8 to 12 exercises can be repeated, or time at each station can be increased to produce overload.

Flexibility exercises are often used as a part of a water exercise program. A static stretch is held 20 to 30 seconds or more for each major muscle group to increase range of motion. Occasionally, it is fun to try a water game for variety. Examples include shallow water polo, inner-tube water polo, water baseball, freeze tag, sharks and minnows, water basketball, and volleyball.

Common Discomforts

The most common discomforts water exercisers encounter are tight calves and blisters from running barefoot on the pool bottom. Blisters can be avoided by

starting with only a few minutes of running in the pool and giving the feet time to toughen as you gradually progress in workouts. You could also wear pool shoes or clean sneakers during workouts. Calves tend to get tight because, due to buoyancy, most running and walking in the pool is done on the ball of the foot. Take care to stretch calves before and after the workout.



PRESCRIPTION FOR ACTION

You've read the chapter. Now go do one or more of these:

- ✓ Walk an extra 2,000 steps. Wear a pedometer all day today. (Hints: Pace around as you talk on the phone; take a walk as you return phone calls; take a marching-in-place minute once an hour; meet with a friend for a walk instead of a soda or coffee; walk around [even in place] during TV commercials.)
- ✓ Try a new cardiomachine in the fitness gym.
- ✓ Enroll in a fitness class.
- ✓ Add hand weights to your walking workout.



Frequently Asked Questions

Q. What happens to your body when you quit exercising?

- A. The initial changes can be as subtle as tiring easily during everyday activities like climbing the stairs. Over the course of 10 weeks, however, you will end up losing much of the gains made from regular workouts (i.e., drop in muscle strength, flexibility, and heart health). Plus, you will probably experience weight gain as well as an increase in blood pressure, cholesterol, and resting heart rate. Your psychological well-being is likely to suffer, too (i.e., increased mood swings, poor self-image, and even mild depression). It takes effort to keep up your present level of fitness. Don't be discouraged if you miss several days or weeks of exercise. Do what you can and get back into your regular routine as soon as you can.

Q. What is the difference between physical activity and exercise?

- A. The terms are sometimes used interchangeably even though they represent different things. Physical activity refers to any movement produced by muscular contractions that burns extra calories. Examples include raking leaves, pushing a stroller, and washing a car.

Exercise is a specific type of physical activity that includes any planned, structured, and repetitive bodily movement done specifically to improve or maintain one or more components of physical fitness. Brisk walking, swimming, and lifting weights are examples.

Q. What is the Pilates Method of body conditioning?

- A. The Pilates (pronounced puh-LAH-teez) Method was developed in the 1920s by physical trainer Joseph H. Pilates for rehabilitation for dancers. It is an exercise system that isolates and strengthens muscles without joint stress and without building bulk. It is a system of controlled exercises aimed at stretching and strengthening muscles of the back, buttocks, and abdomen for improved posture, better balance, relief of aches/pains, and increased flexibility. Pilates movements generate from the "powerhouse" or the "core" (the abdomen, lower back, and buttocks). Today's Pilates classes primarily use mat work, but classes featuring Pilates machines, which magnify resistance by using springs and pulleys, are also available.

Q. Is balance training beneficial?

- A. Yes! Balance training improves posture, enhances movement skills for sports and daily living, is good for fall prevention, and improves mental focus. Balance exercises can be done with or without equipment.

Q. My hands swell when I'm fitness walking. Is this a problem? It feels funny and I don't like it.

- A. Swelling in your hands is normal. When you swing your arms, the blood rushes down into your hands. It isn't harmful but it can be uncomfortable, especially if you wear rings. It's a good idea to take them off before you walk. To improve venous blood flow back to the heart and minimize swelling, keep your elbows bent at a 90-degree angle as you swing your arms. See *Correct Walking Form* in this chapter. You can also try squeezing your hands into fists from time to time as you walk. This helps push blood back from the fingers to the heart.

Q. Are yoga and Tai Chi really considered exercise?

- A. Absolutely. In addition to enhancing balance, flexibility, and strength, these ancient disciplines can improve mood and provide some cardiovascular benefit. For example, an Australian study found that Tai Chi reduces heart rate, blood pressure, and stress hormones as effectively as brisk walking does. Yoga can decrease blood pressure; although traditional versions typically do not supply much aerobic benefit, newer "power yoga" classes incorporate standard yoga poses into a strenuous session that works both the heart and the lungs.

Q. How much benefit do I get from a sport like golf?

- A. To get much benefit from golf, you will have to abandon the cart, since the major exercise is in the walking. In a Finnish study, middle-aged former golfers resumed their game, without carts, two to three times per week. After 5 months, they had increased their aerobic performance and endurance, raised their "good" HDL-cholesterol level, and lost an average of 3 pounds and nearly an inch from their waistlines.

Q. During the winter and at other times when the weather is bad I work out in the fitness gym. How can I avoid picking up a cold, flu, staph infections, and other germs from the equipment?

- A. These five simple tips can help you stay healthy at the gym all year long:
- Wipe down equipment with the alcohol spray that most gyms provide.
 - Keep your hands clean. After touching weights and machine handrails, keep your hands away from your eyes, nose, ears, and mouth until you can wash them.
 - Take two towels. One for yourself and one to wipe down the machines and mats before you use them. Don't share towels with others.
 - Cover up. The less skin-to-equipment contact you have, the better. Keep cuts clean and bandaged. Wear flip-flops in the shower.

- Use your own mat in classes like yoga, etc.
- Launder workout clothes after every workout.

Q. My fitness level has plateaued. What can I do to jump-start it?

- A. To keep improving, change a variable in the FITT prescription every 4 to 6 weeks.
- **Frequency:** If you exercise three times a week and aren't seeing improvement, try adding another day.
 - **Intensity:** Slowly increase your speed or incline when using cardiomachines.
 - **Time:** Add 10 percent to each workout, or add 5 minutes to each workout, or make one weekly workout twice as long.
 - **Type:** Try a different cardiomachine or take a class to add interest to your continuous, rhythmic exercise; add resistance training to your exercise program.

Q. What are the most common mistakes made by individuals who engage in aerobic exercise?

- A. Here are the top 10 common mistakes made by individuals who engage in aerobic exercise:
1. Relying on "muscle burn" as an accurate indicator of exercise intensity. Your heart's response to the demands of exercise is not related to how much your muscles "burn" during physical activity. For a training effect to occur, individuals must exercise within their training heart rate zone. It is okay to use your perception of effort (i.e., rating of perceived exertion, or RPE).
 2. Mistaking neuromuscular difficulty as a meaningful barometer of training intensity. Even though individuals may find it relatively difficult to perform whatever combination of limb and trunk movements are involved in a particular activity (e.g., exercising on a cross-country skiing machine), it does not necessarily mean that they are achieving the desired training effect.
 3. Working out at an inappropriate level of intensity. Getting the most out of your aerobic exercise efforts requires that you exercise within the appropriate training zone.
 4. Engaging in activities that place too much stress on the lower extremities. Some aerobic activities involve a greater degree of impact forces on the lower body of the exerciser than do others. Also, some individuals can withstand greater loads on their lower extremities than can others. It is critical that you select your aerobic exercise modality wisely.
 5. Worrying more about the exercise clothes on their body than the footwear on their feet. The most important personal wear item of significant consequence while exercising is proper footwear.
 6. Leaning on the exercise machine while working out. Many individuals compromise the safety and quality of their aerobic workouts by

excessively leaning on the handrails of whatever aerobic equipment they are using while exercising (e.g., treadmills, ellipticals, cross trainers, or stair climbers).

7. Failing to warm up before exercising.
8. Failing to cool down after exercising.
9. Failing to get enough rest. Even though you may feel passionate about exercising, you need to give your body adequate rest from working out to provide it with the opportunity to recover from the physical demands you have placed on it.
10. Relying on aerobic exercise gimmicks marketed on television and the Internet. Geared to individuals who are wishfully looking for a quick, easy, and painless way to achieve the innumerable benefits of proper exercise, most of these items look too good to be true, and they are.

Q. My friends and I want to join a health club. What are some tips so we don't get ripped off?

- A. Follow these 7 tips on how to select a health club:
- Ask friends and family about local clubs, equipment, and advantages and disadvantages.
 - Visit several clubs at times you would be going, such as after work, to see how crowded they are. Check out the bathrooms, locker room, pool, and weight room. All should be clean and well maintained. Equipment should be in good repair. Talk to the regulars to see how they judge it. See that it has the features and types of equipment you want to use.
 - Professionals should be available to show you how to use the equipment correctly for the most effective workout and to avoid injury. Ask about instructor qualifications. Certification by a professional group demonstrates a commitment to quality instruction. Many national certifying organizations certify instructors in different activities. Some of these are the American College of Sports Medicine, YMCA, YWCA, International Dance-Exercise Association, Aerobics and Fitness Association of America, and National Strength and Conditioning Association.
 - Look for a health club with at least 3 years of continuous operation. Call the local Better Business Bureau or your state or local consumer protection agency to check if any negative reports have been filed. Ask to see evidence of bonding from the club (this protects you if the club goes out of business).
 - Membership fees are negotiable, so no matter what is printed on the brochure, negotiate!
 - Start with a short-term membership. Only 10 percent of members are still working out after 3 months, so either pay on a monthly basis or sign up for a 3-month trial membership.

- Read the contract carefully before signing, making sure it covers everything you have discussed with the club employees. If you change your mind,

most states have a 3-day cooling-off period during which you can void the contract and get a full refund.

Summary

Cardiorespiratory endurance is perhaps the most important component of health-related fitness. It is measured by VO_{2max} , your body's maximal ability to transport and utilize oxygen during exercise. VO_{2max} can be increased by training, and decreases with inactivity or aging. It is often measured in field tests such as the 1.5-mile run or 1-mile walk. Benefits of long-term cardiorespiratory fitness training include improvements in exercise capacity, exercise recovery, muscular fitness, weight management, cognitive function, and psychological well-being. Regular exercise also reduces risk of chronic diseases such as cardiovascular disease, high blood pressure, type 2 diabetes, and certain types of cancer. The FITT prescription factors for cardiorespiratory fitness can be applied to many different activities to produce high-level fitness. Intensity of exercise, measured by heart rate, is a key factor in developing cardiorespiratory endurance. The Karvonen equation can be used to determine an

adequate target heart rate range to produce cardiorespiratory benefits in many fitness activities. The Perceived Rate of Exertion can also be used.

The new exercise guidelines from the American Heart Association and the American College of Sports Medicine are outlined in this chapter. How to use a pedometer to accumulate 10,000 steps is discussed.

The eight fitness activities in this chapter are aerobic dance, bicycling, fitness swimming, fitness walking, indoor exercise equipment, in-line skating, jogging, and water exercise/aqua aerobics. Each activity unit gave you valuable information concerning taking part in the activity. Now you have the necessary tools to begin a program of aerobic activity—one you will enjoy and pursue for a lifetime. You will also have the satisfaction of knowing you are nurturing the most important habit you can adopt to safeguard your health. The ball is in your court. Select an activity and go to it. We wish you well.

General Resources

Dynamix Music Service, 733 W. 40th St., Suite 10, Baltimore, MD 21211, (800) 843-6499.

Muscle Mixes, P.O. Box 533967, Orlando, FL 32853, (800) 52-MIXES or (407) 872-7576.

Power Productions, P.O. Box 550, Gaithersburg, MD 20884-0550, (301) 926-0707 or (800) 777-BEAT (call for a free catalogue).

Collage Video Specialists, 5390 Main St. N.E. Dept. 1, Minneapolis, MN 55421, (800) 433-6769. (Pilates, yoga, Tai Chi)

Creative Instructors Aerobics Educational Videos, 2314 Naudain Street, Philadelphia, PA 19146, (215) 790-9767 or (800) 435-0055.

IDEA Resource Library: Aqua Exercise, IDEA: The Association for Fitness Professionals, 6190 Cornerstone Court E., Suite 204, San Diego, CA 92121-3773.

Resources for Walking Equipment: Wrist/hand/ankle Weights: any large department and sporting equipment stores.

Weighted Vests: Smart Vest, Training Zone Concepts, Inc. Flint, MI (888) 797-8378.

Walking Poles: Exerstrider, Exerstrider Products Inc., Madison, WI (800) 554-0989.

Powerbelts: Inergi Fitness, Norcross, GA (800) 797-2358.

Pedometers: Digi-Walker, www.digiwalker.com (888) 748-5377.

Accusplit Eagle, (800) 935-1996.



Internet Resources

Aerobics Fitness Association of America

www.afaa.com

Includes "Exercise Gets Personal," an interactive site where you can design a customized exercise program.

America on the Move

www.americaonthemove.org

Inspirational hints to help increase walking.

American College of Sports Medicine

[www.acsm.org/\(800-846-5643\)](http://www.acsm.org/(800-846-5643))

Information on sports research, health and fitness, and aerobic exercise guidelines, along with a quarterly fitness newsletter. “News Releases” gives information on a variety of exercise topics of recent interest.

American Council on Exercise

www.acefitness.org/

Features 100 fitness fact sheets, free e-newsletters, and a variety of different fitness activities from bicycling to swimming.

American Heart Association

www.americanheart.org

Health tools include an exercise diary and a body mass calculator. Information includes exercise and fitness promotion for women, children, and seniors; information on how exercise affects heart health; exercise tips; and a health heart workout quiz.

American Volkssport Association

www.ava.org (800-830-9255)

Walking and hiking events sponsored by chapters throughout the United States.

Centers for Disease Control and Prevention

www.cdc.gov/

Information on getting started in physical activity, exercise tips, links to other fitness resources, and health promotion for increasing physical activity in your school or community.

The Cooper Institute for Aerobics Research

www.cooperinst.org

Discover the latest fitness news, from aerobics to weight loss.

Digiwalker pedometers

www.digiwalker.com

Information on programs and how to purchase this pedometer.

Health Partners

www.healthpartners.com

Information on the 10,000 steps movement.

International Dance-Exercise Association (IDEA)

<http://www.ideafit.com>

Information about certification and equipment.

Marathoning: Listings of marathons, training logs, charts, race results, and other helpful links.**Marathon Guide**

www.marathonguide.com

Chicago Marathon Program (designed by Hal Higdon)

www.halhigdon.com/marathon

Galloway Program (designed by Jeff Galloway)

www.jeffgalloway.com

National President's Challenge

www.presidentschallenge.org

Contains a personal activity log, allows you to choose a program, encourages participation in advanced exercise programs.

The National Strength and Conditioning Association

www.nsca-lift.org (800-815-6826)

Information about new strength and conditioning research.

The President's Council on Physical Fitness and Sports

www.fitness.gov/challenge/challenge.html

Information on award programs such as Presidential Active Lifestyle Award (PALA). Site explains how to count steps using a pedometer.

Runner's World

www.runnersworld.com

Search for half-marathon/full-marathon schedules.

Shape Up America

www.shapeup.org

Provides information, programs, and tips on weight management.

Small Step

www.smallstep.gov

A U.S. Department of Health and Human Services website; helps people get started toward a more active and healthy lifestyle. Gives tips to eat healthier and get more activity.

LAB Activity 2-1

Name _____ Class/Activity Section _____ Date _____

Calculate Your Target Heart Rate (THR) Range

The target heart rate represents the intensity level at which you should exercise to produce cardiorespiratory benefits. This amount of exercise (overload) is enough to condition the heart, lungs, and muscles but is not overly strenuous. Monitoring intensity during a workout is done by measuring the heart rate. For fitness to occur, your heart rate must be raised to approximately 60 percent of the difference between the resting and maximal heart rates. An increase in heart rate equal to 80 percent of the difference between resting and maximal rates is a reasonable upper intensity level for most exercises. This is the target heart rate range (or training heart range). The Karvonen formula for calculating your target heart rate is as follows:

$$\text{THR} = (\text{maximal HR}^* - \text{resting HR}^{**}) \times \text{Intensity \%} + \text{Resting HR}$$

*Maximal HR = 220 minus age

**Resting HR = count your pulse at rest for 60 seconds

When estimating your target heart rate range, two factors are involved:

- Your age: _____.
- Your resting heart rate (RHR): _____.

Use these numbers in the formula that follows:

1. $220 - \text{your age} = \text{(estimated maximal heart rate [MHR])}$
2. $\text{MHR} - \text{(resting HR)} = \text{HR reserve}$
3. $\frac{\text{HR reserve}}{\text{(HR reserve)}} \times \frac{0.60}{\text{(lower intensity)}} + \text{resting HR} = \text{(lower target heart rate)}$
 $\frac{\text{HR reserve}}{\text{(HR reserve)}} \times \frac{0.80}{\text{(higher intensity)}} + \text{resting HR} = \text{(higher target heart rate)}$
4. Target heart rate range is _____ to _____ beats per minute.
5. For a quick pulse check during exercise, my $\text{THR} \div 10$ is _____ to _____ beats.

Example: Jeff is 23 years old and has a resting heart rate of 72 beats per minute.

1. $220 - 23 = 197$ MHR
2. $197 - 72 = 125$ heart rate reserve
3. $125 \times .60 = 75 + 72 = 147$
 $125 \times .80 = 100 + 72 = 172$
4. THR range is 147 to 172 beats per minute.
5. $\text{THR} \div 10$ is 15 to 17 beats.

LAB Activity 2-2

Name _____ Class/Activity Section _____ Date _____

Using a Pedometer: “How Many Steps Do I Take?”

Wear your pedometer for one full “normal” or “typical” week. Put it on first thing in the morning and wear it until you go to bed at night. Before you go to bed, record your steps for that day. Read the section in this chapter about pedometer use, and see Table 2-3, “Five Steps to Reach 10,000 Steps a Day.” See the “1-Mile Equivalent” section in Lab Activity 2-3 for additional activities that can count toward your step goal.

1. Week 1: Steps I accumulated each day.

Day/date _____ Steps = _____

Day/date _____ Steps = _____

Day/date _____ Steps = _____

Day/date _____ Steps = _____

Day/date _____ Steps = _____

Day/date _____ Steps = _____

Day/date _____ Steps = _____

Total number of steps for Week 1 is _____

2. Divide by 7. This is your 7-day step average, also known as your **baseline activity level**.

What is your **7-day step average** or **baseline activity level**? _____

Any surprises? _____

3. Weeks 2 and 3:

- Calculate your **step count goal** using the 10% method. This is the number of steps you wish to add each day beyond your baseline activity level. Example: If your baseline activity level is 6,000 steps, an increase of 10% will be 600 steps ($6,000 \times .10 = 600$). During Weeks 2–3 you would accumulate 6,600 steps per day. To progress, you would plan to add 600 steps every 2 weeks thereafter. (Example: Weeks 3–4 your goal would be to increase to 7,200 steps; Weeks 5–6 your goal would be to increase to 7,800 steps; Weeks 7–8 your goal would be to increase to 8,400 steps, and so on until you reach your ultimate goal of 10,000 steps or more.)

What is your personal DAILY STEP COUNT GOAL for Week 2 and Week 3?

_____ steps. (Your 7-DAY AVERAGE/BASELINE ACTIVITY $\times .10$)

OR

- **ALTERNATIVE METHOD:** Calculate your personal 7-DAY AVERAGE or BASELINE ACTIVITY LEVEL using the 500-Step Method. Increase your 7-Day Average by 500 steps instead of using the 10% Method. (Example: If your baseline is 6,000 steps, add 500 steps to set the goal for Weeks 2–3. This would be $6,000 + 500 = 6,500$; Weeks 4–5 would be 7,000 steps; Weeks 6–7 would be 7,500, and so on until you reach your ultimate goal of 10,000 steps or more.)

What is your personal DAILY STEP COUNT GOAL for Week 2 and Week 3?

_____ steps. (Your 7-DAY AVERAGE/BASELINE + 500)

4. Calculate your personal activity goals using the 10% Method or the 500-Step Method for the next 12 weeks. Your instructor may prefer one method over the other. Use the pedometer log to record your daily activity.

Weeks 2–3: _____ steps per day

Weeks 4–5: _____ steps per day

Weeks 6–7: _____ steps per day

Weeks 8–9: _____ steps per day

Weeks 10–11: _____ steps per day

Weeks 12+: _____ steps per day

5. List specific strategies you plan to use in order to work toward your step goals.

PEDOMETER LOG

Name _____ Class/Activity Section _____

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Weekly Average
Week of: _____	_____	_____	_____	_____	_____	_____	_____	_____
Goal: _____	_____	_____	_____	_____	_____	_____	_____	_____
Steps = _____	_____	_____	_____	_____	_____	_____	_____	_____
Miles = _____	_____	_____	_____	_____	_____	_____	_____	_____
Week of: _____	_____	_____	_____	_____	_____	_____	_____	_____
Goal: _____	_____	_____	_____	_____	_____	_____	_____	_____
Steps = _____	_____	_____	_____	_____	_____	_____	_____	_____
Miles = _____	_____	_____	_____	_____	_____	_____	_____	_____
Week of: _____	_____	_____	_____	_____	_____	_____	_____	_____
Goal: _____	_____	_____	_____	_____	_____	_____	_____	_____
Steps = _____	_____	_____	_____	_____	_____	_____	_____	_____
Miles = _____	_____	_____	_____	_____	_____	_____	_____	_____
Week of: _____	_____	_____	_____	_____	_____	_____	_____	_____
Goal: _____	_____	_____	_____	_____	_____	_____	_____	_____
Steps = _____	_____	_____	_____	_____	_____	_____	_____	_____
Miles = _____	_____	_____	_____	_____	_____	_____	_____	_____

NOTE: Approximately 2,000 Steps = 1 Mile
List the specific strategies you use to work toward your step goals:
(make copies as needed)

Name _____

Class/Activity Section _____

Date _____

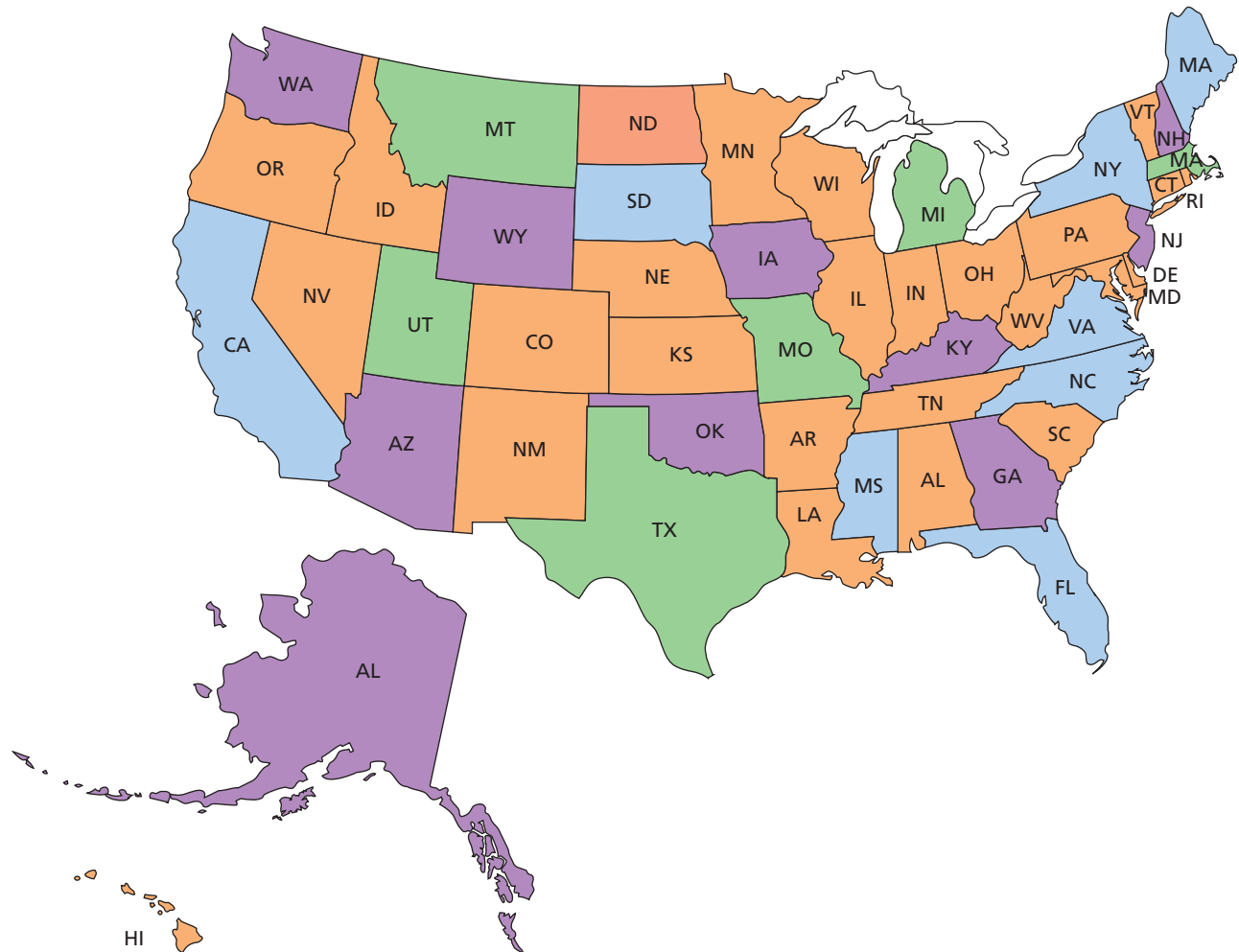
Exercise Across the U.S.A. Log (make copies as needed)

State/distance		Activity(s)		Start date		End date	
Month: _____		Month: _____		Month: _____		Month: _____	
1	17	1	17	1	17	1	17
2	18	2	18	2	18	2	18
3	19	3	19	3	19	3	19
4	20	4	20	4	20	4	20
5	21	5	21	5	21	5	21
6	22	6	22	6	22	6	22
7	23	7	23	7	23	7	23
8	24	8	24	8	24	8	24
9	25	9	25	9	25	9	25
10	26	10	26	10	26	10	26
11	27	11	27	11	27	11	27
12	28	12	28	12	28	12	28
13	29	13	29	13	29	13	29
14	30	14	30	14	30	14	30
15	31	15	31	15	31	15	31
16	Total	16	Total	16	Total	16	Total

LAB Activity **2-3**

Name _____ Class/Activity Section _____ Date _____

Exercise Across the U.S.A.



DIRECTIONS: (NOTE: ALL MILEAGE IS APPROXIMATE.)

1. Select a state to exercise across or go for the coast-to-coast challenge and a grand total of 2,755 miles.
2. Record your exercise miles on the Exercise Across the U.S.A. log form.
3. If you wish, you may make the trip interesting by incorporating different activities to reach your total mileage goal. Many sports are easy to measure in miles, but if you prefer a different activity, see the 1-Mile Equivalents chart, which is measured in minutes (estimated for a 143-pound person).

Exercise Across the U.S.A (Grand Total: 2,775 Miles)

Pick a State

Alabama 195 Miles	Hawaii 75 Miles	Massachusetts 25 Miles	New Mexico 340 Miles	South Dakota 379 Miles
Alaska 858 Miles	Idaho 302 Miles	Michigan 185 Miles	New York 285 Miles	Tennessee 439 Miles
Arizona 315 Miles	Illinois 212 Miles	Minnesota 273 Miles	North Carolina 396 Miles	Texas 661 Miles
Arkansas 227 Miles	Indiana 139 Miles	Mississippi 273 Miles	North Dakota 355 Miles	Utah 267 Miles
California 247 Miles	Iowa 310 Miles	Missouri 295 Miles	Ohio 225 Miles	Vermont 81 Miles
Colorado 371 Miles	Kansas 390 Miles	Montana 546 Miles	Oklahoma 305 Miles	Virginia 340 Miles
Connecticut 80 Miles	Kentucky 351 Miles	Nebraska 400 Miles	Oregon 358 Miles	Washington 335 Miles
Delaware 36 Miles	Louisiana 177 Miles	Nevada 317 Miles	Pennsylvania 286 Miles	West Virginia 149 Miles
Florida 138 Miles	Maine 198 Miles	New Hampshire 76 Miles	Rhode Island 27 Miles	Wisconsin 254 Miles
Georgia 227 Miles	Maryland 215 Miles	New Jersey 72 Miles	South Carolina 207 Miles	Wyoming 348 Miles

Other Destinations

Length of Mississippi River	740 miles
Circumference of Earth	24,901 miles
Length of Grand Canyon	277 miles
To the moon	238,330 miles
The Lewis and Clark Expedition (from St. Louis to the Pacific Ocean)	4,000 miles
The Pony Express Trail (from St. Joseph, MO, to Sacramento, CA)	1,966 miles
The Great Wall of China	3,517 miles

1-Mile Equivalents (Approximately 2,000 Steps)

Activity	Minutes	Activity	Minutes	Activity	Minutes
Aerobic dance	18	Gardening		Rowing	12
Basketball	13	Digging	15	Skiing	
Biking		Mowing	16	Cross country	13
Leisure	29	Raking	32	Downhill	16
Moderate	19	Golf (without cart)	21	Softball (fielder)	32
Racing	11	In-line skating		Stair climbing	9
Calisthenics		(use actual distance covered)	16	Swimming	12
(Sit-ups, push-ups, etc.)	25	Jumping rope	11	Tennis	16
Canoeing (leisure pace)	40	Karate	9	Weight training	15

LAB Activity 2-4

Name _____ Class/Activity Section _____ Date _____

“I Have No Time . . .” Overcoming Obstacles to Exercise

Many people have reasons, excuses, or obstacles that keep them from exercising on a regular basis. Some of these reasons are perceived; others are legitimate. With varied social, environmental, and motivational challenges, it is important to find ways to overcome these barriers. Listed below are the most common reasons for not exercising. Under each reason, list ways one might overcome each challenge.

1. Lack of time
2. Lack of willpower/motivation
3. Lack of resources (money, facilities, equipment, etc.)
4. Lack of social support (friends, family, coworkers, etc.)
5. Weather issues (too hot, too cold, rainy, snowy, etc.)
6. Family/child-care obligations

7. Injuries/disabilities

8. Fear of failure (too old, too out of shape, too fat, too much to overcome, etc.)

What are **your** three biggest personal challenges in maintaining a regular exercise program?

1.

2.

3.

List ways you could overcome each of these obstacles.

Obstacle 1

Obstacle 2

Obstacle 3

LAB Activity 2-5

Name _____ Class/Activity Section _____ Date _____

Cardiorespiratory Exercise Log Sheet

(MAKE COPIES OF THIS FORM AS NEEDED)

	Week	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Total
1	Date: _____ RHR: _____ Distance/time/steps: _____ Type of activity: _____ EHR: _____ Location: _____	_____	_____	_____	_____	_____	_____	_____	_____
2	Date: _____ RHR: _____ Distance/time/steps: _____ Type of activity: _____ EHR: _____ Location: _____	_____	_____	_____	_____	_____	_____	_____	_____
3	Date: _____ RHR: _____ Distance/time/steps: _____ Type of activity: _____ EHR: _____ Location: _____	_____	_____	_____	_____	_____	_____	_____	_____
4	Date: _____ RHR: _____ Distance/time/steps: _____ Type of activity: _____ EHR: _____ Location: _____	_____	_____	_____	_____	_____	_____	_____	_____

Comments/Goals: _____

Log Sheet

(MAKE COPIES OF THIS FORM AS NEEDED)

Name _____

Week _____ RHR _____ THR _____

Goals: _____

	Date	RHR	Distance/time/steps	HR (at end of workout)	Location	Comments
Sun						
Mon						
Tues						
Wed						
Thur						
Fri						
Sat						

Total _____

3

Developing Flexibility

*Blessed are the flexible for they shall not
be bent out of shape.*
—Author unknown

Study Questions

You will have successfully mastered this chapter if you can answer the following:

1. What are the benefits of and five cautions for stretching?
2. What factors affect flexibility?
3. What are the two types of flexibility?
4. What are the four types of stretching?
5. What are some basic guidelines for flexibility development?
6. What are the five principles of flexibility development?
7. What are five flexibility exercises for basic fitness?
8. Can you differentiate between the safe and contraindicated exercises illustrated in the chapter?
9. What are the general guidelines for identifying exercises that increase risk of injury?
10. How do flexibility and muscular fitness contribute to wellness?

You will find the answers as you read this chapter.



Visit the Online Learning Center for *A Fit Way of Life*, www.mhhe.com/robbinsfit2e, where you will find additional quizzes and study aids.

Terms

- active stretching
- collagen
- dynamic flexibility
- dynamic stretching
- elastic elongation
- elastin
- golgi tendon organ (GTO)
- inverse stretch reflex
- muscle spindle
- passive stretching
- plastic elongation
- proprioceptive neuromuscular facilitation (PNF)
- reciprocal inhibition
- static flexibility
- static stretching
- stretch reflex

Flexibility, the ability to move the joints through their full range of motion, is an important factor in achieving wellness throughout the life span. It enables us to reach, bend, twist, and perform movements without excessive tightness or stiffness. As children, we are naturally flexible, but as we age, flexibility tends to decrease. Disuse, injury, scar tissue, excessive body fat, and muscle imbalances are common factors associated with loss of range of motion. This chapter covers many aspects of flexibility—its benefits, types, cautions, principles, and guidelines. In addition, it highlights illustrated programs for developing this important component of fitness.

FLEXIBILITY

You can maintain youthful flexibility by incorporating stretching into your regular workouts. The flexibility exercises in this section are grouped as follows: a basic fitness flexibility program with exercises for joggers, walkers, aerobic dancers, cyclists, swimmers, and water exercisers and examples of PNF partner-assisted stretches. Contraindicated exercises, safer substitutes, and general rules for identifying common exercises that put back and joints at increased risk of injury are also discussed.

Benefits of Flexibility

Several benefits can be gained from flexibility development:

- ✓ *Decreased aches and pains.* Tight, inflexible muscles pull unevenly across joints, causing skeletal misalignment, poor posture, unnecessary fatigue, and muscle and joint pain. Stretching can alleviate these problems.
 - ✓ *Enhanced ability to move freely and easily* and to perform activities such as bending down to tie your shoes, scratching your back, and turning to look back as you are driving.
 - ✓ *Possible decreased risk of injury.* When tight muscles restrict the natural range of motion of a joint, the slightest unusual twist can cause a strain or pull, such as a strained hamstring. Inflexibility also is a precipitating factor in overuse injuries such as tendonitis, because inelastic muscles transfer excessive stress to even less pliable connective tissue.
- Some research indicates that the importance of stretching in injury prevention may vary depending on the type of activity to follow. It may be more important in activities involving
- vigorous jumping and bouncing (like soccer or basketball) in which the muscle-tendon unit undergoes high-intensity stretch-shortening cycles. It may be less important in activities with limited demands for stretch-shortening cycles (e.g., jogging, walking). While the effects of stretching in injury prevention are controversial and research has generally not shown that stretching before exercise decreases risk of injury, a long-term flexibility program designed to alleviate muscle tightness and imbalance can offer benefits. Excessively tight areas, identified by flexibility assessment, can be corrected and adequate flexibility restored for sports and daily activities. Many rehabilitation professionals would agree that injury resistance is best enhanced by including in your weekly workouts exercises designed to enhance both flexibility and strength as part of a balanced muscular fitness program.
- ✓ *Recovery from injury.* Athletic trainers and physical therapists commonly utilize stretching in injury rehabilitation programs. Research has shown that gentle stretching in a pain-free range of motion is important in shortening the rehabilitation period after injury. This enables a person to more quickly regain normal range of motion and return to activity.
 - ✓ *Enhanced athletic performance.* In racquetball, golf, tennis, volleyball, and swimming, greater range of motion and ability to apply force through that range of motion can confer a winning edge. However, research indicates that stretching routines preceding strength-dependent activities appear to decrease subsequent performance. Therefore, it may be best to minimize stretching prior to competitive events and to delay stretching for flexibility until after strength-building exercise sessions.
 - ✓ *Reversal of age-related flexibility declines.* We tend to lose flexibility as we age, partly due to age-related changes in connective tissue and muscle, partly due to decreasing levels of activity. A regular stretching program can improve flexibility at any age.
 - ✓ *Improved posture, appearance.* We look and feel better when we carry ourselves tall with shoulders back, chest high, and back straight. Unfortunately, over time, we may tend to “sag into gravity” and develop a “hunched over” appearance with rounded shoulders, forward head, and sagging abdominals. Muscle tightness across the chest, hamstrings, and lower back coupled with weakness of opposing muscles can contribute to and perpetuate poor postural habits. Over time, poor posture tends to worsen and becomes harder to self-correct as muscle imbalances increase. Stretching to correct shortened muscles, along with strengthening the weak opposing muscles,

can enhance posture and help a person “stand tall” naturally without continual conscious effort.

- ✓ *Decreased muscle soreness after exercise.* Research has shown that delayed onset muscle soreness and stiffness that occurs 1–2 days after exercise can be decreased by stretching the affected muscles.
- ✓ *It feels good.* Stretching reduces muscular tension, promoting relaxation.

Cautions

If carelessly done, stretching may cause injury. You must be careful not to overstretch, particularly when muscles are cold and tight. Stretch just to the point of tightness and hold. Stretching is not a competitive activity, so don’t try to imitate the most flexible person in your class. Injured areas should be stretched with great care and not into pain, which risks reinjury. If you feel pain during stretching, particularly joint pain, stop!

While less flexible individuals may envy those who can do splits with ease, keep in mind that more flexibility is better only up to a point. There is concern that excessive flexibility, unless accompanied by muscular strength, may overstretch ligaments and tendons and increase joint laxity and susceptibility to injury. For this reason, it is wise to strengthen muscles that you stretch and to stretch muscles that you strengthen for optimal fitness benefits.

Be aware that some studies show that static stretching immediately preceding strength activities decreases performance approximately 10 percent. Studies also show decreased vertical jump performance immediately following PNF stretching. Therefore, delaying stretching until after competitive or strength-dependent activities would enable a person to maintain flexibility without affecting strength or athletic performance.

Factors Affecting Flexibility

Several factors affect joint flexibility. These include joint structure, soft tissues (joint capsule, muscle, tendon), inactivity, muscle temperature, age, genetics, gender, obesity, injury, and neural factors.

Joint Structure

The range of motion of joints varies from one joint to another depending on joint structure, the joint capsule, and connective tissues of the muscle-tendon structures surrounding the joints. Some joints, like fingers or the elbow, are hinged for flexion and extension. Others, like the shoulder, a ball-and-socket joint, are more mobile and permit motion in several planes. The joint capsule is connective tissue that surrounds the joint and gives it stability while controlling mobility. If joint structure alone determined range of motion, stretching would not be effective, as this is not amenable to

change. However, stretching does affect the range of motion of soft tissues surrounding a joint.

Soft Tissues

Muscles and their fibrous sheaths of connective tissue, ligaments, tendons, and skin surrounding a joint also affect its range of motion. It is estimated that about 47 percent of a joint’s total resistance to stretching is contributed by ligaments and the joint structure, about 41 percent from connective tissue, 10 percent from tendons, and 2 percent from skin. Muscle contains **elastin**, elastic fibers, and **collagen**, fibrous connective tissue. Like an elastic band, when stretched, muscles temporarily lengthen, then return to their resting length. Most of the resistance to stretching that we feel comes from fibrous connective tissue within and covering muscles. Repeated stretching over time increases the ability of a muscle to be lengthened with less resistance.

Inactivity

Physically active individuals tend to be more flexible than sedentary individuals. Perhaps the most common cause of low flexibility is a sedentary lifestyle. With disuse, the body adapts to a limited range of motion. Muscles and connective tissue become less pliable, shorten and weaken, leaving a person more susceptible to injury.

Muscle Temperature

Stretching is easier and more comfortable if muscles have been warmed up first by large-muscle activity such as walking or light calisthenics. When muscles are cold, they are stiffer and more resistant to stretching. As muscle temperature increases, connective tissue becomes softer, and resistance to stretching decreases by as much as 20 percent. Heat with stretching relaxes collagen fibers and allows increased elongation. Stretching alone does not warm up muscles. For this reason, increasing deep-muscle temperature by adequate warm-up is probably more important in reducing risk of injury in the workout that follows than is stretching alone. Also, stretching during a cool-down may allow muscle collagen to restabilize toward its new increased length, making changes more permanent and longer lasting.

Age

As we grow older, we tend to lose flexibility, related partly to decreasing levels of activity with age and partly to connective tissue changes due to aging. It may be more difficult to turn to look back over the shoulder, to back a car out of a parking spot, to zip a back zipper, or to bend down to tie a shoe. A regular program of stretching can counteract these flexibility declines. Research has shown that range of motion can be improved at any age, even in the 80s and 90s.



THE NUMBERS

- 25% Amount of flexibility lost between the ages of 25 and 50.
- 70% Portion of adults who do not stretch for flexibility.
- 30% Portion of adults who stretch 3 or more days per week.
- 2–3 Days per week of stretching recommended for good health.

Genetics

Some people seem to be naturally more flexible than others, even “double-jointed” (they aren’t, really). This may be due to inherited differences in joint structure and elasticity of connective tissue. While you may not be able to change your genetics, you can improve your flexibility within your genetically determined range of motion. People who have never been able to touch their toes may, for example, be able to get inches closer with practice but may never be able to wrap their palms around their feet without bending their knees.

Gender

Females tend to be more flexible than males throughout the life span. This may be due to gender-specific variations in joint structure.

Obesity

Excess body fat in and around joints and muscles can present a mechanical block to full range of motion. The excess tissue acts like a wedge, preventing full joint motion due to tissue approximation. Excessive muscle hypertrophy can likewise impede full joint range of motion.

Injury and Scar Tissue

Injury to muscles and joints results in decreased range of motion initially due to pain and guarding. Flexibility can be lost over time due to decreased use as the injury heals, causing muscles and connective tissue to tighten and weaken. Flexibility is also compromised by the formation of scar tissue, which is tighter, weaker, and less elastic than the original tissues.

Neural Factors

When a muscle is stretched, **muscle spindles**, stretch receptors within the muscle cells, are stimulated. They sense the amount and speed of stretch, and if a muscle is overstretched or stretched too fast, they activate the stretch reflex to prevent injury. The **stretch reflex** causes the muscle to contract to prevent overstretching the joint.

The **golgi tendon organ (GTO)**, another type of receptor located within the muscle tendon, detects the amount of tension in a muscle. When excessive tension

is placed on the muscle, the GTO triggers the **inverse stretch reflex**, causing the muscle to relax to prevent injury. GTO respond after the muscle spindles, and only if a stretch is sustained for 5 seconds or longer. The signal sent by the GTO overrides the signal by the muscle spindles, and causes the muscle to relax, underlining the effectiveness of sustained stretching. Muscle spindles and GTO have opposite effects and both monitor and maintain the muscle-tendon unit in a safe range of motion.

Another neural factor affecting muscle is **reciprocal inhibition**. Muscles work in pairs, and when one muscle contracts, through reciprocal inhibition, its opposing muscle relaxes to permit movement. For example, during a biceps curl, the triceps relaxes to permit the biceps to shorten. This effect is incorporated into some stretching programs, such as PNF, by consciously contracting a muscle to produce relaxation and increased range of motion in the opposing muscle group.

Types of Flexibility

There are two basic types of flexibility: static and dynamic. **Static flexibility** refers to the range of motion that can be achieved through a slow, controlled stretch. **Dynamic flexibility** is the range of motion achieved by quickly moving a limb to its limits.

Static stretching techniques are those in which you slowly stretch a muscle to the point of tension and hold, such as in holding a sitting hamstring stretch. The stretching force is provided by gravity or the force of one limb pulling on another. When a muscle is stretched and held at a constant length, after a period of time there is a gradual loss of tension and muscle lengthening. Static stretching is the most commonly used type of stretching. It does not activate the stretch reflex and is associated with limited muscle soreness. It does not increase muscle temperature, so some type of prior warm-up activity is recommended.

Dynamic stretching employs swinging or ballistic moves such as a high forward kick. Dynamic stretching is associated with increased muscle soreness, and is not used much in personal fitness programs because of increased risk of injury. Dynamic exercises may be useful in preparation for athletic activities requiring such moves, but they carry increased risk that a muscle or

joint could be overstretched, resulting in muscle or tendon tears and joint injury. Also, these exercises may initiate the stretch reflex, which may cause the stretched muscle to contract, limiting flexibility gains. While both types of stretching can increase flexibility, static stretching is preferred in health-related fitness programs because it is highly effective and carries little risk of muscle or joint strain.

Static and dynamic stretching may be performed actively or passively. With **active stretching**, you use your own muscle forces to stretch yourself. For example, you can actively stretch calves by sitting and flexing your ankles to pull the toes back. With **passive stretching**, someone or something else assists with a stretch. The assist could be gravity, body weight, a strap, or leverage: for example, using gravity or a slant board to assist with a calf stretch. You relax the muscle you are trying to stretch and use the external assist to apply force. Both active and passive stretching improve flexibility, but passive stretching is more commonly used.

Guidelines for Flexibility Development

Flexibility exercises are part of a balanced fitness program. The goal is to develop and maintain an adequate range of joint motion for ease of movement in your daily activities. Flexibility gains are proportional to the overload applied: to the frequency, intensity, and time (duration) of stretching.

Prescription for Flexibility

Frequency	Stretch at least 2 to 3 days a week, daily if possible. Greater flexibility is produced by more frequent stretching.
Intensity	Low-intensity stretching is best. Progress at your speed. Stretching is not competitive. Flexibility changes from day to day, and on some days you might not be able to stretch as far as you did the day before. Stretch slightly beyond the normal range of motion, to the point of tension, and hold. Do not force a stretch.
Time	The ACSM recommends a 10- to 30-second stretch, during cool-down for optimal benefit.
Repetitions	At least four 10- to 30-second sustained stretches for each muscle group are recommended.

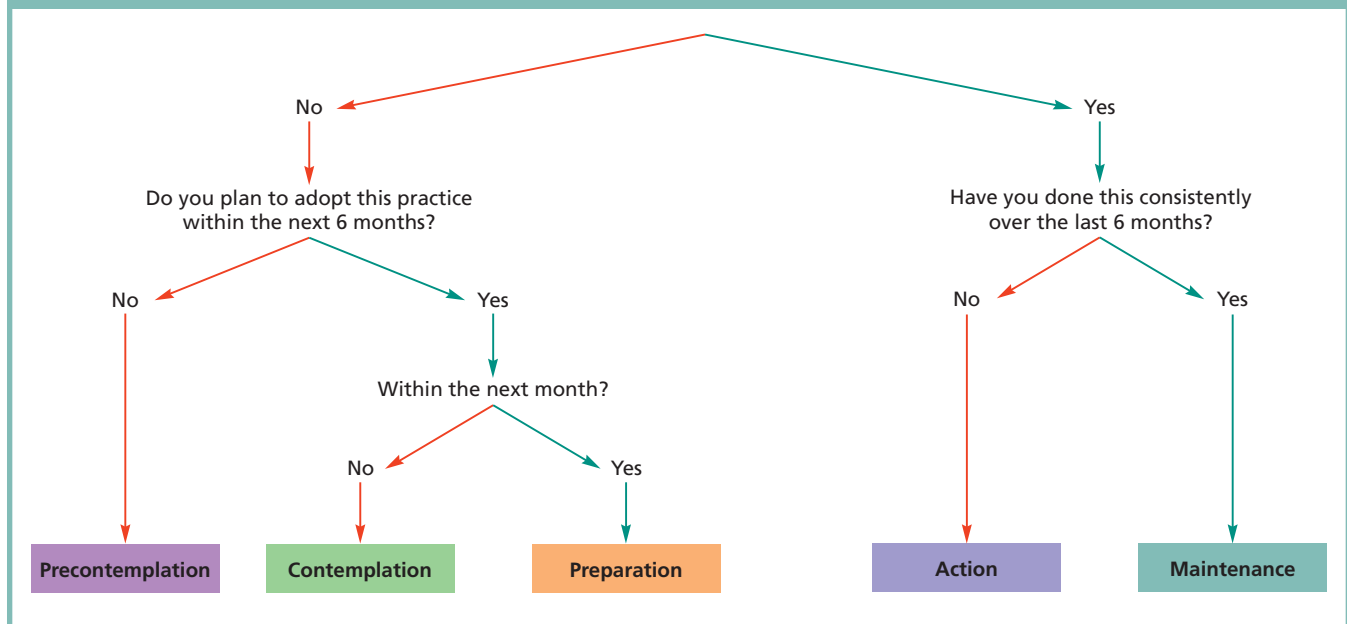
Depending on the number of stretches and length of repetitions, a flexibility session can last 10 to 30 minutes.

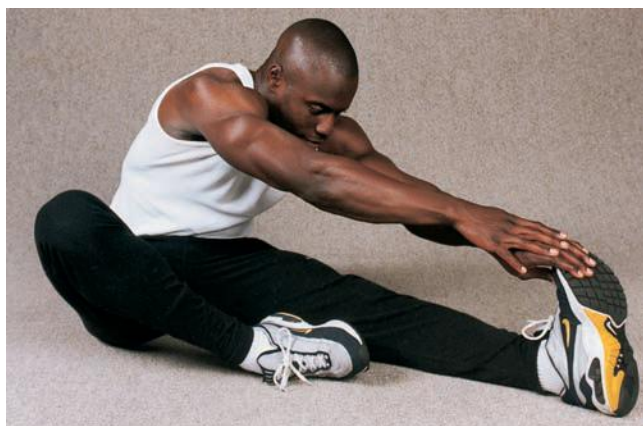
Principles of Flexibility Development

Over time, a program of regular stretching can produce beneficial changes in muscle and joint range of motion. To develop an effective stretching program, several principles affecting flexibility development must be considered. These principles include progressive overload, specificity, reversibility, individual differences, and balance.

What Stage of Change Are You In?

Do you stretch during cool-down?





Flexibility gains are greatest during cool-down stretching.

Progressive Overload

Improvement in joint range of motion can occur when sustained stretching produces elastic and plastic elongation. **Elastic elongation**, the temporary lengthening of soft tissue, occurs when muscle is stretched and returns to its resting length. Connective tissue within and surrounding muscle has both elastic and plastic properties. Longer or more intense stretching can produce **plastic elongation**, a semi-permanent lengthening of tissues. After a stretch is removed, elastic elongation reverses and plastic elongation remains. Plastic elongation is the goal of stretching programs. It is best obtained through static or slow, sustained stretching. The amount of plastic elongation is considered time-dependent and is proportional to the amount of force applied. If tissue is stretched to the point of tension but not pain (which may activate the stretch reflex) and held, the tissue will gradually relax and elongate, and require less force to maintain the new length. A prolonged stretch is needed to achieve plastic elongation.

Specificity

Flexibility is specific to a joint; that is, flexibility in one leg does not guarantee flexibility in the other leg, and flexibility in the shoulders does not ensure flexibility in the lower back. It is also specific to joint angles—a person who can do front splits may be less flexible in side splits.

Reversibility

Like any other fitness component, flexibility changes are reversible. If a person stops stretching, over time, range of motion will decrease back to levels sustained by daily activities. Gains from flexibility can be lost in as little as 3–4 weeks without stretching. On the other hand, flexibility can be maintained with stretching as few as 2–3 days per week.

Individual Differences

People vary in their ability to develop flexibility. Variations in proportions of collagen and elastin in

TOP 10 LIST

Tips for Developing Flexibility

Everyone can benefit from flexibility. To maximize the results from the time invested, implement the following guidelines in your next stretching session:

1. *Warm up before stretching.* An increase in muscle temperature produced by fast walking, slow jogging, jumping jacks, or other large-muscle exercises will make stretching safer and more productive. You are sufficiently warmed up when you begin to sweat.
2. *After warm-up, use stretching as preparation for activity.* While some believe that stretching during warm-up decreases the risk of injury in the activity that follows, there is no evidence that this is true. Warm-up stretching is different from a planned program of stretching for general flexibility. Warm-up stretching can be limited to what is essential, avoiding overstretching. Stretch the muscle groups used in the activity, hold at the point of tension for 10 seconds, and do not push for flexibility increases. Any gains will be minimal due to the tightening effect of the workout that follows.
3. *Stretch for flexibility during cool-down.* Muscles are warmest and most elastic at this point. Stretching is easier. More permanent changes in muscle lengthening occur with low-force, long-duration stretching if muscles are allowed to cool in a stretched position. Cooling muscles before releasing tension apparently causes muscle collagen (connective tissue), like stretched taffy, to stabilize toward its new stretched length.
4. *Stop at the point of tension, not pain.* Stretching to the point of pain, or until muscles quiver, can risk overstretching injury.
5. *Stretch slowly and evenly,* hold 10 to 30 seconds, and release slowly.
6. *Try to consciously relax* the target muscle as you stretch.
7. *Maintain a regular breathing pattern* as you stretch.
8. *Don't bounce.* A slow sustained stretch is more effective.
9. *Incorporate 8 to 12 stretches into your program.* Flexibility is specific to a joint, so a well-planned program for general flexibility will contain one stretch for each major muscle group. Warm-up or cool-down stretching may contain fewer exercises because such stretching is activity-specific and has different goals. Pay particular attention to body areas that are least flexible and stretch them more often.
10. *Strive for muscle balance.* When stretching muscles on one side of a joint, stretch those on the other side as well; for example, if you stretch hamstrings, stretch quadriceps, too.

muscle tissue, joint structure, length of muscles, and attachment points of tendons on bones may contribute to differences in joint range of motion as well as ability to increase that range. Within your genetic endowment, you do have potential for improvement. A regular stretching program can help you enhance and maintain your flexibility within your genetically determined range.

Balance

We often have muscles that are tighter on one side of the body (right-left or front-back). Pay attention to flexibility differences and work to improve them. Your hamstrings may be tighter on one side than the other. It is common

for chest muscles to be tighter than the opposing upper back muscles, and lower back muscles are often tighter than abdominals. Spend more time stretching the tighter areas to alleviate the imbalance.

Flexibility Exercises for Basic Fitness

As part of a warm-up or cool-down, exercises A through F are important for runners, walkers, and aerobic dancers. Cyclists, swimmers, and water exercisers should add upper-body stretches G through I. If time is limited, save stretching for the cool-down. For basic fitness flexibility, perform the full program of exercises in Figure 3-1. Hold each one 10 to 30 seconds and repeat at least four times. Lab 3-1 gives an introductory



(a) Hamstring stretch



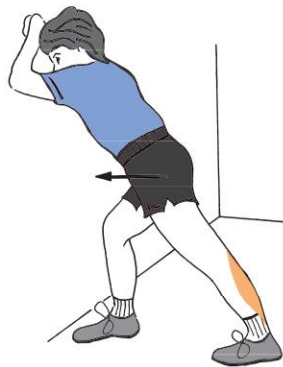
(b) Lower back/hip flexor stretch



(c) Spinal twist



(d) Quadriceps stretch



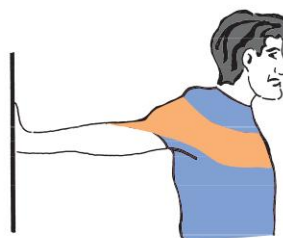
(e) Calf stretch



(f) Iliotibial band stretch



(g) Deltoid stretch



(h) Pectoral stretch



(i) Tricep stretch

FIGURE 3-1

Flexibility exercises.

flexibility session that you can incorporate into your routine.

A. Hamstring stretch

Sit and extend one leg in front, with the other bent and tucked as shown in diagram (a). Keeping shoulders erect, press abdomen forward. Hold. Repeat with other leg.

B. Lower back/hip flexor stretch

Lie on your back with one leg straight and one bent. With hands behind thigh, press thigh toward chest. Keep extended leg straight. Repeat left.

C. Spinal twist (lower back and hip abductors)

Sit with right leg extended, step left leg over right, and turn upper body toward left. Repeat on other side.

D. Quadriceps stretch

Stand with right leg bent at the knee. With left hand, pull right heel toward buttocks. Keep shoulders up, abdominals tight, and hips tucked under to prevent back hyperextension. Omit if you have knee problems.

E. Calf/achilles stretch

Standing in forward lunge position, toes pointing forward, press heel toward floor. Repeat with other leg. Bend back knee to stretch soleus.

F. Iliotibial band stretch

Cross left foot over right, press hips to right. Repeat with other side.

G. Deltoid stretch

Cross right arm in front of body and pull it in toward midline with left hand.

H. Pectoral stretch

Place right hand on wall, with elbow extended but not locked. Twist shoulders left. Repeat with left arm.

I. Triceps stretch

Pull left elbow behind head. Repeat right.

while a partner stretches your limb for 10 to 30 seconds. The forced contraction fatigues the muscle and increases the muscle's ability to relax while being stretched.

Another type of PNF stretching called the *contract-relax-agonist contract* inserts a contraction of the opposing muscle group before the final stretch; for example, in the hamstring stretch (A) below, after contracting hamstrings, the person would contract quadriceps, pulling the leg back as far as possible for about 10 seconds. If the quadriceps is contracted, through reciprocal innervation, the hamstring relaxes even more and can be passively stretched to a greater range of motion. Some research indicates that the contract-relax-agonist contract method is the most effective PNF technique.

For safety, be sensitive to your partner's needs and flexibility levels. Be sure to communicate when more or less resistance or pressure is needed throughout each exercise. Work with the same partner throughout the series. Switching partners can lead to injury because of unfamiliarity with the flexibility limits of the person being stretched. Some examples of PNF stretches are illustrated in Figure 3-2.

A. Hamstring stretch

Lie on your back and lift one leg into the air. Partner supports ankle and knee in a static stretch. Next, keeping knee extended but not locked, push against your partner as he or she resists. Stretch and then relax as partner eases leg into a new stretch.

B. Inner thigh stretch

Sit with knees out and bottoms of feet together. Press down on knees in a static stretch. Next, partner kneels behind and resists on knees as you press them upward. Finally, relax as partner gently presses them toward the floor in a stretch.

C. Gluteal/lower back stretch

Sit cross-legged and stretch forward. Partner kneels behind you with hands on your upper back. Next, resist back against partner. Then stretch forward as partner assists.

D. Pectoral stretch

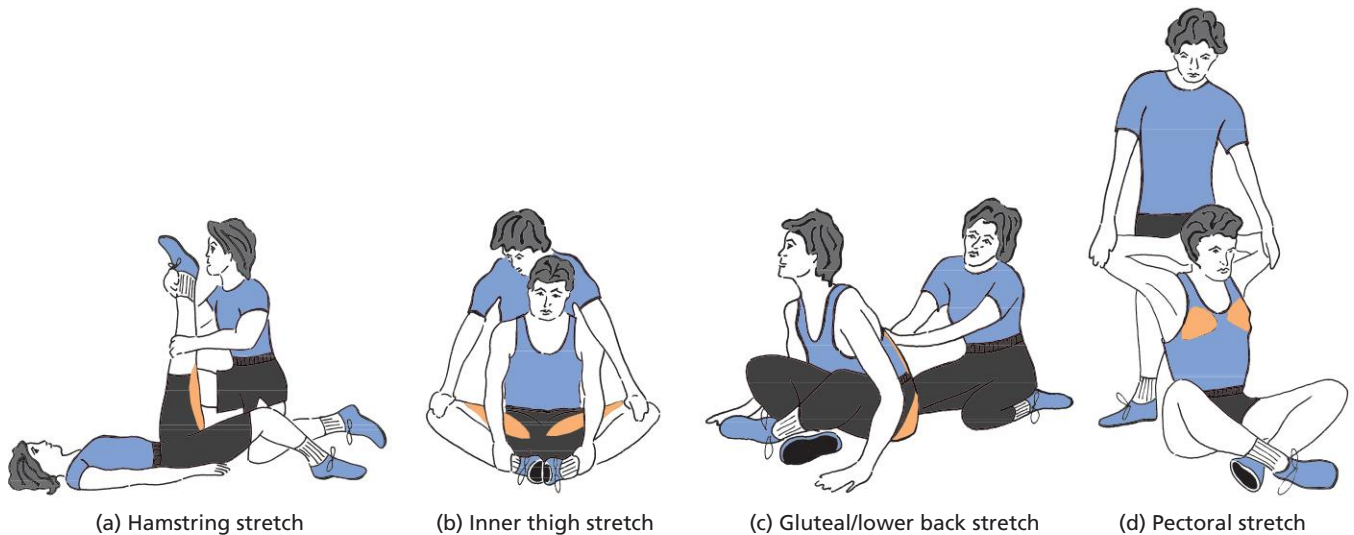
Sit cross-legged with fingers interlaced behind your head and back, supported by partner's thigh. Partner gently pulls your elbows back for 10 seconds and then resists as you attempt to pull them forward. Next, relax as partner gently stretches them back.

PNF Partner-Assisted Stretches

A type of static stretching called **proprioceptive neuromuscular facilitation (PNF)**, a partner-assisted stretch often used by athletic trainers, is highly effective for increasing flexibility. It utilizes the nervous and muscular systems to facilitate stretching. It was developed by Herman Kabat, M.D., and two physical therapists in the 1940s for use on paralysis patients to improve flexibility and strength. PNF utilizes the inverse stretch reflex produced by golgi tendon organs to relax the target muscle and allow a greater stretch. It is thought that when the muscle is first stretched, then contracted, the GTO reflexes are stimulated, relaxing the muscle. To perform a PNF contract-relax stretch, you first perform a 10- to 30-second static stretch, then contract the muscle for 6 seconds to produce fatigue, and then relax

Other Programs for Enhancing Flexibility

Tai Chi and yoga are very old yet newly popular activities that can enhance flexibility and balance as well as reduce stress.

**FIGURE 3-2**

PNF partner-assisted stretches.

Tai Chi is an ancient Chinese exercise known for its slow, graceful movements. It originated as a self-defense activity but now is used to enhance standing balance, flexibility, lower-body strength, and neuromuscular control. It is a good exercise for people of all ages and can be enjoyed throughout the lifetime.

Yoga, which means to yoke or unite, is another ancient art with several branches, each with its own style. Hatha yoga is the most widely practiced in the United States. It involves using mental focus and coordinated breathing while assuming a series of physical postures. Some people do yoga to reduce stress, others to improve flexibility and balance. Some forms of yoga are more vigorous than others; some are more relaxing. If one type doesn't appeal to you, investigate others.



Yoga can improve flexibility and balance.

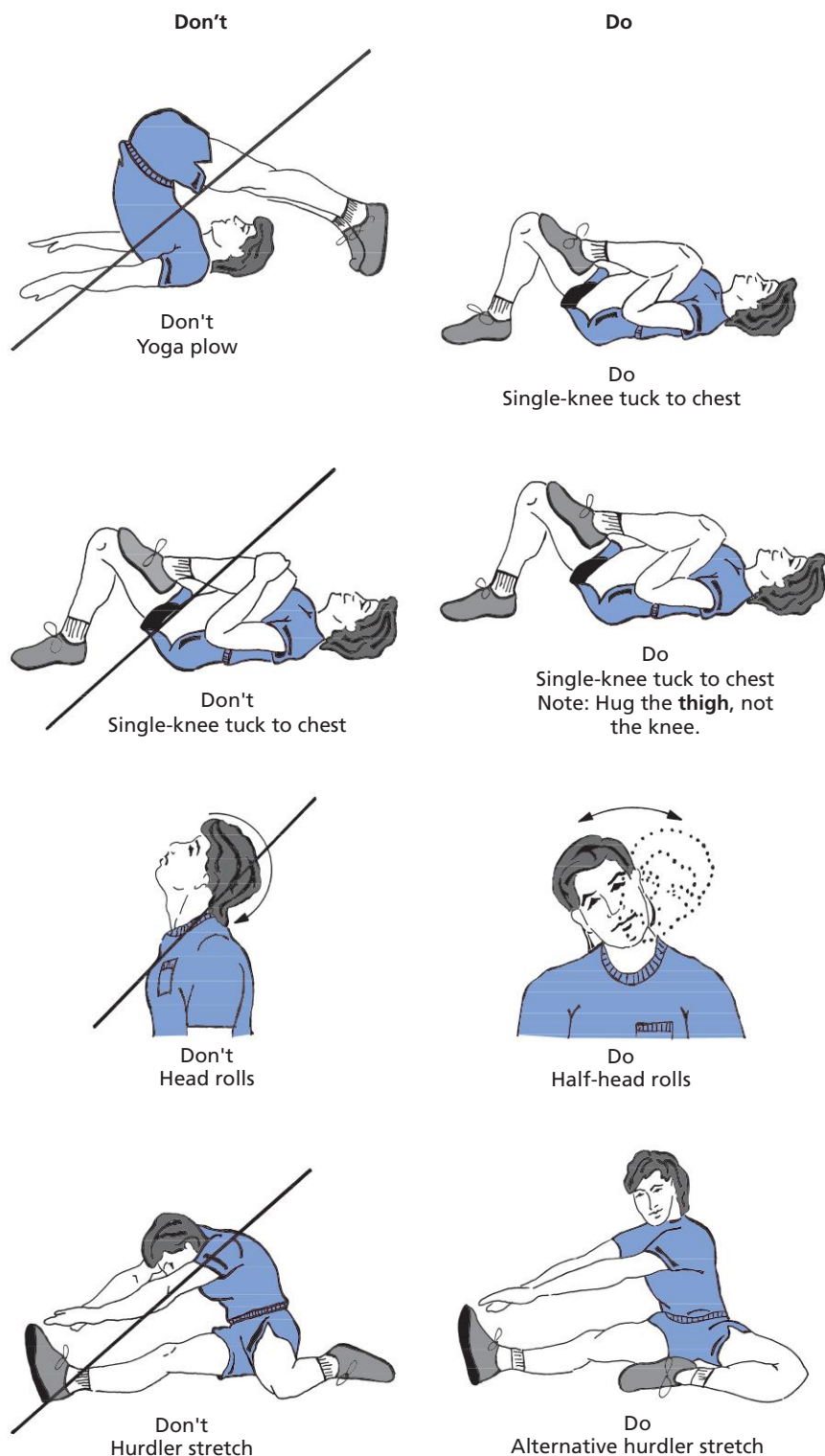
One way to get started in yoga or Tai Chi is to enroll in a class. Either can be learned at a beginning level in a few weeks of instruction, though mastery may take years. Instructional videotapes are available for home use and can be obtained at a video store. The Yoga Sun Salute, a series of yoga poses, is pictured and described in Lab Activity 3-2 for you to experience.

CONTRAINDICATED EXERCISES

A few stretching and toning exercises added to an aerobic program can promote balanced fitness by increasing flexibility in tight muscles and strengthening weak ones. However, not all conditioning exercises commonly done in classes or seen on videotapes are good for everyone. These potentially harmful exercises are labeled *contraindicated exercises*.

Realize that there are exceptions to these guidelines. Some individuals are well conditioned and able to minimize risk in these moves. For example, a competitive hurdler needs to practice hurdle stretches for the sport, and a dance or yoga student will have an instructor make sure that the positioning is safe. The body is able to move safely in many directions. For example, we are rarely injured by squatting down or bending over to pick up a shoe. Likewise an occasional standing toe touch will be harmless for most people, but if high risk moves are practiced repeatedly, day after day, the risk of injury increases, particularly in those with preexisting joint problems.

By studying people with aches and injuries, fitness experts have learned that some common stretching and



Contraindicated exercises.

FIGURE 3-3

toning exercises should be avoided. Others should be modified for safety and effectiveness. Be aware of which commonly done high-risk movements you should avoid and which high-benefit, low-risk exercises

you should do instead. Figure 3-3 shows some examples of each.

Your body is meant to move in many ways—to bend, twist, and stretch. Some people can do high-risk

Explanation

1. *Yoga plow*: Sometimes done as a back stretch, this exercise can injure discs, ligaments, and nerves in the neck and back. A better back stretch is a single-or double-knee tuck to the chest.

2. *Knee tuck to chest*: Hyperflexing the knee by pulling it to the body with the arms or hands placed on top of the tibia places undue stress on the knee joint. Note: The hand position should be *changed to hug the thigh rather than the shin*.

3. *Head roll*: Hyperextension can injure discs in the neck. Safer neck stretches include half-head rolls to the front, turning the head side to side so that the chin touches the right and left shoulders, and touching an ear to each shoulder.

4. *Hurdler stretch*: This stretch can cause groin pull, injure knee cartilage, and overstretch the medial collateral ligament—the one that helps stabilize the knee. It may also cause hip joint discomfort because the femur of the leg that is tucked behind is in a position of extreme rotation in the joint capsule. The alternative hurdler stretch safely stretches hamstrings.

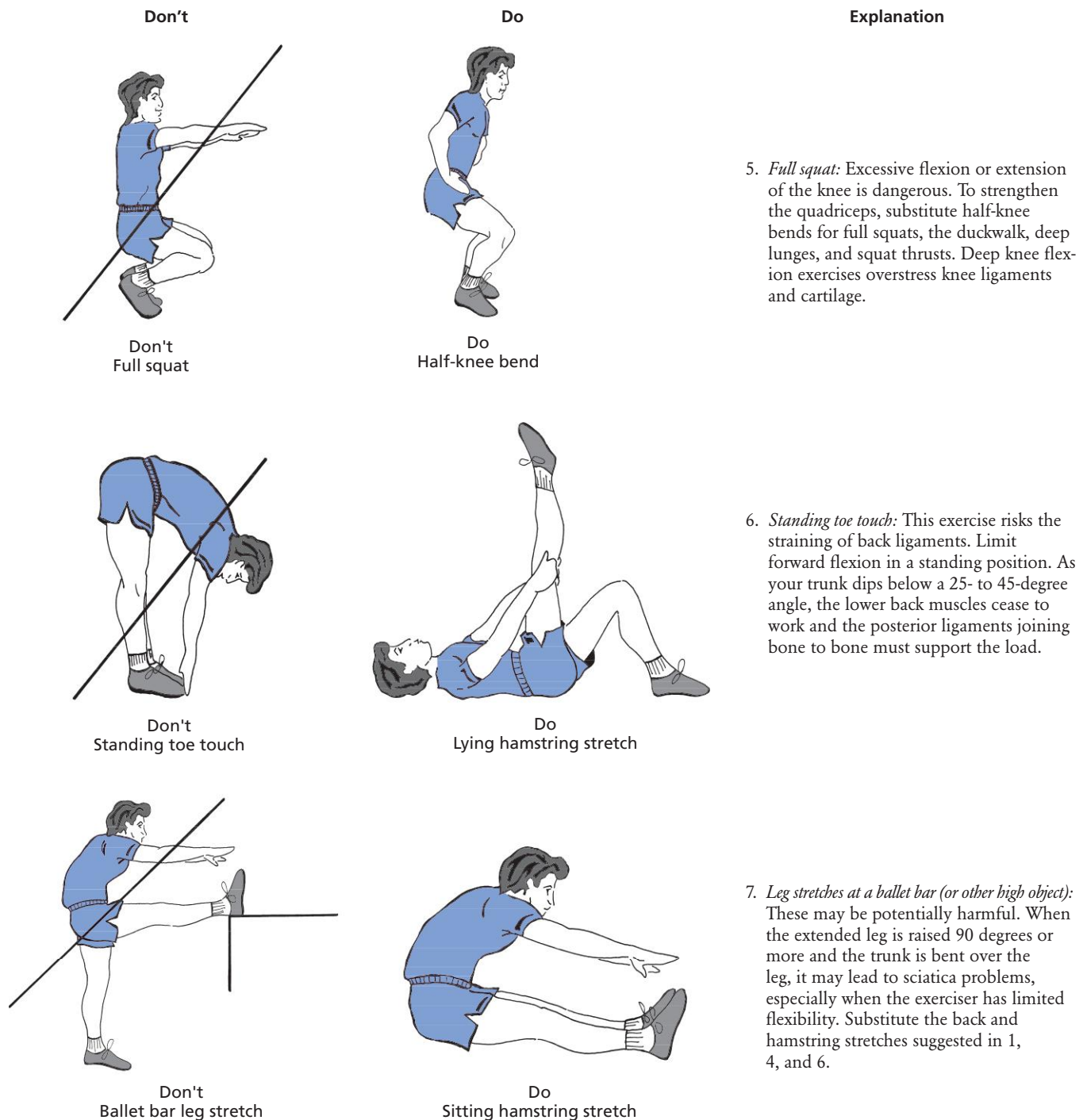


FIGURE 3-3

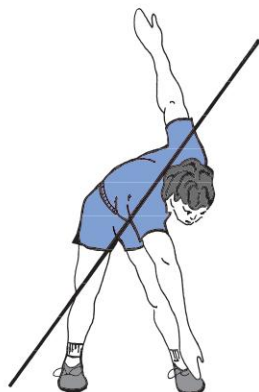
Contraindicated exercises. (continued)

exercises for years with no ill effects. For others, after only a few repetitions, injury occurs. You may not know into which category you fit until it is too late. The problem is that some movements increase risks to muscles, joints, and connective tissue. While you may need to do deep squats if you are a competitive weightlifter or a yoga plow if you are in a yoga class, these moves don't offer any special benefit for the fitness exerciser.

Low-benefit, high-risk exercises should be minimized in programs designed to emphasize personal fitness. Follow these general rules when exercising:

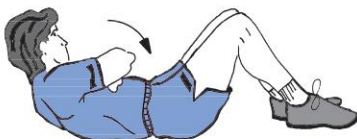
1. Do not hyperflex the knee.
2. Do not hyperextend the knee, neck, or lower back.
3. Do not apply a twisting or lateral force to the knee.
4. Avoid holding your breath during exercise.

Don't



Don't
Windmill toe touches

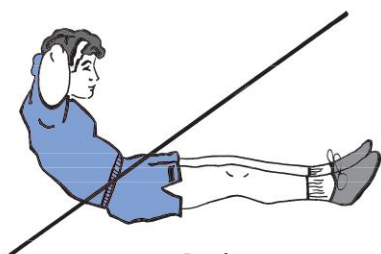
Do



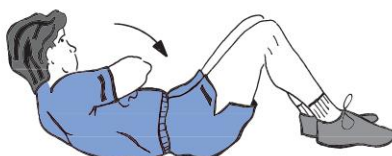
Do
Oblique abdominal curls

Explanation

8. *Leaning forward and twisting the trunk to the side:* These moves are particularly hazardous to the lower back, adding a shearing force to the stress on back ligaments. Avoid swinging hands and the trunk through the knees, windmill toe touches, waist circles, and elbow-knee lunges. There is no exercise you can do standing to tone your waist. The most effective exercise for reducing the waist is aerobic exercise and sensible nutrition. To tone oblique abdominals, the muscles that underlie the waist area, use twisting bent-knee abdominal curls. Lying on your back with heels close to your buttocks and crossing your arms across your chest (or with a hand touching each shoulder), curl the shoulders first toward the right knee and then toward the left knee.

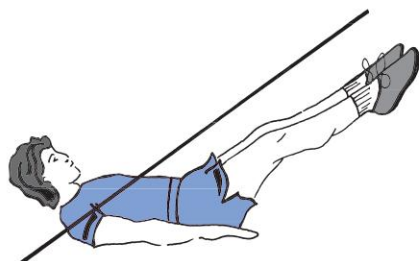


Don't
Straight-leg sit-ups

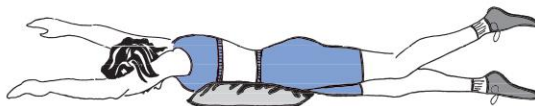


Do
Bent-knee abdominal curls

9. *Double-leg lifts, straight-leg sit-ups, and low leg scissors:* These do little or nothing to tone the abdominals. They tighten hip flexors, which in most people are too tight already, causing lordosis (swayback). They may also cause lower back strain. The most effective exercise for toning abdominals is bent-knee abdominal curls in which the lower back stays on the ground while the shoulders curl forward about 3 inches. To avoid jerking on the head or neck, cross your arms across your chest or behind your head with a hand touching each shoulder.

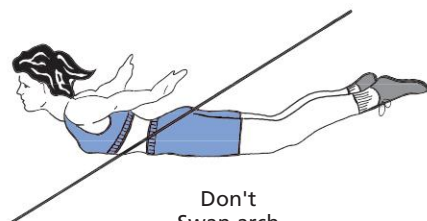


Don't
Double-leg lifts

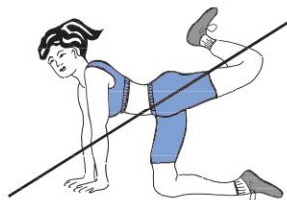


Do
Single arm/leg raises

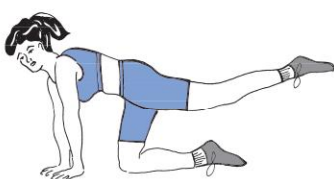
10. *The swan arch, prone double-leg raises, and yoga cobra:* These produce excessive back hyperextension and possible back strain. In a prone position, raise your right arm and the opposite leg a few inches off the ground and then switch; this will strengthen the back safely.



Don't
Swan arch



Don't
Donkey kicks



Do
Modified donkey kicks
(can be done with forearms on floor)

11. *Donkey kicks or fire hydrants:* Done on hands and knees with the back hyperextended, these may strain the lower back. To protect the back, hold your abdominals tight, round your back, and raise your leg no higher than 6 to 12 inches.

5. Avoid stretching long/weak muscles (e.g., abdominals) and avoid shortening already short/strong muscles (e.g., hip flexors). See common muscle imbalances in Table 7-2.
 - a. Most people should avoid aggravating common postural faults: forward head, dorsal kyphosis (rounded upper back), medial rotations of the thigh, and pronation of the foot.
 - b. Most people need to stretch the chest muscles, hip flexors, calves, hamstrings, lower back, and medial thigh rotators.
6. Avoid stretching any joint to the point of pain.
7. Be especially careful when using passive stretches with another person (unless the person is a physical therapist).
8. Avoid movements that place acute compressional forces on spinal discs, such as extending and rotating the spine simultaneously (e.g., trunk and neck circling and double-leg lifts).
9. Avoid movements that cause joint impingements or cartilage damage, such as arm circles in the palm-down position.
10. If the nature of your sport regularly requires the violation of good mechanics (baseball catcher



PRESCRIPTION FOR ACTION

You've read the chapter. Now go do one or more of these.

- ✓ While studying or reading the morning paper, sit on the floor and stretch hamstrings.
- ✓ While on the phone, do calf and quadriceps stretches.
- ✓ If you have a desk job, take a 5-minute stretch break every hour—do ankle circles, half head rolls, and shoulder stretches.
- ✓ After every hour of computer use, stretch wrists, back, and shoulders.
- ✓ While watching TV, stretch during commercials.

assuming a deep squat position or gymnast performing double-leg lifts), make certain the muscles are as strong as possible to endure the stress.



Frequently Asked Questions

Q. Is it possible to become too flexible? Is that a problem?

- A. It is possible for the muscles and connective tissue surrounding a joint to become too flexible. Joints are constructed to move within a certain range of motion. Excessive motion can damage tendons and ligaments and tear the joint capsule. Once a muscle has been stretched to its maximum length, further stretching will only loosen tendons and ligaments (which you do not want to stretch), which can cause joint instability and increase the risk of injury. There is a trade-off between flexibility and stability. The greater the joint's range of motion, the less stable the joint is structurally and the more it must rely on the muscles supporting it to control the range of motion. For example, the shoulder has relatively high flexibility compared with the hip, which has greater structural stability. Shoulder dislocation is fairly common; hip dislocation is not. If the muscles and connective tissue become very extensible, there is a measure of safety as long as there is sufficient muscular strength to control the movement. For example, gymnasts are very flexible but also develop strength to control that range of motion. If you wish to develop greater than average flexibility for a sport or physical activity, it is

important to strengthen the muscles that you stretch (and vice versa) for balanced fitness.

Q. What are the advantages and disadvantages of stretching with a partner?

- A. On the plus side, stretching with a partner adds a social element that makes it more fun. It's a good way to get to know your classmates if you stretch with different people. You can relax while your partner stretches you, so you may get a better stretch. On the minus side, you and your partner must communicate well to minimize the risk of overstretching, and stretching with a partner takes longer than stretching alone. A good compromise is to do a few partner stretches along with individual stretches.

Q. If I am short on time, is it better to stretch before or after exercise?

- A. When you stretch before exercise, the muscles tighten up again during the workout. After exercise, the muscles are warmer, more extensible, and stretching is easier. Also, if you stretch muscles during cool-down, the flexibility changes tend to be longer lasting (plastic elongation) than if you stretch before exercise.

Q. How important is stretching in my training program?

- A. Research does not conclusively demonstrate that stretching prevents injury. However, we tend to lose flexibility and move more stiffly as we age, and regular stretching prevents this loss. Maintaining youthful flexibility can enhance your ability to

perform daily activities, such as turning to look as you are backing up your car. It also enhances performance of athletic activities—making it easier to get a full stride as you run or a full reach in swimming. Being able to apply forces through a full range of motion gives more power to athletic skills.

Summary

Flexibility is an important asset in fitness and daily activities. It enhances the ability to move freely and easily, aids with posture and appearance, helps with recovery from injury, and can reverse joint stiffness and tightness that creeps up over time. Factors that affect flexibility include joint structure, soft tissues, inactivity, muscle temperature, age, genetics, gender, obesity or excessive muscle hypertrophy, injury and scar tissue, as well as neural factors. Flexibility gains are proportional to the overload applied, to the frequency, intensity, and time of

stretching. While static stretching is recommended for most fitness activities, dynamic stretches may be used for certain athletic activities, and both types may be done either passively or actively. Principles of flexibility development include progressive overload, specificity, reversibility, and balance. A series of stretches for basic fitness was given, as well as PNF partner-assisted stretches. Some potentially harmful or contraindicated exercises that put joints at increased risk of injury, and guidelines for identifying them, were also discussed.



Internet Resources

About, Inc.

<http://sportsmedicine.about.com/od/flexibilityandstretching>
Information about how and why to stretch, benefits and limitations, as well as sample flexibility routines.

American College of Sports Medicine

www.acsm.org
Information on sports research, health and fitness, aerobic exercise guidelines, and a quarterly fitness newsletter. “Current Comments” gives information on a variety of exercise topics of recent interest.

International Fitness Association

www.ifafitness.com
Provides information about physical fitness, strength training, types of stretching, and the physiology of stretching.

Mayo Clinic

www.mayoclinic.com
Videos on stretching for the office and slide shows showing stretching exercises.

Women’s Heart Foundation

www.womensheartfoundation.org
Information and illustrations on stretching as a part of warm-up; also general information on strength building and exercise safety.

LAB Activity **3-1**

Name _____ Class/Activity Section _____ Date _____

Introductory Flexibility Session

Equipment Needed:

Mat

Procedure

Read Chapter 3, warm up, and then complete these exercises as illustrated in Figure 3-1. Hold each stretch 10 to 30 seconds and repeat four times. You can tear out this lab and follow the exercise descriptions on the back of this page.

FLEXIBILITY EXERCISES

Exercise	Repetitions	Exercise	Repetitions	Exercise	Repetitions
A. Hamstring stretch	_____	D. Quadriceps stretch	_____	G. Deltoid stretch	_____
B. Lower back/hip flexor stretch	_____	E. Calf/Achilles stretch	_____	H. Pectoral stretch	_____
C. Spinal twist	_____	F. Iliotibial band stretch	_____	I. Triceps stretch	_____

See back of page for instructions.

Results

1. What stretches were the most challenging due to muscle or joint tightness?
2. What stretches were easiest for you? You will want to maintain this flexibility.
3. Considering your own tight or flexible areas, as well as the rule of specificity, which are the most important stretches for you to incorporate into your exercise program?

- A. Hamstring stretch
Sit and extend one leg in front, with the other bent and tucked as shown in diagram (a). Keeping shoulders erect, press abdomen forward. Hold. Repeat with other leg.
- B. Lower back/hip flexor stretch
Lie on your back with one leg straight and one bent. With hands behind thigh, press thigh toward chest. Keep extended leg straight. Repeat left.
- C. Spinal twist (lower back and hip abductors)
Sit with right leg extended, step left leg over right, and turn upper body toward left. Repeat on other side.
- D. Quadriceps stretch
Stand with right leg bent at the knee. With left hand, pull right heel toward buttocks. Keep shoulders up, abdominals tight, and hips tucked under to prevent back hyperextension. Omit if you have knee problems.
- E. Calf/achilles stretch
Standing in forward lunge position, toes pointing forward, press heel toward floor. Repeat with other leg. Bend back knee to stretch soleus.
- F. Iliotibial band stretch
Cross left foot over right, press hips to right. Repeat with other side.
- G. Deltoid stretch
Cross right arm in front of body and pull it in toward midline with left hand.
- H. Pectoral stretch
Place right hand on wall, with elbow extended but not locked. Twist shoulders left. Repeat with left arm.
- I. Triceps stretch
Pull left elbow behind head. Repeat right.

LAB Activity 3-2

Name _____ Class/Activity Section _____ Date _____

Hatha Yoga Workout: Sun Salutation (or Salute to the Sun)

Introduction: The Sun Salutation, one of the most popular yoga routines, is a series of 12 postures (poses) performed in a single, graceful flow. Each movement is coordinated with the breath. Inhale as you extend or stretch, and exhale as you fold or contract. Complete the instructions below and answer the questions. The Sun Salutation is on the back of this page. This is a tear-out exercise that may be used anywhere.

1. Go through the Sun Salutation routine slowly several times. One complete routine consists of two sequences: one for the right side of the body, and one for the left. Concentrate on the proper order of the poses during this initial practice session.
2. Now practice the routine concentrating on inhaling and exhaling at the correct time.
3. Describe how the arms and shoulders feel after going through this yoga workout.
4. Were you able to step each leg up between the hands in one movement on the Lunge pose?
Yes/No Discuss:
5. Were you able to press the heels of the feet down to the floor on the Downward Dog pose?
Yes/No Discuss:
6. What is your evaluation of the Sun Salutation as a strength and flexibility exercise routine?
7. Is there any way to make this routine aerobic? If so, how?
8. How could this routine help with stress management?

Sun Salutations

1
Mountain

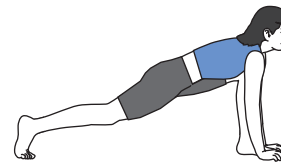
Stand with feet together, slightly pigeon-toed (big toes touching, heels apart), with your hands together, palm to palm, at heart level. Take several deep breaths. **Exhale.**

2
Slight Arch

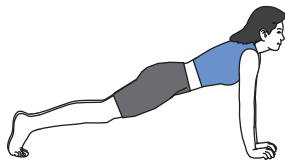
Inhale. Tighten buttocks, stretch arms upward, gently arching your back as far as feels comfortable and safe.

3
Standing Forward Bend

Exhale, while bending forward and downward, bringing your hands flat to the floor beside your feet, bending the knees if necessary. Touch head to knees, if possible.

4
Lunge

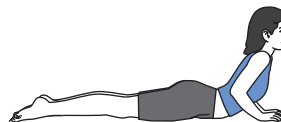
Inhale and step the right leg back in a wide backward lunge. Keep left foot between hands.

5
Plank

Exhale and step left leg back into plank. **Inhale.** Hold the position and breathe. Tighten abs.

6
Knees and Chest

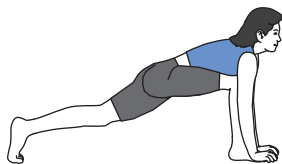
Hold your breath and lower the body in one unit, close to the floor. **Exhale** as you touch knees, chest, and chin to the floor. Lower hips, point feet and toes.

7
Cobra

Inhale, lifting your chest toward the sky, with elbows slightly bent and pressed into your ribs. Straighten arms as much as feels comfortable.

8
Downward Dog

Exhale, tuck toes under lifting hips up and bringing the body into inverted V. Align head with arms. Press heels down.

9
Lunge

Inhale. Lift head and step the right foot up between hands.

10
Standing Forward Bend

Exhale. Bring the left foot up and go into standing forward bend.

11
Slight Arch

Inhale. Rise slowly. Tighten buttocks, lift arms overhead, and arch back.

12
Mountain

Exhale. Return to position number 1. Repeat the sequence, stepping with the left leg.



Developing Muscular Fitness

4

Exercise is a gift you give yourself.
—Anonymous

Study Questions

You will have successfully mastered this chapter if you can answer the following:

1. What are the five benefits of and five cautions for resistance training?
2. What are the differences between training programs for strength and programs for muscular endurance?
3. What are the two basic types of muscular exercise? Give an example of each.
4. What are the three principles of resistance training?
5. What are the correct safety guidelines for weight training?
6. What are the four types of resistance training programs?
7. How does muscular fitness contribute to wellness?

You will find the answers as you read this chapter.



Visit the Online Learning Center for *A Fit Way of Life*, www.mhhe.com/robbinsfit2e, where you will find additional quizzes and other study aids.

Terms

- agonist
- antagonist
- atrophy
- concentric contraction
- constant resistance exercise
- dynamic (isotonic) exercise
- eccentric contraction
- fast-twitch muscle fiber
- hypertrophy
- isokinetic
- muscular power
- progressive overload
- repetition (rep)
- repetition maximum (RM)
- set
- slow-twitch muscle fiber
- static (isometric) exercise
- Valsalva maneuver
- variable resistance exercise

At one time physical fitness programs consisted almost entirely of strength and flexibility exercises. Then, in the 1970s, aerobic activities rose to prominence. As a result, strength and flexibility exercises were swept into the role of supplemental activities and added to the main workout only if time permitted. As people flocked to gyms to do aerobics, they were exposed to weight training and began to value the benefits of muscular fitness. Today, as the emphasis on balanced fitness grows, muscular fitness is assuming new importance. It can enhance the ability to perform daily tasks and athletic performance. Muscular fitness makes it easier to perform routine activities such as carrying groceries upstairs, lifting a child, and moving the couch. It is perhaps the most important fitness component for older adults because muscular fitness is essential for carrying out activities of daily living that help maintain functional independence. Enhanced muscular fitness allows us to perform vigorous activities with less risk of straining muscles or connective tissue, so it is important in the prevention and rehabilitation of injuries. This chapter covers muscular fitness benefits, cautions, principles, and guidelines, along with illustrated programs for developing this important fitness component.

MUSCULAR FITNESS

Many people start muscular fitness programs to look better, feel better, shape and tone muscles, or increase lean muscle mass. At the same time, they increase muscular strength and endurance. In this section, we examine benefits, muscle structure and function, general principles, safety, and specific exercise programs for muscular strength and endurance.

Resistance Training: Benefits and Cautions

An advantage of aerobic activities is their cardiorespiratory benefits. Resistance training can offer additional benefits whether your goal is health-related fitness or improved athletic performance.

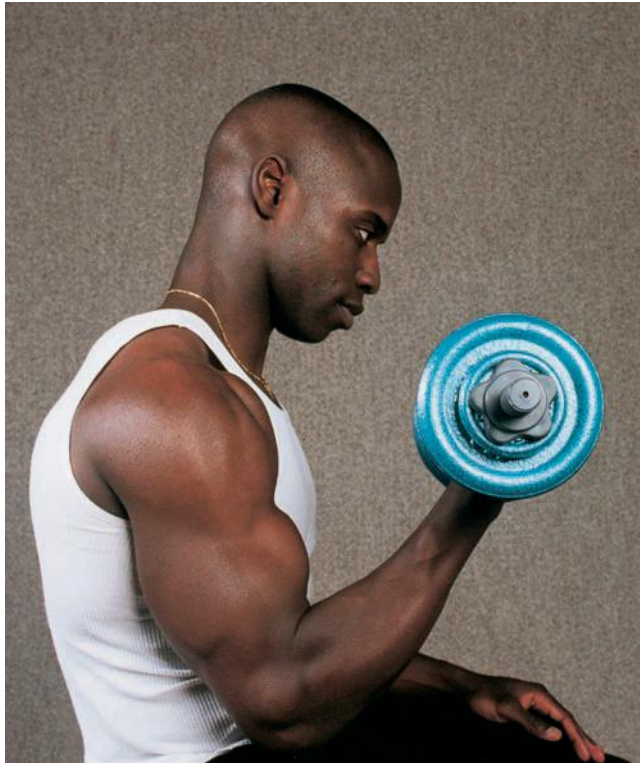
Weight Control The more muscle you have, the higher your metabolism is and the more calories you burn, even at rest. This is one reason men can consume

more calories without gaining weight than can women of equal size—the average male has roughly twice the muscle mass of the average female. Muscle is active, high-metabolic tissue, while fat is storage tissue. Resistance training increases muscle mass, which increases the rate at which you burn calories 24 hours a day, not just during the workout. This makes weight control easier. While women do not appear to gain as much muscle as men do from weight training, when differences in body size are taken into account, gains are comparable. Over a 4- to 6-month period, a man may gain 4 to 6 pounds of muscle, and a woman 2 to 3 pounds. Muscle is denser than fat and pound for pound takes up less space, so as muscle is gained, if fat is lost, the result is a loss of unwanted inches. While aerobic exercise and a nutritious low-fat diet are the quickest ways to reduce body fat, weight training does offer advantages for long-term weight control.

Weight Gain For those who wish to gain weight, increasing lean muscle mass, not fat, is a desirable goal, and there is no better way to do this than weight training. However, rate and quantity of muscle tissue gains vary from person to person because they are partially genetically determined. Those with a naturally tall, lean build tend to gain muscle more slowly than do those with a stockier build, and men gain faster than women do. A weight-gain program is outlined in the weight-training section for those who wish to increase lean weight.

Appearance Developing a lean, well-toned body is the main reason many people exercise. If you think that you need to lose weight, but your body fat percentage is in the average range, reevaluate. Weight loss alone does not give a firm, well-toned appearance to flabby thighs or abdominals. Resistance training is the most effective way to shape and tone muscles, resulting in a trimmer appearance. Posture improves when agonist and antagonist muscles are in balance. Strengthening weak muscles and stretching tight, inflexible muscles help develop good body alignment so that you move more fluidly and feel and look better.

Time Economy Instead of doing 50 leg lifts without weights, you can cut your workout time by adding resistance. Lift a weight heavy enough to produce fatigue in 8 to 12 repetitions, and you will get more benefit in fewer lifts. For basic muscular fitness, a balanced resistance-training workout of 10 to 12 exercises takes approximately 30 minutes to complete. Despite what you may observe in the gym, more is not necessary. While body builders, competitive weightlifters, and other strength-event athletes work out much more than this, keep in mind that they have different goals. Health-related fitness levels can be developed and maintained in much less training time than is needed for competition.



Resistance training is the most effective way to shape and tone muscles and is an important part of a balanced fitness program.

Energy Performance and efficiency improve with resistance training—more work can be done with less effort as muscular strength and endurance increase.

Athletic Performance Stronger muscles enable you to better control the forces of movement—self-generated and external—as well as your body position during activity. Improved muscular fitness contributes to skill-related components of balance, speed, power, coordination, and agility. All other things being equal, a strong person can run faster, jump higher, and throw a ball farther than can a weaker individual.

Injury Prevention Aerobic exercises such as jogging and aerobic dance have the potential to cause injury through repetitive, forceful impact against unyielding surfaces. Strong, flexible muscles and connective tissue can better withstand the stress of many forceful landings during a workout. When ligaments, tendons, muscle, and bone are strengthened through muscular exercise, the risk of injury is decreased. Many aerobic activities tend to develop strength in only a few groups of muscles, leaving others weak. For example, jogging strengthens the quadriceps but leaves the hamstrings weak. Weak muscle groups are more susceptible to strains or pulls. A well-designed resistance-training program develops balanced, proportional strength in agonists (prime movers)

and antagonists (opposing muscle groups). If injury does occur, it may be less severe and may heal more quickly if the muscle is well conditioned. A carefully designed program can also rehabilitate injuries to help you regain normal (or better) strength levels. For more detailed information on injury prevention, see Chapter 7.

Bone Strength Resistance exercises decrease the risk of osteoporosis. This is important not only for the elderly but for young people as well. Osteoporosis may cause a fracture at age 60, but it starts much earlier—in the teens and 20s. You need good exercise and eating habits to build adequate bone density. The pull of muscles on bone in weight-bearing exercise stimulates development of increased bone density and bone quality and preserves existing bone. Research indicates that intensity of lifting is clearly related to bone mineralization. Lifting relatively heavy weights in a few repetitions may be more effective in increasing bone mass than is lifting a light weight many times.

Flexibility Moving weights through a full range of motion, from full extension to full contraction, stretches and tones muscles. This is an important training technique to master to maintain flexibility. Muscles become short and tight if exercises are performed repeatedly through only a partial range of motion.

Balance Strong, fatigue-resistant muscles mean better balance during static and dynamic activities not only in athletics but in functional activities for people of all ages. Studies show improvements in balance for elderly people participating in strength training. This may translate into improved gait stability, decreased risk of falls, and reduced frequency of hip fractures—even for people in their 80s.

Cardiovascular Health Resistance training may enhance cardiovascular health by reducing several risk factors associated with cardiovascular disease. Studies show a decrease in resting diastolic blood pressure that is most significant in individuals with previously elevated blood pressure; decreases in exercise heart rate and exercise blood pressure; increased exercise tolerance; and modest improvements in blood lipid profile. Resistance training has also been shown to increase insulin sensitivity and decrease glucose intolerance in diabetic exercisers. Although little change in VO_{2max} occurs with traditional weight training, if a circuit weight-training program consisting of 10 exercises, 15 repetitions each, with a short (15 to 30 seconds) rest between is followed, modest improvements in VO_{2max} of 5 to 8 percent have been recorded.

Psychological Benefits While many people begin an exercise program to improve appearance, many other



THE NUMBERS

- 80% Adults who do not exercise for muscular strength or endurance.
- 30 Age at which the average person begins to lose muscle mass.
- 1–2% Strength lost yearly after the age of 30.
- 20–30 Minutes of exercise needed to strengthen all major muscle groups.
- 2–3 Days per week of strength training recommended for good health.

less visible but equally important effects may result. Benefits in the emotional dimension of wellness from regular exercise include feeling better, decreased stress, decreased depression, and enhanced self-esteem and self-confidence.

Social Benefits In addition to offering physical and psychological benefits, lifting with a partner or friend offers social benefits. There are many more opportunities for conversation and interaction when you work out with someone than when you watch a movie.

Benefits at Any Age Regardless of your age, you can benefit from resistance training. It is untrue that loss of strength is inevitable with age or that older people cannot gain strength. While the typical sedentary individual can lose up to 30 percent of his or her muscle mass between the ages of 20 and 70, this loss is more from atrophy due to disuse than from aging alone. Adequate levels of muscular strength are particularly important to older adults to maintain their functional independence and quality of life. Several studies including people in their 70s, 80s, and 90s participating in resistance training show that they

increased muscle mass, decreased fat, more than doubled their strength, and improved their functional mobility and ability to perform daily living activities.

Disadvantages and Cautions Although resistance training has many benefits, it does have disadvantages. Resistance training is not a complete exercise program because it does not develop cardiorespiratory endurance. As in any physical activity, injury is possible if you are careless or ignore safety procedures. You may have trouble accessing equipment. Also, you can expect some mild muscle soreness during the first week of the program.

Individuals with cardiovascular problems or high blood pressure should seek medical guidance due to the tendency of blood pressure to increase during strength training. Those who have hernias, arthritis, or lower back problems should also seek medical clearance. Individuals with these health concerns may benefit from resistance training but should be aware that they may need special exercise modifications.

Avoid use of hand and ankle weights during jogging, high-impact aerobic dance workouts, and other activities involving running and jumping. Ankle weights may distort proper form, increase stress to legs and feet, and increase the risk of strains and sprains. While small increases in oxygen consumption and caloric expenditure result from using light weights, the same effect can be produced with less risk by exercising longer or harder.

When used with controlled form and rhythm in a muscle toning or walking program, however, light weights are beneficial for increasing heart rate and muscular fitness in the upper body. All in all, resistance training offers few drawbacks and many major advantages for the time invested.



Resistance training benefits everyone. Greater muscular fitness improves performance of everyday activities and recreational and competitive sports.

Muscle Function

Muscles are made of individual muscle fibers bound together and sheathed in connective tissue. They end in a tendon that connects the muscle to a bone. An example is the Achilles tendon, which you can feel above your heel, connecting your calf to your foot. Muscle fibers can contract to shorten the muscle or relax and return to

their resting length. They are also elastic. They can be stretched and will spring back to their resting length.

Muscle fibers are classified into types based on their endurance, speed of contraction, and ability to exert force. **Slow-twitch (ST) muscle fibers** have high aerobic capacity but low power and are recruited primarily for endurance-type activities such as jogging. **Fast-twitch (FT) muscle fibers** are able to contract more quickly and generate more force but fatigue relatively quickly. They are important for short-burst, powerful activities such as sprinting and jumping. ST fibers are recruited initially during muscular contraction, and FT fibers are recruited when weight training becomes more intense and requires greater speed or force. The ratio of ST to FT muscle fibers is genetically determined and varies from one person to another. Resistance training increases the size and strength of both fiber types as well as their ability to exert force.

Muscles cannot expand and push. Movement is produced as muscle contracts, shortens, and pulls on bones across a joint. As a muscle on one side of a bone contracts, muscles on the other side must relax to allow movement to occur. The contracting muscle that initiates movement is called the **agonist**. The opposing muscle is called the **antagonist**. In a biceps curl (Figure 4-1), the agonist is the biceps and the antagonist is the triceps. In a triceps extension, the roles reverse. What is the agonist in a hamstring curl? What is the antagonist?

Determinants of Muscular Fitness Gains

Gains in muscular fitness result from neurological and muscular adaptations. Dramatic strength gains early in a program are often due to a “learning effect”—that is, you learn how to lift weights more efficiently. Your body represses its self-protective reflexes and increases its ability to recruit muscle fibers fully when needed.

Your overall potential for the development of muscular fitness is determined by many factors, including the types, number, and size of muscle fibers you possess and how well your muscular system can recruit them during muscular effort. The more muscle fibers you have, the larger they are, and the better your system is at

activating them during muscular effort, the greater your strength is. While the types and number of muscle fibers you possess are genetically determined, size and muscle fiber recruitment are a product of training.

Muscle Fiber Recruitment

When a muscle contracts, only the number of muscle fibers required for that momentary effort will shorten. Individual muscle fibers cannot contract partially. They are working as hard as possible or not at all. This is called the *all-or-nothing principle*. For example, when a biceps curl calls for a 50 percent effort, all fibers in the muscle do not contract at 50 percent effort; rather, a portion of the muscle’s fibers contract fully while the remainder rest. After these first muscle fibers contract, fatigue slightly decreases their ability to apply force. On each subsequent contraction, more fibers must be recruited to continue to lift the same weight. After several muscle contractions, enough fibers are fatigued that the muscle temporarily can no longer generate the same effort in what is called *temporary muscular failure*. Muscle fibers increase strength only if they are stimulated by intensity of effort. If your goal is to develop maximal muscular strength, try to recruit, or activate, as many muscle fibers as possible by working a muscle to a state of temporary muscular failure. If you are working for health-related fitness levels, a less intense effort is adequate.

Muscle Atrophy and Hypertrophy

Muscles adapt to the load placed on them. When the load increases over time, muscular strength and endurance improve. When muscles are not used, they grow weaker, stiffen, and **atrophy**, or shrink in size. A dramatic example of muscle atrophy occurs when a person has an injured limb in a cast for several weeks. When the cast is removed, the muscles of the affected limb are noticeably smaller. Increasing amounts of exercise over time are necessary to rebuild muscle strength, size, and flexibility.

When muscles are stimulated by an increased workload, they grow stronger and muscle fibers experience **hypertrophy**, or increase in size. This increase occurs in both men and women and is proportional to muscle mass. The average man has about twice the muscle mass of the average woman, so hypertrophy in men is more pronounced.

Gender Differences

Some women worry that they will develop big shoulders or massive, masculine musculature because of weight training. This myth is reinforced by televised images of women’s body-building competitions. Be assured that shoulder width, like hip width, is influenced by genetics and that significant muscle gains require hours of

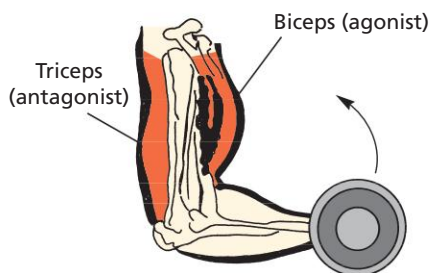


FIGURE 4-1

Biceps curl demonstrating muscle function.

strenuous weight lifting for many months. Dramatic muscle hypertrophy and masculinization can also occur with anabolic steroid abuse. Men have a greater potential for muscle hypertrophy than women do because men have higher levels of the sex hormone testosterone, which promotes muscle growth. Some of the strongest women athletes are gymnasts, who have very feminine physiques. Weight training is also popular with TV and movie stars who exercise to maintain a fit, toned appearance and help control weight. Be assured that massive muscles don't occur by accident or with a 20- to 30-minute muscle-toning workout twice a week.

Types of Resistance Training

Two basic types of muscular exercise are static (isometric) and dynamic (isotonic). Different resistance programs have been developed using each type of exercise.

Static (Isometric) Exercise

Static (isometric) exercise is exercise in which the muscle contracts but does not change length and little or no movement occurs. If you pushed your palms together hard, your pectoral muscles would contract and try to



Weight training can help maintain a fit, toned appearance and control weight.

shorten, but your arms would not move. An advantage of static exercise is that it requires little or no equipment and can be done almost anywhere—for instance, while sitting at a desk. However, these exercises are not widely used because resistance is applied at only one point in your range of motion, and thus strength development is limited. Also, it is difficult to know how much force is being exerted, and so strength gains are not as easy to observe as they are when equipment is being used. However, static exercises can be useful in strengthening muscles after an injury, when dynamic movement would be painful or even increase injury.

Dynamic (Isotonic) Exercise

Dynamic (isotonic) exercise is exercise in which the muscle contracts and shortens and movement occurs. Most daily activities, such as pushing, pulling, and lifting, are dynamic. Dynamic exercise programs can be done with free weights, exercise machines, elastic resistance, or calisthenics such as crunches and push-ups. Dynamic exercise involves two types of muscle contractions: concentric and eccentric.

In a **concentric contraction**, a muscle shortens as it overcomes resistance. For example, a weight is lifted as the biceps contract during the lifting phase of a biceps curl. **Eccentric contraction** occurs when a muscle lengthens and contracts at the same time, gradually allowing a force to overcome muscular resistance; for example, the biceps contract eccentrically during the lowering phase of a biceps curl. Eccentric contraction is a beneficial component of strength development because it makes up half of the muscular effort. The same muscles are involved in eccentric and concentric contractions, so lowering should be done in a smooth, controlled manner for maximal benefit and to prevent potential injury from dropping the weight.

Advantages of dynamic exercise are that it strengthens through a full range of motion, the load is measurable, and a variety of isotonic programs are available. Calisthenics, free weights, and machines such as Universal or Nautilus use dynamic exercise.

Two common types of dynamic exercises involve constant resistance or variable resistance. In **constant resistance exercise**, a constant resistance (weight) is used throughout the range of motion. However, the force needed to move the weight varies with leverage determined by the angle of the joint; that is, it increases or decreases as the load is moved through the range of motion. For example, with a biceps curl, it is easier to move the weight through the first and last thirds of the motion and harder through the middle third. The ability to lift a weight is limited by the amount of strength required to move it through this “sticking point.”

In **variable resistance exercise**, the force needed to move the weight is changed to provide a maximum load

throughout the range of motion. This requires special machines, such as Nautilus, that increase the resistance as the weight is moved through the ends of the range of motion where you are able to exert greater force.

Another type of dynamic exercise is **isokinetic**, in which the speed of movement is controlled. The advantage of isokinetic work is that the load applied mirrors the force exerted by the user while the speed remains constant. Isokinetic machinery is often used in rehabilitation and is not common in most fitness centers.

Both constant resistance exercise and variable resistance exercise are effective in developing muscular fitness. Different types of exercises and equipment have advantages and disadvantages, but the most important factor in fitness gains is a person's motivation and effort rather than the type of equipment used.

Principles of Resistance Training

Strength gains are proportional to the load applied and the frequency and intensity of effort. Basic principles of resistance training include progressive overload, specificity, and recovery.

Progressive Overload

Progressive overload is the most important principle of resistance training. To stimulate a muscle to increase strength or endurance, it must gradually be overloaded or forced to work at a higher than normal effort. Either the number of lifts (**repetitions**) performed or the amount of weight (load or resistance) must gradually be increased or recovery time between exercises must be decreased. Increasing the number of repetitions or decreasing rest increases muscular endurance. Increasing the weight lifted increases strength. General programs increase load and repetitions until a desired maintenance goal is reached.

You must exercise two to three times a week to improve muscular fitness. Significant strength gains require at least 8 consecutive weeks of training. To maintain strength, one intense workout is adequate for health fitness. Athletes need to train at least twice a week to maintain fitness in the off-season.

Specificity

The speed of contraction, range of motion, amount and type of resistance, and number and type of exercise are a few of the variables that determine the results of strength training. If you desire a specific result, such as an increase in muscle mass, your program must be designed and executed to produce that result.

Recovery

Exercise stimulates a muscle to take in more protein and nutrients and undergo changes that increase its ability to

contract forcefully. After a workout, you will be weaker, not stronger, due to fatigue. Improvement occurs during recovery, which gives the muscle fibers time to repair and grow. This requires more recovery time than for the cardiorespiratory system. Strength workouts are best done with 2 to 3 days of rest between sessions to allow recovery and improvement to occur. Lifting may be done more frequently, using a split routine with the upper body one day and the lower body the next.

Guidelines for Developing Muscular Fitness

In increasing muscular strength, endurance, or power, the key variables are resistance, repetitions, and speed. The purest example of strength is one maximal lift, and the closer a program comes to this, the greater the strength gains are. However, risk of injury is high when working at or near maximal levels. Athletes working to develop strength often exercise at 80 to 90 percent or higher effort a few (five to eight) times. Muscular endurance is enhanced by contracting repeatedly (e.g., one to two sets of 15 to 20 reps) with moderate (50 to 60 percent) effort.

There is some crossover effect between muscular strength and muscular endurance. Development of muscular strength also produces an increase in muscular endurance; for example, if you can lift a 100-pound weight 5 times, you can probably lift a 5-pound weight 20 times. However, muscular endurance does not enhance strength. If you can lift a 5-pound weight 20 times, you may not be able to lift a 100-pound weight even once. If you want to develop both muscular strength and endurance, a muscular strength program can provide double benefits.

Muscular power, a function of strength and speed, is the ability to apply force rapidly. Power is increased by performing a muscle contraction quickly, as in the plyometric exercises often used in athletics. While muscular power is not necessary for health-related physical fitness, it is an asset in many sports.

Guidelines for resistance training programs are summarized in Table 4-1. Optimal results can be obtained from any resistance training program, and risk of injury can be minimized if you follow the guidelines in Table 4-2.

Sequence

Ideally, first work large muscle groups and complex multiple joint exercises, ending with small muscle groups and isolated single joint exercises. It is difficult to exercise large muscle groups adequately if you have already fatigued the smaller supporting muscles. The suggested order of exercises is hips/legs, torso, arms, abdominals (see the sample weight-training program).

TABLE 4-1 *Guidelines for Resistance Training Programs*

	Muscular Endurance	Health Fitness	Bodybuilding (Weight Gain)	Muscular Strength
Frequency (workouts per week)	3–5	2–3	4–10	2–3
Resistance (% of 1 RM)	50–60%	70–75%	70–80%	80–90%
Repetitions	15–20	8–12	5–10	5–8
Sets	1–2	1–2	3–5	1–3
Rest between sets*	1/2–1 min.	1–2 min.	1–3 min.	2–4 min.

*Rest between sets may be decreased by alternating lifts using different body parts.

TABLE 4-2 *Safety Guidelines for Resistance Training*

1. Warm up before each workout and stretch afterward. Stretching before lifting impairs muscle performance.
2. Use good technique—keep your abdominals tight, back straight, hips tucked under, knees relaxed.
3. Work each exercise through a full range of motion from full extension without lockout to full contraction.
4. Perform each exercise smoothly, with control. Do not swing the limbs or use momentum. Faster is not better.
5. Before you lift, inhale. Exhale on the exertion. Do not hold your breath.

Form

- ✓ Never sacrifice form for weight. After progressive overload, correct exercise form is the most important (and most neglected) factor in maximizing strength gains and minimizing the risk of injury. Improvement is more rapid if correct technique, not only quantity of weight, is emphasized.
- ✓ Always work through a complete range of motion for flexibility and maximum strength gains. Move from full extension without lockout to full flexion.
- ✓ Keep your back straight and abdominals tight to protect your lower back.
- ✓ When doing standing exercises, keep the knees slightly bent and the hips tucked under to support your back.
- ✓ Avoid “cheating,” a breakdown in exercise form that occurs when extra muscles are used to complete the exercise, decreasing the load to the prime mover. Cheating occurs when the load is too heavy or you are fatigued. Remember: Quality of work is more important than the number of repetitions or amount of weight lifted.

Rest Between Sets

A **set** is a group of lifts followed by a rest period. For example, a person doing eight biceps curls has done one set of eight repetitions. A rest period between sets of an exercise should allow sufficient recovery so that good form

can be maintained. This time will vary, depending on the intensity of lifting with 1 to 2 minutes of rest recommended between sets of a health fitness program and 2 to 4 minutes between sets of a strength program. To make efficient use of time, you may alternate exercises on different body parts—for example, legs, then arms—so that one muscle group is recovering while you are working another.

Muscle Balance

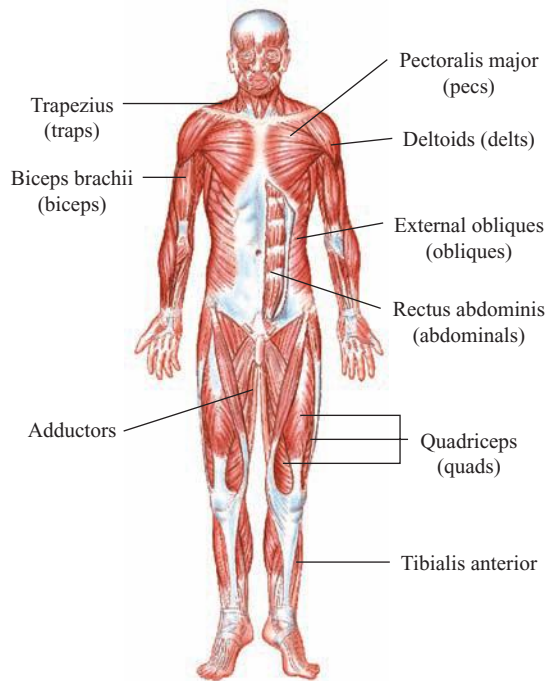
Muscles work in pairs, so it is important to strengthen muscles on both sides of a bone so that they pull evenly across joints and maintain body alignment. For example, if pectorals are stronger than upper back muscles, rounded shoulders result. When upper back muscles are strengthened, shoulders are naturally held erect. Tight lower back muscles opposed by weak, sagging abdominals pull the back into an exaggerated curve. This stresses lumbar vertebrae, increasing back fatigue and the risk of lower back pain. Well-toned abdominals support the back, improve appearance, and prevent back problems. Resistance programs must be planned to develop proportional strength in the following muscle pairs: biceps/triceps, pectorals/trapezius-rhomboids, abdominals/lower back, hamstrings/quadriceps, gastrocnemius/anterior tibialis, and deltoids/latissimus dorsi (Figure 4-2a and 4-2b).

Breathing

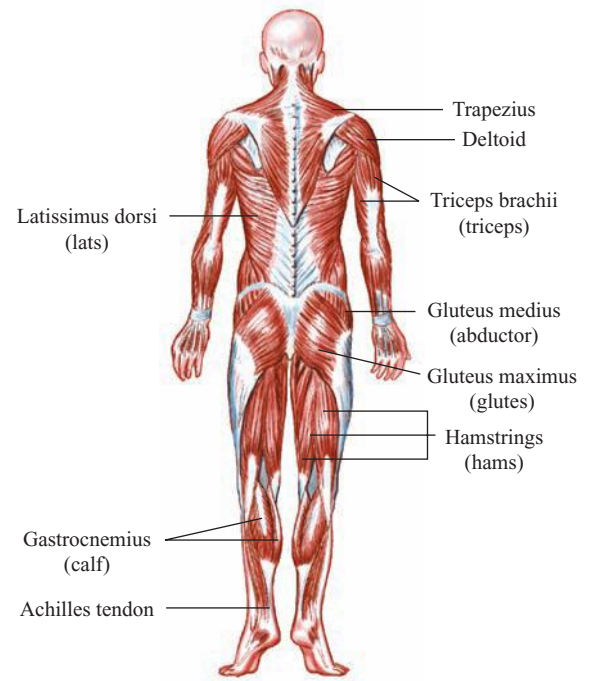
Exhale as you push or pull; inhale as you lower the weight. For example, on a biceps curl, exhale as you lift the weight and inhale as you lower it to the starting position. Holding your breath while you strain against a closed epiglottis is called the **Valsalva maneuver**. This can elevate blood pressure dangerously and cause dizziness or fainting.

Speed of Movement

Exercising in a smooth, controlled manner maximizes strength gains and reduces injuries. Take 2 seconds to lift (concentric or shortening contraction) and 2 to 4 seconds to lower (eccentric or lengthening contraction). Control the movement; do not fling, swing, or kick. Jerky movements will cause excessive wear and tear on your joints.

**FIGURE 4-2A****Major muscles of the body. Front.**

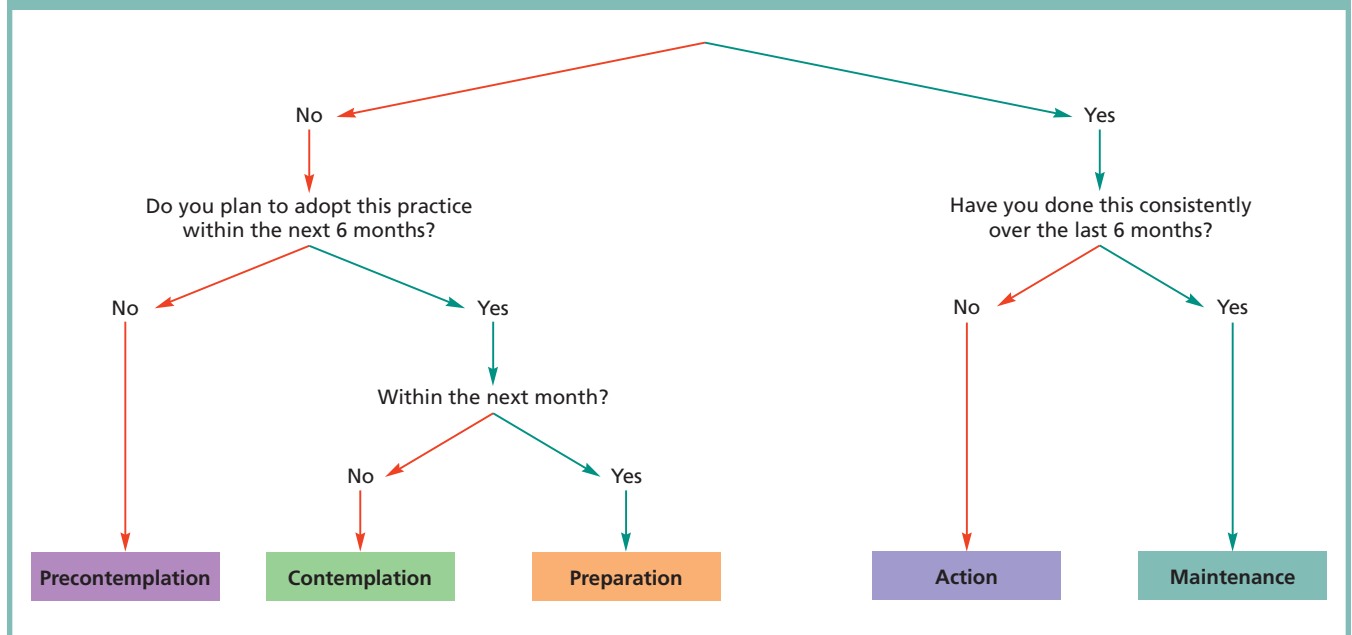
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**FIGURE 4-2B****Major muscles of the body. Back.**

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What Stage of Change Are You In?

Do you practice resistance training two to three times a week?
(exercise band, weights, calisthenics)



Also, when you use momentum to perform an exercise, you apply force and develop strength only through the first part of the movement. Lower a limb with the same control used to lift it. Do not drop weights with a crash. You are stronger lowering a weight than lifting it.

Resistance Training Programs

There are many types of resistance training programs. The type of program you select will depend on your goals and the type of equipment (if any) you plan to use. Four basic resistance training programs are shown in Table 4-3. Regardless of the type of program you select, you can keep track of your progress with the Resistance Training Log in Lab Activity 4-1 at the end of this chapter.

Weight Training

Weight training is a noncompetitive exercise program used to develop several health-related physical fitness components: muscular strength, muscular endurance, flexibility, and body composition. It differs significantly in its goals from the competitive sports of weight lifting and bodybuilding. Male, female, young, old, athlete, and fitness exerciser—all benefit from weight training. Beginners with low levels of muscular fitness benefit the most and will notice results more quickly than will experienced lifters. Weight training can build muscular fitness levels so that recreational, competitive, and daily

activities are accomplished more easily, with less strain and fatigue.

Equipment

For beginners, it really doesn't matter what type of equipment is used. A beginner will improve on almost any type of program as long as an adequate overload is provided. Two major types of equipment used in weight training are free weights and machines. Both have advantages and disadvantages:

- ✓ Free weights are far less expensive than machines, so you can have your own set at home. Free weights cost about \$100 on sale, double that if you add a padded bench and rack. Machines can cost upward of \$500 to \$5,000.
- ✓ You have more variety of exercises on free weights than on machines because you have the freedom to lift in so many different positions.
- ✓ Lifting with proper technique is crucial. A wrong move can cause injury with any lifting but particularly with free weights.
- ✓ To lift free weights safely, you must have a skilled spotting partner who can handle the weight in case you start to lose control.
- ✓ For muscular fitness development, free weights have an advantage over machines because they not only develop strength in the prime movers,

TABLE 4-3 Basic Resistance Training Programs

	Machines	Free Weights	Elastic Band	No Weights
Legs	Leg press Leg extension Hamstring curl	Squats Lunges	Squats Leg extension Hamstring curl Side leg lift Inner thigh lift Three-way leg pointer	Wall sit Lunges Partner leg extension Partner hamstring curl Partner inner/outer thigh press
Ankles, Calves	Toe press	Calf raise	Toe press Toe lifts	Calf raise Partner foot flexion
Chest	Bench press	Bench press	Push-ups	Push-ups Dips Partner elbow press forward
Shoulders	Military press	Military press	Deltoid raise	Partner overhead press
Back	Lat pull Rowing Back extension	Bent-over rowing Back extension	Lat pull Rowing	Partner lat pull Partner elbow press backward Core exercises
Abdominals	Abdominal curls	Abdominal curls	Abdominal curls	Core exercises
Arms	Triceps press Biceps curl	Triceps press Biceps curl	Tricep press Biceps curl	Push-ups Pull-ups Partner biceps curl

TABLE 4-4 *Preventing Injuries*

1. Never attempt to lift more than you know you can handle. Work out—don't show off.
2. Always make sure that the weight pins, bars, and collars are secure.
3. Don't lift weights alone. Always work with someone else.
4. Keep sweat wiped off your hands; it makes weights slippery.
5. When using free weights, work with a trained spotter.
6. Return all equipment to the proper place. Don't leave it lying around for someone to trip over.

but also develop balance and coordination by strengthening other muscles required to balance and control the weight.

- ✓ Machines such as Nautilus and Universal are easy to use and safer than free weights because they guide your movements and control the weights. An advantage of Nautilus equipment is that it provides variable resistance, adjusting the load for strength variations throughout a lift.
- ✓ Because of the cost of machines, it is best to start your machine-workout program at a health club or gym.
- ✓ Proper lifting technique is easier to learn on machines, and you won't need a spotting partner.
- ✓ Loads can be changed quickly, and so the workout may take less time than with free weights.

For safety, convenience, and time, machines have the edge. Whether you use free weights or machines, always follow the safety guidelines in Table 4-4 to minimize risk of injury.

Weight Room Etiquette

Be aware of and follow common weight room etiquette guidelines while working out:

- ✓ Wipe sweat off benches after use.
- ✓ Rerack weights when you are done.
- ✓ Let others work in between sets while you are resting. Don't lie around on the equipment chatting between sets if people are waiting to use the machine.
- ✓ Don't drop or bang the weights together. This can damage the equipment and increases the noise level unnecessarily.
- ✓ If you want to listen to music, wear a headset; don't play your music loudly.
- ✓ Exhale, don't grunt, while lifting.

Program for Health Fitness

A conditioning program should develop balanced strength. Many muscle strains occur because of weakness

TOP 10 LIST

Resistance Training Mistakes to Avoid

Resistance training is a great way to shape and tone muscles. If done wrong, however, it can elevate blood pressure and cause back strain, sore knees, or ankle sprain. Also, training mistakes slow your progress. Here are the most common errors to avoid:

1. *Holding your breath during lifting.* This can cause a dangerous increase in blood pressure. Exhale on exertion, inhale on release.
2. *Lifting too heavy a weight.* If you can't lift it with full range of motion with good form, lighten the load. Train, don't strain.
3. *Arching the back.* During the bench press or military press, this can strain back ligaments. Tighten abdominals and keep the back straight.
4. *Using momentum.* "Kicking" the weight up in the quadriceps extension or hamstring curl decreases the load through the full range of motion and slows progress. Bouncing or jerking a lift strains ligaments and indicates the weight is too heavy or you are getting too tired to lift smoothly.
5. *Doing reps too quickly.* Length of time a force is applied is a factor in muscle fitness. Lift for two to four counts and lower slowly for two to four counts for best results. Yes, it is harder than lifting fast. It takes fewer reps to get the same result compared to lifting fast.
6. *Not using full range of motion.* Strength is built only in the range of motion used. If you stop before the "sticking point," you are building muscle imbalances.
7. *Not wiping off sweat.* Sweat makes your grip slippery.
8. *Going too deep in squats or leg press.* This strains knee ligaments. Don't go below 90 degrees.
9. *Letting ankles roll out when legs are loaded.* This can cause ankle sprain. Keep ankles straight in squats or toe presses.
10. *Working only "problem" areas.* Or working the agonist but not its opposing antagonist. In other words, working biceps but not triceps or abdominals but not the back. This causes muscle imbalances, increasing risk of injury.

in the pulled muscle or its opposing muscle. A well-planned strength program prevents strength imbalances. If you exercised only problem areas, you would increase imbalances. Prime muscle movers, the muscle(s) mainly responsible for the joint movement, are listed and can be found in Figures 4-2a and 4-2b. The following exercises, listed in the order of large muscle groups and complex multiple joint exercises to isolated single joint exercises and small muscle groups, may be done on machines

(Figure 4-3). Free weight exercises are also described and illustrated (Figure 4-4). If you plan to use machines, your first workouts should include learning how to adjust and efficiently use the equipment.

Weight Training Exercises

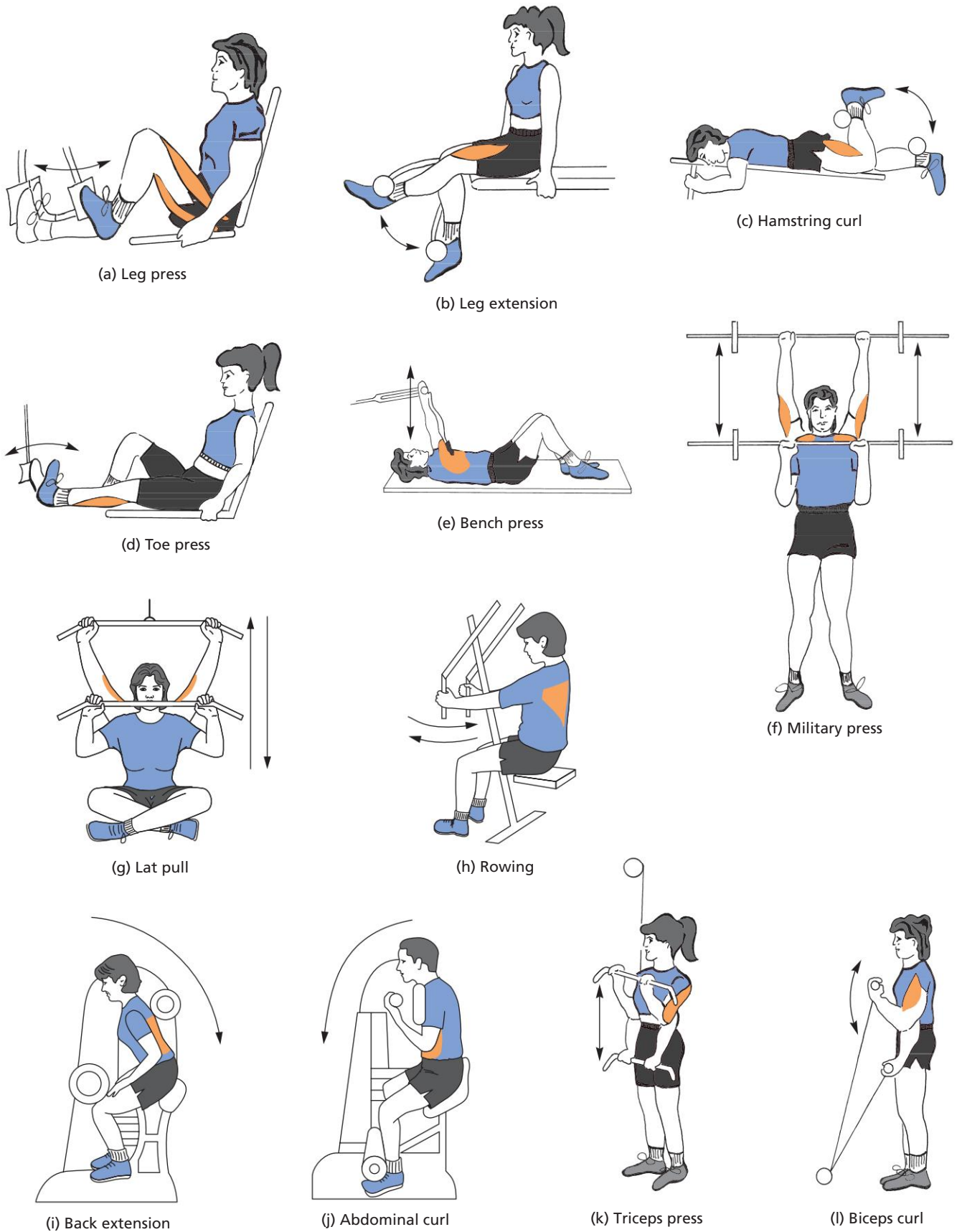
- A. Leg press
Prime movers: quadriceps, hamstrings, and gluteus maximus
On leg press, sit on seat, adjust position to last slot or to a 90-degree knee angle.
Place feet squarely on pedals, press out smoothly (do not lock knees), and return to starting position.
- B. Leg extension
Prime movers: quadriceps
Sit on bench with both feet under the rollers. Toe in slightly. Do not lie back.
Extend your legs, hold 1 second, and return to starting position.
- C. Hamstring curl
Prime movers: hamstrings and gluteus maximus
Lie face down on the bench, hook both heels under the rollers. Position knees at the pivot point where the rollers attach to the bench. Pull up to 90 degrees, hold for 1 second, and return to starting position.
- D. Toe press
Prime mover: gastrocnemius
On leg press station, place feet squarely on pedals, press out to full leg extension without knee lockout. Press with toes from flat-footed position to foot extension and return.
- E. Bench press
Prime movers: pectorals and triceps
Lie on bench, head next to the machine. The grips should be lined up approximately with the shoulders. Place your feet flat on the bench with knees bent and back flat. Press to extension and return. If you tend to have shoulder problems, lower the bar to only 4 inches above your chest, then extend.
- F. Military press
Prime movers: deltoids and triceps
Sit on the stool or stand with abdominals tight, back flat, and knees slightly bent. With shoulders close to handles, extend upward with arms until they are straight but not locked and return.
- G. Lat pull
Prime movers: latissimus dorsi
Grip bar directly above shoulders or at handles. Pull down until you are kneeling or sitting. From this position, pull down to chest and return.
- H. Rowing
Prime movers: rhomboids, latissimus dorsi, and biceps

Sit on the machine with arms almost fully extended. Pull back as far as possible, drawing shoulder blades together. Return to starting position.

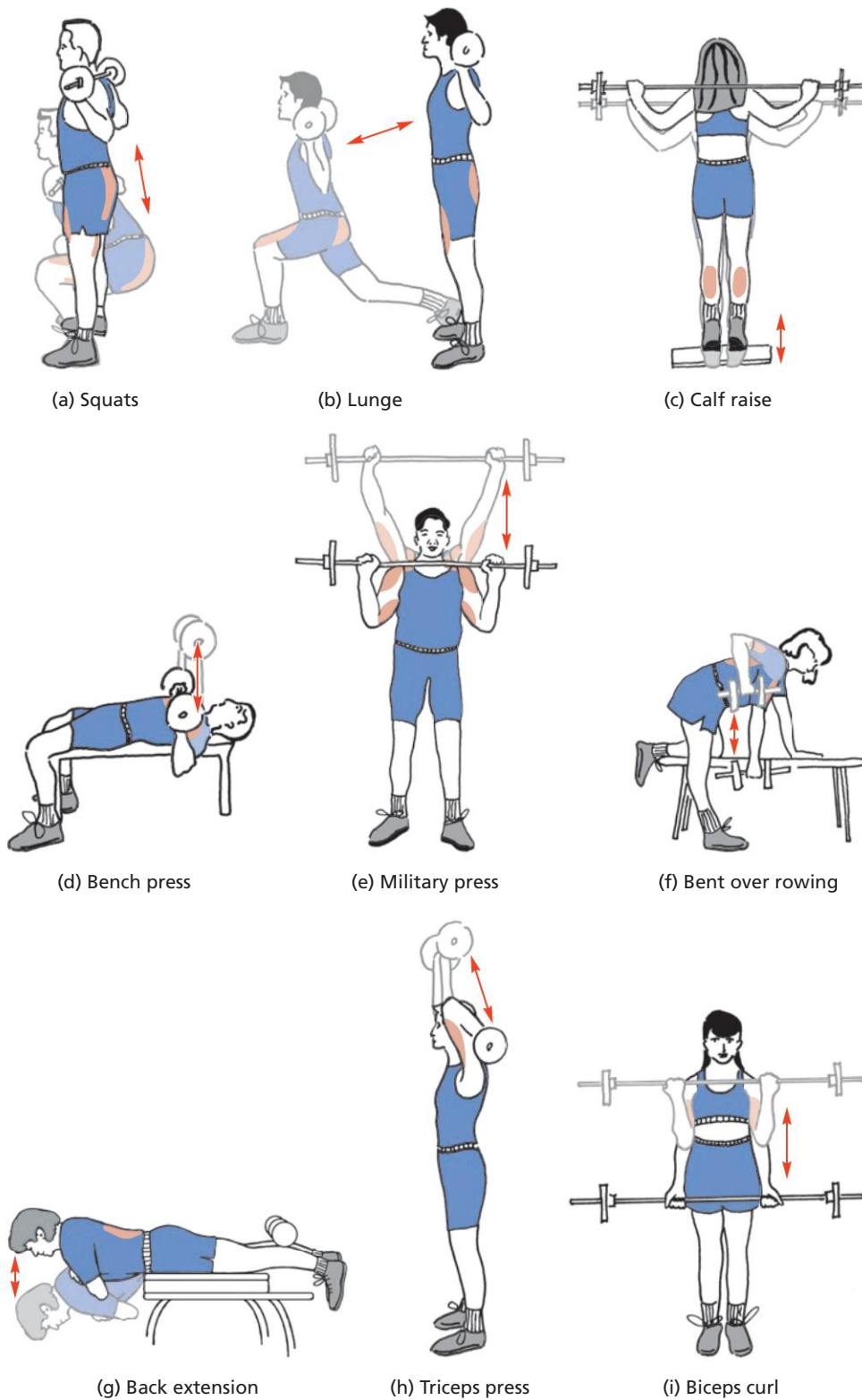
- I. Back extension
Prime movers: erector spinae, gluteus maximus, and quadratus lumborum
Sit on the machine with back against upper back pad and feet under ankle rollers. Fasten hip belt if one is available to keep hips from lifting or sliding out of position. Slowly extend trunk back fully and slowly return to starting position.
- J. Abdominal curls
Prime movers: abdominals and hip flexors
Sit with pad on upper chest, knees flexed, and feet on footpad. Use seat belt if provided to keep hips from lifting off seat. Flex trunk as far forward as possible. Return slowly to starting position.
- K. Triceps press
Prime movers: triceps
Stand facing lat bar. With palms facing down, grasp the bar so that hands are shoulder width apart. Keep elbows at waist. Press down to extension and return.
- L. Biceps curl
Prime movers: biceps
Stand facing the weights, hold bar with both hands, palms up. Flex arms until the bar meets shoulders. Return to starting position. Keep back straight, abdominals firm.

Free Weight Exercises These exercises (Figure 4-4) may be done with a set of barbells or hand weights. Practice each move without weights before attempting weighted sets. Free weights provide additional challenge over machines because balance and coordination are developed in addition to strength. Strict attention to lifting form is critical because with free weights, a moment's carelessness can cause an injury. Always work with an experienced spotter in case you have difficulty. When possible, use power/squat racks with adjustable supports for added safety. To protect the back, you need to keep abdominals firm, back straight. Breathe continuously; do not hold your breath.

- A. Squats
Prime movers: gluteus maximus, quadriceps, and hamstrings
Start standing upright with the bar resting on your shoulders. Keep the head up, abdominals tight, back flat, feet a bit wider than your shoulders. With back straight, slowly lower hips until tops of thighs are parallel with the floor. Pause. Drive up with legs and hips to the starting position.
- B. Lunge
Prime movers: gluteus maximus and quadriceps
Standing upright with the bar on the shoulders off the neck, abdominals tight, back flat, step forward

**FIGURE 4-3**

Weight training exercises.

**FIGURE 4-4**

Free weight exercises.

(or backward) until the front thigh is parallel with the floor. The front knee should be over the ball of the foot. Keeping back straight, take a controlled step back to the starting position.

Repeat with the opposite leg. This exercise requires considerable balance. You may wish to start first with dumbbells and progress slowly to use of a barbell.

- C. Calf raise
Prime mover: gastrocnemius/soleus
Place bar on shoulders, position balls of feet on board and heels off board. Press up onto balls of feet, then lower with control. Knees straight tones gastrocnemius, knees bent tones soleus.
- D. Bench press
Prime movers: pectorals and triceps
Lie with head and buttocks on bench, feet stabilized on ground for balance and safety. Grip about 4 inches wider than shoulders, palms under bar (pronated). Lower bar to chest. Focus eyes up to the sky; do not watch bar. Elbows should be directly under bar and forearms perpendicular to ground. Do not let bar slide to the neck. Press to extension and return.
- E. Military press
Prime movers: deltoids and triceps
Sit on bench or stand. With barbell on chest, press upward with arms until they are straight overhead but not locked, and return.
- F. Bent-over rowing
Prime movers: rhomboids and latissimus dorsi
Stabilize one knee and hand on a bench; opposite hand holds the weight, and foot is flat on the floor. Pull elbow up and in toward the spine.
- G. Back extension
Prime movers: erector spinae, gluteus maximus, and quadratus lumborum
Lie with your hips on the seat pad and ankles under the ankle rollers, arms crossed across chest. Slowly extend trunk to a horizontal position, hold 3 to 5 seconds, and slowly lower to starting position. After you can easily do 15–20 repetitions, you may increase resistance by holding light hand weights to your chest.
- H. Triceps press
Prime movers: triceps
Standing with abdominals firm, feet apart for stability, grip the weight, palms up, and keeping elbows near the ears, slowly lower bar behind the head. Pause, then press until elbows are fully extended.
- I. Biceps curl
Prime movers: biceps
Grasp bar, palms up, holding bar about thigh level. Bend elbows, moving bar in an arc toward shoulders. Pause, and slowly return to starting position.

How to Begin and Progress

According to the ACSM, basic health fitness benefits can be obtained by lifting in a single set of 8 to 12 exercises. If time permits, you may choose to do multiple sets for optimal muscle fitness and muscle growth. A

minimum of two to three intense workouts a week is recommended.

The first week, a beginner should lift for one set of 8 to 12 repetitions under the supervision of a trained professional. The first workouts should use light weights and concentrate on form, rhythm, and breathing. This will also minimize muscular soreness. The second week, an additional set can be added if desired, and the third week, a starting load can be established. Other weight training programs for goals of increasing muscular endurance, strength, or size are given in Table 4-1.

Establishing Your Workload

After several weeks of conditioning and working on lifting form, you may establish an appropriate workload. For each exercise find the maximum amount of weight you can lift once with good form (**one repetition maximum** or **1 RM**). In a general conditioning program, 75 percent of that weight will be your workload. In the workout, lift to fatigue at each station. If you can do fewer than 6 reps, the weight is too heavy. If you can do 12 or more reps at that load, the weight is too light. Increase or decrease the load in the next workout, if necessary. At the correct workload, the last 2 reps of each exercise should be difficult for you to do, and you should reach temporary muscular failure between 8 and 12 reps.

Increasing Your Workload

When you can do 12 reps, increase the amount of weight. If you can do at least 6 reps at the new weight, stay with that weight until you can do 12 reps. If, when you increase the weight, you cannot do at least 6 reps, drop back to your old weight and increase the number of reps each time until you can do 15. You should then be able to increase the weight and do at least 6 reps. In general,

- ✓ Increase only one variable at a time (reps, sets, resistance).
- ✓ Increase reps or sets first, then resistance.
- ✓ When increasing resistance, decrease reps.
- ✓ To increase muscular endurance, increase the number of reps or sets or decrease rest between sets.
- ✓ Increase the workload by no more than 5 to 10 percent each time.

Variety

You can incorporate variety into your workout by changing the workload, recovery period, number of sets, reps, rhythm, and number or order of lifts. Here are a few examples of different programs, and see Internet Resources at the end of this chapter for further ideas.

1. *Health fitness*: One to two sets of 8 to 12 reps at 70 to 75 percent 1 RM. Rest 1 to 2 minutes between sets.

2. *Muscular strength*: One to three sets of 5 to 8 reps at 80 to 90 percent 1 RM. Rest 2 to 4 minutes between sets.
3. *Muscular endurance*: One to three sets of 20 reps at 50 to 60 percent 1 RM. Rest 30 to 60 seconds between sets.
4. *Bone strength*: Two to three sets of 8 to 12 reps at 70 to 85 percent 1 RM. Rest 2 minutes between sets. Do 2–3 times per week.
5. *Eccentric emphasis (negatives)*: Lift for two counts, lower for eight. Some experts say that lowering the weight is more important to strength development than is lifting it. This does tend to promote more muscle soreness. Strength increases occur with eccentric lifting alone, and because you can lower more weight than you can lift, you may need to increase resistance.
6. *Supersets*: Work opposite muscle groups immediately (triceps/biceps, hams/quads).
7. *Continuous set*: Lift to muscular exhaustion at your regular weight, lower one plate and lift to exhaustion, and continue to lower weight as you fatigue. This is a type of muscular endurance program. It is supposed to increase muscular definition. It can be done with machines but is difficult with free weights.
8. *Pyramid*: Lift 6 reps at 70 percent 1 RM, 4 reps at 80 percent 1 RM, 2 reps at 90 percent 1 RM, 1 rep at 100 percent 1 RM. This program emphasizes strength.
9. *Split routine*: Work upper body one day and lower body the next day or do pushers (e.g., quads, triceps) one day and pullers (e.g., hams, biceps) the next. You must work 4 to 6 days per week. This reduces total body fatigue but requires more time.
10. *Aerobic circuit*: A circuit is a group of exercises performed with little rest after each. Lighten weight to 40 to 60 percent of 1 RM. Lift quickly 30 seconds (15 to 20 lifts), recover for 15 to 30 seconds, while switching to the next station and setting the weight. Perform an upper body, lower body, and core exercise with no rest in between, then an aerobic exercise for 1 minute (cycle, jump rope, jumping jacks). Begin with one set of 10 to 12 exercises and work up to three sets, maintaining a target pulse. This is designed to strengthen the heart as well as develop muscular endurance. Be careful to maintain good form—it is easy to get sloppy and hurt yourself in this workout because the lifting rhythm is so quick.
11. *Muscle size (weight gain) program*: A bulk-up of three to five sets of 5, gradually increasing to 10 reps at 70 to 80 percent effort should be performed for several months to increase lean weight.

Common Discomforts and Training Errors

After lifting for a few weeks, you may notice a buildup of callus on your palms. If it bothers you, lifting gloves will offer some protection. If you experience nausea or light-headedness, stop and figure out the cause.

- ✓ Did you allow enough time since your last meal?
- ✓ Are you exhaling on the effort?
- ✓ Are you trying to progress too quickly?

If you experience pain, particularly joint pain, pay attention. It could be an early warning sign of injury. You may be lifting too heavy a weight or stressing your joints with poor form. Lifting too heavy a weight leads to poor form and increases the risk of injury. Jerking, straining, holding your breath, using momentum, bouncing, and arching the back are problems that need to be corrected. Have a professional check your form periodically to make sure you are not falling into bad habits.

Performance Aids

Many people take nutritional supplements or try other products that claim to increase strength, build muscle, or reduce fat. Unfortunately, most of these products do not live up to their advertised claims and are a waste of money, and some are even potentially dangerous. Table 4-5 lists several performance aids used by weight trainers and their effects and side effects. See “Drugs Affecting Physical Performance” in Chapter 6 for further information.

How to Shape and Tone Without Weights

There are many ways to develop muscular strength and endurance. While weight training is an excellent program, it is not always convenient. The programs described next can be done at home or while traveling. The abdominal and core strengthening, hip and thigh, and upper body programs require no special equipment. Partner exercises add a social dimension to a workout. Elastic resistance produces results without bulky equipment and is easy to take with you for exercise on a trip.

While weights add intensity to a workout, they are not always necessary when the goal is to shape and tone. Muscles develop firmness by working against a resistance, and that resistance can be your body weight. These programs emphasize muscular endurance rather than strength by increasing time in contraction or reps. Core trunk muscles in particular benefit from a muscular endurance routine because their function is one of endurance—sustained contraction. If you would like a total body program, combine this with the upper body routine that follows.

TABLE 4-5 *Performance Aids Promoted to Weight Trainers*

Substance	Advertised Claim	Effects/Side Effects
Amino acid and protein supplements	Muscle growth	May cause unbalanced protein metabolism, dehydration, gout, liver and kidney disease, calcium excretion
Anabolic steroids	Increased muscle mass, strength	Increased muscle mass, strength, aggression, testicular atrophy, acne, impotence, masculinizes women (see Chapter 6, Exploring Special Exercise Considerations)
Caffeine	Increased endurance	Increased endurance, nervousness, tremors
Chromium	Muscle growth	No effect on body composition or strength
Clenbuterol and beta 2 agonists	Increased muscle mass, cuts fat	Rapid heart rate, tremor, anxiety, headache, no proven effect on strength or endurance
Creatine monohydrate	Increased energy, muscle growth	Increased power in short-term high-intensity exercise, weight gain, muscle cramps, increased risk of heat stroke, decreased endurance
Ephedrine and other stimulants	Increased energy	Anxiety, tremor, cardiac arrhythmia Increased risk of heat stroke due to cardiac and central nervous system effects
Growth hormone	Increased muscle size, strength	Slight increase in fat-free mass and water No increase in strength or endurance Acromegaly, diabetes, hypothyroidism
HNB (beta-hydroxy beta-methylbutyrate)	Enhanced strength and body composition	No benefit for strength or body composition in trained individuals
Megadose vitamins	Increased energy, strength	No benefit (see Chapter 9, Eating for Wellness) Excess water-soluble excreted Excess fat-soluble can be toxic Excess of one vitamin may decrease absorption of others

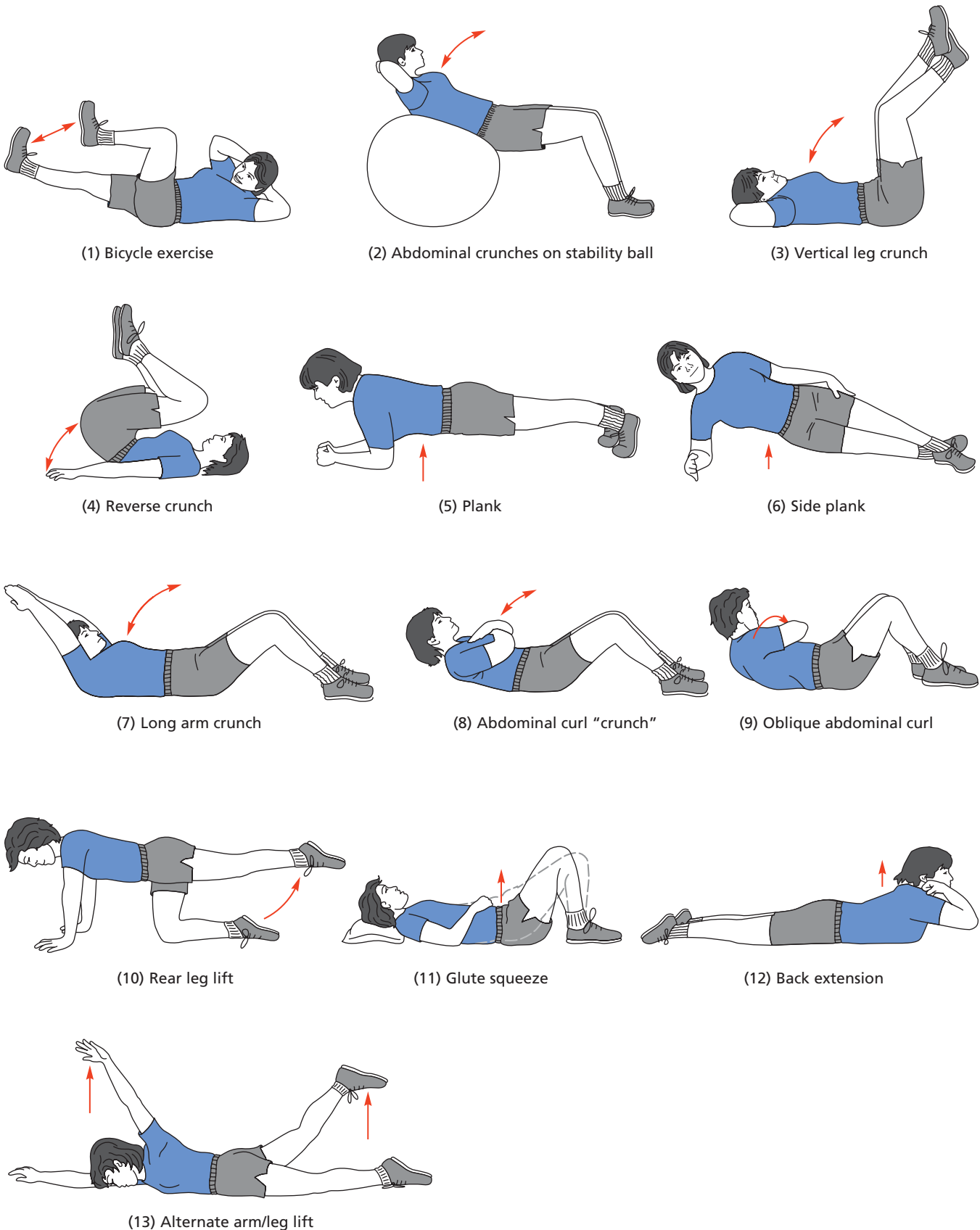
Abdominal and Core Strengthening Exercises

Core trunk stabilizers include all the trunk muscles—the abdominals and the hip and back muscles—which support the body, hold us upright, absorb and transmit forces, and enable us to twist, turn, and bend. Trunk strength is important because it provides a base of stability and power from which the arms and legs work. Most functional movements originate in or rely on trunk stability for efficient performance. Weakness in the trunk musculature increases stress on joints, ligaments, and tendons; impedes performance; and increases the risk of injury. Strong core stabilizers make the body more efficient and decrease the risk of back pain or injury. They also improve posture, appearance, breathing, and athletic performance.

A set of strengthening exercises for abdominals (1–9), gluteus (10, 11), and back muscles (12, 13) is shown in Figure 4-5. The exercises should be performed at a slow, steady pace with equal effort in both directions. Lift two counts and lower two counts—don't just lift and fall out of the contraction. The abdominal exercises chosen include those listed as most effective in a study by Peter

Francis at San Diego State University. Core muscles can be worked 3 to 5 days a week because they are endurance muscles designed for sustained contraction. You will want a mat or carpeted surface to work on.

1. Bicycle exercise
Lie on your back with hands behind your head. Raise knees to a 45-degree angle and slowly do a bicycle pedal motion as shown in Figure 4-5 (1). Touch right elbow to left knee and left elbow to right knee.
2. Abdominal curl “crunch” on stability ball
Lie on stability ball with feet flat on floor, thighs and trunk parallel to floor. Cross arms behind shoulders or across chest; contract abdominals by raising trunk about 45 degrees. Spread feet apart for better balance. To work obliques more, bring feet closer together.
3. Vertical leg crunch
Lie on your back with legs raised in the air, knees slightly bent and crossed at the ankles. Cross hands behind the shoulders to support the head. Keep chin lifted to prevent jerking the head. Lift the trunk and slowly lower.



Abdominal and core strengthening exercises.

FIGURE 4-5

4. Reverse crunch
Lie on your back with ankles crossed, feet off the ground, and knees at about a 90-degree angle. Place arms on the floor beside your trunk. Press lower back to the ground, contract the abdominals, and rotate hips 1 to 2 inches. Your feet will lift slightly toward the ceiling with each contraction.
5. Plank
Lie as in Figure 4-5 (5), face down, propped with elbows under chest, palms down. Lift up on toes and tighten back and abdominals, keeping body straight and head and spine neutral. Hold 10 to 60 seconds, rest, repeat. If a straight-back position is too difficult, begin with hips hiked up or hold the contraction a shorter amount of time. Do not let the hips sag.
6. Side plank
Lie as in Figure 4-5 (6) on side with weight balanced between forearm, palm, and feet. Keep elbow directly under shoulder to avoid irritating the rotator cuff. Contract back and abdominals to hold body straight. Do not push hips out behind the body. Hold 10 to 30 seconds, rest, repeat on the other side. If a full-body position is too difficult, begin with the half-plank, balancing weight between knees and forearm. For an advanced version, try lifting the top foot in the air for 5 to 10 seconds.
7. Long arm crunch
Lie on your back with knees bent and heels next to buttocks. Extend arms alongside your ears, chin raised, eyes focused on ceiling. Contract abdominals, keeping lower back to floor, lift shoulders as for a basic crunch, lower slowly.
8. Abdominal curl “crunch”
Lie on your back with knees bent, heels next to buttocks. Place hands across chest or behind shoulders. Keep eyes focused on ceiling, chin up and about a fist distance from your chest. Contract your abdominals; do not jerk your head forward as you curl. Keeping lower back on the ground, curl shoulders up 3 inches and slowly lower.
9. Oblique abdominal curls
Lie on the back as for the basic crunch but add a twist, bringing right elbow toward left knee, then left elbow toward right knee. Elbow does not have to touch knee.
10. Rear leg lift (gluteus)
On hands and knees, hollow abdomen and round back to protect it. Extend right leg to the rear. Tense gluteus. Raise and lower leg slowly six to eight counts. Repeat left.
11. Glute squeeze
Lying on back with knees bent, squeeze gluteus hard, raising hips no more than 3 inches from

floor. Do not arch back. Hold for a count of five, relax, repeat.

12. Back extension
Lie on your stomach with feet on the floor, head neutral, hands touching shoulders. Slowly lift head, shoulders, and chest. Hold 5 to 10 seconds, slowly lower. Variation: Squeeze shoulder blades in toward spine while holding trunk lift.
13. Alternate arm/leg lift
Lie on your stomach with arms extended in front. Raise right arm while lifting left leg. Hold 5 to 10 seconds. Repeat on other side. Keep head neutral.

Hip and Thigh Exercises

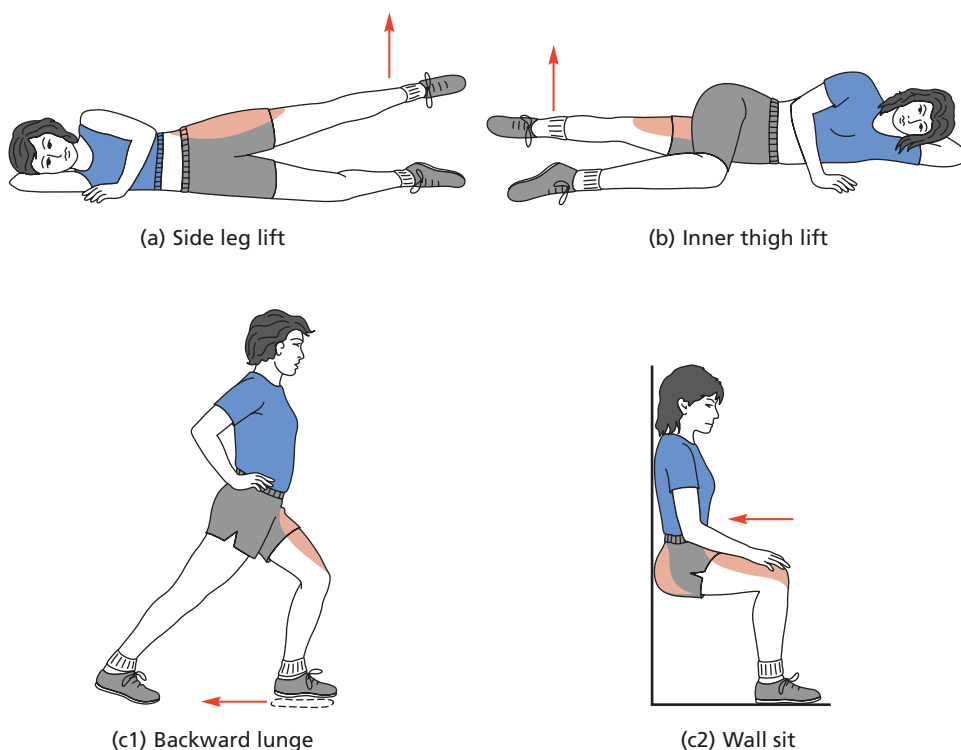
These exercises (Figure 4-6) will not burn calories as aerobic work will, so if you want to remove inches, diet and aerobic exercise are still important. Also, fat will not burn off only in the area exercised. While you can't spot reduce fat, say, in the thighs by doing leg lifts, you can spot tone flabby muscles. Be patient and you may begin to see a difference in 8 to 12 weeks. You do not need to count repetitions. Select one exercise for each body area and perform it for 1 minute. Start with one set and build up to two sets, 3 days a week. Variations are given to add variety to your program. If you wish to add intensity without purchasing weights, a sand-filled sock can be tied on as an ankle weight. You will want a mat or carpeted surface to work on.

A. Outer hip (hip abductors)

1. Lying side leg lift
Lying on one side, head resting on arm and lower leg bent for balance, slowly raise and lower top leg.
Variation: This can be done standing. Keep foot level and leg lifting directly to side, not toward front.
2. Kneeling side leg lift
Take a hands-and-knees position with one leg extended to side.
Tighten abdominals, and round back to protect it. You may also support weight on one forearm if desired. Tense hip and raise and lower leg slowly no higher than 6 inches.
Variation: Circle leg forward, then reverse.

B. Inner thigh (thigh adductors)

1. Inner thigh lift
Lying on left side, raise and lower left leg, keeping foot turned to side (not upward). Repeat right. To increase resistance, press gently on left calf with right foot as you raise and lower leg or add an ankle weight.
2. Plié
Standing with feet 3 feet apart and knees bent, place hands lightly on inner thighs. Press thighs

**FIGURE 4-6**

Hip and thigh exercises.

against hands, pulling in hard for a count of five. Repeat.

C. Quadriceps, hamstrings

1. Backward lunge (quadriceps and hamstrings)
Keeping shoulders erect and weight centered over right foot, step back and touch lightly with left foot and then return to starting position. Repeat. Switch legs after 1 minute of reps.
2. Wall sit (quads)
Hold a sitting position with back against a wall for balance. Keep hips above knee level.

Upper Body Exercises

Upper body exercises can improve appearance by straightening rounded shoulders, firming upper arm muscles, and toning pectorals that underlie and support the breasts. You do not need to count repetitions. Select one exercise for each body area and repeat for 1 minute. If you wish to increase resistance, bricks, books, or cans of food can serve as hand weights. Upper body exercises are illustrated in Figure 4-7.

A. Push-ups (pectorals/triceps)

These may be done standing, with hands against a wall and feet placed about 3 feet away from the wall (easiest), on the floor with knees bent (medium), or with weight supported on hands and feet (hardest). Keep abdominals firm and hips slightly flexed to support back. Lower to

right angles of arms and then press back to arm extension.

Variations: Keeping hands close emphasizes triceps. Keeping hands wide increases pectoral strengthening.

B. Dips (pectorals/triceps)

Dips are an alternative way to tone the same muscle groups that push-ups tone. They may be done on a dip bar or using chairs. With weight evenly distributed between bars or two sturdy chairs, place a hand on each. Bend knees or extend legs so that weight is on arms, not feet. Bend arms to right angles and return to extension.

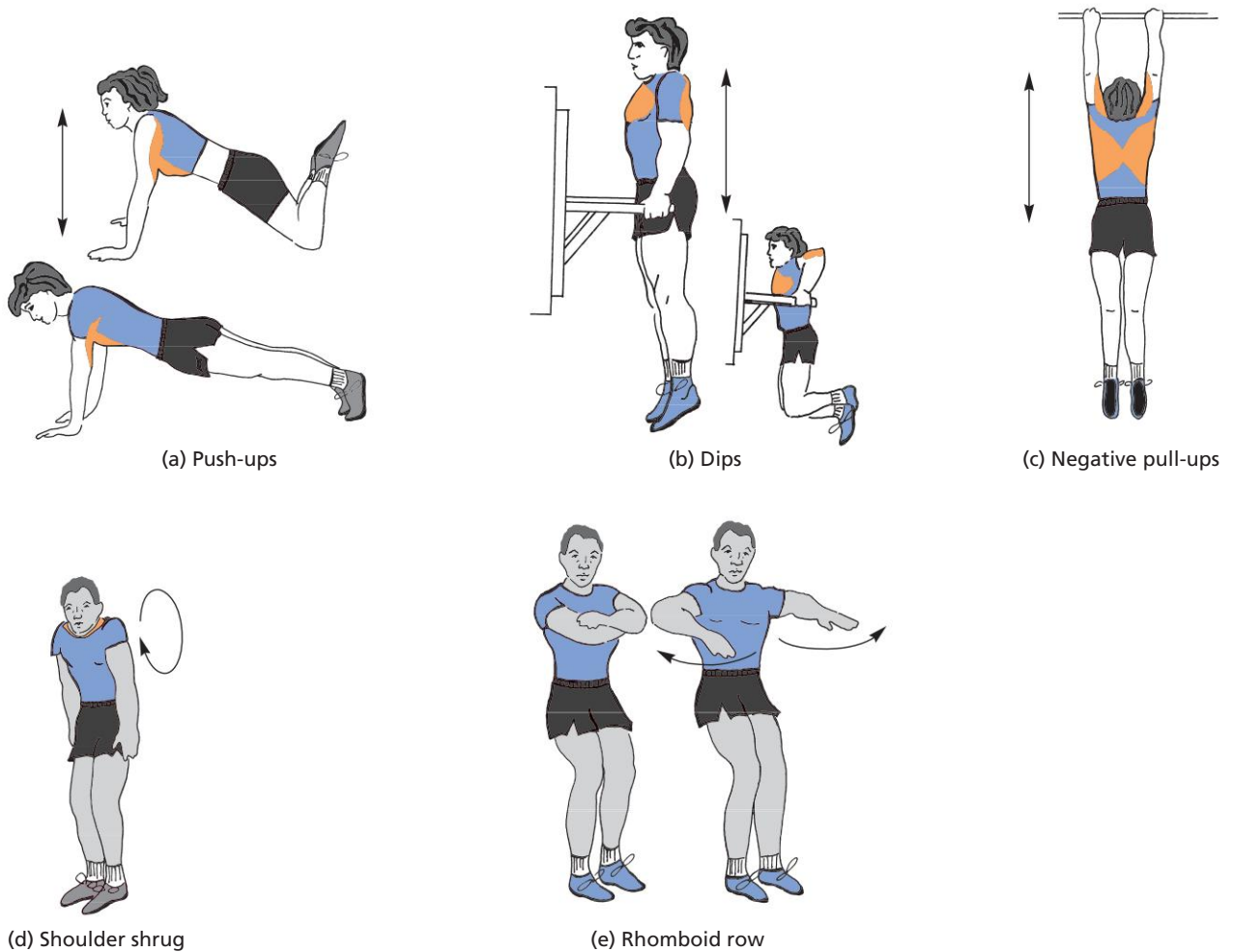
C. Negative pull-ups (latissimus dorsi/biceps)

Negative pull-ups offer the same benefits as full pull-ups for upper back and arms. Stand on a chair if necessary to grasp a pull-up bar with arms flexed. SLOWLY lower yourself to a count of five. As you gain strength over several weeks, try to start with a few full pull-ups and finish with negatives.

D. Shoulder shrugs (trapezius)

Shoulder shrugs can tighten upper back muscles to reduce rounded shoulders. Combine this with pectoral stretches for best results. Rotate shoulders in full circles—up-back-down—working to pull shoulder blades together.

Variations: Add resistance by holding a weight in each hand.

**FIGURE 4-7**

Upper body exercises.

E. Rhomboid row (rhomboids)

Rhomboids are muscles that pull the shoulder blades back, down, and together. These also need to be strengthened to reduce rounded shoulders. With arms slightly below shoulder level, elbows bent, pull elbows fully back, squeezing shoulder blades together, and hold for a count of five. Rest two counts. Repeat.

Stability Balls

The stability ball is a large inflatable rubber ball also known as a Swiss ball, fitness ball, or balance ball. It has long been used in physical therapy because it introduces an element of instability to which the body naturally responds by contracting core trunk muscles to keep the spine in neutral alignment and stay balanced over the ball. It can be used in a fitness class or at home for a variety of exercises to increase muscular fitness, core strength, posture, and balance, because you must

maintain a stable trunk throughout each exercise. To start, you can use it for abdominal crunches, obliques, and back extensions. You can also sit on the ball and exercise with hand weights to build core strength and balance. Many stores offer introductory videos or DVDs along with the equipment so that you can learn to use it in an effective manner.

Stability Ball Exercise Guidelines

- ✓ To choose a ball size—when you sit on the ball, your knees should be at a 90-degree angle and your thighs parallel to the floor.
- ✓ The ball should be inflated so that it is firm, but can still contour to your body. Do not inflate it until it is “hard.”
- ✓ It is important to maintain good posture while working out. Keep your abdominals tight to protect your lower back. Avoid back and neck hyperextension.

- ✓ Do each exercise slowly.
- ✓ If you have never used a ball, start with sitting on the ball and rocking the hips, then try the easiest skills like back extension or bridging. Place the ball against a wall or keep your hands and/or feet on the floor for stability. Ball placement affects exercise difficulty.
- ✓ Attempt more difficult skills only after mastering the easier exercises.
- ✓ Strength exercises should be done for 8–12 repetitions.

Stability Ball Exercises Here are 10 exercises that you can do with a stability ball. They are illustrated in Figure 4-8.

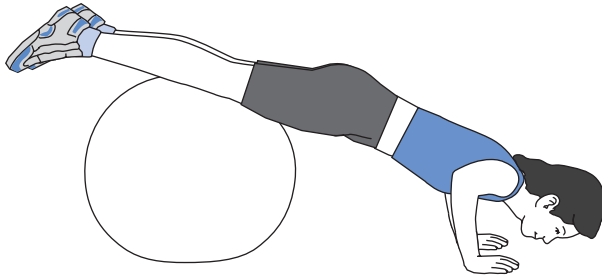
1. Push-ups (pectorals, triceps)
Kneel facing the ball. Roll forward to lie on top of the ball. Reach forward, placing your hands on the floor. Walk your hands out until the ball is under your thighs. Tighten your abdominals, keeping your body straight. Bend your elbows, and lower your upper body toward the floor. Your body should be straight from shoulders to ankles. Push back to the starting position. To increase difficulty, roll the ball back so only your shins or feet are resting on it.
2. Knee tuck press (deltoids, triceps)
Kneel on the stability ball, and hands on the floor. Bend your elbows, and lower your upper body toward the floor. Push up from this position.
3. Shoulder roll-outs from knees (back extensors, rectus abdominis)
Kneeling on the floor, place hands on the stability ball. Roll it forward and back, keeping back straight and abdominals tight.
4. Back wall squat (quadriceps, gluteus maximus, hamstrings)
Stand and press the ball against a wall with your back. Position feet shoulder width apart and forward as if you are going to sit in a chair. Bend your knees, rolling the ball down until your knees are at a 90-degree angle and your thighs are parallel to the floor. Keeping your back pressed against the ball, hold for 5 counts. Straighten your knees and return to the starting position.
5. Ball transfer (rectus abdominis)
Lie on your back with hands resting on the floor and grip ball between your ankles. Curl the pelvis to lift the ball off the floor into the air, reach up, and transfer it to your hands, then back to your ankles.
6. Prone knee tucks (rectus abdominis)
Place shins on the stability ball and hands on the floor. Roll the ball back away from your hands, keeping shoulders aligned with hands,

abdominals tight, body straight. Extend legs, then bend knees in toward your chest and roll the ball forward until your knees are at your chest. To increase difficulty, try from a bent elbow position on the floor.

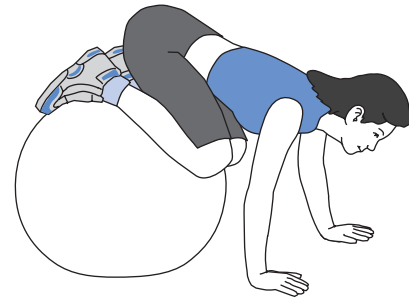
7. Oblique curls (rectus abdominis, external and internal oblique abdominals)
Lie with the top of the ball beneath the center of your back, feet spread wide on the floor for stability. Rotate hips to one side, and slowly curl the right side of the upper body toward the left leg. Return to starting position; repeat, alternating sides.
8. Bridges (back extensors, gluteus maximus, hamstrings)
Lie on your back with legs on the ball, hands resting beside you on the floor. Slowly lift hips until your back is straight and weight is on your upper back. Pause, then return slowly to the starting position. Avoid pressing the neck into the floor or arching the back. To make it easier, place ball under knees. To make it harder, place under heels.
9. Back extension (back extensors)
Lie prone with hips on the ball, feet on the floor, and trunk slightly flexed. Arms may be at your side or behind shoulders. Tighten your upper back, slowly raising shoulders until the spine is straight or slightly extended. Keep head neutral to avoid neck hyperextension. Hold, relax slowly to starting position. Repeat.
10. Prone opposite arm/leg raise (back extensors, gluteus maximus, hamstrings, deltoids)
Lying prone on the ball, extend right leg behind you, foot touching floor. Keep head neutral. Reach in front with the left arm, raising it close to your ear. Lift the arm and leg slowly at the same time, pause as you reach extension, then lower slowly. Repeat, alternating sides. To increase difficulty, lift the non-active arm a few inches off the floor instead of using it to balance.

Pilates

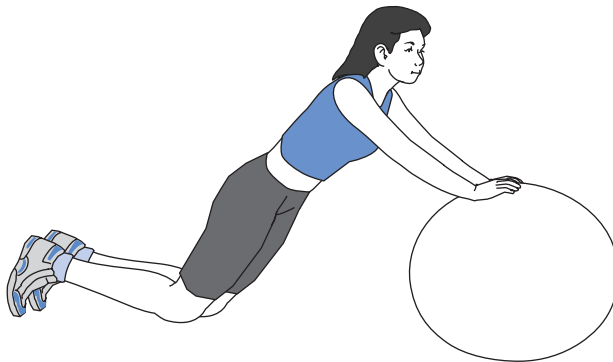
Pilates is a program that originally was used by dancers to improve core muscle strength, balance, muscle control, and flexibility. It now is being offered in fitness centers and is enjoyed by many exercisers for its health benefits. Development of strength and control in abdominal and back muscles is important for preventing back pain. Pilates emphasizes proper breathing, correct spinal and pelvic alignment, and concentration on smooth, flowing movement. It incorporates a series of group mat exercises and Pilates exercise equipment that uses springs to create resistance. If you are interested in trying Pilates, many fitness centers offer introductory sessions and many fitness retailers have videos or DVDs available for home use.



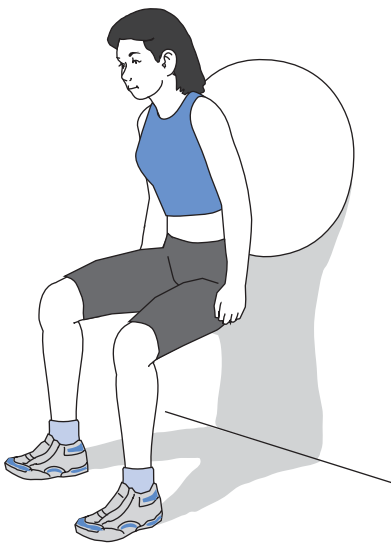
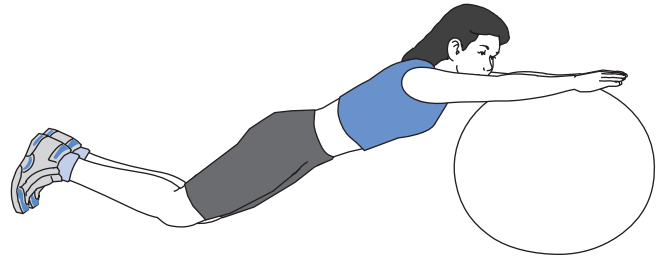
(1) Pushups



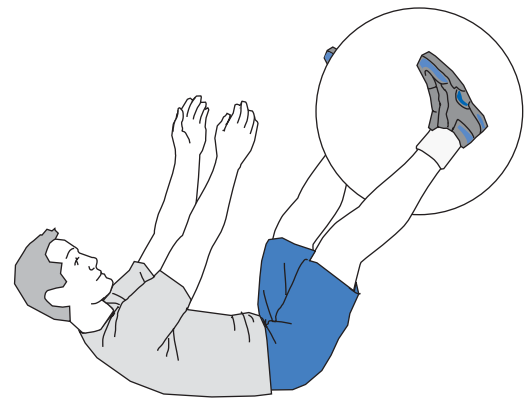
(2) Knee tuck press



(3) Shoulder roll-outs



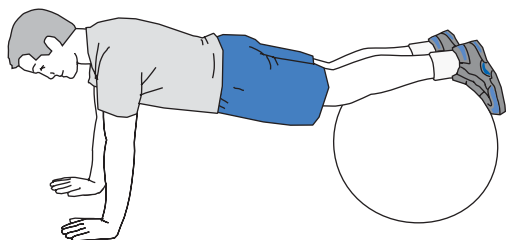
(4) Back wall squat



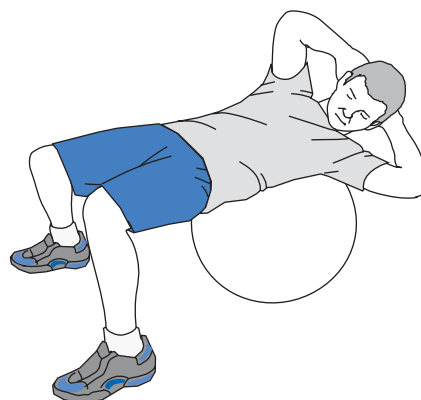
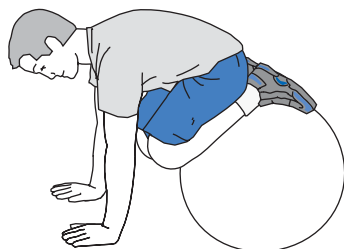
(5) Ball transfer

FIGURE 4-8

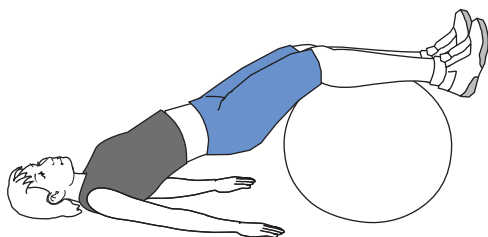
Stability ball exercises.



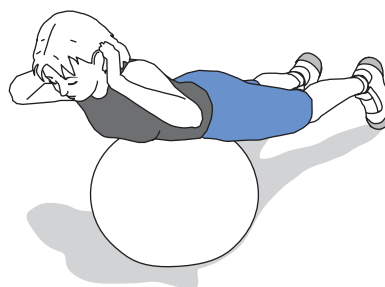
(6) Prone knee tucks



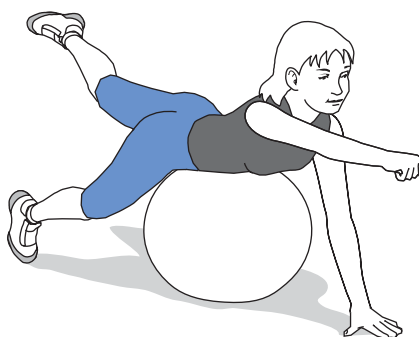
(7) Oblique curls



(8) Bridges



(9) Back extension



(10) Prone opposite arm and leg raise

FIGURE 4-8

Stability ball exercises. (continued)

Elastic Resistance

Elastic resistance exercise was developed in the 1950s. It was originally used by physical therapists who gave patients surgical rubber tubing to add resistance to rehabilitative exercise programs. Elastic bands and tubing are lightweight, portable, and readily available at fitness centers and medical supply companies. They are inexpensive but do not last forever and need to be replaced as they wear out. Safety tips are listed in the Top 10 “Tips for Elastic Resistance Exercise.” They come in different strengths, based on the thickness of the elastic. Thin bands are best for beginners and for upper body work. Thicker bands are useful for lower body work. Two thin bands can be used in place of one thick band. The principles of form, rhythm, and breathing apply here as for any strength training program. Elastic resistance exercises are illustrated in Figure 4-9.

Elastic Resistance Exercises

- A. Squats (gluteus maximus, quadriceps, hamstrings, biceps)

Step on the band with feet about shoulder width apart and hold ends of the band low enough to feel moderate tension. Slowly squat until hips are just above knees, bending elbows to maintain tension in the band. Return to standing.
- B. Leg extension (quadriceps)

Tie band around ankles. Lie back, knees bent and feet on floor. Keeping knees and thighs together, straighten knee, lifting the foot as high as possible. Release slowly and repeat. Change legs.
- C. Hamstring curl (hamstrings, gluteus maximus)

Place the band around ankles. Lie face down with arms under the chin or hands under hips. Bending knee, slowly lift one foot. Release slowly, maintaining some tension in the band. Repeat. Change legs.
- D. Side leg lift (hip abductors)

Place the band around both legs—around ankles is hardest, around knees easiest. Lying on right side, torso supported by arms, slightly bend lower leg for support. Keep hips facing forward, lift upper leg. Lower, keeping tension on the band, and repeat. Change sides.
- E. Inner thigh lift (thigh adductors)

Place band around left arch and right ankle. Lie on right side with trunk supported by arms. Lift bottom leg slowly, hold briefly, lower slowly, repeat. Switch sides.
- F. Three-way leg pointer (gluteus maximus, gluteus medius, quadriceps)

Place band around ankles. Place hand on wall for support. Keeping abdominals firm and back straight, pull foot back, return, side, return, forward, return. Repeat with other leg.

TOP 10 LIST

Tips for Elastic Resistance Exercise

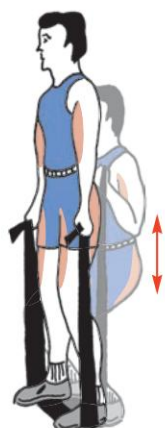
Exercising with elastic bands has its risks as well as its benefits. To maximize your results and minimize the risk of getting snapped by an elastic band, follow these tips:

1. *Check the band for tears before every workout.* Do not use it if it shows cracks or tears because it may break.
 2. *Point the band away from your face.* Never point it toward another person.
 3. *Keep a towel handy to wipe off sweat.* Sweat makes the band slippery.
 4. *Leave slight tension on the band between reps.* This maximizes muscle toning. Do not let the band go slack.
 5. *Wear socks.* This prevents the band from biting into the ankles in leg exercises.
 6. *Men may want to wear exercise pants.* This will prevent the band from ripping out leg hair.
 7. *Keep the wrist in line with the forearm.* Wrist hyperextension, a common mistake in lat pulls and bicep curls, stresses the carpal joints of the wrist.
 8. *Stretch the band slowly and release slowly.* Use a controlled rhythm—pull 2 seconds, hold briefly, release 2 seconds. Begin with 30 seconds of repetitions and work up to 1 minute for each exercise. Completing 1 to 2 sets is a good goal.
 9. *Progress to a stronger band.* Or add a second band to progress when the workout gets too easy (eventually it will).
 10. *Powder the band lightly with cornstarch after use to keep it in good condition.*
- G. Toe press (gastrocnemius, soleus)

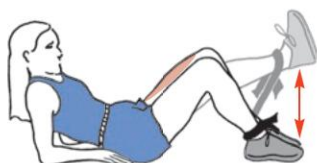
Holding ends of band, place around ball of foot. With knee straight, slowly press through ball of foot from extension to flexion and back (gastrocnemius). To emphasize soleus, repeat with knee slightly bent.
 - H. Toe lifts (tibialis anterior)

Tie band around arches. Place heels about 6 inches apart forward to back. Keeping one foot pointed, pull toes of the other foot back toward your face. Relax. Repeat on both feet.
 - I. Push-ups (pectorals and biceps)

Standing push-ups: Wrap the band around your back and under your arms. Bend elbows and grasp ends of band. Extend arms forward, return slowly.



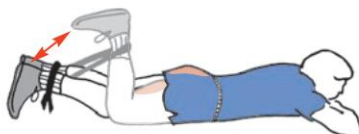
(a) Squats



(b) Leg extension



(d) Side leg lift



(c) Hamstring curl



(e) Inner thigh lift



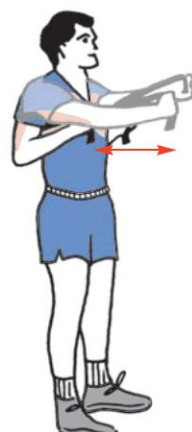
(g) Toe press



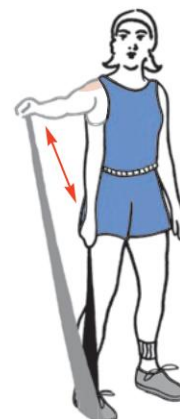
(f) Three-way leg pointer



(h) Toe lifts



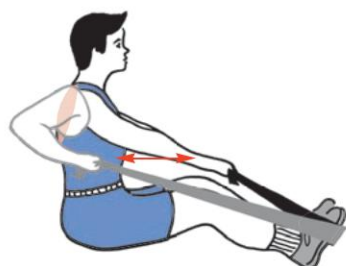
(i) Standing pushups



(j) Deltoid raise



(k) Lat pull



(l) Rowing



(m) Biceps curl



(n) Triceps extension

FIGURE 4-9

Elastic resistance exercises.

- J. Deltoid raise (deltoid and triceps)
Place one end of band under foot, hold the other end by your hip. Standing with good posture, lift arm to shoulder level, lower slowly.
- K. Lat pull (latissimus dorsi)
Hold band overhead, elbows extended but not locked. Pull arms apart to shoulder level. Be careful not to get hair caught in band.
- L. Rowing (rhomboids)
With band around arches and knees extended, grasp band about mid-shin. Pull elbows back and try to bring shoulder blades together. Release slowly.
- M. Biceps curl (biceps)
Place one end of band under foot, grasp other end low, and, keeping elbow at your side, curl right arm to shoulder. Slowly release.
- N. Triceps extension (triceps)
Standing with good posture, grasp ends of band. Press lower hand toward hip, pause, slowly release. Do both arms.
- D. Foot flexion (anterior tibialis)
Sit with legs extended. Partner kneels and presses down on top of both feet as you flex them and then return to extension.
- E. Overhead press (deltoids, triceps)
Sit with hands at shoulder level, palms up. As partner resists, press up toward ceiling and then return to starting position.
- F. Lat pull (latissimus dorsi)
Sit and reach high overhead to grasp partner's hands. As partner resists, pull down to shoulder level and slowly return to starting position.
- G. Elbow press forward (pectorals)
Sit with elbows out and hands touching shoulders. As partner resists at the elbows, pull them in toward your midline and return to starting position.
- H. Elbow press backward (rhomboids)
Sit with elbows out or with arms crossed. Partner sits behind, pressing on your elbows as you press back, pulling shoulder blades together. As partner continues resistance, return to starting position.
- I. Biceps curl (biceps)
Stand, palms facing upward. Partner resists on your palms as you curl arm from extension to flexion and back. This may also be done holding a towel in one hand in front of body. Partner sits or kneels facing you, resisting on other end of towel as you curl your arm.

Partner Resistance Exercises

Exercising with a partner can be both challenging and enjoyable. Partner communication and sensitivity to your levels of strength and fatigue are important. The partner must vary resistance for different muscle groups and increase resistance during the eccentric part of each contraction. While many of these exercises can be done without equipment, to add variety, you may wish to try them using a towel to pull on (biceps curls) or a broomstick (overhead press). This is a balanced program of four lower-body and five upper-body exercises. You may either count reps or perform each exercise for a minute and work up to two to three sets (Figure 4-10).

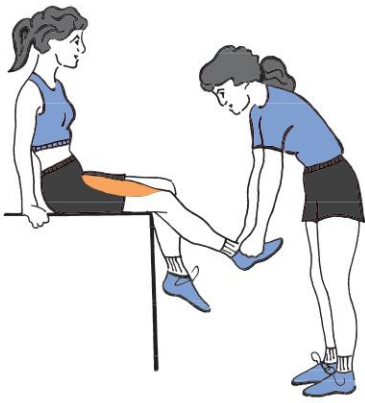
- A. Leg extension (quadriceps)
Sit on a bench or chair. Move one leg from flexion to full extension and back as partner resists by pressing on front of lower leg.
- B. Hamstring curl (hamstrings, gluteus)
Lie face down while partner straddles your back and places a hand on each ankle. Bend knees and curl calves toward buttocks as your partner resists. Continue the resistance as you return to the starting position.
- C. Inner/outer thigh press (thigh adductors and abductors)
Sit, facing each other, legs forward, hands behind hips for balance. One partner places both feet inside the other's feet and presses outward as the other partner resists by pressing inward. Switch positions after six to eight reps.



PRESCRIPTION FOR ACTION

You've read the chapter. Now go do one or more of these:

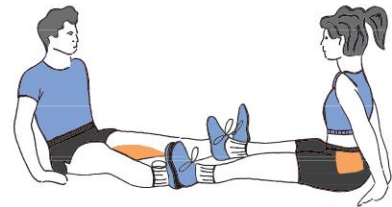
- ✓ While watching TV, use your exercise band during commercials.
- ✓ While sitting, do abdominal isometric contractions or press knees together hard for 6 seconds, 5–10 times, to tone inner thigh.
- ✓ Treat yourself with an exercise ball and video to add variety to your exercise program.
- ✓ Carry and load your own groceries; take the stairs instead of the elevator.
- ✓ If you usually use weight machines, make an appointment for instruction to enable you to try free weight exercises, and vice versa.
- ✓ Try a personal trainer for one session to check your lifting form and technique and make suggestions for improvement in your lifting program.



(a) Leg extension



(b) Hamstring curl



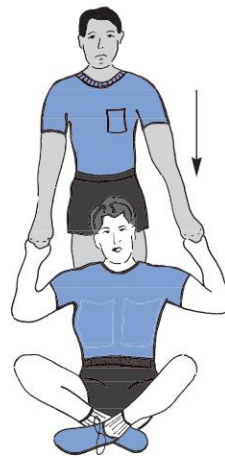
(c) Inner/outer thigh press



(d) Foot flexion



(e) Overhead press



(f) Lat pull



(g) Elbow press forward



(h) Elbow press backward



(i) Biceps curl

Partner resistance exercises.

FIGURE 4-10



Frequently Asked Questions

Q. Why should I add resistance exercises to my exercise program?

- A. Strength training is an important part of a balanced fitness program. Stronger muscles help prevent injury, improve your ability to participate in sports, and prevent loss of muscle fibers that begins around age 25.

Q. Which is better, free weights or machines?

- A. It depends on your goals. A beginner will improve with overload from either system. Machines are safer and you don't need a spotter, but they are expensive to buy or you need access to a gym. With free weights, you need a spotter for safety, but they are inexpensive, and so you can have a set at home. Free weights allow a greater variety of exercises than do machines and develop balance, timing, and muscular fitness, so many athletes prefer them. If you have access to both, start with machines, and as you gain strength, gradually work in a few free weight exercises to see which you like better.

Q. I just started a weight-training program. How long until I see results?

- A. Rate of improvement varies with individuals—some gain quickly, others more slowly. If you are lifting 2 to 3 days a week using a general program of one to two sets of 8 to 12 reps at 75 percent 1 rep max, you may begin increasing reps or load within 3 to 4 weeks. The most rapid gains are seen in the first 6 months, but people can continue to improve for years. Other factors affecting rate of improvement include good nutrition, adequate recovery between workouts, and sufficient sleep.

Q. When I stop exercising, will my muscles turn into fat?

- A. No. Muscle and fat (adipose tissue) are made up of different types of cells. Lack of exercise allows muscles to atrophy and turn flabby. Without exercise, a person burns fewer calories and may add pounds of fat. Muscle tissue can no more be turned into fat tissue than a cat can be turned into a dog!

Q. How can I tone my lower abdominal muscles?

- A. Based on electromyographic studies of people doing various types of abdominal and core exercises, people cannot selectively recruit upper versus lower abdominal muscles. The rectus abdominis acts as a sheet, and contracts as a whole. During certain exercises, like leg lifts, a person may feel greater fatigue in the lower abdominal region because the iliopsoas “hip flexor” is being worked, and it originates below the lower abdominal region. A person can selectively train transverse abdominals, which connect hip-to-hip, by contracting the abdominals, trying to pull the navel toward the

spine, holding for 5 seconds, and repeating 4–5 times.

Q. How good is the abdominal equipment on TV infomercials?

- A. There is no piece of equipment that tones abdominals better than the abdominal exercises in Figure 4-7. Before you rush out to buy the newest advertised piece of abdominal gear, ask yourself if you will use it regularly. Be skeptical of any equipment that promises effortless results, spot reduction, burning more calories, or greater weight loss than other methods. While you can spot tone, you can't wear the fat off just one body area. Loss of abdominal fat requires regular exercise that works the whole body, as well as cutting back on calories. To help you decide, go to a gym or fitness center and try out various types of equipment to see what you like and what meets your needs.

Q. What do I do if I hit a plateau in weight training?

- A. While initial progress may be rapid, after about 6 months of strength training, a plateau is common. If you have been doing the same program for months, it is time to vary the routine. You may benefit from changing the sequence of exercises so that muscles are fatigued in a different order. You can replace some of the exercises with one that strengthens the same muscle group (e.g., fly instead of chest press or squats instead of leg press). If you have been lifting more than 12 repetitions of a weight, increasing the intensity and dropping the number of repetitions will make the muscles work harder. Also, make sure that you are giving your muscles sufficient recovery time, at least 48 hours between workouts.

Q. Does strength training decrease risk for osteoporosis?

- A. Bones are living tissue, constantly remodeling to the stresses placed on them. Without weight-bearing exercise, bones demineralize. They require the regular stimulus of weight-bearing exercise to take up bone mineral. Walking and jogging using the resistance of body weight are excellent leg and hip-bone strengtheners. Weight training at an intensity of 70 to 85 percent of 1 RM, 2 to 3 sets of 8 to 12 repetitions, 2 to 3 days per week has been shown to produce gradual increases in bone density, which decreases risk of osteoporosis. Like muscle, the rule is “use it or lose it.”

Q. Should I eat more protein to build muscle if I weight train?

- A. Research has shown that the primary fuel for muscle is carbohydrate, in the form of glycogen. The American Dietetics Association (ADA) does not support the belief that the protein needs of a weight

lifter are greater than average. The body is unable to store extra protein, and excess protein is converted to fat, not used to build muscle. The average American already consumes 1½ to 2 times the RDA of protein. Excess protein can also promote dehydration and loss of calcium, which can increase risk of osteoporosis. The ADA states that a balanced diet will supply all the protein a weight trainer needs. Exercise scientists and dieticians agree that if you want to build muscle, you should concentrate on a well-balanced diet combined with resistance training.

Q. I have been doing 100 abdominal crunches a day for 6 weeks, and still my abdominals aren't flat. Why? They feel really strong and tight.

A. A layer of fat often overlays the abdominals, giving them a rounded appearance. Crunches will strengthen the abdominals, making them feel firm. If you are overweight, diet will help reduce the fat layer to get the results you seek. If you are of normal weight, check your posture—habitually standing with an overarched lower back will make the abdominals protrude even if they are firm.

Summary

Muscular strength and muscular endurance exercises are a vital supplement to a regular program of aerobic exercise. They can enhance appearance by improving the shape, firmness, and tone of muscles. Enhanced posture, decreased risk of lower back pain, greater ease of movement, improved

athletic performance, and more energy are benefits. While injury is possible in any exercise program if safety guidelines are ignored, sensible strengthening programs decrease the risk of injury for those who participate in health-related fitness programs or athletics.



Internet Resources

American College of Sports Medicine

www.acsm.org/sportsmed

Provides information on sports research and health and fitness, aerobic exercise guidelines, and a quarterly fitness newsletter. "Current Comments" gives information on a variety of exercise topics of recent interest.

American Council on Exercise

www.acefitness.org

Has fitfacts information sheets on over 100 different health and fitness topics, health and fitness tips, fitness questions and answers, healthy recipes, and a free monthly e-newsletter on health and fitness topics.

ExRx.net

www.exrx.net

Exercise information including weight training, fitness testing, bodybuilding, anabolic steroids, and weight management.

International Fitness Association

www.ifafitness.com/wttrain/index.html

Illustrates 26 weight training exercises with moving diagrams and detailed information on lifting technique.

National Strength and Conditioning Association

www.nasca-lift.org

Provides research-based information on strength training and conditioning for improving fitness and athletic performance.

LAB Activity **4-1**

Name _____ Class/Activity Section _____ Date _____

Resistance Training Log

Exercise	Weight	Date							
		Reps/ Sets							
		Reps/ Sets							
		Reps/ Sets							
		Reps/ Sets							
		Reps/ Sets							
		Reps/ Sets							
		Reps/ Sets							
		Reps/ Sets							
		Reps/ Sets							
		Reps/ Sets							

[illegible]

LAB Activity 4-2

Name _____ Class/Activity Section _____ Date _____

Weight Training Experience

Equipment Needed:

Weight training machines or free weights

Purpose

To experience a weight training program

Procedure

Read about resistance training in this chapter and then select one of the weight training programs listed on the next two pages. Perform the exercises using a weight that you can lift 8 to 12 repetitions for one to two sets. As this is an introductory session, use light weights and concentrate on correct form, rhythm, and breathing. If you want to perform and compare the two types of programs, rest 1 day between workouts for best results. If assigned by your instructor, track your weight training program on the Resistance Training Log. This is a stand-alone lab with complete instructions on the back of the page and illustrations in the back of the book. You can tear out this lab and use the exercise descriptions on the back of the page. If using free weights, use a spotter, and follow all safety recommendations with both programs.

WEIGHT TRAINING EXERCISES

(Choose one program)

<i>Machines</i>	<i>Weight</i>	<i>Repetitions</i>	<i>Free Weight</i>	<i>Weight</i>	<i>Repetitions</i>
A. Leg press	_____	_____	A. Squats	_____	_____
B. Leg extension	_____	_____	B. Lunge	_____	_____
C. Hamstring curl	_____	_____	C. Calf raise	_____	_____
D. Toe press	_____	_____	D. Bench press	_____	_____
E. Bench press	_____	_____	E. Military press	_____	_____
F. Military press	_____	_____	F. Bent-over rowing	_____	_____
G. Lat pull	_____	_____	G. Back extension	_____	_____
H. Rowing	_____	_____	H. Triceps press	_____	_____
I. Back extension	_____	_____	I. Biceps curl	_____	_____
J. Abdominal curls	_____	_____			
K. Triceps press	_____	_____			
L. Biceps curl	_____	_____			

Results

1. What are three things you learned about weight training by doing this program?
2. If you tried both types of weight training, how did they compare? Which did you prefer and why?
3. What did you learn about your strength levels in different muscle groups?

Weight Training Exercises

- A. Leg press
Prime movers: quadriceps, hamstrings, and gluteus maximus
On leg press, sit on seat, adjust position to last slot or to a 90-degree knee angle.
Place feet squarely on pedals, press out smoothly (do not lock knees), and return to starting position.
- B. Leg extension
Prime movers: quadriceps
Sit on bench with both feet under the rollers. Toe in slightly. Do not lie back.
Extend your legs, hold 1 second, and return to starting position.
- C. Hamstring curl
Prime movers: hamstrings and gluteus maximus Lie face down on the bench, hook both heels under the rollers.
Position knees at the pivot point where the rollers attach to the bench. Pull up to 90 degrees, hold for 1 second, and return to starting position.
- D. Toe press
Prime mover: gastrocnemius
On leg press station, place feet squarely on pedals, press out to full leg extension without knee lockout. Press with toes from flat-footed position to foot extension and return.
- E. Bench press
Prime movers: pectorals and triceps
Lie on bench, head next to the machine. The grips should be lined up approximately with the shoulders. Place your feet flat on the bench with knees bent and back flat. Press to extension and return. If you tend to have shoulder problems, lower the bar to only 4 inches above your chest, then extend.
- F. Military press
Prime movers: deltoids and triceps
Sit on the stool or stand with abdominals tight, back flat, and knees slightly bent. With shoulders close to handles, extend upward with arms until they are straight but not locked and return.
- G. Lat pull
Prime movers: latissimus dorsi
Grip bar directly above shoulders or at handles. Pull down until you are kneeling or sitting. From this position, pull down to chest and return.
- H. Rowing
Prime movers: rhomboids, latissimus dorsi, and biceps
Sit on the machine with arms almost fully extended. Pull back as far as possible, drawing shoulder blades together. Return to starting position.
- I. Back extension
Prime movers: erector spinae, gluteus maximus, and quadratus lumborum
Sit on the machine with back against upper back pad and feet under ankle rollers. Fasten hip belt if one is available to keep hips from lifting or sliding out of position. Slowly extend trunk back fully and slowly return to starting position.
- J. Abdominal curls
Prime movers: abdominals and hip flexors
Sit with pad on upper chest, knees flexed, and feet on footpad. Use seat belt if provided to keep hips from lifting off seat. Flex trunk as far forward as possible. Return slowly to starting position.

- K. Triceps press
Prime movers: triceps
Stand facing lat bar. With palms facing down, grasp the bar so that hands are shoulder width apart. Keep elbows at waist. Press down to extension and return.
- L. Biceps curl
Prime movers: biceps
Stand facing the weights, hold bar with both hands, palms up. Flex arms until the bar meets shoulders. Return to starting position. Keep back straight, abdominals firm.

Free Weight Exercises

- A. Squats
Prime movers: gluteus maximus, quadriceps, and hamstrings
Start standing upright with the bar resting on your shoulders. Keep the head up, abdominals tight, back flat, feet a bit wider than your shoulders. With back straight, slowly lower hips until tops of thighs are parallel with the floor. Pause. Drive up with legs and hips to the starting position.
- B. Lunge
Prime movers: gluteus maximus and quadriceps
Standing upright with the bar on the shoulders off the neck, abdominals tight, back flat, step forward (or backward) until the front thigh is parallel with the floor. The front knee should be over the ball of the foot. Keeping back straight, take a controlled step back to the starting position. Repeat with the opposite leg. This exercise requires considerable balance. You may wish to start first with dumbbells and progress slowly to use of a barbell.
- C. Calf raise
Prime mover: gastrocnemius/soleus
Place bar on shoulders, position balls of feet on board and heels off board. Press up onto balls of feet, then lower with control. Knees straight tones gastrocnemius, knees bent tones soleus.
- D. Bench press
Prime movers: pectorals and triceps
Lie with head and buttocks on bench, feet stabilized on ground for balance and safety. Grip about 4 inches wider than shoulders, palms under bar (pronated). Lower bar to chest. Focus eyes up to the sky; do not watch bar. Elbows should be directly under bar and forearms perpendicular to ground. Do not let bar slide to the neck. Press to extension, and return.
- E. Military press
Prime movers: deltoids and triceps Sit on bench or stand. With barbell on chest, press upward with arms until they are straight overhead but not locked, and return.
- F. Bent-over rowing
Prime movers: rhomboids and latissimus dorsi
Stabilize one knee and hand on a bench; opposite hand holds the weight, and foot is flat on the floor. Pull elbow up and in toward the spine.
- G. Back extension
Prime movers: erector spinae, gluteus maximus, and quadratus lumborum
Lie with your hips on the seat pad and ankles under the ankle rollers, arms crossed across chest. Slowly extend trunk to a horizontal position, hold 3 to 5 seconds, and slowly lower to starting position. After you can easily do 15–20 repetitions, you may increase resistance by holding light hand weights to your chest.
- H. Triceps press
Prime movers: triceps
Standing with abdominals firm, feet apart for stability, grip the weight, palms up, and keeping elbows near the ears, slowly lower bar behind the head. Pause, then press until elbows are fully extended.
- I. Biceps curl
Prime movers: biceps
Grasp bar, palms up, holding bar about thigh level. Bend elbows, moving bar in an arc toward shoulders. Pause, and slowly return to starting position.

LAB Activity 4-3

Name _____ Class/Activity Section _____ Date _____

Abdominal and Core Strengthening Workout

Equipment Needed:

Floor mat or carpeted surface
Stability ball

Procedure

These exercises are presented in Chapter 4, Figure 4-5. You can add or delete exercises depending on your goals. They should be performed at a slow, steady pace with equal effort in both directions. You can tear out this lab and use the exercise descriptions on the back of this page along with the illustrations in the back of the book.

ABDOMINAL AND CORE STRENGTHENING EXERCISES

<i>Exercise</i>	<i>Repetitions</i>
1. Bicycle exercise	_____
2. Abdominal crunch on stability ball	_____
3. Vertical leg crunch	_____
4. Reverse crunch	_____
5. Plank	_____
6. Side plank	_____
7. Long arm crunch	_____
8. Abdominal curl “crunch”	_____
9. Oblique abdominal curl	_____
10. Rear leg lift	_____
11. Glute squeeze	_____
12. Back extension	_____
13. Alternate arm/leg lift	_____

Results

1. What are three things you learned about abdominal and core strengthening by doing this program?

2. What did you learn about your muscular endurance levels in different muscle groups?

ABDOMINAL AND CORE STRENGTHENING EXERCISES

Exercise Instructions

1. Bicycle exercise
Lie on your back with hands behind your head. Raise knees to a 45-degree angle and slowly do a bicycle pedal motion as in the figure. Touch right elbow to left knee, left elbow to right knee.
2. Abdominal curl “crunch” on stability ball
Lie on stability ball with feet flat on floor, thighs and trunk parallel to floor. Cross arms behind shoulders or across chest, contract abdominals by raising trunk about 45 degrees. Spread feet apart for better balance. To work obliques more, bring feet closer together.
3. Vertical leg crunch
Lie on your back with legs raised in the air, knees slightly bent and crossed at the ankles. Cross hands behind the shoulders to support the head. Keep chin lifted to prevent jerking the head. Lift the trunk and slowly lower.
4. Reverse crunch
Lie on the back with ankles crossed, feet off the ground and knees about a 90-degree angle. Place arms on the floor beside your trunk. Press lower back to the ground, contract the abdominals, and rotate hips 1 to 2 inches. Your feet will lift slightly toward the ceiling each contraction.
5. Plank
Lie face down propped with elbows under chest, palms down. Lift up on toes, tighten back and abdominals, keeping body straight, head and spine neutral. Hold 10–60 seconds, rest, repeat. If a straight-back position is too difficult, begin with hips hiked up, or hold the contraction a shorter amount of time. Do not let the hips sag.
6. Side plank
Lie on side with weight balanced between forearm, flat palm, and feet. Contract back and abdominals to hold body straight. Do not push hips out behind the body. Hold 10–30 seconds, rest, repeat on the other side. If a full-body position is too difficult, begin with the half-plank balancing weight between knees and forearm. For an advanced version, try lifting the top foot in the air 5–10 seconds.
7. Long arm crunch
Lie on your back with knees bent, heels next to buttocks. Extend arms alongside your ears, chin raised, eyes focused on ceiling. Contract abdominals, keeping lower back to floor, lift shoulders as for a basic crunch, lower slowly.
8. Abdominal curl “crunch”
Lie on your back with knees bent, heels next to buttocks. Place hands across chest or behind shoulders. Keep eyes focused on ceiling, chin up and about a fist distance from your chest. Contract your abdominals, do not jerk your head forward as you curl. Keeping lower back on the ground, curl shoulders up 3 inches and slowly lower.
9. Oblique abdominal curls
Lie on the back as for the basic crunch, but add a twist, bringing right elbow toward left knee, then left elbow toward right knee. Elbow does not have to touch knee.
10. Rear leg lift
On hands and knees, hollow abdomen and round back to protect it. Extend right leg to the rear. Tense gluteus. Raise and lower leg slowly, six to eight counts. Repeat left.
11. Glute squeeze
Lying on back with knees bent, squeeze gluteus hard, raising hips no more than 3 inches from floor. Do not arch back. Hold for a count of five, relax, repeat. This may also be done with legs extended, feet on stability ball, back on floor.
12. Back extension.
Lie on your stomach with feet on the floor, head neutral, hands touching shoulders. Slowly lift head, shoulders, and chest. Hold 5–10 seconds, slowly lower. Variation: Squeeze shoulder blades in toward spine while holding trunk lift.
13. Alternate arm/leg lift
Lie on your stomach with arms extended in front. Raise right arm while lifting left leg. Hold 5–10 seconds. Repeat on other side. Keep head neutral.

LAB Activity 4-4

Name _____ Class/Activity Section _____ Date _____

Stability Ball Workout

Equipment Needed:

Stability ball

Procedure

Read the stability ball section in Chapter 4 and review Figure 4-8. You can tear out this lab and use the exercise descriptions on the back of the page. Do these exercises slowly for best results.

STABILITY BALL EXERCISES

<i>Exercise</i>	<i>Repetitions</i>
1. Push-ups	_____
2. Knee tuck press	_____
3. Shoulder roll-outs from knees	_____
4. Back wall squat	_____
5. Ball transfer	_____
6. Prone knee tucks	_____
7. Oblique curls	_____
8. Bridges	_____
9. Back extension	_____
10. Prone opposite arm and leg raise	_____

Results

1. What are three things you learned about abdominal and core strengthening by doing this program?
2. What did you learn about your muscular endurance levels in different muscle groups?

STABILITY BALL EXERCISES

Here are 10 exercises that you can do with a stability ball. They are illustrated in Figure 4-8.

1. Push-ups (pectorals, triceps)
Kneel facing the ball. Roll forward to lie on top of the ball. Reach forward, placing your hands on the floor. Walk your hands out until the ball is under your thighs. Tighten your abdominals, keeping your body straight. Bend your elbows, and lower your upper body toward the floor. Your body should be straight from shoulders to ankles. Push back to the starting position. To increase difficulty, roll the ball back so only your shins or feet are resting on it.
2. Knee tuck press (deltoids, triceps)
Kneel on the stability ball, and hands on the floor. Bend your elbows, and lower your upper body toward the floor. Push up from this position.
3. Shoulder roll-outs from knees (back extensors, rectus abdominis)
Kneeling on the floor, place hands on the stability ball. Roll it forward and back, keeping back straight and abdominals tight.
4. Back wall squat (quadriceps, gluteus maximus, hamstrings)
Stand and press the ball against a wall with your back. Position feet shoulder width apart and forward as if you are going to sit in a chair. Bend your knees, rolling the ball down until your knees are at a 90-degree angle and your thighs are parallel to the floor. Keeping your back pressed against the ball, hold for five counts. Straighten your knees and return to the starting position.
5. Ball transfer (rectus abdominis)
Lie on your back with hands resting on the floor and grip ball between your ankles. Curl the pelvis to lift the ball off the floor into the air, reach up, and transfer it to your hands, then back to ankles. Return to starting position.
6. Prone knee tucks (rectus abdominis)
Place shins on the stability ball and hands on the floor. Roll the ball back away from your hands, keeping shoulders aligned with hands, abdominals tight, body straight. Extend legs, then bend knees in toward your chest and roll the ball forward until your knees are at your chest. To increase difficulty, try from a bent elbow position on the floor.
7. Oblique curls (rectus abdominis, external and internal oblique abdominals)
Lie with the top of the ball beneath the center of your back, feet spread wide on the floor for stability. Rotate hips to one side, and slowly curl the right side of the upper body toward the left leg. Return to starting position; repeat, alternating sides.
8. Bridges (back extensors, gluteus maximus, hamstrings)
Lie on your back with legs on the ball, hands resting beside you on the floor. Slowly lift hips until your back is straight and weight is on your upper back. Pause, then return slowly to the starting position. Avoid pressing the neck into the floor or arching the back. To make it easier, place ball under knees. To make it harder, place under heels.
9. Back extension (back extensors)
Lie prone with hips on the ball, feet on the floor, and trunk slightly flexed. Arms may be at your side or behind shoulders. Tighten your upper back, slowly raising shoulders until the spine is straight or slightly extended. Keep head neutral to avoid neck hyperextension. Hold, relax slowly to starting position. Repeat.
10. Prone opposite arm/leg raise (back extensors, gluteus maximus, hamstrings, deltoids)
Lying prone on the ball, extend right leg behind you, foot touching floor. Keep head neutral. Reach in front with the left arm, raising it close to your ear. Lift the arm and leg slowly at the same time, pause as you reach extension, then lower slowly. Repeat, alternating sides.

LAB Activity 4-5

Name _____ Class/Activity Section _____ Date _____

Elastic Band Workout

Equipment Needed:

Elastic bands

Purpose

To experience a strength-training workout with elastic bands

Procedure

Read the “Elastic Resistance” section and then perform the exercises for 8 to 12 repetitions for one to two sets. As this is an introductory session, concentrate on correct form, rhythm, and breathing. You can tear out this lab and use the exercise descriptions on the back of the page. Also see the illustrations of these exercises on the back cover of this text. If assigned by your instructor, track your program on the Resistance Training Log.

ELASTIC BAND EXERCISES

<i>Exercise</i>	<i>Repetitions</i>	<i>Exercise</i>	<i>Repetitions</i>
A. Squats	_____	G. Deltoid raise	_____
B. Leg extension	_____	H. Lat pull	_____
C. Hamstring curl	_____	I. Rowing	_____
D. Side leg lift	_____	J. Biceps curl	_____
E. Inner thigh lift	_____	K. Triceps extension	_____
F. Push-ups	_____		

Results

1. What are three things you learned about resistance training with elastic bands by doing this program?
2. What did you learn about your strength levels in different muscle groups?

Elastic Resistance Exercises

- A. Squats (gluteus maximus, quadriceps, hamstrings, biceps)
Step on the band with feet about shoulder width apart and hold ends of the band low enough to feel moderate tension. Slowly squat until hips are just above knees, bending elbows to maintain tension in the band. Return to standing.
- B. Leg extension (quadriceps)
Tie band around ankles. Lie back, knees bent and feet on floor. Keeping knees and thighs together, straighten knee, lifting the foot as high as possible. Release slowly and repeat. Change legs.
- C. Hamstring curl (hamstrings, gluteus maximus)
Place the band around ankles. Lie face down with arms under the chin or hands under hips. Bending knee, slowly lift one foot. Release slowly, maintaining some tension in the band. Repeat. Change legs.
- D. Side leg lift (hip abductors)
Place the band around both legs—around ankles is hardest, around knees easiest. Lying on right side, torso supported by arms, slightly bend lower leg for support. Keep hips facing forward, lift upper leg. Lower, keeping tension on the band, and repeat. Change sides.
- E. Inner thigh lift (thigh adductors)
Place band around left arch and right ankle. Lie on right side with trunk supported by arms. Lift bottom leg slowly, hold briefly, lower slowly, repeat. Switch sides.
- F. Push-ups: Wrap the band around your back and under your arms. Bend elbows and grasp ends of band. Extend arms forward, return slowly.
- G. Deltoid raise (deltoid and triceps)
Place one end of band under foot, hold the other end by your hip. Standing with good posture, lift arm to shoulder level, lower slowly.
- H. Lat pull (latissimus dorsi)
Hold band overhead with one arm, elbow extended but not locked. Pull other end of band to shoulder level bringing elbows to your side. Be careful not to get hair caught in band.
- I. Rowing (rhomboids)
With band around arches and knees extended, grasp band about mid-shin. Pull elbows back and try to bring shoulder blades together. Release slowly.
- J. Biceps curl (biceps)
Place one end of band under foot, grasp other end low, and, keeping elbow at your side, curl right arm to shoulder. Slowly release.
- K. Triceps extension (triceps)
Standing with good posture, grasp ends of band. Press lower hand toward hip, pause, slowly release. Do both arms.

LAB Activity 4-6

Name _____ Class/Activity Section _____ Date _____

Partner Resistance Workout

Equipment Needed:

Floor mat or carpeted surface
Partner
Towel or broomstick

Procedure

These exercises are presented in Chapter 4, Figure 4-10. You can add or delete exercises depending on your goals. They should be performed at a slow, steady pace with equal effort in both directions. Perform 6–8 repetitions or about 1 minute of each exercise. You can tear out this lab and follow the exercise descriptions on the back of the page.

PARTNER RESISTANCE EXERCISES

<i>Exercise</i>	<i>Repetitions or time</i>
A. Leg extension	_____
B. Hamstring curl	_____
C. Inner/outer thigh press	_____
D. Foot flexion	_____
E. Overhead press	_____
F. Lat pull	_____
G. Elbow press forward	_____
H. Elbow press backward	_____
I. Biceps curl	_____

Results

1. What are three things you learned about abdominal and core strengthening by doing this program?
2. What did you learn about your muscular fitness levels in different muscle groups?

- A. Leg extension (quadriceps)
Sit on a bench or chair. Move one leg from flexion to full extension and back as partner resists by pressing on front of lower leg.
- B. Hamstring curl (hamstrings, gluteus)
Lie face down while partner straddles your back and places a hand on each ankle. Bend knees and curl calves toward buttocks as your partner resists. Continue the resistance as you return to the starting position.
- C. Inner/outer thigh press (thigh adductors and abductors)
Sit, facing each other, legs forward, hands behind hips for balance. One partner places both feet inside the other's feet and presses outward as the other partner resists by pressing inward. Switch positions after six to eight reps.
- D. Foot flexion (anterior tibialis)
Sit with legs extended. Partner kneels and presses down on top of both feet as you flex them and then return to extension.
- E. Overhead press (deltoids, triceps)
Sit with hands at shoulder level, palms up. As partner resists, press up toward ceiling and then return to starting position.
- F. Lat pull (latissimus dorsi)
Sit and reach high overhead to grasp partner's hands. As partner resists, pull down to shoulder level and slowly return to starting position.
- G. Elbow press forward (pectorals)
Sit with elbows out and hands touching shoulders. As partner resists at the elbows, pull them in toward your midline and return to starting position.
- H. Elbow press backward (rhomboids)
Sit with elbows out or with arms crossed. Partner sits behind, pressing on your elbows as you press back, pulling shoulder blades together. As partner continues resistance, return to starting position.
- I. Biceps curl (biceps)
Stand, palms facing upward. Partner resists on your palms as you curl arm from extension to flexion and back. This may also be done holding a towel in one hand in front of body. Partner sits or kneels facing you, resisting on other end of towel as you curl your arm.



Changing Behavior

5

*There are three kinds of people in this world:
those who make things happen;
those who see things happen;
and far too many who say—"what happened?"*
—Anonymous

Study Questions

You will have successfully mastered this chapter if you can answer the following:

1. How does self-efficacy affect behavior change?
2. Why is willpower alone not enough to change behavior permanently?
3. Can you identify and describe the five stages of change in the transtheoretical model of behavior change?
4. What are the nine processes of change and how do they relate to the stages of change in the transtheoretical model?
5. What are the elements of a well-designed behavior-change plan/contract?
6. What are the components of S.M.A.R.T. goal setting?
7. What are the three contributions to relapses during attempted behavior changes?
8. Can you list ways to prevent or recover from a relapse during behavior change?

You will find the answers as you read this chapter.



Visit the Online Learning Center for *A Fit Way of Life*, www.mhhe.com/robbinsfit2e, where you will find additional quizzes and other study aids.

Terms

- action stage
- contemplation stage
- maintenance stage
- precontemplation stage
- preparation stage
- processes of change
- self-efficacy
- transtheoretical model of behavior change

Though there is strong evidence linking lifestyle abuse and lack of well-being, many people still remain inactive, smoke cigarettes, drink excessive amounts of alcohol and caffeine, burn out due to stress, and eat too much of the wrong foods. It is perplexing that knowledge is not always linked to action. Knowledge is not power; rather, knowledge is only potential power! Information is necessary but not sufficient for creating meaningful change. Traditional educational messages devised to arouse fear (antismoking brochures showing blackened lungs, seat belt campaigns showing crumpled cars, video clips of people having heart attacks) have eliminated high-risk behaviors in some people, but not in the majority of the population. Fear of a heart attack or cancer has not kept many Americans involved in ongoing programs of exercise and dietary change. Even when the information is positive or inspirational, many still have difficulty making lifestyle behavior changes. Our everyday behaviors are learned responses. Why do some continue to smoke cigarettes or need alcohol to have a good time, while others select fruit instead of cake for dessert or automatically fasten their seat belt when getting into a car? These are learned behaviors. They occur as we respond to a variety of societal influences—parents, friends, role models, advertising, and our environment. Many of our choices are shaped by our surroundings. Called habits, these learned behaviors can also be unlearned. What is missing in the link between knowledge and action is a systematic strategy or plan.

MORE THAN WILLPOWER

Change is difficult. All of us who have tried to give up old habits and start new ones know how hard it is. Attempts to change can sometimes leave us feeling overwhelmed and demoralized. We may want to give up, feeling it's easier to hang on to old habits. Change can be especially difficult when someone else tells us to do it—a physician, friend, parent, or spouse. For many of us who face imposed change, the first reaction is to get angry and defensive. We do not like feeling forced to do something even when the change may appear to be in our best interest.



Daily choices affect health and vitality throughout the entire life span.

Sometimes our surroundings make it easier *not* to change. For example, if your only lunch option is a food court loaded with high-fat, high-calorie foods, it becomes the daily norm. Packing your own lunch with healthy fruits, vegetables, and yogurt may seem like a lot of trouble. In the same way, not having an accessible, safe place to jog, walk, or cycle makes exercising a more difficult task. Whatever the circumstances, behavior change starts in the mind. A new mind-set is needed to navigate this challenging path. *We* are the ones who initiate change; not someone else who nags us to do so.

Psychologists use the term **self-efficacy** in relation to behavior change. Self-efficacy is the amount of confidence an individual has in his or her own ability to carry out a desired behavior. You have a high level of self-efficacy if you feel confident in your ability to progress even amid tempting situations. Self-efficacy is also behavior-specific, which means you may have high self-efficacy regarding exercise but low self-efficacy with dietary changes. Having a high level of self-efficacy is one of the strongest factors in making positive wellness choices.

Changing a behavior or breaking an unhealthy habit involves *learning new behavior*. Just as in learning anything else, you must understand and practice the basic skills and techniques of behavior change. Some people are already excellent managers of their lives. They can study when they need to, exercise regularly, turn down an offer of chocolate creme pie, and refuse a beer at a party. These are powerful choices, choices that are linked to wellness. Do these people have a lot of good old willpower? Is that what it takes? Willpower is an ambiguous entity. Others believe that merely *wanting* to change is enough. Isn't it as simple as making a New Year's resolution? No! Certainly desire for change is important, but the "just do it" approach has no strategy to follow. Most of us can relate to the Top 10 "Excuses for Not Changing a Behavior."

The key to permanent change is having a plan. Merely being "motivated" is not enough. A basketball player may be motivated to win but neglect working on the skills necessary to be successful. Successful behavior change involves choosing specific goals and designing strategies to meet them. It is a learned skill that involves conscious decisions, including how to deal with setbacks and temptations. Successful change occurs when *knowledge* and *action* are linked for the purpose of controlling behavior.

THE TRANSTHEORETICAL MODEL OF BEHAVIOR CHANGE

Changing a behavior is a complex process. It has puzzled behavioral scientists for years how some people can successfully self-initiate and maintain major lifestyle changes (stop smoking, lose weight, stick with exercise, cut fat in their diet, etc.), while others fail to make even moderate changes, even after participating in professional group programs (exercise groups, smoking cessation classes, low-fat cooking seminars, etc.). After spending years studying individuals who successfully changed health-related

behaviors by themselves, James Prochaska, John Norcross, and Carlo DiClemente revolutionized behavior-change theory. They concluded that individuals engaging in a new behavior move through five distinct stages of change. This is called the **transtheoretical model of behavior change**. Rather than viewing behavior change as a single *event*, such as quitting overeating or becoming an exerciser, the transtheoretical model identifies change as a *progression* through five stages. These stages are identified as precontemplation, contemplation, preparation, action, and maintenance. This is a self-help approach in which the person is fully involved in the process of change. Rather than focusing on social influences or biological reasons, the transtheoretical model focuses on *personal decision making*. It is a model of intentional change that unfolds gradually over time.

The following is a brief description of each stage, followed by typical statements spoken by people in each stage:

Stage 1: Precontemplation ("I don't have a problem!")

Precontemplation is the stage in which people are not even considering a change in their behavior. People may be in this stage because they are uninformed or underinformed about the consequences of their behavior. They are often in denial about their habit. For example, an obese woman might think she is simply "big-boned" and not at risk for any health problems. A sedentary middle-aged man may think that exercise is only for young people, and since he was an athlete back in high school, he doesn't need to exercise. Or the precontemplator may have tried unsuccessfully to change and become discouraged about his ability to change. In this stage the barriers to and cons of changing outweigh the pros or benefits of changing. Precontemplators are often viewed as unmotivated, uncooperative, and defensive. They tend to avoid reading, talking, or thinking about their behavior. They have often constructed defenses that aid in the denial of the problem.



THE NUMBERS

- 50% Number of Americans who begin an exercise program but quit within the first 6 months.
- 88% Portion of Americans who make a New Year's resolution.
- 60% Amount of resolutions that are health related.
- 10% Number of people who keep their resolutions.

TOP 10 LIST

Excuses for Not Changing a Behavior

Whether it involves our activity level, diet, stress management, or a tendency toward procrastination, we seem to resist change. Here are the top 10 common excuses for not changing.

1. "It can't happen to me."
Denial is the first psychological barrier. Denial prevents us from seeing things the way they are. A wellness lifestyle requires an honest assessment of things as they are and a willingness to change.
2. "I'll do it later."
Change is achieved in little steps, and the time to start is now. The rest of your life starts *today*, not "after Christmas" or "when this tough semester is over."
3. "I'll have to give up and lose the things I love."
Instead of focusing on the benefits of change, most people have a tendency to focus on what they're losing. Instead of mourning the loss of your chocolate cake, cigarettes, or TV time, focus on the gains: money saved, a leaner body, more self-respect, better breathing, etc.
4. "It's someone else's fault that I am the way I am."
Wellness and lifestyle changes begin with self-responsibility and taking ownership of your problem. Blaming others or society in general is a trap, a way of avoiding self-responsibility.
5. "The task is too overwhelming."
When you were a 1-year-old, the task of running around the block was also overwhelming! You started with baby steps (and some falls along the way).
6. "It's too late to change."
Nonsense! No matter what your age or how long you've been avoiding change, you will benefit from any positive lifestyle change.
7. "If I fail, I'll look silly."
There is no such thing as failure; there are only learning experiences. Thomas Edison, for example, learned hundreds of ways *not* to make a lightbulb. All of us have setbacks from time to time.
8. "I don't deserve to succeed."
One way to break through the barrier of negative self-dialog is by affirming the positive. An affirmation is a conscious, positive statement or image that channels your energy into action. When you catch yourself feeling "that you don't deserve success," try visualizing that positive image or repeating a positive self-talk statement such as "I deserve success" or "I've worked hard for success."
9. "My family/friends aren't particularly supportive."
This is a tough one. Have you discussed your plan with them? You may be surprised at how supportive (and proud) of you they are once you tell them how important it is to you.
10. "I don't know how to begin."
Behavior change is a complex process that doesn't happen overnight. As you study the transtheoretical model in this chapter, you'll identify your current stage and the behavior processes that will help you move along. Formulate your plan and act on it.

Typical statements made by precontemplators: "I think my diet is fine." "Smoking doesn't cause heart disease." "I'm too out of shape to exercise." "Individual recycling won't really make a difference." "My weight is not a problem."

Stage 2: Contemplation ("Is change worth it?")

Contemplators have a sense of awareness about their problem behavior but are ambivalent about changing. In this stage, they may intend to take action or are seriously thinking about it, but have not yet made a commitment to take action. They have to be convinced that the trip is worth the effort. They consider the barriers (e.g., time, expense, hassle, fear, etc.) as well as the benefits (e.g., feeling better, looking better, lower blood pressure, etc.). For them, however, the barriers and cons are still more overriding than the perceived pros or benefits. People may remain stuck in this stage for years as they contemplate the pros and cons of changing.

Typical statements made by contemplators: "I really should eat more fruits and vegetables, but I'm not ready." "I know drinking is bad, and maybe someday I'll quit." "Exercise would be good for me, but I don't want to do it." "I really get stressed out, but I don't have the time to work on stress management skills."

Stage 3: Preparation ("Count me in!")

In this stage, the individual is on the verge of making a specific change. He or she is investigating the options available, and may even experiment with small changes as the determination to change increases. This is a key stage where a transition is occurring from cognitive "thinking about it" to beginning to take action. These individuals are putting together a plan of action, having resolved that the pros of changing outweigh the cons. They are making a commitment to the change effort and taking small steps to facilitate the change.

Typical statements made by someone in the preparation stage: "Monday I start my diet." "I signed up for a Bible study class." "I purchased a treadmill and am going to start a walking program." "I bought a low-fat cookbook and have already tried a few of the recipes."

Stage 4: Action ("I'm doing it!")

In this stage the individual overtly takes definitive action, requiring a considerable commitment of time and energy. This stage is most visible to others who see the new



Joining a support group is especially helpful to someone in the *action* stage of change.

behaviors taking place. This is a busy stage of change where the person uses strategies to resist temptations, cope with everyday challenges, and prevent a relapse. Having a strong belief and confidence in the ability to change is a key element in this stage. That's why working toward small, attainable goals is important during the action stage. Most experts agree that one must be in the action stage for 6 months before moving to the maintenance stage.

Typical statements made by someone in the action stage: "I now walk for 20 minutes during my lunch hour." "My roommate and I now go to the library to study three nights a week from 8:00 to 10:00 P.M." "I've switched from doughnuts to a whole-grain cereal for breakfast and have a lot more energy throughout the morning as a result." "When I feel the urge to smoke, a sugar-free mint satisfies my urge."

Stage 5: Maintenance ("It's hard to imagine how it used to be.")

Maintenance is the stage in which a person is sustaining his or her new behavior, usually for 6 months to 5 years. Patterns are becoming more automatic. Maintainers are experiencing the benefits of their change and are increasingly confident in their ability to sustain this new lifestyle. The main goal in maintenance is relapse prevention. For this reason, maintenance is a long, ongoing process.

Typical statements made by maintainers: "I do my breast self-exam on the same day every month." "I haven't had a cigarette for 2 years and really don't miss them." "I prefer skim milk over 2% milk." "My day isn't complete without my evening workout."

Take a look at the algorithm in Figure 5-1. By answering each question you can identify your current stage of change.

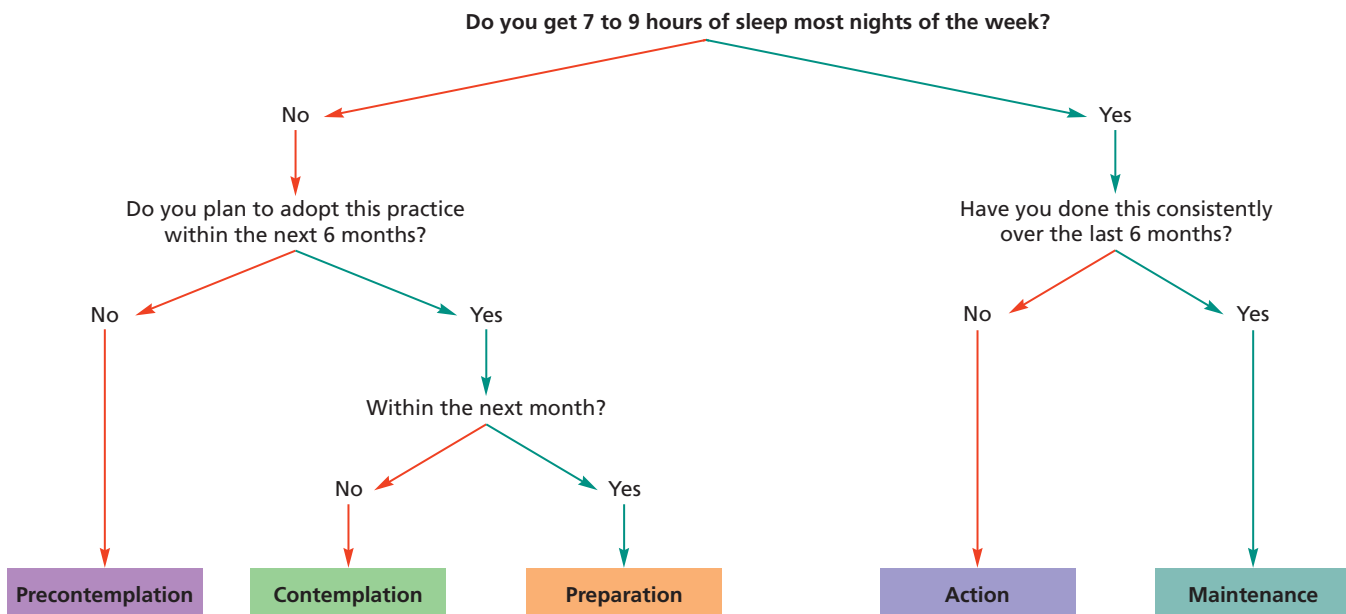
The transtheoretical model acknowledges that each stage is equally important in the change process. To apply this model, you should understand the following principles:

- ✓ Movement through the five stages does not always occur in a distinct, linear manner. Some people spiral back and forth between stages and may be stuck in one stage for many years before the goal is reached (e.g., slip back from the "action" stage to the "contemplation" stage).
- ✓ Successful behavior change is a process that unfolds over time; it doesn't happen all at once. There is no "magic moment."
- ✓ You may be at different stages of change for different behaviors (e.g., be in maintenance for an exercise program but in contemplation for the consumption of fruits and vegetables).
- ✓ Self-efficacy increases as one progresses through the five stages.
- ✓ Specific processes must be applied at the specific stages if progress through the stages is to occur.
- ✓ The key to successful behavior change is *identifying what stage of change you are in and then applying the processes of change that fit that particular stage* to move on to the next stage.

The Processes of Change

Prochaska and his colleagues discovered that to help people progress through the stages toward maintenance, distinct behavioral strategies known as **processes of change** need to be practiced at different stages. These processes are covert and overt activities and experiences that individuals engage in when they attempt to modify problem behaviors. These nine processes and the behavioral change strategies they incorporate have been shown to be the *best* predictors of permanent lifestyle change because they incorporate personal decision making, feelings of self-involvement, and individual confidence. The degree of confidence individuals have that they can practice healthful behaviors across a broad range of daily situations has been shown to be critically important in progressing through behavior change. Table 5-1 explains the nine processes of change that Prochaska, Norcross, and DiClemente have identified. Examples of behavioral strategies are listed for each process.

After looking over these strategies, you may say, "But I tried many of these techniques and *still* went back to my old habits!" The most dramatic implication of this behavior-change research is that efficient self-change depends on implementing the right behavioral strategies (processes) at the right time (stages). In this way, the key



You can substitute a variety of lifestyle questions for the initial question in this algorithm.

Try substituting: Do you recycle used newspapers, glass bottles, and aluminum cans?

Do you wear sunscreen when you know you'll be out in the sun for an hour or more?

Do you consistently limit the fat in your diet to under 70 grams per day?

Do you do aerobic exercise at least three to five times per week?

Do you regularly volunteer for community projects?

Can you think of other questions?

An algorithm for determining your stage of change.

FIGURE 5-1

TABLE 5-1

The Processes of Change

Process	Description	Example Behavioral Strategies
Consciousness-raising <i>Learn about it.</i>	Getting information about the nature and risk of unsafe behaviors; gaining awareness and feedback about a problem behavior; learning about the benefits of changing a problem behavior.	- Learning, "What are the long-term effects of inactivity?" - Assessing, "What foods in my diet are high in fat?" - Asking, "How many calories will I burn if I jog 3 miles?" - Investigating, "What actually triggers my smoking?" - Keep a log of available time for exercise, calories consumed, etc. - Thinking, "What would be the benefits of losing weight?" - Using lifestyle and health assessments to pinpoint problem areas
Social liberation <i>Is there help out there?</i>	Understanding and changing the contingencies that control or maintain the problem behavior; accepting and using new alternatives provided by the external environment; seeking social opportunities that support change.	- Investigating alternative environments (alcohol-free parties; smoke-free buildings; healthy lunch selections; walking clubs, etc.) - Identifying self-help groups and support groups - Utilizing low-fat menu choices in restaurants, campus workout facilities, recycling bins - Empowering policy changes (quiet hours, smoke-free lounges, healthier food court selections, etc.)
Emotional arousal <i>I don't want that to happen to me!</i>	Experiencing emotions related to the problem behavior.	- Watching a dramatization pertaining to the situation or problem - Using mental imagery to envision future health profile, weight, cholesterol, etc., if old habits do not change - Blowing cigarette smoke into a handkerchief to see the yellow stain; visiting a hospital cancer floor, emergency room, or drug rehab center - Reflecting about the illness or death of someone with heart disease or lung cancer, or who was in a DWI accident, etc.

TABLE 5-1 *The Processes of Change (continued)*

Process	Description	Example Behavioral Strategies
Self-reevaluation <i>Is change really worth it?</i>	Determining consequences and impact on personal life with and without a particular habit; reevaluating values, sacrifices, level of commitment; weighing pros and cons.	• Listing pros and cons (benefits and barriers) of changing • Asking, “Is having a fit body worth the sacrifice?” • Reflecting, “Is tanning that important to me?” • Considering, “Will my friends respect me if I stop drinking?” • Asking, “Will studying at the library three nights per week diminish my social life?”
Self-liberation <i>I can do it!</i>	Accepting personal responsibility for changing, especially the belief that it <i>can</i> be done; committing and recommitting to act on that belief.	• Publicly announcing your intentions; making a New Year’s resolution; setting a specific date • Creating a plan of action and taking small steps • Writing and signing a behavior-change contract • Posting motivational signs, pictures, affirmations • Keeping a log, chart, diary of progress
Reward <i>How can I reward myself along the way?</i>	Rewarding oneself or receiving rewards and reinforcement from others for positive changes.	• Using positive self-talk (“I’m looking better.” “It feels good to be in control.” “I like the compliments I’m receiving.”) • Making bets, pacts with others; using money, gifts as goals are reached • Incorporating a step-by-step approach with rewards at each step
Countering <i>What can I do instead?</i>	Substituting alternative behaviors for problem behaviors.	• Walking with your spouse or partner rather than watching TV • Practicing relaxation rather than arguing/retaliating • Thinking positive, self-supporting thoughts • Drinking soda instead of beer • Chewing gum rather than smoking • Going to the gym rather than to “happy hour” • Reading a magazine rather than snacking
Environment control <i>My surroundings must make it convenient and easy.</i>	Restructuring the environment to reduce temptations; avoiding or controlling the situations that trigger the problem behavior.	• Having exercise clothes/gym locker conveniently ready or exercise equipment readily available • Removing ashtrays/cigarettes from the apartment • Never shopping at the grocery store when hungry and tempted to buy high-fat, high-calorie foods • Posting positive signs and reminders • Planning ahead by visualizing your action when confronted with a temptation/trigger
Helping relationships <i>Will you help me stick with this?</i>	Trusting, accepting, and using the support of others during attempts to change the problem behavior.	• Sharing your plans with others; asking for their support • Writing a partner contract with goals and partner’s commitments • Enlisting someone else to “buddy up” and change with you; having someone to talk to • Joining support groups; being with others who are doing the same things

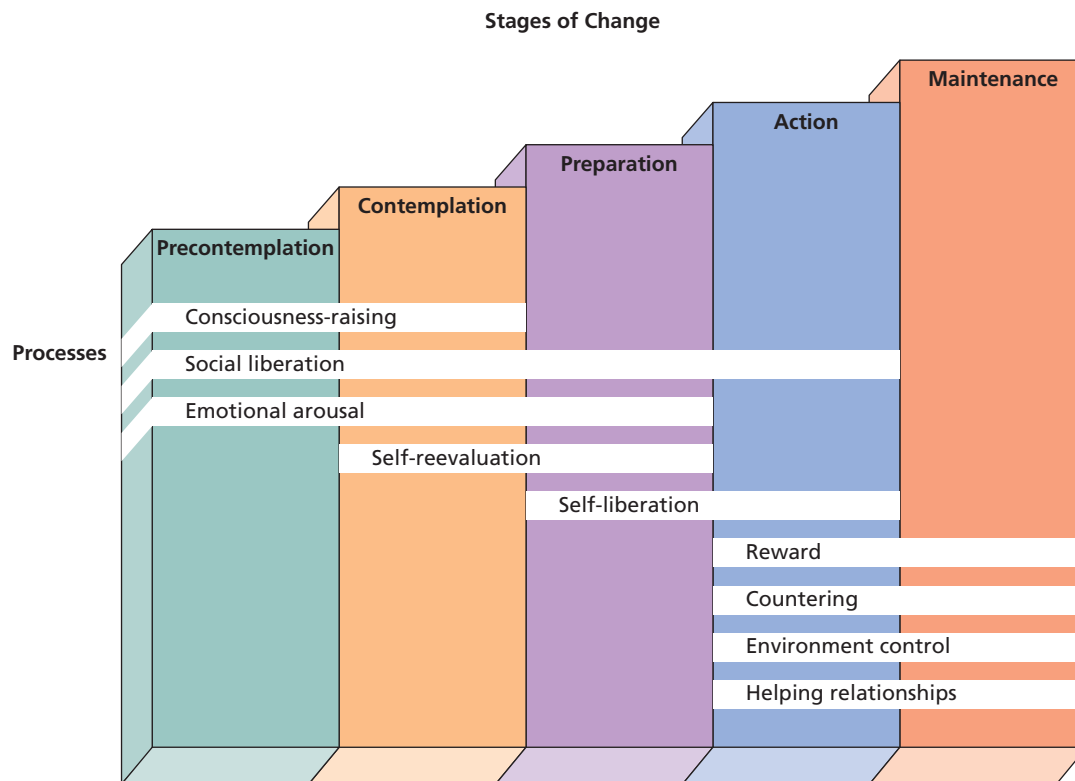
to successful change is *identifying* what stage you are in and matching the change process to maximize the problem-solving efforts. Figure 5-2 identifies the five stages of change and the nine processes that work best within each stage.

Suppose Rick, for example, has been a nonexerciser for over 3 years. He competed in sports while in high school but stopped when he started college. He has gained 20 pounds and feels tired and sluggish. He knows he should exercise but feels overwhelmed with school and a part-time job at the video store. How can the transtheoretical model help Rick?

Identified Stage of Change: Contemplation (i.e., he knows he should but feels he has no time.)

Processes that will help Rick:

- ✓ Consciousness-raising behavioral strategies:
 - Read/learn/investigate the benefits of exercise throughout the life span.
 - Keep a daily time log to see when a workout could possibly fit into his schedule.
 - Investigate how many calories could be burned during a workout.

**FIGURE 5-2**

Stages of change and the processes found to be most useful in each stage.

SOURCE: James O. Prochaska, Cancer Prevention Research Center, University of Rhode Island.

- ✓ Social liberation behavioral strategies:
 - Find out the open hours at the campus recreation center.
 - Map out a safe cycling/walking/jogging route from his apartment with various mileages.
 - Investigate the cycling/jogging/swimming clubs on campus.
- ✓ Emotional arousal behavioral strategies:
 - Reflect on father's heart attack at age 52.
 - Look at high school pictures—a leaner, fit body.
 - Look at latest blood/fitness profile—high body fat, high cholesterol, pre-hypertension.
- ✓ Self-reevaluation behavioral strategies:
 - List pros and cons of daily exercise sessions.
 - Imagine what his health profile will be in 5 years if he continues same inactive lifestyle.
 - Analyze if the sacrifice of time to exercise would be worth it.

By using these processes Rick has a good chance of transitioning successfully from the contemplative stage to the preparation stage. In contrast, starting Rick out by nagging him to join you in your 6:00 A.M. swim or buying him a YMCA membership for his birthday would be futile because Rick is not initially ready for “action.” However, exposure to the processes that impact him as a contemplator can help him move on to

the next stage where additional behavior strategies can then help him. Plus, Rick has taken some ownership and self-involvement in the change, rather than being forced or cajoled by others.

Unfortunately, many health promotion programs address only the needs of people in the “action” stage of change (e.g., aerobics classes, low-fat cooking classes, stress management seminars). Yet a large proportion of individuals are precontemplators and contemplators who need other strategies. For these individuals, joining an action-oriented program often results in failure, guilt, or blame for the lack of willpower or motivation.

Prochaska's stages-of-change model can be a self-directed model that you can use as you begin applying the correct *processes* according to the stage of change you are in.

Why is understanding the transtheoretical model important as you attempt to make a behavior change?

- ✓ Having a realistic view of the work involved may better prepare you for the effort and commitment needed to be successful.
- ✓ Even in the absence of pure action, you can make progress by gaining awareness about the problem behavior, experiencing emotions relative to the problem behavior, and changing your beliefs and attitudes about the problem behavior.



Learning about health risks is a strategy in the consciousness-raising process of change. This is helpful to someone in the precontemplation or contemplation stage of change.

- ✓ Knowing the factors that could cause a setback may help you prepare for success rather than fall into a relapse.

Remember . . . behavior change is a marathon, not a sprint.

MAKING A PLAN

According to the *American Heritage Dictionary* a “plan” is a “detailed scheme, program, or method worked out beforehand to accomplish an objective.” Too often people will say that they “plan” to eat healthier, stop smoking, or exercise. However, they fail to work out or think through the necessary details in advance.

One specific way to initiate a lifestyle change is to write a personal behavior-change contract or plan incorporating the processes for the change. Writing it out makes you think through your plan in its entirety rather than letting things happen as they may. It specifies the *details* for carrying out your plan. Figure 5-3 shows a sample behavior-change contract. The changes you choose to make can pertain to any dimension of wellness—anything from improving study skills, to losing weight, to reducing stress, to controlling anger. The most important outcomes of writing a contract are the self-evaluating and planning involved. Having a *plan* is what differentiates a successful change from a fleeting

New Year’s resolution. A plan can turn a resolution into a reality. A blank contract and a behavior-change log are provided in the lab activities at the end of the chapter for your use. Remember, failing to plan is planning to fail!

Identifying Your Goal

Having a clearly defined goal is essential for successful behavior change. Most of the time people select a vague goal or one that is too broad. Or they try to change too many things at once. You are doomed to failure if you try to lose 40 pounds, get A’s in all your classes, train for a marathon, and eat broccoli every day—all at once! However, developing one succinct, well-defined goal can get you headed toward success.

Self-change strategies are most effective when goals are stated in behavioral terms and quantified. (“I am going to walk 10,000 steps every day.” “I am going to lose 10 pounds by spring break.” “I am going to read my Bible for 15 minutes every morning before class.”) In the business world successful leaders emphasize putting goals in writing. Therefore, as you develop your behavior-change goal, write it down and post it in a prominent place (bulletin board, day planner, bathroom mirror, car dashboard, refrigerator, etc.) where you will see it every day. Think of it this way: You would never attempt to drive from Boston to Chicago without a road map. Just taking off and wandering probably would not get you there. Goal setting is like ordering your road map from AAA!



Keeping a log or diary of your behavior allows you to see your progress and can be a great motivator.

Behavior-Change Contract (using the transtheoretical model)

Name Kate Christopher
Date January 1

Goal (Specific and Measurable): To be able to jog 4 miles nonstop by March 5

Pros/Benefits of Changing: Enhance my cardiorespiratory system; reduce my risk for chronic diseases; lose weight; feel better; build better bones; relieve stress

Cons/Barriers of Changing: Hard to find the time; cold, snowy weather; sometimes feel too tired to exercise; roommates are not exercisers

Identify stage of change currently in:

☐ Precontemplation ☐ Contemplation ☒ Preparation
☐ Action ☐ Maintenance

Processes (with accompanying behavioral strategies)

1. Consciousness-raising a. Research the long-term benefits of exercising b. Keep a time-management log to find days/time when I could fit in a jog c. Talk to other busy students who make time for exercise and see how they do it	6. Reward a. Put a quarter in a jar for every nonstop mile jogged . . . eventually buy a new CD b. Use positive self-talk ("If Janet can do this, so can I." "I've jogged 10 days in a row and don't want to blow it now.") c. Every Sunday morning jog to the coffee shop and treat myself to a hazelnut cappuccino
2. Social liberation a. Find out the winter hours for the indoor track at the recreation center b. Map out a safe 4-mile route starting from my residence hall c. Find out which residence halls have treadmills available for student use	7. Countering a. Rather than driving, jog to the corner pantry for my daily newspaper b. Rather than taking the elevator, jog up the stairs to my computer science class c. When I go to the post office, jog rather than drive
3. Emotional arousal a. Visualize my coronary arteries becoming clogged b. Think about my ill, overweight aunt with a 320 cholesterol c. Visit a hospital coronary care unit	8. Environment control a. Get a locker at the recreation center and keep a towel and extra workout clothes there b. Pack my workout bag each night before bed so it is ready c. Keep an extra pair of running shoes and workout clothes in the car so I have them when I go out of town to visit my boyfriend
4. Self-reevaluation a. List the pros and cons of daily exercise b. Imagine how much <i>more</i> I'll be out of shape in 5 years if I don't exercise regularly c. Reflect on how important it is to me to be more fit and feel better about myself	9. Helping relationships a. Invite my roommates to jog with me b. Tell my boyfriend about my plan c. Discuss my goal and plan with my exercise physiology professor
5. Self-liberation a. Make a chart to log miles with a specific destination—the Grand Canyon b. Post pictures on my bulletin board from a running magazine c. Write a daily training schedule with specific mileages per day; put it on my Outlook calendar	

FIGURE 5-3

Behavior-Change Contract (Note: This sample contract gives suggested strategies for each process even though Kate, having identified herself as being in the "preparation" stage, is best influenced by only four of the processes. Can you identify those four? See below for answers.)

Many success coaches and business consultants use the acronym S.M.A.R.T. to explain goal setting. S.M.A.R.T. refers to **S**pecific, **M**easurable, **A**chievable, **R**eward, and **T**ime-defined.

S = Specific

Goals need to be specific, not vague. *Not* “try to do better in history class” *but* “study my history class notes and chapter assignments every day after class.” *Not* “try to eat better” *but* “add a serving of fruit and a serving of vegetables to every meal.” *Not* “become more environmentally involved” *but* “recycle all of my aluminum cans.” These are specific actions that contribute to the outcome.

M = Measurable

Goals should have concrete criteria for measuring progress (How much? How many? How will I know when it is accomplished?). *Not* “start exercising” *but* “go to the gym M, W, F, S at 5:30 P.M.” *Not* “handle stress better” *but* “get up 15 minutes earlier in the morning to meditate.” *Not* “lose some weight” *but* “lose 10 pounds.” *Not* “save some money” *but* “set aside \$50 per paycheck.”

A = Achievable

Goals should be challenging but also within your capabilities—something you know you can achieve! *Not* “win Wimbledon” *but* “learn to play tennis at an intermediate level.” *Not* “make straight A’s all 4 years” *but* “maintain a 3.5 GPA.” *Not* “run a marathon next month” *but* “run a 5K race next month.”

R = Reward

You need to reward yourself along the way as you reach certain milestones (new shoes, a pedometer, a massage, a new CD, concert tickets, etc.).

T = Time-defined

Establish some time frames for your goal—either when you’ll *do* it or when you’ll *accomplish* it. (“I’ll study between 8 and 10 P.M. Sundays through Thursdays.” “I’ll lose 8 pounds by summer break.” “I’ll cycle the Hilly Hundred by October 15.”)

Get started today by establishing your S.M.A.R.T. goal (see Lab Activity 5-1).

Listing Pros and Cons

The decision to move from one stage to the next is based largely on the weight given to the pros and cons of changing behavior. The pros represent positive aspects or benefits of changing. The cons represent negative aspects of changing behavior and may be thought of as barriers to change. It’s helpful to make a list of the pros and cons

TOP 10 LIST

Keys for Success in Changing Behavior

1. Self-monitor your behavior by keeping a log or record of your habit. This increases self-awareness of cues, triggers, consequences, and challenges.
2. Focus on one habit at a time; don’t try to change everything at once.
3. Set reasonable expectations; be realistic but also challenge yourself!
4. Divide large tasks into a number of small steps.
5. Find someone or a group of people who will support you actively.
6. Each day make a list of three things you *can* and *will* do to reach your goal.
7. Spend time with people who already do what you are trying to do.
8. Practice stress management strategies daily and use positive attitudes and affirmations. Emotional distress is a primary factor in lapses and relapses.
9. Expect occasional setbacks; they are part of change. Plan what you’ll do if things don’t work out as expected or if you face a high-risk situation.
10. Don’t let the change be an obsession; try to maintain a sense of humor and don’t take yourself too seriously.

as you contemplate a change. Seriously ask yourself how your life will be affected by your changed behavior. Realize that changing behavior brings consequences to yourself and, most likely, others. (By quitting drinking I will have better health and less likelihood of suffering from an alcohol-related accident. However, I will lose some social friends and my “mood medication.”)

In the precontemplation stage of the transtheoretical model, the cons of changing outweigh the pros. In the contemplation stage, the pros may begin to match the cons. However, because they are so close to being equal, the resulting indecision and lack of commitment cause many individuals to become stuck in the contemplation stage. These individuals substitute *thinking* for *action* while continually weighing the costs and benefits of changing. As individuals move into preparation and through the final two stages, the positive aspects (pros) of changing progressively outweigh the negative aspects (cons).

Honestly assessing the costs of changing will help you face yourself and your true motivations. This will help you anticipate the obstacles ahead of you. To increase your motivation, you might talk to acquaintances who have successfully made the change you are attempting. Check out the Top 10 “Keys for Success in Changing Behavior.” Keep these in mind as you use the behavior strategies that correspond with your stage of change.

PREVENTING RELAPSE

In the first line of his best-selling book *The Road Less Traveled*, Dr. M. Scott Peck writes, “Life is difficult.” He further adds that “life is always difficult and is full of pain as well as joy.” Changing a habit takes *effort*, but the joy in the growth and self-empowerment is the wellness journey. In our society we have become accustomed to the quick fix: instant cash at the ATM machine, fast food, credit cards, 24-hour Internet shopping, fax machines. Changing a behavior takes *time*, and setbacks are not uncommon. Instead of giving up forever, try to learn from your experiences. Since new behaviors are fragile, maintaining your plan will require flexibility, particularly if the plan is not working properly, if unexpected obstacles arise, or if a support system is failing. Reevaluation is a necessary component in making a permanent lifestyle change. A lapse or setback should be viewed as a mere “bump in the road” where learning and growth can occur. One problem many people have is believing that a setback is a *failure* rather than a temporary obstacle. How you respond to a temporary lapse determines what you will do after it occurs. Often the first line of defense against relapse is *planning*. If chocolate chip cookies are your downfall, don’t buy any. (They’ll keep calling your name from the cupboard.) If you’ve tried and can’t get up 45 minutes earlier in the mornings to exercise, what about using your lunch hour to exercise? Take your walking shoes to work with you and invite a colleague to exercise with you. If you are trying to control your weight, you’ll likely do better ordering from a menu than choosing the all-you-can-eat buffet. Plan so you’ll *succeed*. It is important to recognize “high-risk” situations and have specific coping skills for those situations. Successfully managing high-risk situations can lead to increased feelings of self-efficacy. This

means you’ve increased your behavior-changing skills, which in turn leads to decreased chances of relapse.

As you become the *cause* rather than the *effect* of actions, your confidence and self-esteem are enhanced. Emphasize the positive. Value your successes and your worth as a human being. Most of us do not realize that the majority of our supportive messages come from our internal thought processes rather than from external sources. We carry on a continuous dialog with ourselves each day. Called *self-talk*, our inner voice can be a positive source of motivation. Mental health experts recognize self-talk as a powerful force for changing the way we think and behave. “We have a choice about how we think,” states Martin Seligman, author of *Learned Optimism*. Self-talk that encourages us and reminds us of our achievements helps increase our self-esteem. Self-talk can also be negative and, as a result, a source of discouragement. For example, when confronted with tempting desserts at a holiday party, a positive self-talk statement would be “I’ll have just a small amount because I am looking forward to wearing my new clothes.” A negative self-talk statement would be “I’m already overweight, so it doesn’t matter if I eat a lot.” Remember . . . *you* control your thoughts, and they can be very powerful.



There are many ways to avoid temptations.



By playing the guitar to distract herself from the urge to smoke, this young woman is utilizing the *countering* process of change.

Factors That Contribute to Relapses

Several factors can cause a relapse. The top contributors are (1) stress, (2) social situations, and (3) cravings.

- ✓ Stress has a tendency to drain our energy and blur our focus. For example, suppose you have been exercising every Monday, Wednesday, and Thursday evening at the recreation center. Then you suffer a breakup with your girlfriend. Feeling stressed, you suddenly find yourself skipping workouts and immersing yourself in television. These are times when it is important to have healthy stress-coping strategies. We all face life's stresses at times, and it is important not to give up during these times.
- ✓ Social situations often present a challenge when trying to change a behavior. Other people may be ambivalent about your change and can consciously or unconsciously tempt you to revert to old habits. For example, suppose you have been cutting back on eating candy, limiting yourself to one small treat a week. Then, at a campus party you find yourself eating handfuls of chocolate peanuts from a big bowl. A remedy for social situations is to plan ahead for such high-risk

situations—chew gum, position yourself away from the candy bowl, eat before the party, and so on.

- ✓ Cravings are intense urges that involve emotional and physiological wants and needs. For example, suppose you haven't smoked a cigarette for 3 weeks. Then you attend your high school reunion and find yourself smoking again with old classmates. By using positive self-talk, mental imagery, and countering strategies, you can control cravings.

Regardless of the cause, if a relapse does occur, analyze what happened. Learn what you could do better in the next similar situation. Check out Table 5-2 for more specific tips.

Remember that changing a behavior is a process involving growth. It is a process of assessing and reassessing goals, monitoring behavior, reviewing strategies, learning from setbacks, and acknowledging the joy in the effort to be the best you can be. Successful behavior change requires time, attention, and effort. But you'll find it is well worth it!

Paul J. Meyer, an international self-empowerment author, acknowledges such effort by saying, "Ninety percent of all those who fail are not actually defeated. They simply quit."

TABLE 5-2

Tips for Getting Back on Track After a Setback

1. Cut yourself some slack.
Accept that you are human and that no one is perfect. If you slipped today, tomorrow is another day. More important, what have you learned from this setback? Remember that success does not hinge on 1 or 2 bad days. Therefore, praise yourself for the successes you *have* experienced. In this way you shift your focus from failures to successes. ("I did this successfully for 5 days; what made it work?")
2. Review your goal and plan.
Make sure it is realistic and achievable. Don't set yourself up for failure. If you have never been an early riser, perhaps a 6:00 A.M. workout is not the best time for you. November, just before the holidays, may not be the best time to start a new weight-loss program. Readjust your plan: i.e., exercise at 3:00 P.M.; set a goal to *not gain* extra weight over the holidays.
3. Review your pros for changing.
You must have had strong reasons for wanting to change. Was it to fit into that new swimsuit? Was it to lower your blood pressure? Was it to develop muscle definition? Go over your motivations again. Write them down and post them in a prominent place.
4. Anticipate obstacles.
What do you think triggered this setback? Try to anticipate future triggers and roadblocks and find ways around them, or at least prepare for them. For example, your exercise routine may run afoul during holidays, travel, vacations, or bad weather. Look for hotels with fitness centers; pack a jump rope and an exercise band; investigate indoor facilities during bad weather; ask the concierge about jogging routes, facilities, etc.; organize a family walk after Thanksgiving dinner.
5. Look for role models.
Do you know someone who has reached the goal you are striving for? If you do, chat with them about how they overcame obstacles and setbacks. Gain strength from their experiences. Perhaps you can pair up with a friend or join a group with similar goals. Even reading stories about strangers or celebrities who have succeeded can provide inspiration and hope. Also, look for ways to restructure your environment or personal living situation to make it easier to succeed.
6. For cravings, use the three **D'S**.
Delay at least 10 minutes so that your actions are conscious, not impulsive.
Distract yourself by engaging in an activity that requires concentration (e.g., play the piano, surf the Internet, do a crossword puzzle, etc.).
Distance yourself from the temptation (e.g., stand away from the buffet table; don't walk past the donut shop; sit in the non-smoking area; etc.).
Substitute a fun-size candy bar for a king-size; a low-fat fudgesicle for a super premium turtle sundae; a mint rather than a cigarette; chew on a toothpick rather than fingernails; etc.



It is much easier to stick with a program when you have someone doing it with you. This is a strategy in the *helping relationships* process of change.



PRESCRIPTION FOR ACTION

You've read the chapter. Now go do one or more of these:

- ✓ Keep a log/journal of a habit you are thinking about changing.
- ✓ Write a specific, measurable behavior-change goal and post it in a prominent place.
- ✓ Identify two specific things you can do today to help you reach your goal.
- ✓ State one source of support (campus, community, friends, family, etc.) that could assist you in changing a habit.
- ✓ Identify one way you can modify your environment to help contribute to a successful behavior change.



Frequently Asked Questions

Q. One of the processes of change in the transtheoretical model is called “countering.” What are some of the specific strategies of this process?

A. Countering behaviors replace the problem behavior. This strategy is useful when one faces a craving or a social pressure. Try reading a magazine article; abdominal breathing; calling a friend; surfing the Internet; playing a musical instrument; putting on a CD and dancing or singing; going for a walk; watching a television program; playing a game of solitaire; practicing positive self-talk; doing sit-ups/push-ups; cross-stitching; watching a movie; reading scriptures; chewing gum; closing your eyes and practicing imagery; shooting baskets; practicing a new skill; drinking a diet soda; e-mailing a friend/family member. There are many more. The intention is to divert your attention for 10 to 15 minutes while you refocus on your goals.

Q. My behavior-change needs involve time management—specifically, making myself go to the library 4 nights per week from 7:00 to 10:00 P.M. to do homework. I wrote a contract and did well for 4 weeks; then I missed several nights. Now I feel like a failure and am having a hard time getting back on track. Help!

A. The problem of relapse is an important challenge in changing behavior. When individuals experience a *lapse* (a few days of not complying with a new behavior), they need to avoid the feeling that they are doomed. For dieters, it is the belief that one cookie terminates a diet. For exercisers, it is the belief

that one missed exercise class means they are no longer “exercisers.” Remember that a lapse is a slip, a *relapse* is a string of lapses, and a *collapse* is when the person gives up and returns to past behaviors. Everyone has lapses. Analyze what influenced your lapse. Did you have some other commitments? An invitation to go shopping? A birthday party to attend? Maybe you’d be better off scheduling your 3 hours at the library from 2:00 to 5:00 P.M. Readjust, refocus, recommit, and don’t let a mere lapse turn into a major relapse or collapse.

Q. Is there a way to increase my self-efficacy?

A. Yes. Since self-efficacy deals with your perception of your ability to perform a task or engage in a behavior, you can improve your confidence by using four methods: (1) hands-on practice (give it a try!), (2) observing others like you who are doing it successfully (modeling), (3) internalizing the benefits you’ll be getting (positive expectations), and (4) beginning to feel or see results (positive feedback/reinforcement).

Q. My best friend is very inactive, and I am an avid exerciser. She makes fun of me sometimes! Even though she is trim, I worry about her future health. I have begged her to go to the gym with me, but she just laughs and says she doesn’t need to exercise since she is slim. What can I do to change her mind?

A. Like millions of others, your friend is in the precontemplation stage. She doesn’t see the need for exercise or is in denial about the benefits of exercise

for her. The three processes that will have the most impact on her are consciousness-raising, social liberation, and emotional arousal. Therefore, find opportunities to casually bring up the benefits of exercise. Verbalize how good you feel after your workout and how it reduces your stress. Talk about how nice the campus recreation center is, or how you've met some great new friends there. Mention

the awesome aerobics class that you are taking, or how excited you are about the bike club trip next weekend. Making comments like these in a nonthreatening manner raises your friend's awareness. Letting her know about available campus resources may also help. As time goes by, she may consider giving it a try—or at least move on to the contemplation stage.

Summary

Following a great musician's performance, an admirer said to him, "I'd give my life to play like that." The brilliant performer hesitated for a moment and then replied, "I did." We often view a performance by an athlete or artist with envy. Accomplishment is often deceptive, because we don't see the perseverance that produces it. We don't see the good times and bad, the setbacks and the obstacles. Changing behavior also involves a certain amount of perseverance and discipline. Many desire the benefits of a healthy lifestyle but fail to commit to its precepts.

It takes more than willpower to change a behavior. Permanent behavior change involves passing through five distinct transitional stages, while using the corresponding problem-solving processes and strategies within each stage. Just as special tools are needed in building a house, having skills in the various processes of change will help you

"build your new self." Making a plan, S.M.A.R.T. goal setting, listing pros and cons, and understanding relapses are important skills. Writing a contract helps you construct a plan in its entirety, and keeping a behavior-change log helps you monitor daily activity. Though setbacks may occur, a mind-set of commitment and self-empowerment can help you continue the journey.

Think about a business that places this sign in its window: "UNDER NEW MANAGEMENT." Imagine that your body/life is your "business" and you're the new manager who's been brought in to turn this business around. It's going to be challenging, and you're going to have to make some tough decisions. It'll take effort and commitment, but it is your job! And think of the benefits! So declare it now: "MY LIFE IS UNDER NEW MANAGEMENT!"



Internet Resources

American Academy of Health Behavior

www.ajhb.org

Offers current and archived abstracts of articles from the *American Journal of Health Behavior* with an emphasis on health behavior research.

Health Behavior News Service

www.hbns.org

Has recent scientific research and news stories pertaining to how people can change their behavior to improve and manage existing illnesses.

Home of the Transtheoretical Model

www.uri.edu/research/cprc

Offers detailed information about the transtheoretical model of behavior change. Included are assessment inventories for various behaviors and habits.

Psychology Today

www.psychologytoday.com

Accesses thousands of articles related to a variety of psychological topics: anxiety, behavior, depression, family, personality, relationships, stress, and addictions.

LAB Activity 5-1

Name _____ Class/Activity Section _____ Date _____

Identify Your S.M.A.R.T. Goal

By using the information in this chapter on goal setting, identify your **S.M.A.R.T.** goal.

S (Specific):

(Examples: Poor = “I want to look better.”; Good = “I am going to increase the muscle definition in my arms.”)

M (Measurable):

(Examples: Poor = “I want to try to eat more fruit.”; Good = “I will eat 4 servings of fruit every day.”)

A (Achievable):

(Examples: Poor = “I will lose 120 pounds.”; Good = “I will lose 10 pounds.”)

R (Reward):

(Examples: Poor = “For every pound that I lose, I am going to treat myself to a hot fudge sundae.”; Good = “For every pound that I lose, I am going to put \$3 in a jar toward the purchase of a new outfit.”)

T (Time-defined):

(Examples: Poor = “I want to stop biting my nails.” Good = “I will stop biting my nails by spring break.”)

(continue on the back)

Now . . . state your *final, completed goal statement* using all S.M.A.R.T. factors:

(Example: “I will get up at 7:30 A.M. on MWF to do 20 minutes of spiritual reading and journaling, and my reward for sticking with it for a whole month will be to treat myself to a massage.”)

Anticipated obstacles, barriers, or high-risk situations:

Strategies for overcoming obstacles, barriers, or high-risk situations:

LAB Activity 5-2

Name _____ Class/Activity Section _____ Date _____

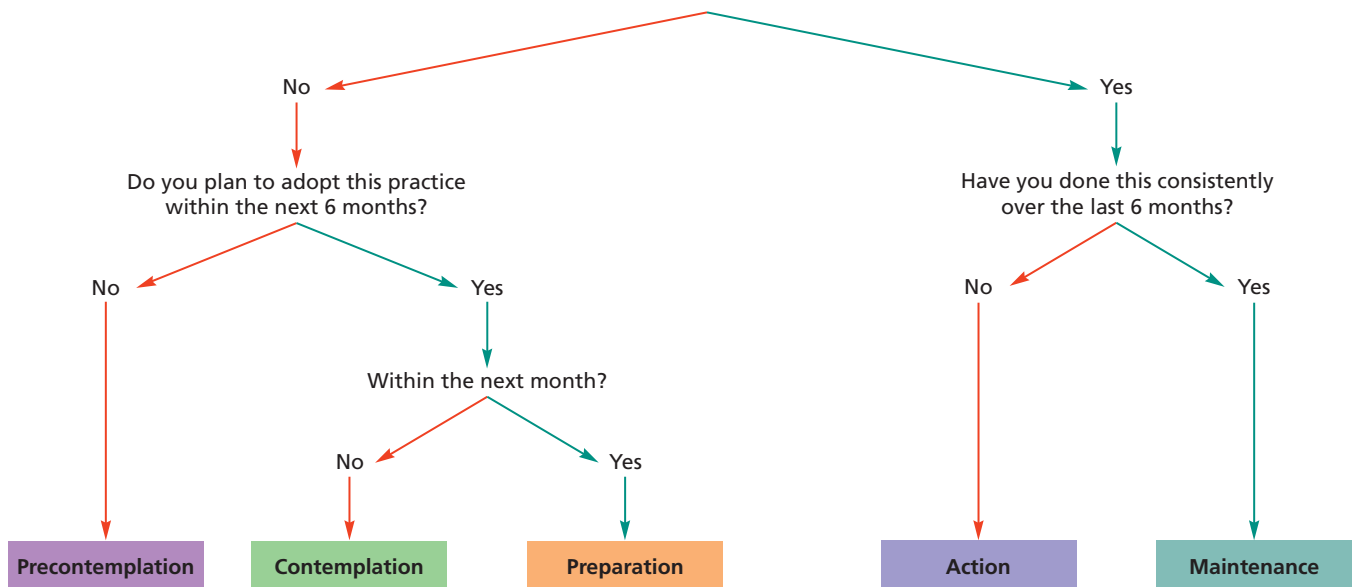
Behavior-Change Contract (Using the Transtheoretical Model)

Writing a contract makes you think through your plan in its entirety. It specifies the *details* for carrying out your plan.

STEP 1: Turn your personal goal into a question (see Figure 5-1), and write it on the line below. Then trace a path along the algorithm to find your current stage of change.

Do you _____?

(Example: Do you consume at least 1,000 mg of calcium every day?)



STEP 2: Write your contract, using your behavioral strategies. (See Figure 5-3 for a sample contract.)

Goal (specific and measurable):

Pros/Benefits of changing:

Cons/Barriers of changing:

State your current stage of change (as identified by the algorithm):

Now identify three *processes* of change that correspond to your personal stage of change (see Figure 5-2), and list two specific behavioral strategies you will use for each process. (See Table 5-1 and Figure 5-3 for several examples of behavioral strategies.)

1. Process: _____

Strategies: (1)

(2)

Example:

Process: Consciousness-raising

Strategies: (1) Find out amount of calcium I need for my age.

(2) Keep track of my daily calcium intake to see what I currently get.

2. Process: _____

Strategies: (1)

(2)

3. Process: _____

Strategies: (1)

(2)

Witness (optional) _____

LAB Activity 5-3

Name _____ Class/Activity Section _____ Date _____

Behavior-Change Log/Journal

Rather than writing a formal contract, you may find it easier to simply keep a log or journal of your behavior. In this way you can monitor your behavior, track your progress, identify stumbling blocks, incorporate coping behavior strategies, and readjust your plan as circumstances dictate. (Make copies as needed.)

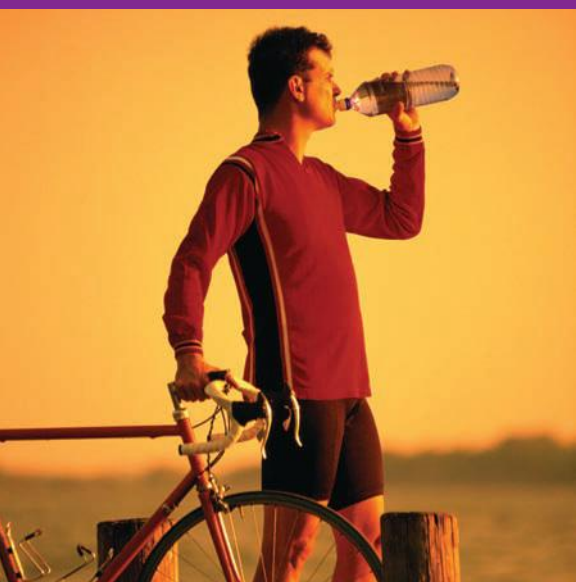
Goal (specific and measurable):

Potential obstacles/challenges:

Behavioral/coping strategies to overcome obstacles:

Day/date	Today's challenges/obstacles	Today's behavioral/ coping strategies	Comments (personal and/or instructor)

[illegible]



Exploring Special Exercise Considerations

6

Obstacles are those frightful things you see when you take your eye off the goal.
—Hannah More, English author

Study Questions

You will have successfully mastered this chapter if you can answer the following:

1. What are the physiological differences in men's and women's exercise performance levels?
2. What are the similarities in men's and women's responses to exercise?
3. What are the correct recommendations for exercise during pregnancy?
4. What is exercise addiction?
5. How does exercise affect disease resistance?
6. What are the recommendations for exercising safely in hot and cold weather?
7. What are the best replacement fluids to prevent dehydration during exercise in hot weather?
8. What drugs affect physical performance? How do they do so?
9. What are the effects of a regular program of exercise on the aging process?
10. What are the correct recommendations for exercise for individuals with chronic health conditions such as arthritis, asthma, diabetes, hypertension, and osteoporosis?

You will find the answers as you read this chapter.



Visit the Online Learning Center for *A Fit Way of Life*, www.mhhe.com/robbinsfit2e, where you will find additional quizzes and study aids.

Terms

- amenorrhea
- amphetamines
- anabolic steroids
- caffeine
- diuretics
- dysmenorrhea
- electrolytes
- endorphins
- estrogen
- exercise addiction
- female athlete triad
- hemoglobin
- hyperthermia
- hyponatremia
- hypothermia
- Kegel exercises
- menarche
- narcolepsy
- oligomenorrhea
- 'roid rage
- sarcopenia
- stress incontinence

This chapter brings together several concerns related to exercise participation. Nine major areas are addressed: similarities and differences in men's and women's exercise performance, females and exercise, males and exercise, exercise addiction, exercise and disease resistance, environmental considerations, drugs that affect physical performance, aging and physical activity, and exercise and chronic health conditions. With increased knowledge of these special exercise considerations you will have a greater understanding of how to participate in and enjoy physical exercise throughout your life span. Be motivated to do so by these words: "Don't wait for your ship to come in. Row out to meet it."

SIMILARITIES AND DIFFERENCES IN MEN'S AND WOMEN'S EXERCISE PERFORMANCE

While performance levels may differ, men and women respond to exercise in a similar manner. Although women have approximately 20 percent lower maximal oxygen uptake than men (due to smaller heart size), with exercise they show similar rates of improvement. Performance levels differ for several reasons.

- ✓ *Strength:* Due to hormonal changes during puberty, a woman adds fat because of estrogen, while a man's muscle mass doubles because of testosterone. In fact, women have half as much or more muscle to move their weight and more inactive fat weight to carry. In addition, men's greater muscle mass gives them 30 to 40 percent greater strength. See "The Numbers" later in this chapter.
- ✓ *Performance and endurance:* Physically the male heart and lungs are larger than those of the female. The larger male heart and lungs produce higher stroke volumes and vital capacities than those of females. Men also have more **hemoglobin** (the oxygen-carrying component in red blood cells) in their arterial blood than do women. Both the larger heart size and more oxygen in the blood result in greater cardiac output and greater maximal oxygen uptake. These factors give males advantages in terms of performance and endurance.

- ✓ *Heat tolerance:* Women have a higher body temperature at rest, fewer sweat glands, lower sweat production, and a propensity to start sweating at higher temperatures than do men. A woman's greater amount of adipose tissue (fat) serves as insulation and inhibits heat dissipation. The implication of these differences is that women have less tolerance to heat than do men. As a result, women are more subject to heat stress than are men and have to work relatively harder than men to achieve similar workloads under higher levels of heat conditions.

Even though women are at a disadvantage in terms of physical performance, they benefit equally from aerobic exercise in terms of fitness improvement. Training effect benefits such as loss of fat from deposit areas, increased bone density, and decreased exercise heart rates are similar for men and women. When differences in body size are taken into account, fitness gains for men and women are *essentially* the same.

Some women fear that exercise will make them develop large or bulky muscles or a masculine appearance. This is not likely unless a woman is using anabolic steroids and spending many hours doing extremely strenuous weight training. A person's potential for muscular development is genetically determined by levels of the sex hormone testosterone, and women have only one-tenth as much of this hormone as men. While women, like men, vary in their potential for muscular size development, what most women want from exercise is exactly what they will gain: decreased fat, increased lean body tissue, and firmer, toned muscles.

FEMALES AND EXERCISE

Once the sight of a female training on the road or competing in a race was sufficiently unusual that people would stop and stare. As late as 1965 women were threatened with banishment from international competition if they ran races longer than 1.5 miles, and it was 1984 before the first women's Olympic marathon took place. As the interest in fitness as a lifestyle has grown, so has the number of women participants in aerobic activities and athletics. Now that large numbers of females have adopted a physically active lifestyle, research has provided us with new information about topics of special interest to women.

Menstruation

Is it safe to exercise during menstruation? Yes. Menstruation is only one small part of the ongoing female reproductive cycle. In the past women sometimes used this as an excuse to avoid exercise, but now women are



More women are discovering how enjoyable physical activity can be.

encouraged to follow a normal routine during all parts of the reproductive cycle. Research indicates that physical activity has little or no effect on the average woman's menstrual cycle. Accordingly, no restriction should be placed on the physical activity level of the average woman at any phase of her cycle. The way women experience menstruation varies greatly. Most feel no different than usual; some may experience abdominal and leg cramps, backache, or mood swings, particularly during the first 2 days of the menstrual flow.

Dysmenorrhea, or painful menstruation, is probably neither caused nor cured by exercise. However, there is some evidence that enhanced fitness leads to a reduction in menstrual complaints, although this is still being researched. Some studies indicate that exercise decreases mood swings and relieves depression, anxiety, and irritability. Excess body water lost through perspiration can reduce weight gain due to water retention, relieving premenstrual bloating and edema. While no specific exercises cure severe cramps, participation in a program of regular exercise has been shown to decrease the frequency of minor menstrual cramps. This is perhaps due to increased abdominal tone, increased circulation to the uterus, or increased levels of pain-relieving **endorphins**.

Menstruation should be treated as a normal physiological function, not an illness. As long as she is com-

fortable, a woman should continue her regular exercise program. For women who want to look and feel their best, exercise is beneficial at any time of the month.

Studies indicate that young girls who exercise vigorously may experience a delay in **menarche**, the start of the menstrual cycle, decreasing their risk of cancer later in life. While the average American girl experiences menarche between ages 11 and 12, those who train vigorously experience the first menstrual cycle at an average age of 15½, the same as the average age for menarche 100 years ago. This delay may be natural and even desirable, because it reduces the body's lifetime exposure to **estrogen**, a female sex hormone. The more menstrual cycles a woman has over her lifetime, the longer her exposure to estrogen and the greater her risk of cancer of the breast and reproductive organs. In addition, women who exercise tend to be leaner, thus producing less potent estrogen. In one study, women who had been athletic in high school and college compared with sedentary women had half the incidence of breast and reproductive cancer in later life. A sedentary lifestyle is considered a primary risk factor for cancer.

Menstrual abnormalities such as **oligomenorrhea** (infrequent or irregular menses) and **amenorrhea** (absent menses) occur in about 2 to 5 percent of the general population of women and in up to 28 percent of women athletes. In athletes, the prevalence appears high in sports that require greater intensity, frequency, and duration of training (e.g., distance running and swimming) or sports that emphasize low body weight or involve competition by weight class (e.g., dance, gymnastics, boxing, wrestling). Numerous factors, physiological and psychological, including change in diet or inadequate diet and physical and emotional stress, may affect menstruation abnormally (for example, stressors such as heavy athletic training and competition acting synergistically with other stressors in life). In athletes, the vast majority of cases of amenorrhea stem from an imbalance between activity level and nutritional intake. For



Everybody benefits from physical activity.

example, a female student who menstruates during her off-season may lose her periods once preseason training begins because of increases in her activity level without corresponding increases in her nutritional intake. Her body can't sustain all its functions without adequate calories and nutrition, and reproduction mechanisms are the first to shut down.

Exercise-induced oligomenorrhea and amenorrhea are rare in women doing moderate amounts of exercise as part of a fitness program. They are more common among those whose menstrual cycles started late, past age 15, or who had a history of irregularity before starting exercise programs. Although no specific body fat percentage has been associated with the development of exercise-induced amenorrhea, the evidence suggests that decreased fat levels may lead to decreased production of one form of estrogen. Thus, as fat percentages decrease, estrogen levels decline, and the evidence of amenorrhea increases. Some scientists have suggested that the critical body fat level may be as low as 13 percent or that there may be no such critical level. If such a critical fat percentage does exist, it probably varies widely from individual to individual.

The focus of research is on how all the factors mentioned here may affect the hypothalamus, thereby influencing the production of important regulatory hormones relative to menstruation and metabolism, including estrogen, epinephrine, and corticoids. Whatever the cause, exercise-induced amenorrhea is considered reversible. Normal menstrual cycles resume with as minor a change in lifestyle as a 10 percent decrease in exercise, improved nutrition, or a weight gain of 4 to 5 pounds. Also, exercise-induced amenorrhea does not seem to affect long-term fertility. While a woman with amenorrhea does not experience a regular menstrual cycle, she may still ovulate and become pregnant. She should not rely on this for birth control and should continue her regular birth control method if pregnancy is not desired. Any active woman should be aware of her normal menstrual cycle and should discuss any irregularities with her physician to rule out conditions such as thyroid disorders, ovarian cysts, brain tumors, and pregnancy.

Female Athlete Triad

Some female athletes and other physically active women who are underweight and nonmenstruating are being diagnosed as victims of the **female athlete triad**. This is a life-threatening syndrome marked by three disorders:

- ✓ Disordered eating habits (inadequate food, energy intake insufficient to meet metabolic demands)
- ✓ Amenorrhea (for more than 3 months)
- ✓ Osteoporosis

Sports can be a win-win activity for young women. Research shows that exercise builds strong bones, helps control weight, and improves mood. It also reduces the risk of developing serious illnesses such as heart disease and breast cancer. But it also comes with risks such as female athlete triad.

Societal pressure on females to have an unrealistically low body weight fuels this condition. Fitness professionals who work with physically active females should learn ways to prevent, recognize, treat, and reduce its risks.

The problem has caught the attention of the International Olympic Committee Medical Commission, which recently developed a consensus statement on the dangers and possible treatments, and the National Collegiate Athletic Association, which published a coach's handbook on the topic.

The female athlete triad is not limited to college or elite athletes. It occurs in high school and middle school girls as well as other women who are physically active. Any woman, even one in her 40s, who has disordered eating and becomes amenorrheic will lose bone. A woman who has been amenorrheic for several years can have the bones of a 70- or 80-year-old woman.

Bone loss also can occur in men who have eating disorders. Those at risk are athletes in sports in which body weight is important, such as running, wrestling, and ski jumping. There is no triad for men at this time.

The problem begins when women do not consume enough calories for their activity levels; their energy deficits may disrupt their menstrual cycles. Estrogen, which is critical for preserving bone, drops to the level

TOP 10 LIST

Who's at Risk for Osteoporosis?

Although no one is immune to osteoporosis, the following factors increase one's risk:

1. Female
2. Postmenopausal
3. Amenorrheic
4. Small-boned
5. Eating a diet low in calcium
6. Alcohol, tobacco, and caffeine use
7. Eating a diet high in protein
8. A sedentary lifestyle and/or getting only low-impact exercise
9. Medications (including corticosteroid)
10. A family history of osteoporosis

Note: Some vegetarian diets also increase the risk.

of postmenopausal women. At the same time, inadequate nutrition leads to other hormonal changes that inhibit the ability to build bone. With restrictive dieting, women often limit calcium-rich dairy products and other important nutrients for bone health. Such behaviors are especially harmful during the teen years up until about age 21 because women at those ages are still building bone.

No one knows how long women can go without menstruating before they experience bone loss, but going 3 months without a period is considered extremely dangerous. The exception is when the pause is recommended and supervised by a physician. The weakened skeletons of athletes (or other physically active women) can lead to fractures, especially in the legs, hips, and pelvis.

Amenorrhea can often be reversed with an increase in calories or a decrease in physical activity. Bone density does increase with a resumption in normal estrogen levels, but it does not appear to recover fully. Active young women who have not been menstruating regularly should have a bone-mineral density test, discuss low-dose estrogen replacement therapy with a physician, and consume a calcium intake of 1,500 mg/day (about 5 cups of milk). See the Top 10 list “Who’s at Risk for Osteoporosis?”

Pregnancy

Is exercise advisable during pregnancy? How much? What are the benefits? Are there limitations or cautions to keep in mind? Are some exercises better than others?

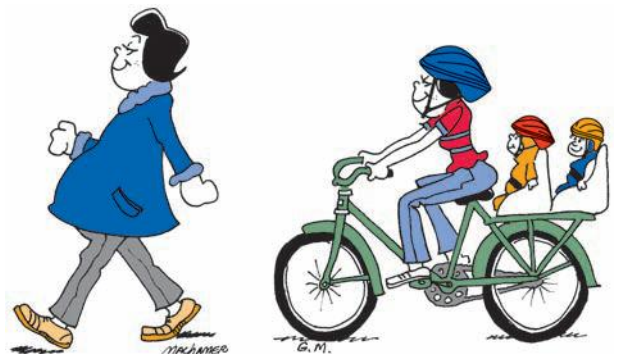
Pregnancy is a natural and normal physiological function, not an illness. A pregnant woman is not fragile. Although she should always discuss her exercise plan with her physician, evidence keeps rolling in that exercise is more than just okay for a pregnant woman—it is good for both her and her baby. General advice for a healthy woman having an uncomplicated pregnancy is to continue her regular exercise program, being careful not to get overtired. If she has not been exercising before pregnancy, this is not a time to begin a crash program. A 20- to 30-minute walk, 3 to 4 days per week, is a program a doctor might approve. Throughout pregnancy, to keep the effort aerobic, a woman should use the “talk test.” She should be able to carry on a conversation while exercising without getting out of breath. In early pregnancy, if exercising seems to require more effort, decrease the intensity and duration. Pregnant women should be counseled not to undertake excessive physical activity in a hot climate to which they are not acclimated. A gradual weight gain, which is natural and desirable, is likely to increase stress to joints, ligaments, and muscles. Also, muscles and connective tissues become more lax as they gradually undergo hormonal changes. Increases in the pregnancy hormone relaxin

help facilitate the baby’s birth but make the pregnant woman more susceptible to strains and sprains. Therefore, during late pregnancy and the early postdelivery period, vigorous increases in flexibility should not be pursued.

In the fifth to sixth month of pregnancy, due to increasing weight and joint flexibility, impact activities may become uncomfortable. At this time, many women switch to low- or no-impact exercises such as walking, swimming, and stationary cycling. Some women continue their normal exercise program to the day of delivery with no ill effects, but don’t feel guilty if you feel a need to cut back. Toward the end of pregnancy, if you fatigue easily and exercise seems to require more effort, it is natural to decrease the activity level. After the first trimester it is not advised to do exercises that require lying on your back. This position can block the blood supply to the uterus (by compressing the aorta and/or the vena cava), resulting in depression of the fetal heart rate. Throughout pregnancy, a woman needs to listen to her body and adjust her exercise level to maintain comfort. Specific pregnancy exercise guidelines from the American College of Obstetricians and Gynecologists are listed in Table 6-1. Also review Table 6-2.

There are many reasons exercise is important during pregnancy. The physiological changes of pregnancy place a great demand on the body. Labor and delivery are perhaps the most physically demanding events a woman will experience. Exercise can maintain optimal fitness, enabling a woman to control weight gain, improve muscle tone, improve posture, decrease backache, and decrease constipation. Exercise can also aid in increasing energy, increasing psychological well-being, managing stress, enhancing sleep at night, and regaining a prepregnancy figure.

While fitness is no guarantee of a quick labor or an easy delivery, endurance and increased capacity to deal with the physical stress of childbirth are assets that come from fitness. A fit mother can enjoy a quicker recovery from childbirth and can regain her normal fitness and activity levels in less time than can the unfit.



Exercise during and after pregnancy has many advantages.

TABLE 6-1 *ACOG Guidelines for Exercise During Pregnancy and Postpartum*

1. Thirty minutes or more of moderate exercise a day on most, if not all, days of the week is recommended for pregnant women.
2. No exercise should be performed while lying on the back after the first trimester. This slows blood flow back to the heart and decreases its output. Also, avoid *motionless standing*, which may also decrease heart output.
3. Avoid activities with a high risk of falling because of a changing center of gravity (i.e., gymnastics, horseback riding, downhill skiing, etc.) or those with a high potential for impact of abdominal trauma.
4. Previously inactive women or those with medical or obstetric complications should be evaluated before an exercise program begins.
5. Women with a history or risk for pre-term labor or fetal growth restriction should reduce physical activity in the second and third trimesters.
6. Take steps to avoid a heat injury. Avoid exercise in hot, humid weather or when you have a fever.
7. Avoid extremes of barometric pressure. Avoid scuba diving and exercising at altitudes of more than 6,000 feet.
8. Ballistic movements (jerky, bouncy motions) should be avoided. Exercise should be done on a wooden floor or a tightly carpeted surface to reduce shock and provide a sure footing.
9. Deep flexion or extension of joints should be avoided because of connective tissue laxity. Activities that require jumping, jarring motions, or rapid changes in direction should be performed with caution because of joint instability and high risk of injury.
10. Vigorous exercise should be preceded by a 5-minute period of muscle warm-up. This can be accomplished by slow walking or stationary cycling with low resistance.
11. Vigorous exercise should be followed by a period of gradually declining activity that includes gentle stationary stretching. Because connective tissue laxity increases the risk of joint injury, stretches should not be taken to the point of maximum resistance.
12. Heart rate should be measured at times of peak activity. Target heart rates and limits established in consultation with a physician should not be exceeded. Use the “talk test” to gauge exercise intensity. Slow down if you cannot comfortably maintain a conversation during exercise.
13. Care should be taken to rise gradually from the floor to avoid a sudden drop in blood pressure. Some form of activity involving the legs should be continued for a brief period.
14. Exercises that employ the Valsalva maneuver should be avoided.
15. Caloric intake should be adequate to meet not only the extra energy needs of pregnancy but also those of the exercise performed.
16. Liquids should be taken liberally before and after exercise to prevent dehydration. If necessary, activity should be interrupted to replenish fluids.
17. Women who have led sedentary lifestyles should begin with physical activity of low intensity and advance activity levels gradually.
18. Activity should be stopped and the physician consulted if any unusual symptoms appear. (See Table 6-2.)

TABLE 6-2 *Reasons to Discontinue Exercise and Seek Medical Advice During Pregnancy*

1. Any signs of bloody discharge from the vagina.
2. Any “gush” of fluid from the vagina.
3. Sudden swelling of the ankles, hands, or face.
4. Persistent, severe headaches and/or visual disturbance; unexplained spell of faintness or dizziness.
5. Swelling, pain, and redness in the calf of one leg (phlebitis).
6. Elevation of pulse rate or blood pressure that persists after exercise.
7. Excessive fatigue, palpitations, chest pain.
8. Persistent contractions (more than six to eight per hour) that may suggest onset of premature labor.
9. Unexplained abdominal pain.
10. Insufficient weight gain during the last two trimesters.

Stress Incontinence

Stress incontinence, an involuntary leakage of urine when you laugh, cough, sneeze, or exercise, is a common problem, particularly in women over 30 who have given birth. During pregnancy and birth, these muscles become weakened and stretched. One solution is to wear a sanitary pad, but a better approach is to strengthen the perineal muscles that control this function. The pelvic floor is a hammocklike muscle layer

attached at the front and back of the pelvis. It supports the pelvic organs, including the bladder, uterus, and rectum. Kegel exercises, named after the Los Angeles physician who developed them, strengthen the pelvic floor muscles and may prevent or cure stress incontinence. As a side benefit, many women report increased pleasure during intercourse.

Kegel Exercise

Kegel exercises are done by contracting the perineal muscles, which surround the bladder neck and vagina. To learn the exercise, when urinating stop and start the flow. Hold the contraction for 3 to 4 seconds during the stop phase. The muscle action you take to do this when urinating is the action you must take when doing Kegel exercises. You can do these exercises anytime—contract hard and then release. Do 10 in a row, and work up to five sets of 10 daily. Do these exercises before, during, and after pregnancy.

Postpartum: Getting Back into Shape

Giving birth and coping with the demands of a new baby are both joyful and stressful for a new mother. The main problem in resuming exercise is not fatigue or shortness of breath, which might be expected, but finding someone to watch the baby while the mother



No exercise should be performed while lying on the back after the first trimester.

takes a well-deserved break. Postpartum recovery times vary greatly. If the delivery has been normal, walking is encouraged in the hospital the day after delivery. This can be continued when the woman returns home. Rest, good nutrition, and a progressive walking program will make recovery faster than will complete inactivity or resuming prepregnancy activity levels too soon. You should not rush into impact activities such as jogging or pursue flexibility increases until you have given loosened joints (due to the hormone relaxin) a chance to recover—6 to 16 weeks. Abdominal curls are important for toning overstretched abdominal muscles and preventing back problems. Also, do Kegel exercises to strengthen pelvic floor muscles.

A nursing mother needs to avoid fatigue and dehydration, which may reduce milk production. Drink fluids liberally, and nap when the baby does to ensure adequate rest. Wear a good supportive bra, with pads to absorb leaks, and nurse before exercise for greater comfort. There is no conflict between nursing a baby and doing moderate exercise. Both help a mother regain her prepregnancy figure.

Breast Support

Does bouncing cause breasts to sag? Some believe that breast movement stretches the skin and ligaments that support the breasts. There is no evidence to support this claim; the main culprits are genetics and pregnancy. Still, a good bra makes exercise more comfortable by reducing breast movement during activity. The best designs flatten breasts to redistribute their mass across the chest wall. This results in less mass for gravity to affect. Racerback and crossback straps prevent slippage off the shoulder. Certain designs are more suited to small-breasted women, while others are more comfortable for large-breasted exercisers. A woman should try different styles to decide what is best for her. A good exercise bra

should (1) limit breast movement, (2) have wide straps that do not slip off the shoulders, (3) have a wide band at the bottom to prevent the bra from riding up, (4) have no rough seams or uncovered fasteners to prevent chafing, and (5) be made of nonabrasive materials and be seamless or at least have seams that do not cross the nipple area.

MALES AND EXERCISE

Participation in sports and physical activities no longer ends with graduation from high school or college. Large numbers of men are continuing or beginning lifetime exercise programs.

Exercise appears to lower the hormonal levels of males as it does that of females. In one study, testosterone levels of men who ran 40 miles a week averaged 30 percent less than the levels of nonexercisers. The runners' levels were still in a normal range, and the effect was reversible. Sperm count and libido were not affected. While it may lower hormonal levels, overtraining is not associated with decreased fertility in male athletes unless it is accompanied by anorexic behavior and a high-stress lifestyle.

A more common male fertility problem results from constantly wearing tight undershorts. For the testicles to maintain normal sperm production, they must be a few degrees cooler than normal body temperature. Their position outside and slightly away from the body accomplishes this. When the testicles are overheated by consistently being held close to the body, sperm production temporarily decreases. A switch to boxer shorts solves the problem.

Male bicyclists have additional concerns. Males who ride for extended periods (i.e., 2 to 3 hours or more) have an increased risk of reduced perineal (crotch) area circulation. It is caused by compression of the bike saddle. This can lead to pain; numbness; and, in severe cases, male impotence. Females are not exempt from this problem. Reduced perineal circulation in females may result in sexual and urinary tract dysfunction. Male bicyclists traveling over rough terrain may also experience pain and injury to the testicles. The following tips will help avoid these problems:

- ✓ Level the seat or point the nose downward to reduce pressure on the perineum.
- ✓ Lower the seat so that the legs support more weight. (Knees should bend slightly at the bottom of the pedal stroke.)
- ✓ Avoid handlebar extensions because they place more body weight on the nose of the seat.
- ✓ Stand up and pedal every 10 minutes to encourage blood flow in the perineum.
- ✓ Rise out of the seat when going over bumps.

- ✓ Avoid crush injuries involving the top tube by riding a bike of proper size. The top tube of a mountain bike should be 3 to 4 inches below the crotch when one is standing over it; for road bikes, clearance should be 1 to 2 inches.
- ✓ Consider replacing a narrow racing-style saddle with a wider seat or a seat designed to reduce compression on the perineum. Special “male” seats are available.
- ✓ Switch to a recumbent bike.

EXERCISE ADDICTION

Exercising is unconditionally great for the body, the soul, and the mind, right? Almost, but not quite. Even the most benign or beneficial elements can cause harm when taken to an extreme. Although exercise is highly recommended for health and vigor, it is not protected from this universal truth. When a commitment to exercise crosses the line to dependency and compulsion, it can create physical, social, and psychological havoc for those involved.

A “positive addiction” can be a healthy adaptation to the barriers to exercise in life because commitments to work, family, and other healthy pursuits must compete with time to work out. Sometimes the line between commitment and compulsion is crossed. There can be a negative side to exercise that gradually, insidiously takes over from the positive.

Exercise addiction is not just another term for overtraining syndrome. Healthy athletes training for peak performance and competition can experience overtraining symptoms, the short-term result of too little rest and recovery. **Exercise addiction**, in contrast, is a chronic loss of perspective of the role of exercise in a full life. A healthy athlete and an exercise addict may share similar levels of training volume. The difference is in the attitude and the consequences. An addicted individual isn’t able to see value in unrelated activities and pursues the activity even when it is against his or her best interest.

The exercise addict has lost balance, allowing exercise to become overvalued compared to elements widely recognized as giving meaning to a full life (e.g., school, work, friends, family, community involvement). When emotional connections are passed up in favor of additional hours of training; when injury, illness, and fatigue don’t stop a workout; when all free time is consumed by training—*exercise addiction* is the diagnosis. Withdrawal symptoms such as anxiety, irritability, and depression, which appear when circumstances prevent exercise, are the warning signs of addiction.

TABLE 6-3 *Are You Addicted to Exercise?*

Directions: Rate yourself as honestly as you can on the following checklist.

Yes	No	
—	—	1. I have missed important social obligations and family events in order to exercise.
—	—	2. I have given up other interests, including time with friends, to make more time to exercise.
—	—	3. Missing a workout makes me irritable and depressed.
—	—	4. I feel content only when I am exercising or within the hour after exercising.
—	—	5. I like exercise better than sex, good food, or a movie—there’s almost nothing I’d rather do.
—	—	6. I work out even if I’m sick, injured, or exhausted. I feel better when I get moving.
—	—	7. In addition to my regular exercise schedule, I exercise more if I find extra time.
—	—	8. Family and friends have told me I’m too involved in exercise.
—	—	9. I have a history (or family history) of anxiety or depression.

Scoring: If you checked yes on three or more of the statements, you may be losing your perspective on exercise.

To the addict, there is no exception to the rule “the more, the better.” Anything that interferes with the quest for more exercise is resented.

The paradox inherent in exercise addiction is the blurred boundary between what is healthy, admirable, and desirable and behavior that is over the edge and dependent. The addict answers poor performance with more exercise and less rest. A healthy athlete looks at the big picture and adjusts training programs, allowing for rest and recovery among the training variables.

Remember that working out should always have an element of play. If exercising loses all aspects of fun, something has gone wrong. The most competitive athletes still love their sport. They love it because it gives pleasure, not because it has become a compulsive need. Take the self-assessment in Table 6-3 to see if you are losing your perspective on exercise.

EXERCISE AND DISEASE RESISTANCE

During exercise, 75 to 85 percent of the energy produced is released in the form of heat, producing an increase in body temperature. Much of this heat is dissipated at the skin, but body temperature still is elevated during exercise. This regular increase in body

temperature, it is speculated, is inhospitable to some viruses and might decrease the incidence of viral infections in exercisers. Moderate exercise has also been found to boost the immune system. However, overtraining leading to exhaustion might weaken the system and increase susceptibility to colds and minor infections. Studies on the relationship between the immune system and physical exercise have produced contradictory results. Nonexercisers who start a new program of intense exercise, exceeding their individual exercise limits, or who exercise sporadically may experience weakened immunity for a brief period. Highly trained athletes may weaken their immune systems with acute, exhaustive exercise. Of course, psychological and emotional stress may play important roles here, too—whether it be the anxiety felt by the new, out-of-shape exerciser or by the athlete competing for a championship. Few people exercise so strenuously that they need to worry about any possible adverse effects on immunity. The problem for most Americans is too little exercise rather than too much. For anyone in doubt, a consistent and regular program of moderate exercise is a key component of overall health and well-being, including the immune system. However, the optimal level of exercise for each individual's immune system is unknown.

Should you exercise when you have a cold or feel ill? Many professionals recommend that you decrease the intensity and frequency of workouts or take some days off when you have a cold or feel one coming on. Illness affects lung and heart function as well as skeletal muscles. As a result, performance may be reduced. Some people find that exercising when they have a mild cold makes them feel better. Illnesses vary in severity and people react differently to them, so listen to your body. If you have only a minor head cold and otherwise feel fine, it is probably acceptable to work out. Avoid exercise to the point of exhaustion. Avoid exercise if you have the flu, have a fever, feel achy, feel extremely tired, are heavily congested, or have swollen glands. Exercise does not cure illness. The old adage that “you can sweat out a cold” with exercise is untrue. When you recover from illness, do not start exercising at the same level as before. Give yourself a few days to build back to normal levels.

ENVIRONMENTAL CONSIDERATIONS

Exercising in the Cold

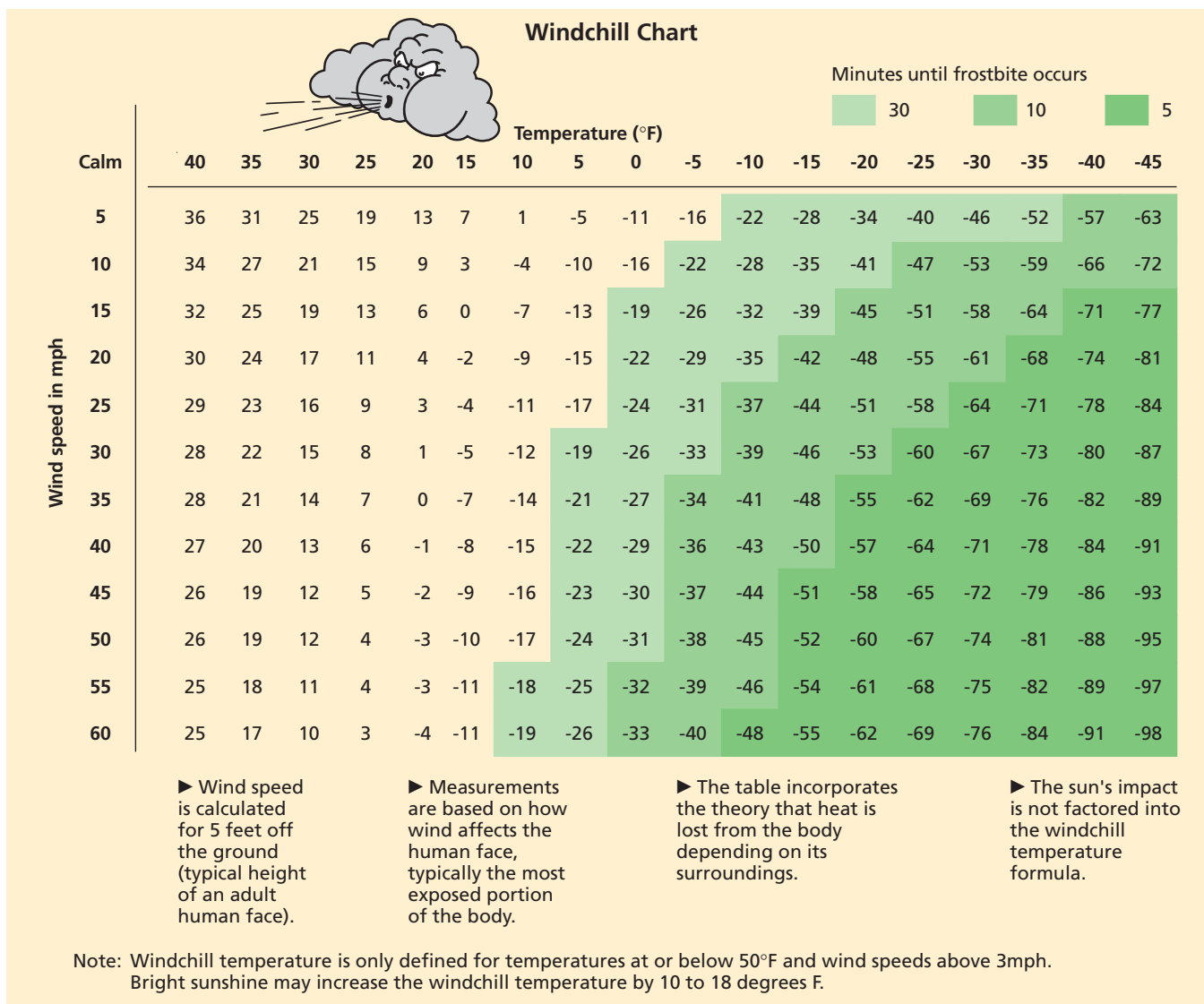
Your friends think you're crazy for sharing a narrow roadway with cars that spray you with slush as you exercise on a chilly winter day. Walking, running, and cycling are more complicated in the winter. Still, there is

something liberating about a good workout on an icy winter day. Cold-weather workouts can be invigorating, comfortable, and safe if you follow these tips:

1. *Layer clothing:* Dress in several thin layers so that you can remove or add a layer as needed. Wool and polypropylene clothing wick moisture away from the skin to keep you dry. The outer layer of clothing should be breathable and windproof.
2. *Avoid overheating:* Don't overdress or you'll overheat. You should feel a little cool until you warm up. Do take the windchill factor into account when preparing for a workout (Figure 6-1).
3. *Avoid overexposure:* There is a possibility of frostbite if you don't dress properly. Frostbite can occur on outer body areas such as the fingers and toes when your skin temperature drops below 32°F. Frostbite can easily be avoided by covering exposed areas and by getting inside and warming up if any body parts feel numb or tingly. **Hypothermia** is a



There is no possibility that you will freeze your lungs or throat. The air is warmed as it passes through your mouth and throat. Wear a mask or scarf over your nose and mouth if the cold air bothers you.



Windchill chart. SOURCE: National Weather Service.

FIGURE 6-1

life-threatening condition in which body temperature drops to a dangerously low level. Medical attention should be sought immediately.

4. *Protect exposed parts:* Fingers and toes receive the smallest blood supply and experience winter's chill fastest. Mittens are more effective than gloves, which allow cold air to circulate around the fingers. On extremely cold days you may need to wear two pairs of socks or a thermal insole to keep your feet from getting too cold. Exposed ears or face can lead to windburn or chapping. To avoid discomfort, wear a hat and spread a thin layer of petroleum jelly on exposed skin areas.
5. *Work with the wind:* Plan out-and-back workouts, heading into the wind on the way out so that you can return with the wind to your back. Not only will you appreciate the push when you're tired,

you'll be less likely to be chilled by your sweat during the return.

6. *Exercise with caution:* Winter weather changes the safety rules for outdoor exercise: Fewer daylight hours, icy roads, and snowy nights lower visibility for drivers. Exercise at midday as often as possible. Avoid high-volume traffic areas, wear bright clothing, and be prepared for potential hazards by remaining alert. Wear waffled or ridged shoe soles to provide extra traction on icy roads.
7. *Stay motivated:* Winter exercising demands greater personal motivation than exercising at any other time of the year. Winter holidays, less daylight, and poor weather can disrupt a routine. To maintain enthusiasm, set realistic wintertime goals to work toward. Don't worry about your pace. Between the slick footing and the heavy clothing,

TABLE 6-4 *Heat Illnesses*

Condition	Symptoms	Immediate Care
Heat cramps	Painful muscle spasms (calf is common) Sweaty skin Normal body temperature	Isolate cramps: Direct pressure to cramp and release, stretch muscle slowly and gently, gentle massage, ice
Heat exhaustion	Profuse sweating Cold, clammy skin Flu-like symptoms Dizziness Weak, rapid pulse Shallow breathing Headache Normal or slightly above normal temperature	Move individual out of sun to a well-ventilated area Place in shock position (feet elevated 12–18°) Gently massage extremities Give cool water to drink Remove extra clothing and cool the skin with water or a fan Reassure May apply wet towels Refer to physician or call EMS
Heatstroke (this is an extreme medical condition)	No perspiration Dry skin Very hot Temperature as high as 106°F Skin color bright red or flushed (African American—ashen) Rapid strong pulse Unresponsiveness (may be confused, stagger, or be agitated)	Transport to hospital quickly (call EMS) Remove as much clothing as possible without exposing the individual Cool quickly, starting at the head and continue down the body (use any means possible—fan, hose down, pack in ice) Wrap in cold, wet sheets for transport Treat for shock (place in a semireclining position)

it's prudent to run relaxed. Just go fast enough to stay warm.

8. *Be safe:* Tell someone your route and when you expect to be back. Better yet, go with a friend.

Don't hesitate to mix your usual exercise with other activities—cross-country skiing or sledding in snow country, aerobics, stair climbing, indoor cycling, or water exercise if you crave a break from the cold. Your heart will benefit as long as you stay in your training zone, and the cross training will work new muscle groups.

Exercising in the Heat

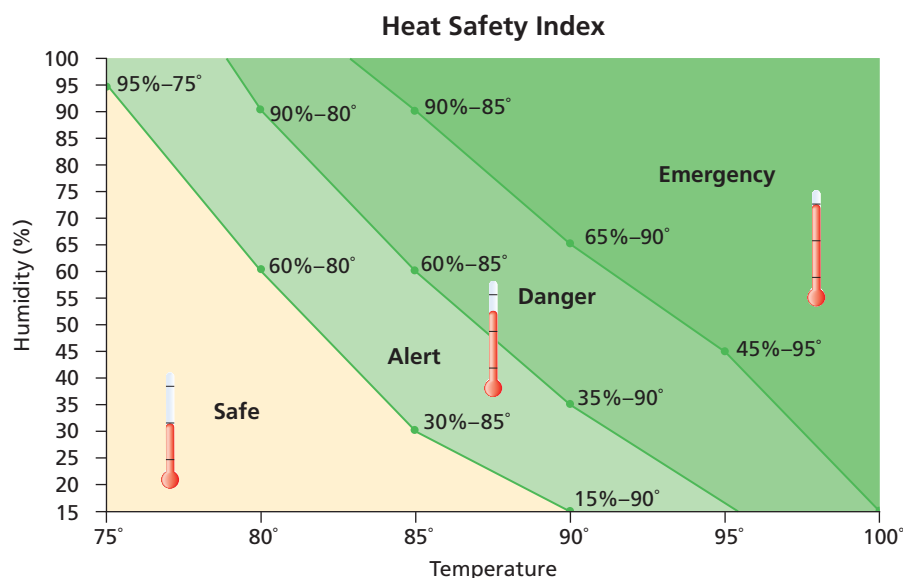
Given a couple of weeks and plenty of water, the human body can adapt well to exercising in the heat. Hot weather workouts make the body work harder than it does in cool weather. The heart must pump enough blood to not only fuel working muscles but also carry heat to the skin to be dissipated, reducing work capacity. Drinking plenty of cold fluids is critical to maintain sweating, your body's air-conditioning system. The body can acclimatize to heat but not to dehydration. Overexertion in hot weather, particularly when coupled with dehydration, can lead to heat cramps; heat exhaustion; heatstroke; or **hyperthermia**, a life-threatening condition in which the body's temperature rises to a dangerous level. Particularly susceptible are people who are over 40, are out of shape, are overweight, have heart

disease, or have previously experienced heat injury. See Table 6-4 for symptoms and care of heat illnesses.

When performing endurance exercise, men and women have similar responses in terms of adaptability to hot weather. Both genders are equally susceptible to heat stress, and both respond by acclimatization. To exercise safely when the weather is hot and humid, follow the Top 10 "Guidelines for Hot Weather Exercise" and postpone the workout when the heat safety index is in the danger zone or above (Figure 6-2).

Heavy Sweating During Exercise

One of the hazards of exercising in hot, humid weather is dehydration caused by excessive loss of body water in the form of sweat. Overheating while exercising indoors at any time of the year can be as dangerous as outdoor exercise due to low levels of air movement. Sweat cannot evaporate effectively, and this may result in a heat illness. Dehydration disturbs cellular fluid and electrolyte balance, thus interfering with muscular contraction. Water losses of as little as 2 to 3 percent of body weight have been shown to impair exercise performance, reduce the amount of time a person can exercise, reduce cardiac stroke volume (volume of blood pumped out with each heartbeat), and reduce cardiac output (the amount of blood pumped by the heart over time). Water loss can also interfere with the body's ability to regulate internal temperature, resulting in overheating, which can be deadly.

**FIGURE 6-2**

Heat safety index. SOURCE: Ball State University Weather Station, Department of Geography.

Sweat is primarily water, but a number of major **electrolytes** (essential minerals in the form of salts) and other nutrients may be found in varying amounts. Sodium, chloride, and potassium are the predominant electrolytes found in sweat. They help maintain normal body fluid volume and are involved in nerve impulse transmission and muscle contraction (this includes the heart muscle).

Electrolyte Replacement

Is profuse sweating likely to create an electrolyte deficiency? No. That is not likely to occur even during prolonged exercise, such as marathon running. This is not to say that electrolyte replacement is not important and that electrolyte deficiency is impossible. After prolonged exercise with heavy sweating, the body's stores of electrolytes are diminished and could eventually become deficient. However, with a normal diet, it is difficult to create an electrolyte deficiency.

Salt tablets are not recommended to replace lost sodium and chloride because these electrolytes are abundant in a normal diet. Tablets may be prescribed for those who cannot replace them through normal dietary means. Keep in mind that diets high in sodium have been associated with high blood pressure. Citrus fruits, fruit juices, and bananas are foods recommended for electrolyte replacement.

Fluid Replacement: Water or Sports Drinks?

Rehydration (replacing body fluid volume) is critical to safe, effective exercise involving heavy sweating indoors or outdoors. For years we were told that water is

TOP 10 LIST

Guidelines for Hot Weather Exercise

1. Respect the heat. Hot, humid, sunny weather can be deadly.
2. Monitor weather conditions before exercising and adjust your workout accordingly. Postpone exercise when the heat safety index is in the danger zone or above.
3. Drink plenty of fluids to avoid dehydration (see Figure 6-3).
4. Weigh yourself before and after a workout. A sudden loss of weight may signal dehydration.
5. Wear loose-fitting clothing that allows air to circulate and expose as much skin to the air as possible to promote sweat evaporation.
6. Wear light colors because they reflect rather than absorb sunlight.
7. When acclimating to warmer weather in the spring, decrease exercise intensity and duration. Allow 2 weeks to acclimate to normal exercise levels.
8. Check with your doctor about the effects of any medications you take because some can reduce heat tolerance.
9. Do not wear vinyl or rubber sweat suits to lose body weight. They can lead to dehydration and death.
10. Stop exercising at the first sign of heat illness. See Table 6-4.

the best drink to replace fluids, because that is mainly what you lose when you sweat during a hard workout. But science is dynamic, and conventional wisdom sometimes becomes history in the light of new discoveries. Water is still considered one of the most effective ways to rehydrate and works fine for the fitness exerciser and those exercising for less than 1 hour. Also, water is convenient and free. New information concerning exercise of *1 hour or more* now gives the slight edge in fluid replacement to electrolyte-containing beverages such as the popular sports drinks. This is the case because fluids containing electrolytes are more readily retained in the body's tissues. Why? Because plain water tends to increase urination slightly so that fewer fluids remain in the body's tissues. Also, when fluids taste good (as sports drinks do), they are more readily consumed. Thus the intake is increased. Due to these new findings, many commercial beverages have been produced to help in the process of rehydrating the body. These drinks are commonly known as carbohydrate-electrolyte replacement solutions (CES) or sports drinks. Other than water, the major ingredients in these solutions are carbohydrates in the form of glucose and/or sucrose and some of the major electrolytes. The glucose/sucrose content varies with the different brands, ranging from 1 percent to over 10 percent. Studies show that sports drinks containing carbohydrates boost endurance and energy, as well as help delay fatigue during exercise. Select a sports drink carefully. Drinks with high carbohydrate concentrations are slow to empty from the stomach, interfering with rehydration, and can cause bloating and nausea. Avoid sports drinks containing carbohydrate concentrations higher than 8 percent (4 to 8 percent works best). Experiment during training to find out if you can handle one of these drinks. You should drink early and frequently during your workouts. Don't do anything new for competitive events. If you are a competitive athlete or marathoner or if you are exercising for several hours at a time in hot humid weather, the fluid of choice for most effective rehydration or prevention of dehydration is a sports drink (not to exceed 8 percent carbohydrate concentration). Water is the next best fluid, followed by fruit juices diluted with 50 percent water. All three are preferable to caffeinated sodas. Caffeine promotes urination, and the carbonation gives you a feeling of being fuller than you are. This information, which gives sports drinks a slight edge in terms of rehydration, does not mean that drinking water is not a good way to replace lost fluids.

Whatever you drink, drink it cold. Cold drinks are better than warm ones because they help cool down the core temperature of the body and empty from the stomach faster. Athletes/exercisers drink substantially more when fluids are cold. See the Fluid Pyramid in Figure 6-3 for fluid replacement guidelines.

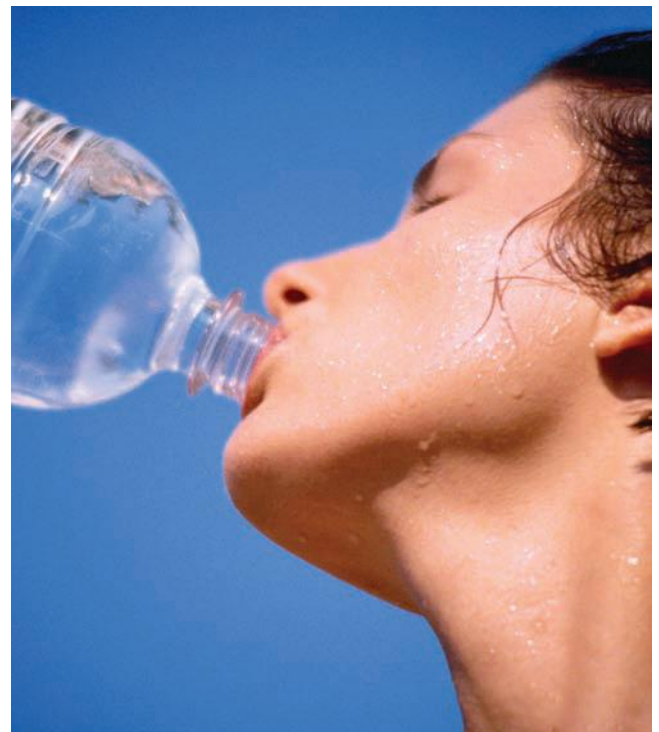
Water: Are Americans Dehydrated?

Probably not. New research has reexamined the old question of how much water we should consume daily. Until recently it was believed that most Americans were dehydrated and in danger of all kinds of health problems because of that. Is there anyone on the planet who has not heard of the longtime standard health rule "drink at least eight 8-ounce glasses of water every day"? That's 64 ounces! Where did that advice originate? Is this the recommendation today?

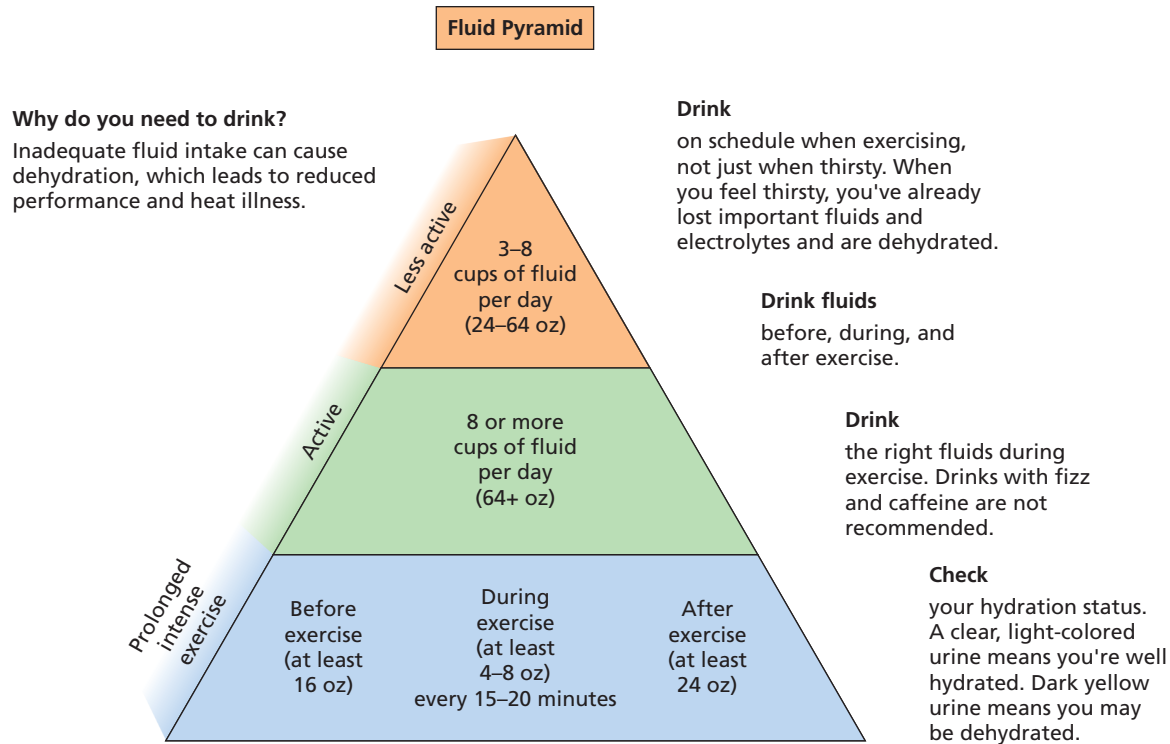
The "8 × 8 rule" originated from a 1945 Food and Nutrition Board report recommending 1 milliliter of water for every calorie consumed, averaging eight cups for a 2,000-calorie diet. The medical community at the time bought into that report, and the notion that the body needs at least eight 8-ounce glasses of water a day became a firmly established rule.

Later research found no evidence to support the notion that it is mandatory to consume eight 8-ounce glasses of water. Water is essential, and 64 ounces is fine. However, most people can stay perfectly healthy with six or perhaps even three glasses of fluids a day, depending on how active they are, how hot it is, what the altitude is, and what else they are consuming (see Figure 6-3). Body size also enters into the picture. Larger people need more fluids than do smaller ones.

The body is very good at regulating fluid balance, and thirst is generally a reliable indicator of water needs. Under normal circumstances there is no reason to tote a



Weigh before and after exercise and finish within 2% of your starting weight.

**FIGURE 6-3**

Use the Fluid Pyramid as a guide to replenish body fluids lost during physical activity.

water bottle around all day. When you are exercising strenuously or doing hard physical work, especially of long duration and in hot weather or in high altitudes, you should make an effort to drink even if you don't feel thirsty.

Does the water in other beverages and foods (such as fruits and soup) count toward meeting the body's total fluid requirement? Yes. Milk, soup, fruits, and vegetables consist almost entirely of water, so they count. Even meat has some water. Caffeinated beverages such as coffee, tea, and cola tend to promote urination, but they also count, in part, as fluid intake.

Do not lose sight of the fact that while water is a vital component of good health (every organ and body function depends on it), it is not magic. Plain old tap water is fine, and it's convenient and free.

Note: Though uncommon, it is possible to drink too much water. When your kidneys are unable to excrete the excess water, the electrolyte content of the blood is diluted, resulting in a condition called **hyponatremia** (low sodium levels in the blood) or water intoxication. Hyponatremia risk is higher among females, exercisers using non-steroid anti-inflammatory drugs (such as aspirin and ibuprofen), people who exercise 3 hours or more (as in marathons or triathlons) in extreme conditions or high altitudes, and exercisers who because of a genetic condition produce very salty sweat. In general, though, drinking too much water is rare in healthy adults who consume an average American diet.

DRUGS AFFECTING PHYSICAL PERFORMANCE

In the world of competitive athletics, where the margin between winning and losing may be only a fraction of a second, athletes looking for an edge are tempted by legal and illegal drugs. Anabolic steroids are taken to build muscle. Amphetamines may be taken to mask fatigue, caffeine to enhance performance. Diuretics may be used to cause rapid weight loss or to mask anabolic steroid use. These drugs can adversely affect your health. Keep in mind physical performance has more to do with skill and hard work than with popping a pill, injecting a drug, or drinking a superdrink.

Anabolic Steroids

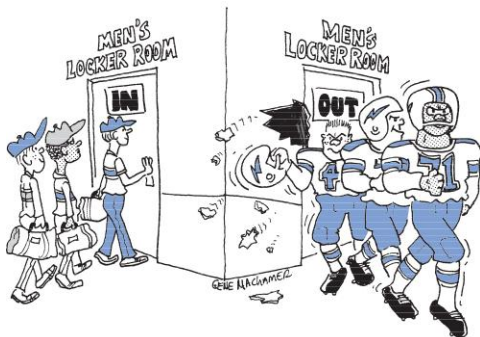
Anabolic steroids are an artificial form of the male hormone testosterone. These drugs function like testosterone to produce increases in weight, strength, endurance, and aggressiveness. Steroids were first developed in the 1930s to build body tissues and prevent the breakdown of tissue that occurs in some diseases. In the 1950s, a few foreign countries experimented with giving testosterone to their male and female athletes. Because those athletes dominated many international competitions, a U.S. doctor

developed a form of anabolic steroid that could help build muscle yet minimize masculinizing side effects. Initially steroids were used only by weightlifters in small doses, but athletes assumed that larger doses would build even more muscle. Today anabolic steroids are widely used and abused by both male and female athletes, from young teens to professionals, at all levels of competition. Many athletes “stack” them—that is, take a combination of brands in quantities of 100 mg or more daily.

Although testing procedures are now in place to deter illegal steroid abuse among professional, Olympic, and college athletes, new designer drugs constantly become available. These can escape detection and put athletes willing to cheat one step ahead of testing efforts. The dynamic, however, may be about to shift if the saving of urine and blood samples for retesting at a future date becomes the standard. The high probability of eventual detection of the newer designer steroids, once the technology becomes available, plus the fear of retroactive sanctions, should give athletes pause.

Steroids can be deadly. Unfortunately, to the high school junior trying to make first-string linebacker, the long-term effects of steroids may not seem important. However, steroid use can lead to early heart attack, strokes, liver tumors, kidney failure, sterility, bleeding ulcers, cancer, high blood pressure, lowered high-density lipoprotein, and death. One surprising risk to the user who injects anabolic steroids is the exposure to HIV/AIDS and hepatitis B and C. See Table 6-5. The primary medical uses of anabolic steroids are to treat delayed puberty and some types of impotence, and wasting of the body caused by HIV/AIDS infection or other diseases.

Although steroids may be easily accessible through health clubs and spas, they are illegal if purchased without a physician’s prescription. New research suggests the drugs can cause a powerful psychological dependency and stopping them requires careful medical oversight. Withdrawal can lead to severe depression lasting for months.



Overly aggressive behavior or ‘roid rage is a symptom of steroid use in males.

TABLE 6-5 *The Bad News About Steroids*

Men may develop
Breast development
Baldness
Shrunk testicles
A higher voice
Infertility
Women may develop
A deep voice
An enlarged clitoris
Increased body hair
Baldness
Increased appetite
Both men and women might experience
Severe acne
Liver abnormalities and tumors
High blood pressure
Increased low-density lipoprotein (LDL) cholesterol (the “bad” cholesterol)
Decreased high-density lipoprotein (HDL) cholesterol (the “good” cholesterol)
‘Roid rage or uncontrollable aggressive behaviors, rage, or violence
Psychiatric disorders, such as depression
Drug dependence
Increased chance of injury to muscles, tendons, and ligaments
Death

Amphetamines

Amphetamines (*speed, uppers, L.A. turnaround, bennies, or black beauties*) are powerful central nervous system stimulants. Biphetamine and dexedrine are commercial names for these drugs. They are controlled drugs, meaning legislation has severely restricted even medical use. Their use without a prescription is illegal. Amphetamines include closely related compounds: methamphetamine and dextroamphetamine. The sharp increase in the use of methamphetamine is a serious concern today. Currently, amphetamines are legitimately used for short-term diet control in persons with obesity, **narcolepsy** (uncontrollable attacks of deep sleep), and attention deficit/hyperactivity disorder (ADHD). They increase blood pressure, heart rate, respiratory rate, and metabolic rate; suppress the appetite; and place the body in a state of stress. The ability of amphetamines to relieve sleepiness and fatigue; decrease appetite; and increase alertness, confidence, aggressiveness, and short-term performance has led to extensive nonmedical use, particularly by people involved in activities that demand stamina and long periods of wakefulness: long-distance truck drivers, pilots, flight attendants, and entertainers. They have also been used by students cramming for exams and athletes trying to enhance their performance. These drugs do not increase maximal

oxygen uptake. Although these stimulants can boost physical performance and promote aggressiveness, they have side effects that can impair athletic performance. Nervousness and irritability make it hard to concentrate on the game, and insomnia can prevent an athlete from getting needed sleep. Also, a person using amphetamines in competition may be seriously injured and not be aware of it.

Common side effects include headaches, mood swings, rapid heartbeat, restlessness, insomnia, and anxiety. Use of amphetamines over a prolonged period increases tolerance of the drug and results in a need for larger doses. Large doses can lead to high blood pressure, anorexia, convulsions, and psychosis. Use of amphetamines during exercise in a hot environment may result in an elevated body temperature and death. Amphetamine injections, when needles are shared, may expose the user to diseases such as hepatitis and AIDS.

Diuretics

Diuretics cause the body to pass water by increasing urine output. They are useful in treating edema and mild hypertension. Diuretics are useless in producing true weight loss, because they result in loss of water, not fat. Any water lost is quickly regained over the next 24 hours. When used by wrestlers to decrease weight temporarily in order to compete, the resulting dehydration produces weakness and fatigue, along with increased susceptibility to heat illness. Diuretics have also been used, ineffectively, by some athletes to mask anabolic steroid use. Urine tests for steroids are sufficiently sensitive to detect amounts as minute as a drop in a swimming pool of water.

Using diuretics may cause

- ✓ Muscle cramps
- ✓ Exhaustion
- ✓ Decreased ability to regulate body temperature
- ✓ Potassium deficiency
- ✓ Heart arrhythmias

Caffeine

Caffeine is probably the most common drug used by adults and children in our society. It occurs naturally in coffee, tea, colas, cocoa, and chocolate and is added to some prescription and nonprescription drugs. Table 6-6 lists average amounts of caffeine found in commonly used drinks, food, and drugs. Caffeine is a powerful central nervous system stimulant. In healthy, rested people, a dose of 100 milligrams (about 1 cup of coffee) increases alertness, banishes drowsiness, quickens reaction time, enhances intellectual and muscular effort, increases heart and respiratory rates, and stimulates urinary output.

Ingestion of one to two cups of coffee an hour before prolonged exhaustive exercise produces a glycogen-sparing effect by promoting fat use, which may enhance performance in endurance activities. It also tends to mask fatigue. This effect decreases as fitness increases, however, resulting in little or no benefit for highly trained athletes. If a competitive edge is desired, an athlete is wiser to drink a sports drink or plain water. Caffeine produces dehydration and, in some individuals, abnormalities in heart electrical function, both of which hinder performance.

While moderate use of caffeine is generally harmless, overconsumption can produce a toxic reaction known as *caffeinism*. Too much caffeine produces insomnia, nervousness, irritability, restlessness, muscle twitches, headaches, heart palpitations, and gastric disturbances. How much caffeine is too much? Although tolerance varies from one person to another, intake of less than 200 milligrams per day is a wise limit. People with certain heart problems are sometimes advised to avoid it.

Caffeine use is habit-forming, and those who try to abruptly stop a long-term pattern of heavy consumption



How many milligrams of caffeine does Red Bull or Monster have? How many does a 12 oz. and 16 oz. Starbucks have?

TABLE 6-6 *Common Sources of Caffeine*

	Milligrams		Milligrams
Coffee (6-oz. cup)		Mountain Dew	55
Starbucks 12 oz. “tall”	279–300	Mellow Yellow	52
Starbucks 16 oz. “grande”	400–500	Coca-Cola	35
Brewed, drip method	80–150	Diet Coke	47
Decaffeinated, brewed	3	Pepsi-Cola	35
Instant	60–100	Diet Pepsi	36
Decaffeinated, instant	2	Pepsi One	55
Espresso (2 oz.)	90–120	Water, caffeine enhanced (12 oz.)	60–125
Hot chocolate (8 oz.)	5–20	Tea (8-oz. cup)	
Chocolate milk (8 oz.)	5	Brewed	20–100
Chocolate		Oolong	36
Dark chocolate (1 oz.)	5–35	Green	32
Chocolate cake (1 slice)	20–30	Ice	5–9
Milk chocolate (1 oz.)	1–10	Analgesics (Excedrin, Anacin, Midol)	30–70
Chocolate-flavored syrup (1 oz.)	4	Cold/allergy remedies	16–30
Energy drinks		Maximum Strength No-Doz	200
Red Bull (16 oz.)	160	Weight control drugs	50–200
Monster (16 oz.)	160	Diuretics	100–200
Soft drinks (12 oz.)		Stay Alert gum	100
Jolt Cola	110	Jolt gum	13

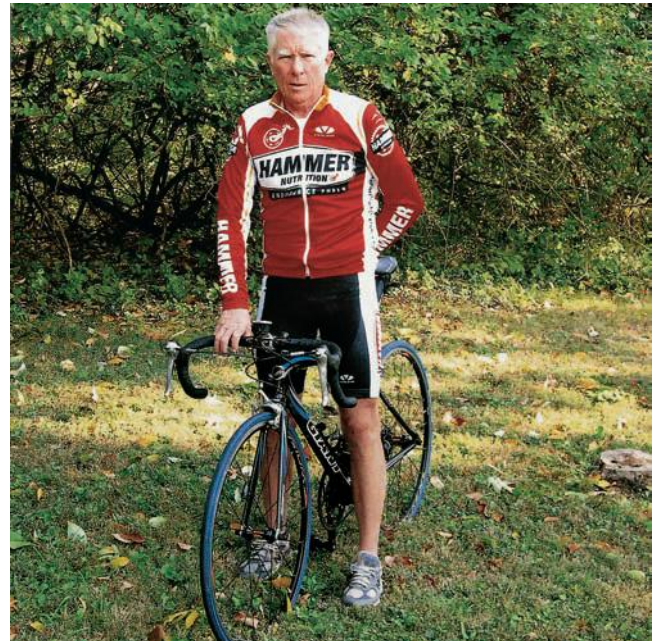
often experience withdrawal symptoms. Headaches, lethargy, irritability, and difficulty concentrating are common symptoms that will gradually diminish over a few days to 2 weeks.

Recent studies have linked caffeine to a reduced risk of several diseases: type 2 diabetes, Parkinson’s, gallstones, liver damage, and colon cancer. It has also been found to help preserve the cognitive skills of older men and women. So, the drug has both benefits and negative consequences.

AGING AND PHYSICAL ACTIVITY

Is your body older than you are? Scientist and well-known physical educator T. K. Cureton estimated that middle age begins for the average person at age 26, because at that age he or she has the physical capacity our ancestors did when they were 40. When we retire, we are expected to slow down and take it easy. This often produces disastrous results as atrophy and disuse take their toll. Exercise is probably the single most important thing we can do to age successfully. Even in moderate amounts, exercise has been found to help us enjoy life and avoid diseases that many people mistakenly believe come automatically with age. Regular physical activity cuts risk of

- ✓ Heart attack
- ✓ Stroke
- ✓ High blood pressure and high cholesterol



Studies show that people who exercise are less likely to suffer from dementia and Alzheimer’s disease.

- ✓ Diabetes
- ✓ Osteoporosis
- ✓ Depression and anxiety
- ✓ Falls and broken bones
- ✓ Some kinds of cancer
- ✓ Alzheimer’s disease

We now think that these health problems are more related to physical inactivity. The body adapts to whatever load is placed on it, and the ability to do work is reduced if the load lessens. Attitudes are changing. Older adults, encouraged by their doctors and by research revealing the benefits of exercise, are biking, swimming, jogging, lifting weights, and walking in ever-increasing numbers. We know that older adults (even up to age 100) are remarkably responsive to exercise, reaping health benefits. As the health-conscious baby-boom generation matures, its members are likely to redefine the concept of aging.

Aging and Performance

Some say, “Growing old isn’t so bad if you consider the alternative.” James Dean’s “Live fast, die young, and leave a good-looking corpse” does have its proponents, but they are quickly weeded out of the genetic pool. At birth, we each have an 80-plus-year warranty, but the maintenance is up to us. Just like any machine, the human body grows less efficient as it ages. The decline in aerobic fitness among the sedentary is about 1 percent every year after age 25. Decreases in strength, flexibility, and endurance and increases in body fat proportion with age are often accepted as a natural part of the aging process. These changes may be common, but they are not inevitable. The most significant factor contributing to declines in physiological capacity at any age is *lack of regular exercise*. The “use it or lose it” rule applies. As much as 50 percent of the functional decline seen in aging is related to disuse and can be prevented with regular aerobic exercise. Unused muscles atrophy, lose elasticity, and grow weak. Ligaments and tendons shorten and tighten, decreasing range of motion and causing aches and pains as they pull across joints. As muscle tissue atrophies, basal metabolism drops, resulting in an increase in body fat even when a person is not eating enough to maintain adequate nutritional levels.

Other adverse changes that occur with aging can also be favorably affected by exercise. For example, exercise can enhance insulin sensitivity, reduce blood pressure, and improve psychological well-being.

Osteoporosis has become a national health priority—one in two women and one in four men over the age of 50 will have an osteoporotic fracture in their lifetime. See “The Numbers.” As the population ages, osteoporosis here and around the world will result in an epidemic of life-diminishing, life-threatening fractures. To develop optimal bone strength and mass and to ward off osteoporosis, women need adequate amounts of calcium in the diet, estrogen in the bloodstream, and weight-bearing exercise in their lifestyle. Exercise acts synergistically with estrogen to develop bone strength. Inactivity accelerates bone mineral loss and increases



Postmenopausal women (and men) can maintain and may increase their bone density by regularly doing weight-bearing and resistance exercise.

the risk of osteoporosis. Bone mass usually peaks between the ages of 25 and 30 and then gradually declines. The decline is hastened by menopause. While exercise alone cannot prevent osteoporosis, it may help premenopausal women build their bone densities so that they enter menopause ahead of the game. Ideally, women and men should exercise early in life to build bone and later in life to keep it strong. Weight-bearing exercise and strength training that stresses the bone help increase bone content and is better increased by a combination of the two than it is by strength training alone. Once osteoporosis has developed, women and men should still be encouraged to exercise except while a fracture is healing. Men are also affected by osteoporosis, but at later ages than women. Studies show that men and women 60 and older who train with weights, exercise bands, and resistance machines several times a week can quickly double their total body strength. See the exercise band photo. This helps fight osteoporosis by keeping skeletons sturdy. Also, such strength gains have



THE NUMBERS

43%	Amount of lean muscle tissue on the male body.
23%	Amount of lean muscle tissue on the female body.
2%	College-age women who already have osteoporosis. Another 15% have significant losses in bone density and may be on their way to developing the disease. (Data from a University of Arkansas study.)
50%	Body heat lost through the head.
1–6%	Athletes who use anabolic steroids.
21 million	Number of Americans (7%) who are living with diabetes. Of these, 6 million do not know they have it. Another 41 million have prediabetes.
1 in 3	American adults who have hypertension.
10 million	Americans over age 50 who have osteoporosis. Another 34 million have osteopenia—bone density that's lower than normal, though not quite low enough to be called osteoporosis.
24%	Persons over age 50 with hip fractures who die within 1 year of their fracture.
20%	Possible amount of bone loss 5 to 7 years after menopause.
40%	Decreased risk of death attributed to seniors who participated in a brisk activity once a week compared to that of their inactive peers.

major implications for maintaining independence in later years. Muscle weakness can advance to the stage where an elderly individual cannot do common activities of daily living. Household tasks such as getting out of a chair, sweeping the floor, and taking out the trash may become impossible. Reduced functional ability may then increase the chance of nursing home placement. Lifelong exercise may also help protect the

elderly against falls and the devastating effects of hip fractures. It's never too late to start exercising. Starting late in life is far preferable to not starting at all.

While aging is unavoidable, declines in functional capacity with age are not inevitable. How you age is largely up to you. Cardiologist George Sheehan has said that growing older isn't so bad; it is inactive people who give aging a bad name.

As one physician observed, "So many things we think are linked to aging . . . actually have to do with lifestyle. Exercise produces a 40-year age offset. A fit person of 70 is the equal of an unfit person of 30 in regard to bones, muscles, heart, brain, sex, and everything else. I see an immense energy in old people who continue [exercise]." Exercise intensity appears to be the key to getting the greatest benefit. A group of master athletes (ages 40 to 75) studied over an 18-year period showed no significant decline in aerobic capacity if they maintained training intensity.

The effect of true nonpreventable aging involves a gradual loss of the speed and vigor with which we do activities, but it should not prevent us from doing them. As one older runner observed, "I can do everything I used to. It just takes longer to do it and longer to recover."

Exercise is adult play. At what point was our childhood eagerness to get out and romp replaced by hours



Instead of looking for the "fountain of youth," Ponce de Leon would have been better off docking his ship, remaining on land, and starting a fitness program. Research confirms that exercise truly is the "fountain of youth."

of sitting in front of the TV watching others play? Whether aging is an extension of a full and active life or a gradual wasting away is determined by how you choose to live your life.

American College of Sports Medicine (ACSM) and the American Heart Association (AHA) Exercise Guidelines for the Older Adult

The ACSM and the AHA recently combined their expertise to update exercise guidelines for older adults (adults aged 65 and older and adults aged 50–64 with chronic health conditions that affect movement and physical fitness) along with their recommendations for healthy younger adults. Older adults are advised to follow the same general guidelines recommended for the healthy younger adult group as described in Chapter 1: 30 minutes of moderately intense exercise 5 days a week or 20 minutes of vigorously intense exercise 3 days a week, and 8–10 strength building exercises at least 2 days a week. While the general recommendation is that older adults should meet or exceed 30 minutes of moderate physical activity on most days of the week, it is also recognized that goals below this time period may be necessary for older adults who have physical or functional limitations.

The main differences in the recommendations for the two groups involve strength training, flexibility, and balance activities. Older adults are advised to perform more repetitions—10 to 15—of each muscle strengthening exercise (instead of 8–12 repetitions) to prevent loss of muscle and bone mass and to decrease functional limitations. Older adults are also advised to perform 10 minutes of flexibility activities each day that strength training exercises are done. For those who are at risk for falling, balance exercises are recommended. This is good advice for younger people, too.

Does Exercise Increase Life Span?

While the length of your life may have a strong genetic component, study after study has shown that exercise helps lower the risk of major chronic diseases and premature death. Research conducted at the Cooper Institute for Aerobics Research in Dallas found that exercise of *moderate* intensity improved the overall *quality* of life (e.g., enhanced the ability to perform daily tasks, helped with weight control, enhanced psychological well-being) and perhaps increased the *quantity* of life by postponing a heart attack or stroke. A second study, part of the famous ongoing research of male Harvard alumni, reported that exercise of moderate intensity improved the quality of life but that it took exercise at a *vigorous* intensity level to add years to one's life. The Harvard men who had expended at least 1,500 calories a week in

TOP 10 LIST

Benefits of Exercise for Older Adults

1. Helps maintain the ability to live independently and reduces the risk of falling and fracturing bones.
2. Increases energy and helps the individual perform daily routines with greater ease.
3. Decreases risk of dementia, frailty, and Alzheimer's disease that spell the end of independence.
4. Helps maintain healthy bones, muscles, and joints; helps control joint swelling and pain associated with arthritis.
5. Enhances cardiorespiratory function and improves peripheral circulation; decreases the risk of arteriosclerosis and other circulatory problems.
6. Reduces constipation.
7. Reduces symptoms of anxiety and depression and fosters improvements in mood and feelings of well-being.
8. Helps people with chronic, disabling conditions improve stamina and muscle strength.
9. Reduces the risk of dying from coronary heart disease and of developing high blood pressure, colon cancer, and diabetes.
10. Improves a person's posture, decreases backache, enhances appearance, and helps control weight.

vigorous physical activity had a 25 percent lower death rate than did sedentary men. Vigorous activity was defined as fast walking, jogging, playing singles tennis, swimming, and performing heavy, sustained household chores. Studies such as these illustrate that any exercise has health benefits, but more exercise, enough to give your heart and lungs a real workout, is better. While a healthful lifestyle is no guarantee of a longer life, it does stack the odds in your favor.

Are you ever “too old” to begin exercise? No! While the overall impact you can make on the quality of your life is greater if you start exercising young and continue throughout life, there is no age at which the benefits of exercise stop. The older you are, the more you need exercise. See the Top 10 “Benefits of Exercise for Older Adults.”

EXERCISE AND CHRONIC HEALTH CONDITIONS

The general FITT principles of exercise prescription apply to individuals with and without chronic disease. Also, it is essential to include flexibility and strength-training

exercises in all well-designed exercise programs. However, certain conditions may require differences or modifications in exercise programming in order to maximize effectiveness, avoid complications, and increase enjoyment of the activity. Each of the following conditions is highlighted with a brief overview and special exercise considerations to ensure safety and enjoyment: arthritis, asthma, diabetes, hypertension, and osteoporosis. If you have any of these conditions, it is important to check with your physician before participating in an exercise program. Have your doctor fill out the Exercise Clearance Form in Chapter 1.

Arthritis

Arthritis and rheumatoid disease cause muscle weakness, fatigue, pain and stiffness, and swelling in joints and other supporting structures of the body such as muscles, tendons, ligaments, and bones. The two most common forms are osteoarthritis and rheumatoid arthritis. Fourteen percent of Americans have arthritis and rheumatoid disease. Osteoarthritis is a degenerative joint disease that typically affects the knees, hips, feet, spine, and hands. Rheumatoid arthritis is a chronic, systemic inflammatory disease that affects the synovial membranes of joints. The complications of arthritis may lead to a less active lifestyle.

Scientists stress that physical activity of the type and amount recommended for health has not been shown to cause or worsen arthritis. While rest is important during flare-ups, lack of physical activity is associated with increased muscle weakness, joint stiffness, reduced range of motion, and fatigue. It is true that arthritic joints cannot be cured, but staying active will help alleviate much of the pain of osteoarthritis.

The goals of an exercise program for people with arthritis are to preserve or restore range of motion and flexibility around affected joints; increase muscle strength and endurance; and increase cardiorespiratory endurance conditioning to improve mood and decrease health risks associated with a sedentary lifestyle.

Recommendations/modifications for exercise for those with arthritis include the following:

- ✓ Begin slowly and progress gradually.
- ✓ Avoid rapid or repetitive movements of affected joints.
- ✓ Perform flexibility exercise one to two times daily, using pain-free range of motion exercises. These can be done on land or in water such as a pool, hot tub, or warm bath. Physicians should provide specific stretches to be done instead of saying, “just stretch.” Yoga and Tai Chi are good activities for increasing flexibility.
- ✓ Perform cardiorespiratory endurance exercise initially in short bouts (i.e., 10 minutes each

time). Work up to 30 minutes. Performing three 10-minute sessions per day is also acceptable. Aquatic, walking, and cycling activities are advised.

- ✓ Perform resistance training two to three times per week. Do not exercise with pain.
- ✓ Include functional lifestyle activities (e.g., climbing stairs, standing up from a sitting position, buttoning clothes, etc.) daily.
- ✓ Avoid exercise during flare-ups.
- ✓ Stop exercise if you have continuing joint pain that lasts more than an hour after exercise, unusual fatigue, increased weakness, decreased range of motion, or increased joint swelling.
- ✓ Morning exercise may not be advised for those with significant morning stiffness.

Asthma

Years ago, it was thought that strenuous physical activity was dangerous if you had asthma, but now we know better. Exercise is not only safe if done properly, it is an integral part of treatment. Studies show that physically fit people have fewer attacks, need less medication, and lose less time from work or school. Seventeen million Americans are living with asthma.

Activities that involve short, intermittent periods of exertion such as volleyball, baseball, half-court basketball, and tennis are generally well tolerated by individuals with asthma. Activities that involve continuous exertion such as jogging, field hockey, and cycling as well as cold weather sports (e.g., cross-country skiing, ice skating, jogging in winter) may be less well tolerated. However, with proper precaution, most people with asthma are able to participate fully in these activities. Swimming is well tolerated because of the warm, moist air environment. Other beneficial activities include both indoor and outdoor cycling, aerobics, walking, or running on a treadmill.

To make sure asthma doesn't interfere with your ability to exercise, keep it under control. If your doctor has prescribed medications for daily use, use them faithfully. Take necessary steps to control allergies. Visit the doctor on a regular schedule, follow instructions about monitoring your condition at home, and be sure to report any problems promptly.

People with well-controlled asthma can exercise following the FITT prescription for exercise outlined in Chapter 2. For balanced fitness, also include strength training and flexibility components. Follow the guidelines described in Chapters 3 and 4. However, if your asthma is exercise-induced, pay special attention to avoiding environment “triggers” such as cold, dry, dusty air and/or inhaled pollutants and chemicals. Even if your asthma is well controlled, you may develop coughing, shortness of breath, chest pain, or nausea if you

exercise without taking precautions. Do not exercise during an acute asthma attack; wait until the symptoms have subsided. For safe exercise participation follow these guidelines:

- ✓ Exercise regularly. Acute attacks are more likely if you exercise only occasionally.
- ✓ Drink plenty of water before, during, and after a workout, even in cool weather, to moisten the airways.
- ✓ Warm up and cool down thoroughly.
- ✓ Avoid exercising in cold, dry air. In the winter, work out indoors or if you are active outside, cover your mouth and nose with a scarf or breathing mask to warm the air you breathe.
- ✓ Don't exercise on days when your symptoms are bothersome, such as when you are wheezing or coughing.
- ✓ Avoid areas where air pollution is high (e.g., near highways or during high-traffic times of the day). On days when pollution is worse than normal or the pollen count is particularly high, exercise indoors or not at all.
- ✓ If your doctor recommends it, use medications as prescribed before exercising.
- ✓ If you develop symptoms during exercise, don't try to push your way through them. Stop what you are doing and follow the directions on your inhaler. If this doesn't bring relief within 15 to 20 minutes, seek medical help.

Diabetes Mellitus

Diabetes mellitus (both type 1 and type 2) is a chronic disease characterized by the body's inability to produce insulin or use the hormone properly. See Chapter 8 for expanded information about diabetes, especially Table 8-5. The treatment goal for diabetes is blood glucose control, which includes exercise, diet, and medications. One of the best things diabetic individuals can do is to stay active. Moderate to intense exercise may cause blood glucose levels to diminish for the 24 hours following exercise. Before beginning an exercise program, they should undergo an extensive medical evaluation, particularly for the cardiovascular, nervous, renal (kidney), and visual systems because these are at high risk for diabetic complications.

Exercise increases vulnerability to two major diabetes-related problems: hypoglycemia (a rapid drop in blood glucose level) and foot sores (caused by peripheral vascular disease). Hypoglycemia is initially characterized by sweating, hunger, dizziness, anxiety, a rapid heart rate, and tremor. Without proper attention, the sufferer may lose consciousness and go into shock. Foot sores that are not properly treated can rapidly worsen, sometimes within a matter of hours, and lead to infection.

TOP 10 LIST

Exercising with Diabetes

1. Get proper medical advice before starting an exercise program.
2. Monitor blood glucose levels before, during, and after exercise, especially in the early stages of exercise training. Check twice prior to exercise, 30 minutes before and immediately before; and every 20 to 30 minutes during prolonged exercise. **If your blood glucose level is 300 mg/dl or higher, do not exercise.**
3. Don't exercise when you are sick. Exercising when you are sick can make your blood glucose levels fluctuate dramatically and it may take longer to get well.
4. Keep fluid levels well up before, during, and after exercise, especially during hot weather. Dehydration can affect blood glucose levels and heart function.
5. Be aware of signs of hypoglycemia (low blood glucose) even several hours after exercise. Have a carbohydrate-based snack or drink handy.
6. Exercise 1 to 2 hours after a meal.
7. Avoid injecting insulin in a muscle that is about to be used for exercise.
8. Wear correct footwear. Peripheral vascular disease is relatively common in diabetics and it often affects the feet.
9. Exercise at the same time each day. Exercise at a similar time, intensity, and duration each day helps you get to know your own blood glucose response to exercise training.
10. In case of emergency, wear an identification bracelet or shoe tag while exercising.

Severe cases may require amputation. Individuals with advanced diabetic neuropathy should choose low-impact activities like swimming, rowing, water exercise, and cycling rather than high-impact ones like jogging. Everyone with diabetes should inspect the feet for signs of irritation before and after exercise. Activities like scuba diving and rock climbing can be dangerous if there is any possibility of hypoglycemia.

Diabetics with retinopathy and nephropathy should avoid activities that sharply raise blood pressure. This means that when these individuals strength train they should lift lighter weights and a higher number of repetitions instead of heavier weights and a lower number of reps. Avoid exercise that causes jerky motions (e.g., bouncing on a trampoline); increases eye pressure (e.g., scuba diving or mountain climbing); or places your eyes below the level of your heart (e.g., toe touching).

With proper training, most diabetics can exercise as much as they wish. Follow the FITT prescription for cardiorespiratory endurance fitness and include flexibility and strength-training components for balanced fitness. See the Top 10 “Exercising with Diabetes.”

Hypertension

Hypertension (or high blood pressure) is defined as a blood pressure (BP) equal to or exceeding a systolic BP of 140 mm Hg and/or a diastolic BP of 90 mm Hg. Hypertension is one of the most prevalent forms of cardiovascular disease. It is the major contributor to strokes, heart attacks, congestive heart failure, peripheral vascular disease, and kidney failure. The risk of many of these diseases increases at levels of blood pressure well below the diagnostic threshold of 140/90 mm Hg. Therefore, lowering blood pressure may benefit individuals with any elevation above optimal levels. See Chapter 8 for important blood pressure information.

The American College of Sports Medicine advises that exercise should be the cornerstone of therapy for the prevention, treatment, and control of high blood pressure. Most aerobic, resistance, and flexibility types of exercise are recommended, but the primary form of exercise should be the aerobic type. The FITT prescription for cardiorespiratory endurance exercise should be adhered to but with the following adaptations:

- ✓ The preferred intensity of the aerobic exercise should be at the moderate-intensity level (below 70 percent HRR) because it appears to reduce BP as much as, if not more than, exercise at higher intensities. Walking, cycling, and swimming are good choices. The intensity level of running may be too high.
- ✓ The preferred frequency of the aerobic exercise is 7 days per week because BP is lowered for several hours after a single bout of exercise. Lowering BP just a few days per week with aerobic exercise is not sufficient.

Here are additional special exercise guidelines for those with high blood pressure:

- ✓ Do not exercise if resting systolic BP is greater than 200 mm Hg or diastolic BP is greater than 110 mm Hg.
- ✓ Vigorous activities done with high force, such as sprinting, rowing, or heavy lifting or straining, are not advised for hypertensive individuals.
- ✓ Downhill skiing may exaggerate an elevated BP response from the cold and elevation.
- ✓ Be aware of heat. Some BP medications impair the ability to regulate body temperature or can cause dehydration.

- ✓ Cool down. Extend the cool-down period because some BP medications may cause BP levels to drop after abruptly stopping exercise.
- ✓ Weight loss, even a few pounds, helps to lower BP.

Resistance training should not be the only or main mode of exercise for individuals with hypertension, but it should be combined with an aerobic exercise program. Use lower resistance (i.e., 30 to 60 percent of maximal effort) with higher repetitions (i.e., 12 to 15). Follow these guidelines when performing resistance exercise:

- ✓ Avoid isometric types of exercise.
- ✓ Do not hold your muscle at the point of full muscle contraction.
- ✓ Avoid “holding” your breath while exercising, especially during resistance types of exercise.

Osteoporosis

Osteoporosis literally means “porous bone.” It is a skeletal disease characterized by low bone mass, increased bone fragility, and increased risk for bone fracture. Osteoporotic fractures commonly occur in the hip, spine, and wrist but can occur at other sites. Osteoporosis is a silent disease in that a fracture is frequently the first indication of bone loss. This disease has a debilitating effect on independence and quality of life, especially for older adults. Risk factors for osteoporosis are family history, female gender, estrogen deficiency, low weight, dietary factors, prolonged use of corticosteroids, and physical inactivity. Bone mass attained early in life is perhaps the most important determinant of lifelong skeletal health. Young women who suffer from female athlete triad are at risk of bone loss and osteoporosis. Exercise can positively affect peak bone mass in children and adolescents, maintain or even modestly increase bone mass in adulthood, and assist in minimizing age-related bone loss in older adults. See Aging and Physical Activity in this chapter.

How does exercise help prevent osteoporosis? If bones are not used, they weaken. Studies on astronauts and injured athletes have shown that even well-conditioned individuals suffer from a reduction in bone mass and density during prolonged periods of inactivity. The detrimental results of little or no activity may be heightened as we get older. When force or stress is applied to a bone, the bone bends. This sets up a cascade of events that stimulates cells to strengthen the bone. The bone can adapt to stress or the lack of it by forming or losing mass. For the bone to become bigger and more dense, the stress must be above and beyond normal levels. The bone will continue to grow and adapt until it is restructured to handle the new imposed stress.



Strength training becomes increasingly important with age. Older adults need lighter weights with more repetitions and more time between sessions to recover. Jumping, hopping, and skipping are great for the bones, too.

Each bone in the body must be stressed to grow strong. If the leg bones are stressed by running and jumping, the arm bones will not benefit unless they too are stressed with specific exercises (e.g., weight lifting). Thus a good exercise program to prevent and treat osteoporosis involves all of the major muscle and bone groups in the entire body.

Young bone is more responsive to exercise stress than old bone. Given that approximately 60 percent of the final skeleton is built during adolescence, vigorous physical exercise during childhood and adolescence is more important than at any other time in life.

If you already have osteoporosis or low bone density, consult your doctor before starting an exercise program. Depending on the status of your condition, your doctor may or may not recommend certain exercises and will inform you of precautions that are necessary when you exercise or perform regular activities. Avoid exercise when a fracture is healing. Use extreme caution when performing exercise that involves the following movements, as they may be dangerous:

- ✓ *Forward bending.* Avoid activities and exercise that involve bending forward excessively at the waist because they increase the risk of compression fractures of the vertebrae.

- ✓ *Heavy lifting.* Avoid heavy lifting, especially when bending forward at the waist. This may include lifting loads of laundry, bags of groceries, or exercise weights.
- ✓ *Twisting.* Twisting movement can place unusual force on your spine. Golfing and bowling are two common sports that involve twisting and may be harmful. Check with your doctor about whether you can safely participate in these sports.
- ✓ *High-impact activities.* Activities that involve higher-impact movements, sudden stops and starts, and abrupt weight shifts put too much stress on your spine and can lead to falls and knee injuries. Such activities include sprinting, soccer, racket sports, volleyball, and basketball.

Sometimes you cannot avoid certain movements such as bending forward or reaching overhead. But you can use caution and practice good posture and body mechanics to decrease risk of injury.

If you don't have osteoporosis and are otherwise healthy, exercising to prevent osteoporosis is generally safe. Once osteoporosis has developed, exercise is still encouraged except while a fracture is healing. The following types of exercises are recommended for osteoporosis prevention:

1. *Weight-bearing and impact exercise.* Weight-bearing exercise means your bones and muscles are working against gravity as you exercise. These involve activities you do on your feet with your bones supporting your weight. Examples include brisk walking, jogging, skipping, jumping rope, stair-climbing or step-type exercises, racket sports, aerobic dance, dancing, hiking, and team sports. *Swimming and bicycling are not weight-bearing* because your body is supported by the water or the bike rather than your legs. Recent research reveals that for many, walking may not adequately stress the bones to improve their strength. Activities with more impact and higher intensity may be necessary. This, however, would not be the case for the frail elderly. For osteoporosis prevention, weight-bearing/high-impact activities are best and weight-bearing/low-impact activities are good, but less so. This latter category includes low-impact aerobics and most cardiovascular machines (stair climbers, rowers, elliptical trainers, treadmill walking). Yoga and Pilates are nonimpact and are least beneficial for osteoporosis prevention.
2. *Strength training.* Strength training uses resistance, such as free weights, weight machines, resistance bands, and water activities to strengthen muscles. Strength-training activities for the legs, abdomen, and back should be emphasized to improve lower-body strength and posture to help prevent falls

and broken bones. Because of the increase in gravitational force on bone in a weight-bearing position, strength-training exercises performed on the feet are considered to be more effective at stimulating bone than are machine-based exercises performed in a seated position. In the on-the-feet weight-bearing position, there is an increased load at the hip and greater demand for postural control and balance, which in turn optimizes bone health. Also, push-ups and exercises performed on the feet (with or without hand weights), such as forward, backward, and sideways lunge; squat; chair raise; heel and toe raise; stepping; and jumping, are also recommended.

3. **Back strengthening.** Back-strengthening exercises should be included in exercise programs for the treatment and prevention of osteoporosis. Strengthening the muscles of the back may help improve the health of people with osteoporosis and low bone mass by improving posture and decreasing risk of compression fractures caused by the stooped posture commonly seen in people with the disease. Exercises that gently arch the back, the opposite direction of a stooped posture, can strengthen back muscle while minimizing back stress. See the Exercises for the Lower Back pullout at the back of the book.



PRESCRIPTION FOR ACTION

You've read the chapter. Now go do one or more of these:

- ✓ Make a list of reasons why you didn't exercise outside last winter and ways you can counter this during the cold months this year.
- ✓ Get up during TV commercial breaks and do 30 seconds (about the length of one commercial) of each of the following exercises:
 - jumping jacks (or jog in place)
 - push-ups
 - abdominal curls or planks
 - squats
- ✓ Show your grandparents or another older person how to use an exercise band.
- ✓ Weigh yourself before and after your workout today and see how much water you lost.
- ✓ Write down three reasons why you will want to exercise across your life span.
- ✓ Keep a log of how much water you drink today.
- ✓ Keep a log of how much calcium you get today.



Frequently Asked Questions

Q. Is THG a vitamin or an anabolic steroid? As a college athlete, should I be taking it?

- A. No! Do not take it. Tetrahydrogestrinone, or THG, is one anabolic steroid that is receiving a lot of attention. Until recently, THG was marketed as a dietary supplement for enhancing athletic performance. However, researchers have found that THG is actually a chemically altered version of an anabolic steroid that is banned by most sports organizations. THG is referred to as a “designer” steroid because it is undetectable by traditional steroid testing techniques. THG is not approved by the Food and Drug Administration and carries their health warning.

Q. Can healthy people do anything to boost their immunity?

- A. There is nothing more powerful than *regular, moderate exercise*. When unfit, sedentary people work out for 45 minutes at a moderate intensity most days of the week, the number of days they are sick falls by about half. The natural killer cells and neutrophils of the

immune system that provide the first defense against bacteria, viruses, and other invaders start circulating at a higher level. These remain elevated for about 3 hours after the workout and then return to normal until the next time you exercise.

Q. Can I work out when I have a cold or upper respiratory infection?

- A. It depends. Studies suggest that *moderate* exercise training (at 70 percent HRR) during an upper respiratory infection (URI) does not appear to extend the length or increase the severity of the illness. However, exercising during a URI should be considered carefully. Use the following guidelines to decide if it is okay for you to exercise during a cold or URI.
 - If you are not experiencing extreme tiredness, malaise, fever, or swollen lymph glands, you may safely exercise at an intensity level lower than that of your regular workouts.
 - Also, perform a “neck check.” Assess cold symptoms and classify them as either above or

below the neck. If symptoms are “above the neck” (i.e., runny nose, sneezing, or scratchy throat), you may exercise at a lower intensity. Exercise is not advised when you have “below the neck” symptoms (i.e., fever, aching muscles, productive cough, vomiting, or diarrhea).

- If you begin feeling better during the workout, increase the intensity of the workout accordingly.

Q. True or false? All alcoholic beverages are dehydrating.

- A. False. Although nonalcoholic beverages are recommended for rehydration, especially when you are exercising or working in hot weather, beer, many mixed drinks, and wine are fairly diluted and thus add to the total fluid intake. Concentrated alcoholic beverages such as vodka and brandy, if drunk undiluted, are very dehydrating.

Q. True or false? “Oxygenated” water, which is infused with 5 to 10 times as much oxygen as regular water, will help your muscles and improve your performance. So will vitamin-enriched water.

- A. False and false. Studies show that oxygenated water does not improve aerobic performance or increase oxygen levels in the blood. The only way to get oxygen into the blood and muscles is through the lungs. Vitamin-enriched waters and those containing herbs will not improve performance or benefit your health in any way. However, “sports drinks” containing low levels of sugar and sodium can help conserve carbohydrate stores and delay fatigue during a prolonged workout.

Q. Does exercise affect the cognitive ability of older adults?

- A. Yes. Older adults who stay fit may be better equipped to deal with situations that require quick or multitask thinking. Research reveals that active seniors have increased “executive control function” (ECF). ECF is a type of complex thinking needed to handle a sudden unexpected change (such as a car darting into your lane) and in multitasking situations (such as talking on the telephone and checking e-mail simultaneously). Fit seniors have sharper thinking, a reduced risk of cognitive decline, and improved motor preparation. So do fit *young* people.

Q. What is sarcopenia?

- A. Pronounced sark-ko-PEEN-ya, this is a word you are likely to begin hearing more often. It means not only loss of muscle and strength but also decreased quality of muscle tissue. Most people lose 20 to 40 percent of their muscle tissue as they get older. Strength training can restore muscle mass and strength or at least slow this loss.

Q. Is it ever too late to start strength training?

- A. No. In several recent studies, even elderly nursing home residents saw marked improvement after undertaking an 8-week program that significantly improved their balance, strength, and walking speed. It also helped lower cholesterol.

Summary

Exercise is meant to be enjoyed throughout life. Regardless of gender or age, the body improves with use and degenerates with disuse. People don’t wear out; they rust out. For the greatest benefit from an exercise program, it is helpful to be aware of special concerns, such as how to exercise safely in hot and cold weather and how to avoid high-risk exercises. You have learned in this chapter that women respond to exercise the way men do but perhaps a little slower and to a lesser extent, and, with a physician’s approval, pregnant women can safely exercise. This means training principles are approximately the same, regardless of gender. You have also learned that water is a fine rehydrater after exercise but that sports drinks are recommended for rehydration after prolonged exercise (60 to 90 minutes) and profuse sweating. Sports drinks contain electrolytes, which enhance fluid retention, contain carbohydrates, delay

the onset of fatigue, and boost energy, and they taste good, which increases the likelihood that we will drink more when working out. You now understand that moderate exercise intensity strengthens the immune system and that unfortunately for some, exercise can become addictive. As you adjust to a physically active lifestyle, you will find that the benefits far outweigh the effort involved. Exercise will become a habit, and you will begin to look forward to your workout as an important part of your day. You have also become aware of the health consequences of using physical-performance-enhancing drugs.

Let the words of Don Ardeall inspire you to maximize your potential to be the best you can be: “Excellence ain’t easy. If it were, everyone would be doing it and it would be ordinary. Know that, in lots of ways, the deck is stacked against anyone who wants to excel. Do it anyway.”



Internet Resources

AARP Health

www.aarp.org/health

Information on drugs, insurance, and staying healthy at 50 plus.

Administration of Aging

www.aoa.dhhs.gov

Department of Health and Human Services site that contains links on aging-related topics.

Alzheimer's Association

www.alz.org

Learn about what you can do to maintain a healthy brain.

American Diabetes Association

www.diabetes.org

Has an exercise section with FAQs, and information about cycling and walking events. It also provides news on the latest research, nutritional information, and even recipes.

Arthritis Foundation

www.arthritis.org

Has information on health and exercise tips concerning arthritis. Also provides tips about living with arthritis, and the latest research.

Cooper Institute for Aerobics Research

www.cooperinst.org

Provides information about exercise research.

Health A to Z

www.healthatoz.com

Includes health and medical search engines.

Healthfinder

www.healthfinder.gov

Consolidates official government health resources and offers links to over 500 health sites.

Mayo Clinic/Mayo Health Oasis

www.mayoclinic.com or www.mayohealth.org

A complete health and wellness library. Search by major subject area.

Medline Plus

www.medlineplus.gov

The National Library of Medicine's health information portal.

National High Blood Pressure Education Program

www.nh/bi.nih.gov

Learn how to lower high blood pressure.

National Institute on Aging

www.nih.gov/nia

Provides information on healthy aging and aging concerns.

National Osteoporosis Foundation

www.nof.org

Gives information and exercises.

National Osteoporosis Society

www.nos.org.uk

Provides information, exercises, and can answer questions.

National Women's Health Information Center

www.4women.gov

Contains women's health information.

Shape Up America

www.shapeup.org

Run by former surgeon general C. Everett Koop. Dedicated to educating and empowering consumers to improve their health.

Steroid Abuse

www.steroidabuse.gov

Provides information on steroid abuse.

U.S. Anti-Doping Organization

www.usantidoping.org

Information on the full list of banned drugs.

LAB Activity 6-1

Name _____ Class/Activity Section _____ Date _____

Exploring Special Exercise Considerations Challenge

1. Your sister's gynecologist just told her she is pregnant. Knowing you are taking a college fitness/wellness course, she asks you for advice concerning the fitness walking program she began 2 months ago to help her get back into shape and lose a few pounds. Give her three or four tips.
2. At dinner, two of your friends were debating whether to use a popular sports drink to replace the sweat they expected to lose in the July 4 12-mile run, which they estimated would take *more* than 1 hour to complete. The July 4 festivities are tomorrow, with the race beginning at noon in Old Town and ending at the top of Heartbreak Hill. What advice would you give them?
3. Your grandparents (age 65) were advised by their neighbor to stop that "foolish" exercising, slow down, and start acting their age. They ask you your opinion about this advice. What can you tell them about the benefits of staying physically active?
4. In Speech 101, your topic for the final exam speech is "The Difference between Men's and Women's Exercise Performance Levels: Are They More Alike Than Different?" List three similarities and three differences you want to highlight in your speech.

5. Take the “Are You Addicted to Exercise?” self-assessment in this chapter. How many “yes” statements did you check? _____. Discuss your assessment score. Have a friend you think may be becoming addicted to exercise also take the self-assessment in this chapter. How can you help a friend who may be becoming addicted to exercise?

6. Is there anything healthy people can do to boost their immunity?

7. Many of my friends are afraid to exercise outside during cold weather because they think they might freeze their lungs. How do you respond to that?

8. You suspect that your roommate, who is on the football team, is using steroids. He is really “bulking up” and bursts into a rage at the slightest irritations. What are other signs of anabolic steroid use? What are the health consequences?

9. Your grandmother has been diagnosed with osteoporosis and your grandfather has been taking medication for hypertension for several years. They want to begin an exercise program. List three or more dos and don’ts for each condition for them to follow.

Preventing Common Injuries and Caring for the Lower Back

7



An ounce of prevention is worth a ton of cure.
—Anonymous

Study Questions

You will have successfully mastered this chapter if you can answer the following:

1. Can you identify four main reasons injuries occur?
2. Can you give three tips for avoiding an overuse injury?
3. How do muscle weakness and inflexibility contribute to injuries?
4. What are four common muscle imbalances?
5. Can you list and explain the general recommended treatment for common injuries (P.R.I.C.E.)?
6. What are the basic causes and treatment of ankle sprain, blisters, bursitis, chafing, heel spur syndrome, iliotibial band syndrome, muscle cramp, muscle soreness, muscle strain, patellofemoral syndrome, plantar fasciitis, shin splints, side stitch, stress fracture, and tendinitis?
7. What are the symptoms of injury that indicate the need for medical attention?
8. What are two vital components of rehabilitation needed to resume activity safely without injury?
9. What are the two most important keys to preventing lower back pain?
10. Can you describe exercises recommended to reduce the risk of lower back pain?

You will find the answers as you read this chapter.



Visit the Online Learning Center for *A Fit Way of Life*, www.mhhe.com/robbinsfit2e, where you will find additional quizzes and other study aids.

Terms

- blisters
- bursitis
- cramp
- heel spur
- iliotibial band
- intervertebral disc
- ischemia
- ligament
- orthotics
- overpronation
- overuse
- patellofemoral syndrome
- plantar fasciitis
- P.R.I.C.E.
- pronation
- shin splint
- side stitch
- sprain
- strain
- stress fracture
- tendinitis
- tendons
- underpronation

You walk into your first jogging class, eager to improve your fitness. You have not exercised regularly, and you hope this class will help you get in shape. Your instructor begins with a warm-up and an easy jog around campus. After your run, you feel great and invigorated. The next morning, you wake up and your whole body aches. You don't remember having been run over by a truck. "What should I do now? Withdraw from class? Stay in bed? Buy stock in Ben-Gay? When will I be able to move again?"

Participation in fitness activities offers many benefits. These benefits far exceed the risk of injury. When you exercise, you intentionally use certain muscles to increase their strength and endurance. As your body adapts to these efforts, you may experience minor aches and soreness. Physical activity also carries some risk of overuse or injury. Fortunately, many of these discomforts are minor, and you will be able to continue or quickly resume your workouts. Everybody is built differently and varies in physical potential, so "listen to your body" to improve your personal fitness level safely—and avoid the pain of injury. This chapter discusses how to prevent injuries, how to recognize their signs and symptoms, and what treatments are recommended. It also examines how to maintain a healthy back, because chronic back pain is a common problem. Finally, factors that affect the musculature of the spine and ways to avoid lower back injury are covered.

INJURY PREVENTION

Prevention is the key to reducing the frequency of injuries. Ninety percent of injuries include slow wear and tear, strains, sprains, and inflammations. Understanding the causes of injuries allows you to stop minor problems before they turn you into the "walking wounded." Prevention is far more conducive to wellness than is any patch and repair job. There are four main reasons injuries occur:

1. *Overuse*: doing too much too soon or too often, causing a breakdown at the weakest point—ankle, Achilles tendon, shin, knee, or back.
2. *Footwear*: wearing improper or worn-out shoes.
3. *Weakness and inflexibility*: muscles so weak or tight that the slightest unusual twist strains them.

4. *Mechanical problems*: the result of biomechanical/anatomical problems (the way the foot hits the ground, body build, etc.) or using poor form while exercising.

An individually adjusted workload, well-made and well-kept shoes, supplemental toning and stretching exercises, and mechanical improvements will prevent the majority of injuries.

Overuse

To improve or maintain fitness, you must overload, or push beyond normal demands. Progressive overload following the guidelines in Chapter 1 is necessary and good to a point, but you must be able to recover between workouts. The goal is to exercise so that you improve but not so much that you cause **overuse**, excessive overload leading to injury or illness (Figure 7-1). Overuse problems commonly occur at the beginning of a new exercise program and account for 25 to 50 percent of injuries. The first 2 months of a new program are the most critical. The body and muscles must be given time to adapt gradually to the new demands.

Set realistic goals early in a fitness program. Your instructor will help you determine an appropriate entry-level conditioning program and progression. Gradually increase your exercise intensity and duration to attain your personal goals. Try not to compete or compare yourself with friends who may be able to exercise for a longer duration or at higher intensity. You will be able to catch up in time, but if you attempt to keep up with them before your body is ready, you risk an overuse problem.

A good rule of thumb when building your program is to increase the duration of the workout no more than 10 percent weekly. A beginner should not jump from a 20-minute workout up to 40 minutes. Also, do not increase both intensity and duration during the same week. Total time spent training per week is a pretty good predictor of injury. If training volume or intensity is too high and the recovery inadequate, tissue repair may be incomplete, resulting in overuse syndrome. Many fitness buffs and athletes have a feeling of invulnerability. They think their bodies can adapt to increased exercise workloads without any problem. Realize that more is not always better. By allowing your body to adjust gradually to new exercise demands, you will greatly reduce the risk of suffering an overuse injury. See Table 7-1 for symptoms of overtraining, overuse, and chronic fatigue.

Consider alternating an impact activity with a low-impact or nonimpact activity. This alternation gives the muscles a period of rest and recovery and switches the demands to a new muscle group. It is repetitive stress on the body that causes problems.

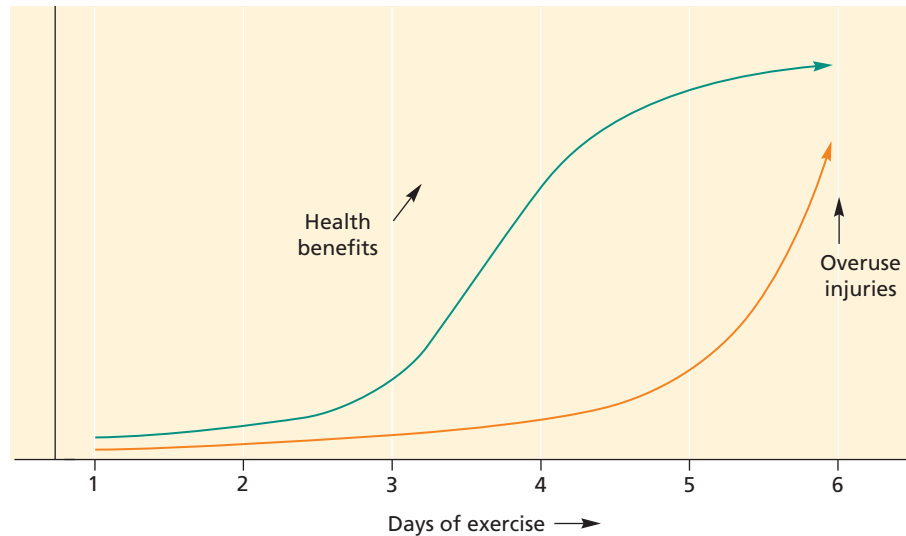


FIGURE 7-1 Overload is good up to a point. Overuse may cause injury. Health benefits accrue rapidly with 3 to 5 days per week of exercise. The risk of injuries increases with more than 5 days per week of exercise.



THE NUMBERS

17,000,000	Average annual number of Americans who sustain an exercise-related injury.
500	Miles of use in which your shoes will maintain their ability to absorb shock.
85%	Americans affected by low back pain at some time in their lives.
82%	Injuries that occur in the lower extremities.
78%	Injuries that are attributable to overuse.
10%	Maximum amount of time to safely increase exercise weekly.

If you are getting the right amount of exercise, you should look good, feel good, and be alert and productive. After a workout, you should get enough rest to be fully recovered by the next workout. Rest is probably the most neglected aspect of fitness. Fitness does not occur during exercise alone but results from the proper combination of training and recovery. Exercise provides the overload that stimulates that improvement. During the rest period between workouts, the body adapts to the demands made on it. When the recovery is adequate, you will begin the next workout feeling strong and energetic. If you feel tired and washed out, rest will do you more good than exercise will. Some may need to add an extra day of rest to the weekly program. Others may need to drop the intensity of exercise or volume (number of miles, time, or number of sets or reps). Dehydration can

be a major contributor to fatigue. Drink plenty of water daily—especially if you exercise in a hot climate. Also keep in mind that exercise isn't the only source of over-stress. Other aspects of daily life, such as poor nutrition; emotional tension; job, social, or family problems; and lack of sleep, can contribute to chronic fatigue.

There is a difference between the pain of injury and the pain of hard effort. The concepts of “no pain, no gain” and “going for the burn” are useful in athletics but inappropriate for fitness exercisers whose goal is health, not athletic performance. Pain is the body's natural way of informing you that something is wrong. Do not try to exercise through pain or injury. Previous injury is a strong risk factor for future injuries. Allow time for healing, and correct mechanical problems before resuming activity.

TABLE 7-1 *Symptoms of Overtraining, Overuse, and Chronic Fatigue*

Signs in Your Training
• Persistent soreness and stiffness in joints, tendons, or muscles • Labored breathing during a workout of normal intensity • Performance decline or cutting sessions short • Recovery taking longer • Persistent lethargy, fatigue, weakness, and unusual lack of interest in exercise • “Giving up” when the going gets tough • Impaired muscular strength
Signs in Your Life
• Increased tension, anger, irritability, depression, mood changes • No interest in activities you usually do, general apathy • Poor concentration (general clumsiness, tripping, poor auto driving) and easily distracted • Not sleeping well
Signs in Your Health
• Increased infections and colds • Increases of six to eight beats per minute in morning resting pulse • Swelling or aching lymph glands in neck, underarm, or groin area • Skin eruptions in nonadolescents • Constipation or diarrhea • Loss of appetite, frequent nausea • Chronic thirst • Cuts and scars taking a long time to heal • Inexplicable weight changes, either up or down • Anemia or amenorrhea (in women)

Footwear

While many injuries are due to overuse, that is only part of the problem. Wearing improper or worn-out shoes places added stress on your hips, knees, ankles, and feet—the sites of up to 90 percent of sports injuries. The feet are the most abused and neglected part of the body. Good footwear can prevent many injuries and is the best investment you can make in an exercise program. Each time your foot hits the ground when you are jogging, the force of impact is three to five times your body weight. Your feet, ankles, shins, knees, hips, and lower back must absorb a tremendous amount of stress. If the stress is too great, breakdown occurs at the weakest link in the chain. A well-fitted pair of shoes is the first line of defense against impact injuries.

Shoes should provide good shock absorption, support, and stability yet maintain a reasonable degree of flexibility. Your foot will naturally roll inward from outer heel contact to big toe pushoff when you jog;

therefore, the heel counter (the rigid plastic insert in the shoe’s heel) must be firm to prevent excessive heel movement. The bottom of the shoe must have good traction to prevent slipping. Shoes are manufactured to be used for a certain number of miles, and they can lose their cushioning ability even if the uppers still look good. Each step compresses the sole, causing it to flatten and gradually lose shock absorbability. Exercise shoes typically lose about one-third of their ability to absorb shock after 400 to 500 miles of use. The upper part of the shoe stretches and weakens, decreasing lateral support. This happens so gradually that you may not notice it until you try on a new pair of shoes. With less cushioning and support, there is a greater chance of injury. If you wear the shoes 5 to 10 hours a week during exercise (walking, jogging, aerobics, etc.), you should probably replace them every 6 months to retain adequate cushioning. Runners would be well advised to keep a log of their mileage as a reminder of when to buy new shoes.

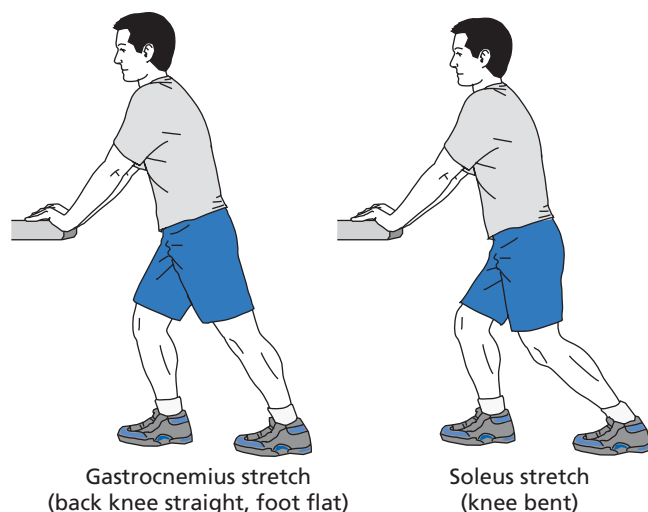
Weakness and Inflexibility

Sit down with your feet extended in front. Slowly reach toward your toes. Can you touch them without bending your knees? Many exercisers who neglect flexibility exercises cannot pass this test for minimal flexibility. Their legs are too tight, and this increases susceptibility to muscle and tendon injuries. Aerobic activities are great for the cardiorespiratory system, but they alone do not develop balanced fitness. They tend to shorten and tighten muscles that are used repetitively, leaving opposing, relatively unused muscles weak. This can lead to muscle imbalance. If some muscles are too tight, joint movement is restricted. Table 7-2 lists some common muscle imbalances. The solution to this problem is to stretch the tight muscles and strengthen the weak ones. A balance of strength and flexibility is important in injury prevention.

Incorporate a basic stretching routine into each workout, preferably during the cool-down. (See Chapter 3

TABLE 7-2 *Common Muscle Imbalances*

The rule of thumb in avoiding injuries is to <i>stretch</i> the muscles that are tight and <i>strengthen</i> the opposing muscles that are weak.	
Tight	Weak
Gastrocnemius (calf)	Tibialis anterior (shin)
Quadriceps (front of thigh)	Hamstrings (back of thigh)
Erector spinae (lower back)	Abdominals (stomach)
Pectorals (chest)	Rhomboids (Upper back)



Good calf flexibility reduces the risk of Achilles tendinitis, plantar fasciitis, and shin splints.

for recommended flexibility exercises.) Concentrate on event-specific exercises. For example, if you are a swimmer, you will want to spend additional time stretching the shoulders and arms. If jogging or aerobics is your activity, concentrate on stretching the hamstrings, quadriceps, lower back, and calves. Muscle strength may be more important in injury prevention than flexibility. Studies of tennis players show that those who do not do resistance training have more frequent injuries such as “tennis elbow.” In swimmers, poor rotator cuff strength is a predictor of shoulder injury, and strengthening it reduces the frequency of shoulder problems. Abdominal curls are an important supplement to any fitness workout. Strong abdominals and a flexible lower back are critical in preventing lower back problems. See Chapter 4 for specific resistance training programs.

Mechanics

Structural weaknesses, affecting mainly the legs, knees, ankles, and feet, are often revealed when a beginner starts a new exercise program or when overuse occurs. Biomechanical difficulties often arise in the feet. The foot is a marvelous structure of 26 bones, with almost double that number of ligaments and muscles. It strikes the ground about 80 to 90 times a minute during exercise. When a weak foot pounds the ground several thousand times a day, the potential for injury is great. Slight **pronation** of the foot is natural—that is, your foot will roll inward slightly after the outer edge of the heel strikes the ground. All bodies are not created equal, so different foot types, gait styles, and body mechanics vary in susceptibility to injury. For example, knock knees or flat feet may cause **overpronation**—too much inward roll when

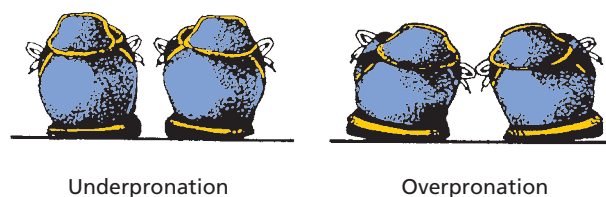


FIGURE 7-2

Underpronation and overpronation.

the foot should be pushing off (Figure 7-2). This twists the foot, shin, and knee and can cause tendinitis, plantar fasciitis, or knee strain. Observing the wear pattern on your shoes can help you select a shoe designed for your specific mechanics. Set your shoes on a flat surface. If they tilt inward and if there is excessive shoe wear on the inside of the forefoot, your feet may overpronate. If, in contrast, the outside of the shoe is overstretched and tilts outward and there is excessive wear on the outside of the shoe, your feet may pronate too little. **Underpronation** is insufficient inward roll of the foot upon contact. People with high arches and tight Achilles tendons tend to underpronate. When the foot hits the ground, it does not roll inward enough to absorb the shock of impact, increasing the risk of shin splints, stress fractures, iliotibial band syndrome, tendinitis, and plantar fasciitis. Underpronation causes excessive wear on the outside of the shoe sole.

Moderate pronation problems can be corrected through wise shoe selection. Most exercise shoes are designed to limit overpronation, not eliminate all inward rotation. A person who overpronates needs motion-control shoes with a straight or semicurved last and features that limit pronation. The best shoe for an underpronator has a curved last to allow normal pronation. Employees in many sports shoe stores are trained to help you select a proper shoe. If discomfort persists, you may want to consult a physician or podiatrist who will check your foot mechanics. He or she may prescribe **orthotics**, shoe inserts molded to your foot, to correct abnormalities. They allow the foot to operate with mechanical efficiency. They are highly effective for alleviating excessive foot under- or overpronation.

Regardless of your body type, pay attention to form when participating in any aerobic activity. In this way, many injuries and discomforts can be avoided. You will find technique and safety tips for a variety of aerobic activities in Chapter 2. You may also want to refer to the contraindicated exercises listed in Chapter 3.

The body is a marvelous mechanism. Considering its complexity, it is a wonder it doesn't break down more often. Exercise is vital to maintain wellness. Illness and injury are less common in those who maintain peak performance through regular exercise than it is in those who exercise sporadically. Even when injuries do occur, few are debilitating. Many simply cause some inconvenience.

TOP 10 LIST

Tips for Preventing Injuries

1. **Warm up** with walking, slow jogging, or gentle calisthenics.
2. **Progress slowly.** Increase your workload by no more than 10 percent per week.
3. **Work out regularly.** Exercising every other day is more effective than weekend workout binges that leave you stiff and sore.
4. **Cool down.** Continue your exercise at a lower pace for a few minutes to give your heart rate a chance to recover.
5. **Stretch for flexibility.** This is most effective during the cool-down, when muscles are warm (see Chapter 3).
6. **Try cross training.** Combining aerobic, strength, and flexibility exercises in your weekly program develops balanced fitness.
7. **Drink water before, during, and after exercise.** See Chapter 6 for additional information on fluid replacement for active people.
8. **Modify workouts in extreme heat or cold.** In hot spells, shift to early or late workouts, and try noon during cold weather.
9. **Pay attention to pain.** If something begins to hurt or if you're not recovering from one workout to the next, cut back, switch activities, or take a couple of days off to give yourself a chance to mend.
10. **Wear good, well-fitted shoes.** They are your first line of defense against impact injuries.

For a summary of tips on preventing injuries, see the accompanying Top 10 List. If we can't prevent all injuries, it is important to be able to recognize the signs and symptoms of those most commonly encountered by exercisers. This gives you an opportunity to take corrective action in the early stages and limit downtime.

P.R.I.C.E.

Acute injuries to muscles, joints, and tendons are often accompanied by swelling. Swelling causes pain and decreased range of motion. Rapid recovery requires keeping the swelling to a minimum. The aim of treatment is to assist the healing process. The recommended treatment for many injuries, whether mild or severe, is protect, rest, ice, compress, and elevate, or **P.R.I.C.E.** (see Table 7-3).

TABLE 7-3 Recommended Treatment for Common Injuries

P	=	Protect from further injury
R	=	Rest to allow healing and avoid tissue irritation
I	=	Ice to reduce pain and swelling
C	=	Compress with a wrap to control swelling
E	=	Elevate to reduce swelling

P = Protect

The classic advice of old-time coaches was to “run it off.” On the contrary, it is important to protect the injured area from further tissue damage. Don't let the problem get worse. Look for the cause of the injury and remedy the situation. A medical professional might recommend that a more severely injured limb be protected with crutches, a splint, or sling. The aim is to minimize irritation, tissue bleeding, inflammation, and pain and provide optimal healing conditions.

R = Rest

The injured area should be rested for 24 to 72 hours or more, depending on the severity of the injury. A few days of rest from the activity in which the problem occurred might be sufficient to protect irritated tissue from reinjury while healing from a minor strain. Switching to a different activity, such as swimming, cycling, or deep-water running, can rest a sore area and maintain your conditioning. A minor complaint can become a major problem if you keep aggravating the situation. Healing progresses more rapidly when stress to the area is reduced. Frequently, people will start back into their usual activity before they are ready, and will reinjure themselves. Wait until most of the pain and swelling



For a serious injury, a medical professional may recommend a splint to protect and rest the area while healing.

have subsided and you have regained 80 percent of your normal range of motion compared with the uninjured side. If you are unable to exercise for a week, when you return to your usual workout routine, reduce your duration, frequency, and/or intensity by at least 25 percent. Do not resume your normal workout level until you are free of pain during and after exercise.

I = Ice

Apply ice to the injured part immediately. A convenient way to apply ice is to put ice cubes or crushed ice in a plastic freezer bag and place it on the injured area. A pound bag of frozen peas or corn also works well. You may apply the ice directly to the skin without risking freezing the skin. The ice may make the injured part ache for the first 5 to 10 minutes. Keep it on! When the area feels numb, discontinue the ice. This will give immediate pain relief and reduce inflammation and tissue damage.

How long will you need to leave the ice on? It varies with the amount of fat and muscle in the area being treated. Apply ice for about 10 minutes to areas with little fat and muscle, like fingers and toes. Apply the ice for 15 to 30 minutes to larger areas like an ankle or knee. Areas with a lot of fat and muscle, like a thigh, may need to be treated for up to 30–45 minutes for greatest effectiveness. Allow the area to rewarm for 45 minutes to an hour before icing again. What about frozen gel packs? Gel packs should be left on for only about 10 minutes because they are much colder than ice packs and have potential to cause tissue damage (frostbite). Ice is preferred because as it cools, it melts, and it is not likely to

cause tissue damage. Ice the injured area every 3–4 hours for 48–72 hours or longer if pain and swelling persist. Ice should not be used by anyone who has diabetes, sensitivity to cold, or a medical condition with reduced blood flow to the arms or legs. These individuals need to seek medical advice for care of minor injuries.

If you feel mild discomfort when exercising and suspect an overuse injury such as tendinitis, you should apply ice to the tender areas right after you work out and reapply it several times a day for the next 48 hours or longer if pain lingers. Remember: You can never go wrong with ice. Sports medicine physician Francis G. O'Connor states, "Ice is indicated as long as inflammation persists—from the onset of the injury, through rehabilitation, and into sports return."

C = Compress

When not icing the injury, wrap the part with an elastic wrap to prevent fluid buildup in the injured area. Wrap it snugly but not tightly enough to interfere with circulation. If the part starts throbbing, the wrap may be on too tight. Remove the wrap and reapply it more loosely. Do not sleep with the wrap on.

E = Elevate

Raise the injured area above the level of the heart whenever possible. This will reduce the swelling by combating the effect of gravity pulling blood and fluids down to the injured area. Most people with an injured ankle or knee will place it on a pillow for elevation when going to sleep. However, you may move during the night and lose the elevation. Instead, place three or four books under the mattress to raise it approximately 6 to 8 inches.



P.R.I.C.E. To transmit cold effectively, wet the elastic wrap before applying ice to the injury.

HEAT AND PAIN RELIEVERS

Many people mistakenly apply heat to an acute injury. Heat applied too early stimulates blood flow and increases swelling and inflammation. Stick with ice for at least the first 48–72 hours or more after an injury, and only then, *after swelling has completely subsided*, should heat be applied. At that point heat may speed healing, relax muscles, and reduce stiffness. Either dry heat (heating pad or lamp) or moist heat (a hot bath, whirlpool, hot-water bottle, damp heat pack) will do. Apply the heat for 10–20 minutes, two or three times a day. You can also use it for 5–10 minutes before exercising to reduce stiffness.

Over-the-counter liniments and balms are popular methods for producing a warm feeling in muscles. The effect of these products is only superficial—the active

ingredients stimulate sensory nerve endings in the skin to produce a sensation of heat. This has no healing effect and may mask the pain.

Aspirin or ibuprofen (such as Motrin or Advil) can reduce the pain and inflammation of minor sprains, strains, and tendinitis. Acetaminophen (such as Tylenol) is less helpful because it has no anti-inflammatory effect. Do not use anti-inflammatories to mask pain so that you can continue to work out—this will worsen an injury. Do not use the maximum recommended dose of these pain relievers more than 2 or 3 consecutive days because they increase risk of stomach bleeding. Consult your doctor before using any drugs.

COMMON INJURIES

In pursuit of wellness, you may occasionally push yourself beyond the current capabilities of your structure. Finding your peak and keeping it is a challenge and part of a process of learning about your body's unique strengths and weaknesses. While some acute injuries are obvious, others can creep up slowly and gradually worsen. If, in your zeal to experience peak performance, you develop an athletic ailment, it will usually be minor and you will be able to resume activity within a few days. Here we discuss the potential causes of, symptoms of, and treatments for the most common injuries listed alphabetically. Table 7-4 gives a summary of these common injuries, their symptoms, and their treatments.

Ankle Sprain

A **sprain** is a partial or complete tear of a **ligament**, the fibrous connective tissue that binds bones together to form a joint. A sprain is most often a result of a sudden force, typically a twisting motion that surrounding muscles are not strong enough to control. Both ankles and knees are vulnerable to sprains. An ankle sprain will produce swelling and tenderness on the outside of the ankle. The amount of swelling depends on the severity of the injury. In severe cases, discoloration or bruising will develop. Range of motion in the ankle may be decreased by swelling and pain. P.R.I.C.E. for the first 72 hours is the best treatment for sprains. It is extremely important to control the amount of swelling in the joint in order to return to activity quickly. Strong, flexible muscles help protect against sprains. For example, to prevent ankle sprain, strengthen ankles with flexion, inversion, and eversion exercises. High-top shoes or a commercial ankle wrap will not reduce the risk of reinjury and can provide a false sense of confidence. When you start back into activity, progress gradually. A sprained ankle can take 1 to 2 months to heal.

Blisters

Blisters are a common problem, especially for beginning exercisers. They are an accumulation of fluid under the skin due to excess friction. They are usually a problem only if they become infected or cause you to limp. The most common areas for blisters are the bottom of the foot, the sides of the big and little toes, and the back of the heel. Blisters can be prevented by eliminating the friction that causes them. Keep the feet as dry as possible and wear 100 percent acrylic (Orlon) socks. Acrylic is best at dissipating moisture and preventing blisters from forming. Cotton socks produce twice as many blisters, and even worse is a cotton-acrylic blend. One trick for preventing a blister is to apply a piece of duct tape over “a hotspot” *before* a blister forms. Also, cover or remove the irritation from inside the shoe. Never wear new shoes for a workout without first breaking them in by walking around in them at home for a few days. Should a blister be opened? Some say no; let the fluid reabsorb into the system because an open blister invites infection. Others say to pop the blister if it is painful and causes you to limp. The best treatment is to apply a donut pad and lubricant to the blister to reduce friction and pressure. To prevent blisters, some runners wear their socks inside out to avoid the abrasion of the rough interior seam. It may also help to wear two socks on the affected foot—a thin nylon sock inside an acrylic sock. If the blister is lanced, leave as much of the skin as possible covering the wound, and keep the area clean to prevent infection. Consult your physician if you think it may be infected.

Bursitis

Bursitis is inflammation of a bursa, a fluid-filled sac that lies between tissues and allows tendons, ligaments, muscles, and skin to glide smoothly over one another during activity. There are over 150 bursae, but the most commonly affected lie in the knee, elbow, shoulder, and hip. When a bursa becomes irritated because of overuse or training, it begins producing extra fluid. The sac swells, often within 24 hours, causing pain and limiting motion in the affected area. The recommended treatment is to protect the area, rest from activity, ice, compress with an elastic bandage to reduce swelling, and take anti-inflammatory medication. Do not wrap the knee tightly, however, as this could lead to blood clots by compressing the large vein behind the joint.

Chafing

When skin rubs against skin or against clothing, it becomes irritated and can crack and bleed. The most common problem areas are between the thighs, under the armpits, and on the nipples (runner's nipples). While

TABLE 7-4 *Common Injuries, Symptoms, and Treatments*

Injury	Symptoms	Treatment
Ankle sprain	Pain, swelling, tenderness on the side of the ankle	P.R.I.C.E., anti-inflammatories Move in pain-free range, strengthen when pain and swelling subside
Blisters	Small fluid-filled skin swelling at a site of friction	Remove source of irritation, protect area, do not pop unless painful, use antiseptic and bandage, leave skin in place
Bursitis	Pain, swelling, loss of movement near a joint	Rest area, ice, anti-inflammatories
Chafing	Skin irritation from friction	Remove source of irritation Protect with petroleum jelly, clothing, or bandage
Heel spur	Pain underneath heel	Rest, anti-inflammatories, heel pad in shoe, calf stretch
Iliotibial band syndrome	Snapping, pain on side of hip or knee	Rest from causative activity, ice, iliotibial band stretch
Muscle cramp	Muscle spasm, tightness, and pain	Gently stretch and massage muscle Drink fluids, rest or decrease intensity of activity, increase dietary calcium and potassium
Muscle soreness	Muscle aching with movement 1 to 4 days after increased exercise	Hot shower to area, gentle stretching, heat, anti-inflammatories help somewhat
Muscle strain	Tightness, sharp pain, swelling Weakness, loss of use Usually began during activity	Rest from activity that caused strain, ice, stretch and strengthen after pain decreases
Patellofemoral syndrome	Knee pain, stiffness walking up and down stairs or after sitting	Ice, strengthen quadriceps
Plantar fasciitis	Heel or arch pain Usually worse in morning	Ice, stretch arch, heel lift, arch support, stretch calf
Shin splints	Pain in lower third of front of lower leg	Rest from activity that caused injury, ice, stretch calves, strengthen anterior tibialis
Side stitch	Pain in side during activity	Stop activity, stretch side, press on sore area
Stress fracture	Pinpoint pain, swelling along bone	See physician Discontinue causative activity until healed
Tendinitis	Swelling, tightness, pain with movement near a joint where muscle attaches to bone	Rest from causative activity, ice, gentle stretching when pain abates

chafing can happen to anyone, its frequency increases with greater body fat percentage. Treat chafing by applying petroleum jelly to the affected area. To prevent chafing, select clothing of smooth, nonabrasive material with few or well-covered seams. Synthetics are best. Avoid cotton because it stays wet, causing friction.

Avoid clothing that is tight or that bunches under the arms or between the legs. Wearing tights or knee-length exercise shorts can protect chafed thighs. Nipple chafing can be decreased by going shirtless in warm weather or by applying petroleum jelly and adhesive

bandages to the nipples. Women should select a good exercise bra that has flat or covered seams.

Heel Spur

A **heel spur** is a bony growth on the underside of the calcaneus (heel bone) at the insertion of the plantar fascia. The pull of fascia on the heel can remodel the bone into a spur pointing toward the toes. Heel spurs are common and are not necessarily the sign of a problem. They do not always cause pain unless there is significant

fat pad atrophy or unless they are caused by chronic irritation of the plantar fascia at its insertion. The heel pain of plantar fasciitis is sometimes associated with a heel spur. Treatment involves rest; anti-inflammatory medications; and insertion of a heel pad in the shoe to protect the heel, alleviate inflammation, and distribute impact during activity.

Iliotibial Band Syndrome

Tightness, burning, snapping, and pain on the side of the knee or hip may be related to inflammation of the **iliotibial band**, a long tendon that begins in the buttocks, runs down the side of the thigh, and attaches to the side of the lower leg just below the knee. Common in runners, an overtight iliotibial band may become inflamed from the friction of rubbing against the outer knee or hip bone as the knee repetitively flexes and extends. Pain may increase with running hills and is most intense at heel strike. Cyclists may experience ITBS due to a bike seat that is too high or bike cleats rotated inward. This is primarily an overuse injury and can be treated with decreasing or changing activity, ice, anti-inflammatories, strengthening hip abductors, and stretching the iliotibial band, hamstrings, and quadriceps (see stretches in Figure 3-1).

Muscle Cramp

A **cramp** is a sharp, involuntary muscle contraction. It may occur during exercise or at rest. The calf is the most common area for a muscle cramp to occur, but cramps may occur anywhere in the body. Muscle cramps may be caused by fatigue, which causes the nervous system to overstimulate muscles. Cramps may also be related to a strength imbalance, an electrolyte imbalance, or dehydration. Occasionally, low levels of circulating calcium or potassium in the blood can contribute to cramps. Cramps can be treated with fluid intake and with gradual stretching of the muscle. A calf cramp may be treated by extending the foot to a 90-degree angle. Occasionally, gentle massage may help.

Muscle cramps may be prevented by taking precautions when exercising in the heat. Wear light, loose clothing; drink water freely; gradually acclimatize yourself to the heat; and exercise during the cooler hours of the day. Improve fitness gradually and get plenty of potassium and calcium in your diet. Extra salt is not needed. A regular program of stretching may also help prevent muscle cramps.

Muscle Soreness

Muscle soreness is discomfort or tenderness after an increase in workout level. It may be fairly mild and usually



A calf cramp may be relieved by extending the foot and stretching the calf.

is just a reminder that you had a good workout. For example, a person who has not recently lifted weights will develop muscle soreness following the first workout. There is no real pain but rather a mild achiness when you move the major muscle groups used in the activity. After several sessions of the same activity, soreness will diminish or disappear. Intensity of muscle soreness is related to intensity of exercise, duration, and eccentric (lengthening) contractions. For example, running downhill repeatedly will produce more quadricep soreness than will an equal amount of flat or uphill running. Muscle soreness is thought to be caused by microscopic tears or spasms of the connective tissue. There is no long-term damage from this. Muscle soreness may develop immediately or over a 24- to 36-hour period following unaccustomed exercise and will usually disappear within 2 to 4 days. Other than following a sensible progression in activities and intensity, there is no real prevention for muscle soreness. This is a normal response to an increase in exertion and part of an adaptation process that causes muscles to recover and build, leading to greater strength and endurance. There is little that can be done for mild muscle soreness. While stretching is beneficial for flexibility, it has little effect on reducing soreness. If there is sharp pain rather than soreness during activity, the problem may be a muscle strain.

Muscle Strain

A muscle **strain** is a tear of muscle fibers or a tendon and is sometimes referred to as a *pull*. Symptoms include

sharp pain, weakness with possible loss of function, spasm or extreme tightness, and tenderness to the touch. There are many different causes, but it most often results from a violent contraction of the muscle. A strain may be caused by fatigue, overexertion, muscle imbalance or weakness, or electrolyte or water imbalance.

A strain may range from mild (more painful than just soreness) to a complete rupture of the muscle. The muscles most likely to be affected are the hamstrings, gastrocnemius, Achilles tendon, erector spinae, groin, and the rotator cuff muscles of the shoulder. Rest, ice, and anti-inflammatories are used to treat muscle strain. Reduce or eliminate activity until the injury starts to heal. The severity of the injury and which muscle is injured will affect the recovery time. The hamstrings usually take the longest to heal and rehabilitate. If the strain is severe, it will heal with a significant amount of scar tissue, leaving it more susceptible to reinjury. Scar tissue is not elastic like muscle, so stretching and strengthening exercises are important to return to normal function. To prevent strains, complete a full warm-up before working out, take care not to overdo it, and work toward balancing the strength and flexibility in opposing muscles.

Patellofemoral Syndrome

Pain around and under the kneecap, along with knee stiffness, is characteristic of **patellofemoral syndrome**. Symptoms include a dull pain when walking up and down stairs, squatting, or after sitting with the knees bent for a period of time (“theater sign”), and occasionally mild swelling or a feeling that the knee is “giving way.” Patellofemoral syndrome is associated with overuse, worn-out shoes, always running in the same direction on the track, excessive downhill running, and rapid ballistic movements such as those done in aerobics. One common cause is structural. Wide hips tend to make the quadriceps pull the kneecap out against the femur, producing inflammation. Loose kneecaps or a quadriceps muscle not strong enough to keep the patella in its groove may also lead to patellofemoral syndrome. The knee will not get better if you continue your activity during the injury.

Rest, ice, and anti-inflammatories are the conventional treatments for this injury. If the knee swells significantly, see a physician. Swelling can indicate a major problem and take much longer to heal.

To prevent recurrence, the knee must be rehabilitated. Low-impact activities are recommended to strengthen muscles, for example, swimming and bicycling. To stabilize the knee and assist in correcting the tracking mechanism of the patella, strengthen the quadriceps. Stretching should increase hamstring and iliotibial band flexibility. In severe cases, surgery may be indicated.

Plantar Fasciitis

Plantar fasciitis causes heel or arch pain. It is most painful when a person takes the first few steps in the morning, but in severe cases, pain may continue throughout the day. It results from micro tears of collagen fibers of the plantar fascia, a long thick band of connective tissue on the underside of the foot that attaches the base of the calcaneus to the base of the toes. Micro tears may result from excessive impact, worn shoes, or poor foot mechanics. Anatomical problems frequently cause plantar fasciitis—tight Achilles tendon, high arches, flat feet, or excessive pronation. Also, with age and repeated weight-bearing stress, the fat pad under the heel becomes flattened and less shock-absorbent. Rest, night splints, stretching the toes toward the face, calf stretching, ice, and arch supports or heel cups are the recommended treatments. Rolling a can of chilled soda or a frozen plastic bottle of water back and forth under the arch is a good way to apply cold to the area. Orthotics are often recommended to reduce symptoms in persistent/recurrent cases of plantar fasciitis.



To treat plantar fasciitis, roll a cold can of soda under your arch to ice and stretch the fascia.



Orthotics or heel cups may reduce symptoms in persistent cases of plantar fasciitis.

Shin Splints

A **shin splint** refers to pain in the front of the lower leg (shin). Early signs are acute burning pain or irritation in the lower third of the anterior tibialis. This may progress to slight swelling, redness, warmth, and inflammation. A variety of factors contribute to shin splints. They often come early in an exercise program and are particularly common in those who are out of shape, overweight, wide-hipped, knock-kneed, or duck-footed. Working out on very hard or very soft surfaces can bring on shin splints even if a person is well conditioned. Switching from a hard to a soft surface or vice versa, excessive mileage, improper footwear, poor foot mechanics, running on a road slope, and running in the same direction all the time on an indoor track may cause them. Women, particularly those who wear high heels, are affected nearly three times more often than are men.

Shin splints may be a sign of a long arch problem in the foot. As the long arch begins to sag, it stretches lower leg muscles and causes pain. Another cause is a muscle imbalance between the strong calf muscle and the weak anterior tibialis, which may lead to inflammation of the membrane between the tibia and the fibula. This imbalance can be corrected with toe pulls to strengthen the anterior tibialis and by stretching the calf (see the photos in this chapter). These should be done each workout. If mechanical problems are not corrected, shin splints tend to recur.

To treat shin splints switch to a low- or nonimpact activity and rub ice on the affected area for 15 to 20 minutes three to four times a day. Aspirin therapy may be indicated for a few days to reduce inflammation. If the pain is persistent, consult a physician to rule out a stress fracture.



To decrease risk of shin splints, strengthen shins with a set of 15 to 20 toe pulls twice a week using an elastic band.

Side Stitch

A **side stitch** is a sharp pain just under the ribs, typically on the right side. It may result from participating in vigorous activity before the body has had a sufficient warm-up. It may be related to a lack of conditioning, weak abdominals, shallow breathing, consuming a meal too near the time of exercise, dehydration, excessive exercise intensity, or **ischemia** (inadequate oxygen) to the diaphragm. Side stitches tend to occur in unfit or new exercisers. Better conditioning brings more efficient blood flow and oxygen delivery to the respiratory muscles. To prevent side stitches, warm up well, increase exercise intensity gradually, and avoid eating 1 to 2 hours before a vigorous workout. Side stitches can be treated by stopping activity and stretching, massaging, or pressing on the painful area. After cessation of the activity for a few minutes, the pain and spasm should subside. Taking a deep breath may also break the spasm. Once the pain has dissipated, activity may resume.

Stress Fracture

A **stress fracture** is a microscopic break in a bone caused by overuse. While it can occur anywhere in the lower legs and feet, it is most common at the end of the tibia near the ankle and in the metatarsals of the feet. Unlike a broken bone that occurs with a distinct traumatic event, a stress fracture is the result of cumulative overload that occurs over many days or weeks. Overtraining and overly rapid increases in training are the major causes. Bone is living tissue that adjusts to the exercise force demands placed on it. As force is

applied, bone will remodel itself to handle the force better. If too much force is applied, the bone may fracture before it can successfully remodel. Running excessive mileage, overdoing impact aerobics, wearing worn-out shoes, exercising on hard surfaces such as asphalt or concrete, and having poor foot mechanics may cause a stress fracture. Because they have smaller, lighter bones, women are more susceptible to stress fractures than are men. Especially when combined with hard training, an inadequate intake of calcium and vitamin D can predispose one to the onset—and recurrence—of stress fractures.

A stress fracture may be confused with a case of severe shin splints, but stress fractures are more likely to cause pinpoint pain on the sore bone. Stress fractures are difficult to detect clinically. Frequently, they will not show up on an X ray until 3 to 4 weeks after the onset of symptoms. A bone scan can detect a stress fracture much earlier in the injury because it reveals the active bone formation that occurs while the fracture is healing. The pain of a stress fracture will not go away with conventional treatments (ice, ultrasound) or medication. Only rest will decrease the pain.

The best treatment for a stress fracture is rest from the activity that caused it. This does not mean elimination of exercise altogether. Nonimpact activities such as riding a bicycle and swimming are good alternatives during the healing phase. Depending on the severity of the stress fracture, activity may be resumed within 2 to 6 weeks of diagnosis. “Running through the injury” is not recommended. This may lead to a nonunion fracture of the bone and a 6- to 8-week recovery period in a cast.

Tendinitis

Anytime you see “-itis,” think inflammation. **Tendinitis** is the inflammation of a tendon from repetitive stress. Common signs of inflammation include pain, redness, heat, and swelling. **Tendons** are the fibrous cords that connect muscles to bones. They are vulnerable to inflammation because the force of muscle contractions is transmitted through them. The most commonly affected in runners, walkers, and aerobic dancers is the Achilles tendon, which connects two calf muscles, the gastrocnemius and soleus, to the back of the heel bone. Other areas commonly affected are the knee, shoulder, and elbow (“tennis elbow”). When a tendon is inflamed, normal daily activities, such as opening a door and walking up the stairs, can be painful. Tendinitis is often brought on by muscle tightness or increasing the workload too quickly. Achilles tendon problems are often due to tight calf muscles. When the foot flexes to push off, the powerful Achilles pulls the heel up. If the calf is too tight, it yanks the heel up prematurely, stressing the Achilles tendon. Rest from the activity that

caused the injury and stretching the calves to alleviate excessive tightness are recommended. Over-the-counter anti-inflammatory medications (ibuprofen, aspirin) may also help. It may take 2 to 3 weeks to heal and rehabilitate completely. Continuing activity will only delay healing. Meanwhile, you may include alternative activities to maintain fitness. A regular program incorporating stretching and strengthening can help prevent tendinitis.

WHEN TO SEEK MEDICAL HELP

Not all injuries can be self-treated. If symptoms are severe or if self-treatment is not working, you need professional medical treatment. You should seek medical assistance for an injury if you experience any of the following symptoms:

1. The injury is extremely painful or the pain has not decreased in intensity within a day or two. You are unable to bear complete weight on that part or are unable to walk more than three or four steps without significant pain.
2. There is joint pain lasting more than 2 days or significant tenderness when you press on a specific spot in a joint, muscle, or bone, such as a bony part of the foot.
3. There is a loss of strength or range of motion (compared with the uninjured side) and loss of the ability to do normal tasks.
4. The limb gives way when you try to use it.
5. You heard a distinct “pop” or “snap” when the injury occurred.
6. The injured area, compared with the uninjured side, looks misshapen or has unusual lumps (other than swelling).
7. There is numbness or tingling in the injured area, which may indicate nerve compression.

Once injured, whom should you see? Your family doctor will be able to treat common sprains and strains. However, there are other sports injury specialists who can help. Table 7-5 describes some of these specialists.

Communicating with a doctor is an important step in assuming an active role in your health care. Be sure to tell the physician how the injury occurred: what you felt, signs and symptoms, and any additional information to aid in diagnosing the injury. Do not feel rushed or intimidated by confusing terminology and tests. You are the consumer and are paying for the doctor’s time and services. Do not rely on the nurse, the receptionist, or a friend to explain your injury and treatment. Make sure you completely understand everything you must do to speed your recovery.

TABLE 7-5 *Injury Specialists*

Physical Therapists: These therapists are licensed by the state to administer rehabilitative techniques—from ultrasound to strength and flexibility exercises. Some states require a doctor's referral before visiting a registered physical therapist.

Athletic Trainers: Many colleges, universities, and sports medicine clinics have athletic trainers who have extensive knowledge of and experience in dealing with injuries. They are highly trained and must pass rigorous written and practical examinations to become certified.

Sports Medicine Clinics: Many clinics have “walk-in” hours and are likely to include some of the specialists already mentioned as part of their staffs.

Orthopedists: These M.D.s with specialized surgical training treat injuries to any part of the musculoskeletal system. Many specialize in athletic injuries.

Podiatrists: These D.P.M.s (doctors of podiatric medicine) treat foot-related problems common to fitness-related injuries. Though not M.D.s, they receive special training and are state-licensed. They can prescribe medications, design orthotics, and perform some surgeries.

Chiropractors: These D.C.s (doctors of chiropractic), believing that the alignment of the spine and proper nerve function are essential to body functioning, use manual manipulation and other techniques to relieve pain and structural disorders.



While recovering from an injury, switching to a nonimpact activity such as swimming can maintain your aerobic fitness.

GETTING BACK INTO ACTION

There are three steps to getting back into action after an injury. First, move the injured part as early as possible, within a pain-free range, to regain flexibility. This motion will increase circulation and reduce stiffness and swelling. As you are able, work all the motions of a joint. For example, in an ankle injury, move the ankle up and down, in and out, 10 to 20 times, three to four times a day. Gradually increase the range of motion. If you feel pain after moving the part, it should subside within 1 hour. Apply ice and reduce the amount of repetitions in the next session. You may be doing too much too soon.

Second, after obtaining at least 80 percent pain-free range of motion, begin to build strength. Gradually increase the strength of a part to equal that of the uninjured side. You can use partner resistance, free weights, rubber tubing, or weight machines. If possible, work under the supervision of a qualified physical therapist or another rehabilitation professional, especially in the early stages of rehabilitation, because this is when you are most susceptible to reinjury.

Third, gradually work your way back to your former activity level. Do not expect to start where you stopped. Frequently, exercisers will try to begin working out at their previous level after merely reducing swelling and pain. Healing may not yet be complete. The result

is often reinjury because the weakened area is unable to withstand the stress. Overload should be gradual, with the realization that *more* is not always *better*. If in doubt, start at the lowest level for your activity in Chapter 2 and increase that time by no more than 10 percent per week. While recovering from an injury, participating in a nonimpact activity such as deepwater running, swimming, and stationary cycling can maintain endurance.

CARE OF THE LOWER BACK

Without question, back pain is one of the most common conditions affecting Americans—second only to the common cold as a reason for seeing a physician. Eighty percent of Americans will experience back pain some time in their lives. Back pain affects a largely youthful population, with the first back pain episodes afflicting people in their 20s and 30s. One of the main contributors to this epidemic of poor back health is a sedentary lifestyle (and spending hours hunched over a computer or working at a desk). Fortunately, most back pain is preventable with exercise, good posture, and good lifting mechanics.

Ways to Avoid Lower Back Pain

Why does back pain occur? How can risk of back injury be reduced? We often take a healthy back for granted until something goes wrong. Back problems are rarely caused by a single, isolated factor. The 32-year-old computer programmer who hurts his back while pulling the lawn mower chain prefers to blame the lawn mower. His condition may actually be a result of several years of abuse and neglect. The pull on the lawn mower chain merely “triggered” the condition. During high school and college years, our bodies are relatively flexible. As we age, muscles begin to shorten and tighten, decreasing flexibility, especially in the back. Combine this with possible weight gain and declining overall fitness and it becomes evident why back pain afflicts millions. With few exceptions, back problems can be prevented with improved fitness, living and work habits, and posture.

The most important key to preventing lower back pain is maintaining strong abdominal muscles and back flexibility. Studies show that people who are physically fit have almost 10 times less back pain. Many of those who suffer back pain are overweight and have weak, sagging abdominals and short, tight back muscles. This puts additional stress on the spinal column. Maintaining normal weight and keeping abdominal muscles strong and tight reduces strain on the spine. Strong abdominals keep the pelvis and spinal column stabilized in a normal position. At the same time, it is important to keep the opposing back muscles and hamstrings flexible. People with chronic back problems need to stretch and strengthen regularly, using the exercises in Figure 7-3. Exercise, not rest, is recommended for most people with back problems.



Habitually carrying a heavy backpack on one shoulder may cause back pain.



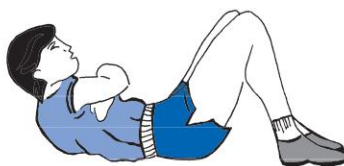
Correct lifting technique.



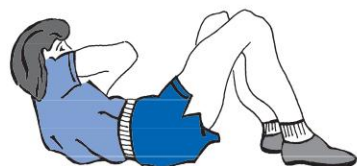
Incorrect lifting technique.



1. Pelvic tilt. Lie on back, knees bent. Press small of back firmly down to floor by tightening the abdominal muscles. Hold for a count of 5.



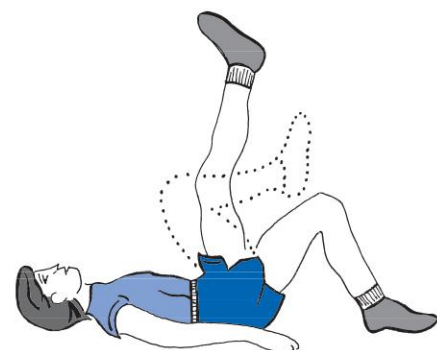
2. Abdominal curl. Do a pelvic tilt and, while holding this position, curl head and shoulders up until shoulder blades have been lifted from the floor. Hold briefly. Lower slowly.



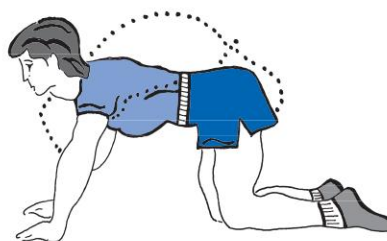
3. Oblique abdominal curl. Do a pelvic tilt and, while holding this position, curl head and shoulders up, twisting right shoulder toward left knee. Hold briefly. Lower slowly. Repeat on other side.



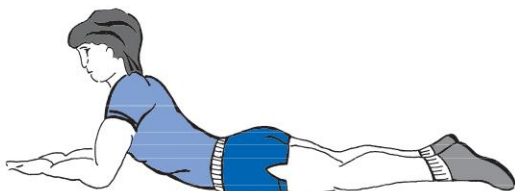
4. Low back stretch. (a) Lie on back. Pull one knee toward chest. Hold for a count of 5. Repeat with other leg. (b) Double knee pull. Pull both knees to chest; hold for a count of 5.



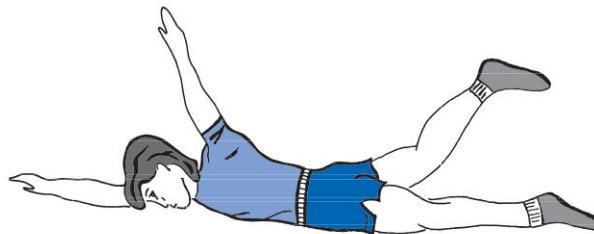
5. Lying hamstring stretch. Lie on back. Bring knee toward chest and extend leg toward ceiling. Flex foot. (You may grasp the back of your thigh with your hands.) Hold 20 seconds. Repeat with other leg.



6. Cat stretch. Start on all fours. Round the back upward like a cat. Tighten abdominals. Hold for 5 seconds. Relax and return to starting position. Do not let back sag.



7. Upper back lift. Lie on your stomach with forearms flat on the ground. Tighten abdominals. Lift upper body by using back muscles. Do not press with arms. Hold for a count of 5.



8. Alternate arm/leg lift. Lie on your stomach with arms extended in front. Raise one arm overhead toward ceiling while simultaneously lifting the opposite leg. Hold for a count of 5. Repeat with the other arm and leg.

FIGURE 7-3

Exercises for the lower back.

Sleeping position plays a role in back health. The one-third of your life you spend sleeping should help, not harm, your back. This makes it important to select a firm but not extremely hard mattress. Sleeping on a mattress that is too hard will leave the back unsupported. Sleeping on a sagging mattress places the back in an unbalanced position. Water beds, properly adjusted, may provide satisfactory back support as an alternative to a traditional mattress.

The fetal position is the best sleeping position for maintaining a healthy back. Lie on your side, pull your knees up to your chest, and put a pillow between your knees. This will round the lower back and alleviate back stress. If you must sleep on your back, place a pillow or similar object under your knees to relax the lower back. Sleeping on your stomach increases the arch of the back, shortening the back muscles. Placing a small pillow, or even your arm, under your pelvic bone (abdomen) may help reduce strain on your back.

To decrease back stress when getting out of bed, roll to one side and sit up sideways, using your arms to help. This will eliminate using all your back and abdominal muscles to get out of bed. This tip is especially helpful if you currently have a back problem.

Good lifting mechanics can reduce the risk of lower back injury. When lifting a heavy weight, bend your knees as if sitting down; keep your head up and looking straight ahead. Your trunk should be held as erect as possible to maintain a neutral spine, and you

should use the large muscles of the buttocks and legs to lift. It is also important not to let the knees pass the toes as you squat in order to avoid excessive knee stress. Combining lifting with a twisting force is one of the most common causes of back injury. Instead, lift the object and pivot with your feet rather than your waist.

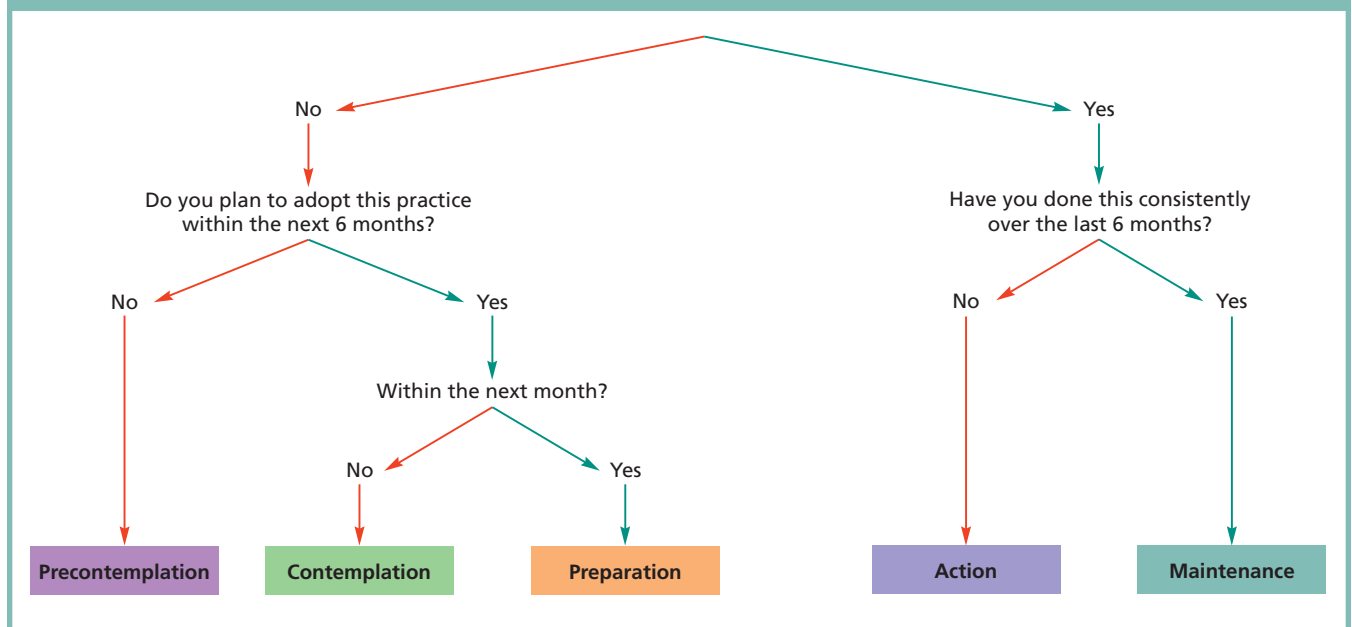
Keep your body close to the object. Standing far away from the object will place undue stress on the lower back. Lift with your back straight rather than bent at the waist. When carrying heavy objects such as books, backpacks, and groceries, try to distribute the load equally and close to the body. Do not carry a backpack on one shoulder, as this puts uneven stress on back muscles and is a common cause of back pain. Finally, obtain help when lifting heavy objects. See the Top 10 “Ways to Improve Back Health.”

Back Tips for Sitting, Standing, and Driving

Many Americans spend the majority of their time behind desks or in cars. Sedentary jobs and lifestyle make us vulnerable to back pain. How can you maintain a healthy back if you spend a lot of time sitting at a desk? Sit close to your work and keep your hips and knees at a 90-degree angle. Your head should be positioned in line with your shoulder, and your chin should be parallel to the floor. This will straighten the lower back and prevent slouching. When you sit in a chair, place both feet on

What Stage of Change Are You In?

Do you practice safe lifting techniques to protect your back?





If you spend a lot of time behind a desk, sitting with good alignment can reduce the risk of back, neck, and shoulder pain.

the floor. If the chair is too low, it will increase your back curvature excessively. Use a chair that supports your back in its normal slightly arched position, or you can place a small pillow or towel against your lower back. Remove this low back support for a few minutes every half hour to allow your back to change position.

Maintain good posture while driving, especially when driving long distances. Sitting for extended periods in an automobile is a common cause of back pain. To maintain normal spinal curvature, place a small pillow between your lower back and the seat. Sit close enough to reach the accelerator and steering wheel without slumping.

If your job requires long periods of standing, you can minimize stress on the back by putting one foot on a low stool. Frequently shift your weight from one leg to the other. Some occupations put unusual physical stress on the back. Dentists, nurses, and musicians may sit, lift, or move in twisted, awkward positions.

Wearing high-heeled shoes is unhealthy for the lower back. This shortens the Achilles tendon and hamstrings, throws the back into an overarched position, and overstretches the abdominals. Wear low-heeled shoes to maintain back health.

A common cause of pain farther up the spine is holding the phone between your ear and shoulder, which is usually done to free the hands. When your neck is scrunched to one side frequently throughout the day, it can cause headaches and neck and upper back or shoulder pain. If you use the phone a lot, to prevent neck and shoulder problems, try this:

- ✓ Buy an inexpensive phone rest that holds the receiver on your shoulder so that you don't have to twist your neck.
- ✓ Use a clipboard to secure your papers so that your hands are free.

TOP 10 LIST

Ways to Improve Back Health

1. **Stretch and strengthen.** Weak, tight muscles invite injury. Strengthen the abdominals with abdominal curls and do back stretching/strengthening exercises to maintain a strong, flexible spine (see Figure 7-3).
2. **Use good sitting posture.** Sitting for hours hunched in front of a computer screen can overstress back muscles. Sit erect, knees level with hips, feet flat on the floor. Add a towel roll behind your back to maintain the natural spinal curve.
3. **Use good standing posture.** To decrease back stress, stand with one foot elevated a few inches on a box to relax the back.
4. **Change positions frequently.** When sitting, take frequent breaks—1 to 2 minutes every 30 to 60 minutes. Stand up, stretch, move around. When standing, vary your body position and shift weight frequently.
5. **Use good sleeping posture.** Sleep on your side with knees bent and a pillow between your knees to relax your back. If you prefer sleeping on your back, put a pillow under your knees to reduce back stress. Avoid sleeping on your stomach.
6. **Use good lifting techniques.** Stand close to the object and bend your knees as if sitting down, keeping the back straight and head up. Tighten your abdominals and lift with your legs, keeping the object close to your body. Avoid bending from the waist and twisting as you lift.
7. **Don't overdo it.** Know your limits. Weekend bouts of yard work, such as 2 to 3 hours of gardening and raking the lawn on Saturday, and playing 2 hours of basketball when you've been sitting behind a desk all week overstress the back. Spread out the work and play in shorter bouts over a few days to give your muscles a chance to adjust.
8. **Keep active.** Maintaining a base of fitness throughout the week enables you to go canoeing, play ball, or do that yard work on the weekend with less risk of a stiff, sore back compared with a couch potato.
9. **Manage your weight.** Carrying extra pounds in front increases the load your back must support. Losing weight decreases back stress 24 hours a day.
10. **Distribute the load.** Habitually carrying a heavy bag, books, or backpack on one side creates uneven spinal stresses. Evenly distribute the load or switch sides to even out the stresses.

- ✓ Try a speaker phone or headset.
- ✓ Hold the phone in the hand opposite the one you usually write with and make a conscious effort to avoid twisting your neck.

If you must sit, stand, or work in one position for an extended time, get up, stretch, and walk for several minutes. You will feel better, and your back will benefit from the change.

Not to be overlooked is the effect of emotional stress on back health. Stress produces tension, which increases sensitivity to pain, which creates more stress. The stress → tension → pain cycle can exacerbate the symptoms of any injury. Stress reduction and relaxation techniques can play an important role in the treatment of low back problems and other injuries.

Lower Back Injuries

The lower back is made up of many tiny ligaments that hold the vertebrae together from the skull to the tailbone. A sudden twisting force can injure these ligaments. Several groups of muscles, called the *erector spinae muscle group*, also parallel the spinal column. These muscles may be injured by lifting a heavy weight, excessively bending and twisting, or sleeping on a sagging mattress.

If your back aches, press the sore area with your fingers. If this does not cause pain, the injury is probably deeper. For sore, achy back muscles, lie on a bag of crushed ice or a cold pack for 20 minutes, or alternate 20 minutes of ice with 20 minutes of heat. If you have back pain, what symptoms indicate that you should see a physician? If the pain is severe, doesn't decrease with a few days of home treatment, radiates from the back into the buttocks or legs, or is accompanied by numbness or tingling, it may indicate an **intervertebral disc** injury. The intervertebral disc is a cushion that separates the bony vertebrae. Discs are filled with fluid and are flexible through early adulthood but thin and lose their resiliency as we age. A ruptured intervertebral disc may compress nerves, causing pain down the buttocks and legs. Consult a physician who specializes in back pain for these injuries.

Core Exercises for Lower Back Health

Research has shown that 80 percent of patients with back discomfort who visit physicians have no underlying organic disease. Most of these patients are deficient in strength and flexibility of core postural muscles of the trunk. There are several exercises you can do to maintain a healthy back. We recommend the exercise routine in Figure 7-3. These exercises focus on core strengthening for the abdominals *and* stretching and strengthening the back. Practice this series daily to get the best results. The exercises can easily be included as part of your exercise warm-up or cool-down routine. These exercises should not cause any pain, numbness, or tingling in the back and legs. If they do, discontinue them and consult your specialist.

Other exercise programs that can develop muscular fitness in core stabilizers include Pilates and stability ball exercises. Yoga and Tai Chi may also reduce back pain by increasing flexibility and reducing stress. For information on these exercise programs and additional core stability exercises, see Chapters 3 and 4.



PRESCRIPTION FOR ACTION

You've read the chapter. Now go do one or more of these:

- ✓ Check the inner side of the midsole of your shoes for wrinkles, which indicate they have been compressed by daily impact and need to be replaced.
- ✓ While waiting in line, clasp hands behind your back and pull elbows back to strengthen postural muscles.
- ✓ While watching TV, do 20 to 30 abdominal crunches or 5 to 10 back extensions.
- ✓ Put on your favorite music and do the back exercise program in this chapter.



Frequently Asked Questions

Q. My joints pop and crack a lot when I move. Is there something wrong with them?

A. Joints can be noisy for a lot of reasons, mostly benign. If there is pain or swelling along with the popping, see your physician. If your joints feel fine, a little noise is common and harmless.

Q. I've been working out for 4 months and am not doing anything different. Why are my knees starting to bother me?

A. Are you wearing the same shoes you started with? If so, it is time to replace them because the soles compress over time, leaving you with less

cushioning. Check your workout—are you running on hard surfaces, constantly going the same direction on a track or crowned roads, or repeatedly stepping up on curbs with the same leg? Finally, outside of workouts, have you added any new activity such as weekend yard work or carrying unaccustomed loads? Switch to a nonimpact activity for a few days to give your knees a chance to recover, then modify your workouts to reduce excessive impact or repetitive stresses on your knees.

Q. Every time I start a running program, I get shin splints. What can I do to keep this from happening next time?

- A. First, check your shoes. Are they less than 6 months (500 miles) old, and are they good running shoes? Well-cushioned shoes designed for the stresses of running are your first line of defense against impact injuries. If your shoes are okay, the problem may be overuse—doing too much too soon. Many beginners, in their zeal to get in shape, try to run a mile in the first workout and increase from there. Start with several weeks of walking. Once you can walk 2 to 3 miles without discomfort, alternate jogging and walking. Review the progression in Chapter 2, and do not try to progress faster. Try the shin-strengthening exercise in Chapter 4, and stretch the calves. Consider alternating days of running with cycling or another nonimpact activity, and do not try to run through the shin splints. If your shins start to ache, switch to a nonimpact activity until they heal. When you start back after a layoff, decrease your workout by 25 to 50 percent, do more walking, and build back slowly.

Q. Which is better for an injury—heat or ice?

- A. Ice is the treatment of choice for any acute injury. It decreases pain, limits swelling, and penetrates deep tissues better than heat does. Heat applied too early can increase swelling. Once swelling has subsided, heat can be relaxing and can decrease stiffness.

Q. I was told that I shouldn't pedal backward on an indoor cycling machine. Why not?

- A. Pedaling backward can increase risk of knee injuries. When you pedal, the greatest pressure is exerted in the middle of the downstroke. Pedaling forward, this occurs in front of your body with your foot in the 3 o'clock position, a mechanically stable and safe position for the knee. Pedaling backward, the greatest force occurs in the 9 o'clock position, where the knee is less mechanically stable, putting you at increased risk of injury.

Q. Does exercise cause arthritis?

- A. No. Exercise increases joint lubrication, helps joint range of motion, and strengthens muscles that support joints. Gentle range-of-motion and low-impact aerobic exercises are recommended as a way to decrease the stiffness and pain of arthritis, either rheumatoid or osteoarthritis. Osteoarthritis from joint wear and tear is common in those over 40, may have a hereditary component, and can be brought on by joint injury, jogging, or doing other high-impact activities that stress aging joints. So if arthritis runs in your family or if you have had joint injuries, it is even more important to keep your joints strong and flexible with regular exercise such as walking, swimming, and stretching.

Q. I've read that wearing magnets can relieve back pain. Do they work?

- A. Every year a new fad comes along, promising results that don't pan out. The body has natural healing ability, so if you buy a product and get relief, it is easy to attribute it to that product, when you would have gotten better without it. A randomized, double-blind crossover study of chronic back pain patients found no difference in pain relief between those using real and sham magnets. Don't waste your money.

Summary

Much soreness and injury can be prevented. Stretching, strengthening, proper warm-up, sensible progressions, and avoiding overuse are the keys. It is better to block injuries at the source than to pay doctors' fees to treat breakdowns. The pursuit of excellence involves learning to balance your strengths and weaknesses and cooperating with your body instead of assaulting it.

You can prevent lower back problems with proper care and treatment. Maintain leg and back flexibility, strengthen abdominals, use correct lifting mechanics, and reduce sources of lower back stress. This is all within your control.



Internet Resources

About.com Sports Medicine

<http://sportsmedicine.about.com>

Includes articles about sports, sports medicine, injury prevention, diagnosis, and treatment.

American Academy of Family Physicians

www.familydoctor.org

Check out the patient site with information on all types of conditions, including common sports injuries and their diagnosis, treatment, and prevention.

American Academy of Orthopaedic Surgeons

www.aaos.org

Contains information about orthopedic conditions, including sports injuries and their diagnosis, treatment, and prevention.

American College of Sports Medicine

www.acsm.org/sportsmed

Has information on sports research and on health and fitness, aerobic exercise guidelines, and a quarterly fitness newsletter.

“Current Comments” gives information on a variety of exercise topics of recent interest.

eMedicine from WebMD

www.emedicine.com

An open-access comprehensive textbook for all clinical fields. Features a keyword search for injuries, prevention, and treatment.

Medline Plus: Sports Injuries

www.nlm.nih.gov/medlineplus/sportsinjuries.html

Covers sports injuries, screening, prevention, frequently asked questions, and treatment options.

The Physician and Sports Medicine

www.physsportsmed.com

Contains articles on exercise, nutrition, injury prevention, personal fitness, and rehabilitation.

Sports Injury Bulletin

www.sportsinjurybulletin.com

Information, prevention, and rehabilitation of sports injuries.

Virtual Sports Injury Clinic

www.sportsinjuryclinic.net

Includes self-help advice and a virtual diagnosis for common sports injuries. Also covers rehabilitation, stretching, and strengthening for injury prevention.

LAB Activity 7-1

Name _____ Class/Activity Section _____ Date _____

Phil A. Case Study

Phil is a 20-year-old student at State College. He has kept himself in good shape and has been running road races for the last 4 years. This morning, while running on White River Road, he stepped into a chuck hole and sprained his ankle. He was able to limp home. You are one of his best friends, and he has come to you for advice. He asks, “Should I go to a doctor?”

1. List five questions you would ask Phil to determine whether you should recommend a doctor:
 - a.
 - b.
 - c.
 - d.
 - e.
2. Phil answers no to your questions. He asks, “What do you think I should do to keep it from swelling?” List and describe five treatments you would prescribe for Phil’s injury:
 - a.
 - b.

c.

d.

e.

3. Phil wants to keep in shape and plans to start running again as soon as possible. He asks, "Do you think I should try to run tomorrow?" List three steps in the progression of getting back into action. Also, tell him how he might keep in shape while his injury heals:

a.

b.

c.

d.

LAB Activity 7-2

Name _____ Class/Activity Section _____ Date _____

Action Plan for the Back

BACK EXERCISES

Complete the series of back exercises that are described in Figure 7-3.

1. Describe how your lower back area felt at the completion of the exercise session.
2. Explain how you will fit this exercise regimen into your daily schedule.

BACK CARE

Explain how you will perform the following tasks using proper body mechanics/alignment:

1. Lifting a garage door to open it:
2. Lifting a heavy box to put in the back of a station wagon:

3. Sitting several hours at a desk studying:
4. Driving a car for 5 hours:
5. Standing/working at a checkout counter for 5 hours:
6. Sleeping:



Maximizing Heart Health

8

“Do it! Move it! No one ever sat their way to success.”

—H. Jackson Brown, Jr., ed., *A Father's Book of Wisdom*

Study Questions

You will have successfully mastered this chapter if you can answer the following:

1. What are the 10 primary cardiovascular disease (CVD) risk factors?
2. What are the 6 secondary CVD risk factors?
3. What are the 12 controllable and 4 uncontrollable risk factors for CVD?
4. How are *arteriosclerosis*, *atherosclerosis*, *angina pectoris*, *myocardial infarction*, and *stroke* defined?
5. What are the differences between cardiovascular disease (CVD) and coronary heart disease (CHD)?
6. What are the symptoms of a heart attack and a stroke, and what is the S.T.R. approach to stroke awareness?
7. What are the roles of HDL and LDL in heart health?
8. How does smoking cigarettes increase heart disease risk?
9. What are prehypertension, normal blood pressure range, and the blood pressure reading that indicates hypertension?
10. What cholesterol reading indicates high blood cholesterol?
11. Which CVD risk factors are positively affected by exercise?
12. What are the positive and negative effects of alcohol on CVD?
13. What is the importance of lifestyle for cardiovascular disease and how does the mind–body connection impact it?

You will find the answers as you read this chapter.



Visit the Online Learning Center for *A Fit Way of Life*, www.mhhe.com/robbinsfit2e, where you will find additional quizzes and other study aids.

Terms

- angina pectoris
- arteriosclerosis
- atherosclerosis
- cardiovascular disease
- cholesterol
- collateral circulation
- C-reactive protein
- diabetes mellitus
- diastolic pressure
- high-density lipoprotein (HDL)
- homocysteine
- hot reactors
- hypercholesterolemia
- hypertension
- LDL cholesterol receptors
- low-density lipoprotein (LDL)
- metabolic syndrome
- myocardial infarction (MI)
- plaque
- prediabetes
- prehypertension
- primary risk factors
- risk factors
- secondary hypertension
- secondary risk factors
- stroke
- systolic pressure
- triglycerides
- Types A, B, C, and D personalities

As Rob lay in the coronary care unit, his eyes surveyed the various tubes and wires connected to his tired body. The nightmare of the last 24 hours was over, but the pain and confusion lingered.

"How can this be? I'm only 49 years old. How could I have had a heart attack? What if I die? What about my wife? My son? My daughter? I've just become a grandpa. I was given a big promotion at work. Why now?" Rob's mind drifted.

"But I'm an athlete! Well, I was an athlete back in high school. Once I started college, there was no time for sports or exercise. Started smoking, too. Figured I'd stop when the deadlines subsided, but the stresses never ended. Drank too much, too; partied a lot. Still like a couple of drinks to end the day. I always thought I'd lose those extra 30 pounds—always next year, always a New Year's resolution. Diet? Too busy. Vending machines, hot dog stands, snacks in front of the TV, fast food. No time. Too much to do. Money to make. A lot of stress. Can't stop now. There'll be time later."

Rob's mind drifted back to his room. He could faintly hear his doctor's voice—"Stop smoking. Change in lifestyle. Low-fat diet. Start exercising. Cholesterol is 280. Break old habits." Rob thought, "How I wish I could turn back the clock!"

This scenario is too common in the United States. The number one killer in America is not cancer, accidents, or AIDS. It is cardiovascular disease (CVD) (Figure 8-1). Make no mistake: cancer and other diseases are real threats, but cardiovascular diseases claim more lives each year than cancer, chronic respiratory diseases, accidents, and diabetes combined! If all major forms of CVD were eliminated, U.S. life expectancy would rise by 7 years. In contrast, if all forms of cancer were eliminated, the gain would be 3 years. The tragedy is compounded because cardiovascular diseases are often inaccurately perceived as diseases of the elderly. On the contrary, based on data from the

Framingham Heart Study, approximately 45 percent of heart attack victims are under age 65 and 5 percent are under age 40. Young adults are not exempt from the grim heart disease picture either—most teenagers already have two or more risk factors for heart disease. The American Heart Association states that one in six teenagers and one in three people in their 20s showed evidence of atherosclerosis. This information was obtained from autopsies of young accident victims. This is alarming information and confirms that the disease process starts early in life. "Heart disease is a man's disease" is another myth. CVD claims the lives of as many, or more, women as men, and the gap continues to widen. These diseases demand attention because they are killing too many Americans in the prime of life. Don't become complacent! The way you live your life now determines your future heart health. Many cardiovascular disease deaths are preventable. You can reduce your chances of developing CVD by assessing your current level of risk and learning ways to reduce those identified risk factors. Education and behavior change are the keys.

The importance of lifestyle and knowledge for the heart health picture is emphasized by the remarks of the world-renowned CVD expert Dr. Jeremiah Stamler when he was asked, "Are diet and exercise enough to cut CVD risk?" He responded, "Yes, along with not smoking. Americans are pushed to solve problems with pills—for cholesterol, for diabetes, for blood pressure. But pills often fail to lower risk to optimum levels. They are costly and have side effects. They ameliorate but don't cure the underlying problem. *Heart disease is caused by adverse lifestyles. If you want to get rid of the disease, get rid of these lifestyles.*"

Are you at risk for heart disease? Would you know what to do if you were? Read the Top 10 "Ways to Protect Your Heart." This chapter provides you with valuable information about each of those items and guides you toward maximizing your heart health.

IMPACT OF CARDIOVASCULAR DISEASE

Cardiovascular disease (including stroke) accounts for nearly 37 percent of deaths in the United States, according to American Heart Association (AHA) statistics. In

other words, 1 in 2.7 Americans who die each year does so from CVD. How do the death rates from cancer and other causes compare to that from CVD? See Figure 8-1. **Cardiovascular disease** (from *cardio* meaning "heart" and *vascular* meaning "blood vessels") refers to diseases of the heart and blood vessels. Common forms of CVD

TOP 10 LIST

Ways to Protect Your Heart

1. Exercise regularly. Aim for at least 30 minutes, at least 5 days of the week. Performing aerobic exercise regularly helps protect coronary arteries by reducing heart rate, blood pressure, cholesterol level, and body fat.
2. Maintain blood pressure level within normal limits.
3. Maintain blood cholesterol levels within acceptable limits.
4. Don't smoke.
5. Keep your weight within reasonable limits. Weighing too much (especially if you carry the extra pounds in your waistline) raises the risk of a heart attack.
6. Keep blood sugar (glucose) level close to normal.
7. Don't let your triglyceride level exceed 150 mg/dl (or 100 mg/dl if you have other coronary risk factors).
8. Control stress and hostility. Learn and practice stress management strategies and know how to diffuse anger/hostile behaviors.
9. Know the early warning symptoms of angina pectoris and the symptoms of a heart attack and a stroke.
10. Be aware of your genes. If one or more close blood relatives have had a heart attack before age 60, your risk rises substantially. Accordingly, the need to control the primary risk factors for cardiovascular disease is heightened.

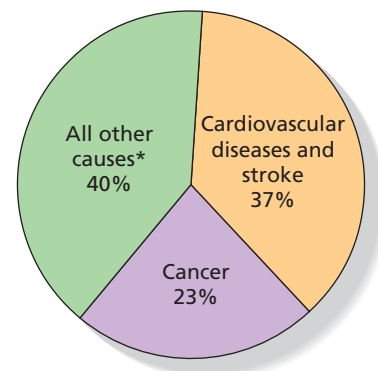
Note: In addition to the Top 10 “Ways to Protect Your Heart,” eat healthy. This will provide added protection against CVD. Recommendations include reducing homocysteine levels by eating five servings of fruits and vegetables and six servings of grains per day. Also, consuming foods high in antioxidants (vitamins C, E, and beta carotene) helps prevent heart attacks by preventing LDL oxidation (which increases clotting and plaque rupture).

include coronary heart disease (i.e., heart attack, angina pectoris, atherosclerosis in the heart's blood vessels), congestive heart failure, rheumatic heart disease, congenital heart disease, stroke, high blood pressure, pulmonary (lung) disease, diseases of the arteries and veins, and renal disease. More than one in three Americans suffer from some form of CVD. See Figure 8-2 to see the toll taken by these various forms of CVD. Which type of CVD claims the most American lives? Studies show that lower educational levels are directly associated with increased incidence of death from CVD.

Coronary heart disease, the most prevalent form of CVD, is still the single largest killer of American men and women (about one of every five deaths). The cost of



More Americans die each year from cardiovascular disease than would have been killed in 10 Vietnam wars.



*Includes accidents, diabetes, chronic respiratory diseases, and other diseases and conditions.

FIGURE 8-1

Cardiovascular disease is still the number one cause of death in the United States.

SOURCE: Centers for Disease Control and Prevention. Causes of death for all Americans in the United States, 2004 Final Data.

all CVD in 2006 was estimated by the AHA at \$431.8 billion. This figure includes the costs of physician and nursing services, hospital and nursing home services, medications, and lost productivity resulting from disability. While costs for treatment of CVD are spiraling upward, the death rate for these diseases appears to be declining. Advances in medical treatment and education and healthy lifestyle changes can be credited for the declining death rate. However, don't become too complacent about these facts. We still have a long way to go. Cardiovascular disease is the *number one* health concern in the United States. It is a killer. Someone still dies



THE NUMBERS

1 in 3	Americans who have some form of cardiovascular disease (CVD).
35	Seconds someone dies of CVD. Compared to every 56 seconds someone dies of cancer.
1 in 2	Women in the United States dies of heart disease or stroke, while 1 in 30 dies of breast cancer.
52%	Percent of the CVD deaths from coronary heart disease, making it the single largest killer of Americans.
45	Seconds someone in the United States has a stroke. About every 3 minutes someone dies of one.
1 in 3	American adults (18 and older) that have hypertension (high blood pressure). 30% don't know they have it. Another 30% of American adults have prehypertension.
1 in 5	Deaths each year attributed to smoking cigarettes.
1 to 4	Cigarettes a day increase the risk of dying from heart disease by nearly 200% and from all causes by 50% compared to no cigarettes.
2 of 3	Number of people with diabetes mellitus who die of some form of CVD.
20.8	Million American children and adults—7% of the population—have diabetes; 14.6 million are undiagnosed, and 54 million have prediabetes.

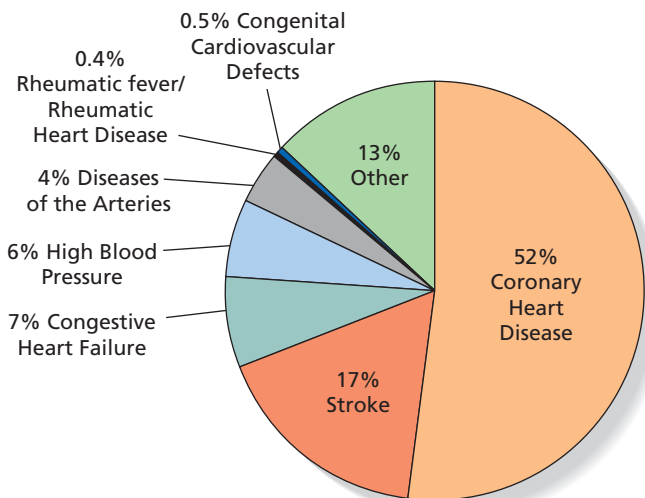


FIGURE 8-2 Percentage breakdown of deaths from cardiovascular diseases; one in three Americans has some form of CVD. United States, 2004. SOURCE: CDC/NCHS.

every 36 seconds; more than 2,400 Americans die each day of CVD.

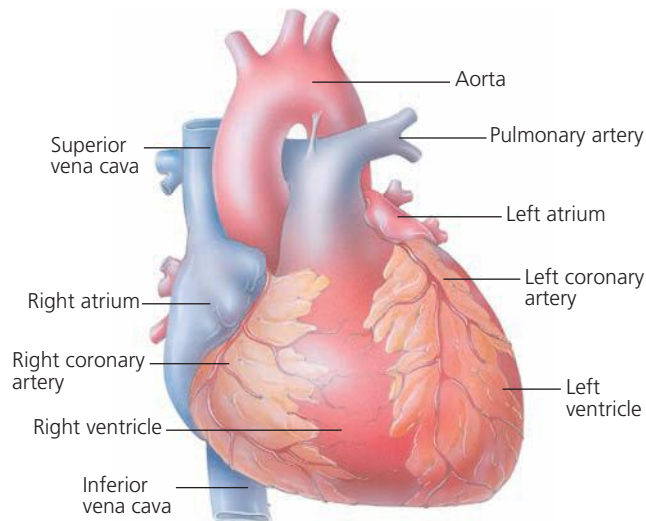
Coronary Heart Disease (CHD)

Coronary heart disease includes angina pectoris, myocardial infarction, and the atherosclerotic process in the heart's blood vessels. CHD accounts for more than half of all cases of CVD and is the *single* largest killer of

American men and women. See Figure 8-2. About every 26 seconds an American suffers a coronary event, and about every minute someone dies from one.

The heart is a muscle (a little larger than a fist) that works all the time. It never stops beating. Each day, the average heart beats 100,000 times and pumps about 2,000 gallons of blood. The heart pumps blood continuously through the circulatory system, which includes the lungs and blood vessels (i.e., arteries and veins). The arteries, arterioles (small arteries), and capillaries (very tiny blood vessels) carry oxygen- and nutrient-rich blood to all parts of the body. Veins and venules (small veins) carry oxygen- and nutrient-depleted blood back to the heart and lungs. If all the vessels were laid end-to-end, they would extend for about 60,000 miles. That's enough to encircle the earth more than twice.

Besides providing oxygen and other nutrients to all tissues of the body, the heart must supply itself with oxygen. This is accomplished by a separate circulatory system, which nourishes only the heart muscle. The two coronary arteries (the right coronary artery and the left coronary artery) branch off the aorta and then divide into many smaller arteries that lie in the heart muscle and feed the heart (see Figure 8-3). The most important factor in your heart's health is the efficiency of your coronary arteries to transport blood to your heart. The heart requires a steady supply of oxygen-rich blood to function properly. The most common barrier to that supply is coronary artery disease, in which the

**FIGURE 8-3**

Blood supply to the heart. Blood is supplied to the heart from the right and left coronary arteries, which branch off the aorta. If a coronary artery is blocked by a blood clot caused by a ruptured fatty patch, a heart attack occurs; part of the heart muscle may die due to lack of oxygen. SOURCE: Paul M. Insel and Walton T. Roth. *Core Concepts in Health*, 10th Edition Update. New York: McGraw-Hill, 2008, p. 448. Reproduced with permission of The McGraw-Hill Companies.

arteries become blocked or narrowed. Coronary heart disease is most commonly the result of atherosclerosis.

You supply the ingredients for what damages or protects the blood vessels of the heart through what you eat, how you exercise, and how you react to stress. You have the power to make your heart stronger.

Atherosclerosis

What is commonly known as “hardening of the arteries” is **arteriosclerosis**, a general term for the thickening and hardening of arteries. Some hardening of arteries normally occurs as we age. **Atherosclerosis** (*athero* from the Greek work for “paste” and *sclerosis* for “hardness”) is a type of arteriosclerosis. It is a progressive condition in which fatty patches (deposits of cholesterol and other lipids) accumulate inside coronary arteries or arteries in other places in the body. This buildup is called **plaque**. The fatty patches of plaque impede blood flow by causing arteries to become thick and rigid. An atherosclerotic patch is actually like a blister: soft on the inside, with a thin skin that can easily burst when it becomes inflamed or irritated. When a blister ruptures, debris (like a blood clot) is sent into the bloodstream where it can enter an artery in the heart or the brain causing a heart attack or a stroke.

Many scientists think the atherosclerotic process begins with damage to the innermost layer of the artery wall. This layer is called endothelium (or endothelial cell layer). When these delicate cells are injured, they pull away from each other and form a gap. This “nick” or injury has to be closed quickly to protect and keep the blood vessel lining

smooth. The body tries to repair the “nicks” by covering them with cholesterol (especially the “bad” type) and other substances. To counter, the body’s immune system sends in white cell protectors to attack the plaque buildup. In trying to heal the damaged area, inflammation develops at the site. The inflamed plaque gets irritated, becomes unstable, then cracks, and a clot is released into the bloodstream. A heart attack or stroke may result (see Figure 8-4) if the clot flows to the heart or brain.

What injures the lining of the arteries, especially the coronary arteries, and leads to atherosclerosis (and inflammation)? While there is a strong genetic component to atherosclerosis, you can largely control many contributing factors: high blood pressure, smoking, high blood cholesterol (the “bad” type and triglycerides), diabetes, high blood levels of some compounds like homocysteine, chronic inflammation from things as diverse as gum (periodontal) disease or sexually transmitted diseases, your reaction to perceived emotional stress, and anger. All of these factors are influenced by lifestyle. To reduce the risk of atherosclerosis and inflammation, become physically fit, consume a diet high in omega-3 fats (fish), don’t smoke (and avoid secondhand smoke), control blood pressure, and reduce weight (if overweight). Atherosclerosis, a major cause of CVD, coronary heart disease, and stroke, does not suddenly develop at age 65. It is a long, progressive process beginning in childhood.

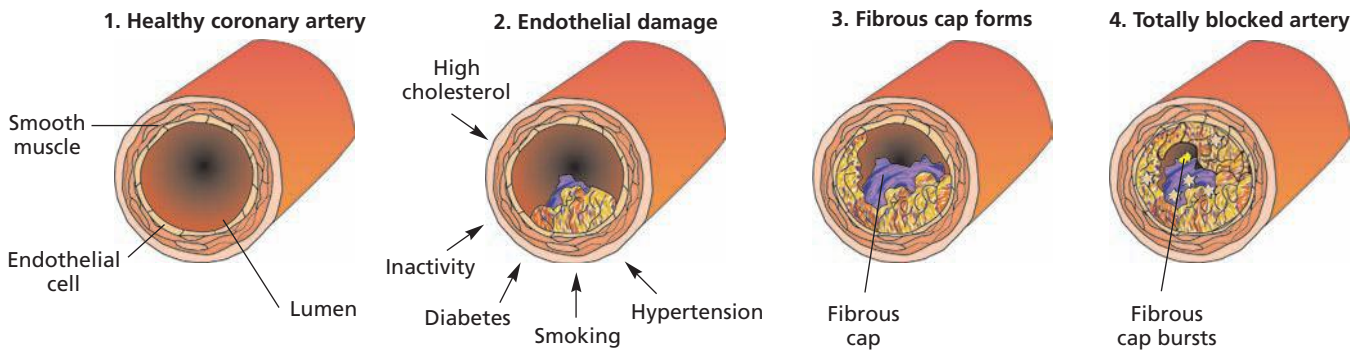
Angina Pectoris

Atherosclerosis may lead to **angina pectoris**, or chest pain/discomfort due to CHD. This pain/discomfort occurs when a coronary artery becomes partially blocked, causing an oxygen debt in the heart muscle. Often, angina pectoris is brought on by sudden exertion or vigorous exercise, emotional stress, or even extreme temperatures when the blood flow to the heart is insufficient to meet its oxygen demands. Typical angina is uncomfortable pressure, fullness, and squeezing or pain in the center of the chest. The discomfort may also be felt in the neck, jaw, shoulder, back, or arm. Many types of chest discomfort are not related to angina, such as that caused by acid reflux (heartburn) and lung infection. Angina is a sign that someone is at higher risk of heart attack. The AHA estimates that over 6 million people suffer from angina pectoris, with 350,000 new cases occurring each year.

Myocardial Infarction (MI)

Myocardial infarction (MI), or heart attack, results when one or more of the coronary arteries is partially blocked by atherosclerotic deposits called plaque. Plaque blisters can rupture, causing a blood clot (thrombus) to form, which chokes off the supply of blood to the heart muscle.

The portion of heart muscle beyond the blockage is deprived of oxygen, resulting in injury or death of that portion. If a damaged area is large enough or in a

**FIGURE 8-4****Progression of atherosclerosis.**

- 1. Healthy coronary artery.** The lumen is not narrowed by atherosclerotic plaque patches, so blood can flow easily through the artery.
- 2. Beginning stage of atherosclerosis.** Plaque builds up when the endothelial cells, which line the arteries, are damaged by an unhealthy lifestyle. Circulating cholesterol and other debris in the blood begin collecting at the injured area.
- 3. Advanced atherosclerosis leads to diminished blood flow.** Due to the damage and cholesterol buildup, plaque continues to accumulate, and then a fibrous cap or blister forms over the site.
- 4. Totally blocked artery.** The body interprets plaque as an injury to the blood vessel wall. The immune system sends white blood cells to attack the plaque. The plaque can become inflamed, unstable, and may result in the blister bursting, creating a blood clot that can block the lumen and lead to a heart attack or stroke.

vital area of the heart, the individual will die. However, many people do survive a heart attack and are capable of living productive lives. See the box “Warning Signs of a Heart Attack.”

A number of studies have shown that in some damaged hearts, new blood vessels develop to nourish the area that is being starved of oxygen and other nutrients. This is called **collateral circulation**. Everyone has collateral blood vessels, which are microscopic and are closed under normal conditions. However, in some people with coronary heart disease, these vessels seem to enlarge and

form a detour around the blockage to provide alternative routes for the blood. *Exercise* appears to be one practical way to increase myocardial oxygen demand, which in turn may stimulate the development of collateral vessels. In some cases, coronary angiography (X ray) has revealed increased collateralization after exercise training.

Stroke (Brain Attack)

A **stroke** occurs when blood flow to the brain is interrupted either by a blockage (ischemic stroke) or by a burst blood vessel (cerebral hemorrhage). More than 80 percent of strokes are ischemic. The brain needs a continuous supply of oxygen-rich blood to function. When a blood clot interrupts the flow of oxygen, the brain does not receive the nourishment it needs, and brain cells die. When considered separately from other CVDs, stroke, primarily caused by atherosclerosis, is the *third* leading killer of Americans (behind CHD and cancer). About 700,000 Americans will have a stroke this year—that’s someone every 45 seconds. See the box listing “Most Common Warning Signs of Stroke.” Many Americans,

Warning Signs of a Heart Attack

“Classic” or more common signs

- Uncomfortable pressure, fullness, squeezing, or pain in the center of the chest that lasts more than a few minutes or that goes away and comes back.
- Pain or discomfort in other areas of the body: shoulder, neck, jaw, back, or stomach, one or both arms.

Less common signs

- Atypical chest pain, stomach or abdominal pain.
- Nausea or dizziness.
- Shortness of breath and difficulty breathing.
- Unexplained anxiety, weakness, or fatigue.
- Palpitations, cold sweat, or paleness.

Not all of these signs occur in every heart attack. If some of these symptoms do occur, don’t wait. Get help immediately! Call 911.

NOTE: Women don’t always have the crushing chest pain type of heart attack seen on TV. They may experience less dramatic, lighter symptoms such as fatigue or a burning feeling in the back.

Most Common Warning Signs of Stroke

- Sudden numbness or weakness of face, arm, or leg, especially on one side of the body.
- Sudden confusion, trouble speaking or understanding.
- Sudden trouble seeing in one or both eyes.
- Sudden trouble walking, dizziness, loss of balance or coordination.
- Sudden severe headaches with no known cause.

Not all warning signs occur in every stroke. If any or some start to occur, get help immediately. Call 911.

S.T.R. Approach to Stroke Awareness

- SMILE:** Ask the person to SMILE. Does the smile sag or droop on one side?
- TALK:** Ask the person to TALK or repeat a simple sentence: “The sky is blue.” Is the speech slurred or jumbled?
- RAISE:** Ask the person to RAISE BOTH ARMS. Is one arm weaker? Can both be raised easily and evenly?

Action Step: Call 911 immediately if the person has trouble with ANY ONE of these tasks, even if there is improvement in condition.

NOTE: Another sign of stroke: Ask the person to stick out their TONGUE. If the tongue is crooked, if it goes to one side or the other, that is an indication of a stroke.

however, cannot name a single warning sign or do not know that a stroke is treatable if caught early. So, a group of researchers determined the top three symptoms, combined them with the most important action step, and came up with the S.T.R. approach to stroke awareness. See the box “S.T.R. Approach to Stroke Awareness.”

Stroke is the chief cause of serious disability and a major contributor to dementia later in life. A stroke can result in paralysis of one side of the body, loss of ability to speak or understand the speech of others, loss of memory, and behavioral change. Because brain cells can’t heal, modification of risk factors is important in the prevention of this disease that kills about 150,000 Americans every year. It is not solely a disease of the elderly; more than 28 percent of stroke victims are under age 65. Your risk of stroke increases with these factors:

- ✓ **Hypertension:** If you have high blood pressure, you are two to four times more likely to have a stroke than is someone with normal blood pressure. It is the most important risk factor for stroke.
- ✓ **Heart disease:** Sometimes blood clots forming in the heart can move up to the brain and block blood flow.
- ✓ **Gender:** Because women live longer than men, more women die of stroke each year. Women account for 61 percent of stroke deaths.
- ✓ **Diabetes:** Those with diabetes have almost double the risk of stroke.
- ✓ **Age:** The incidence more than doubles in each decade after age 55.
- ✓ **Smoking:** Smoking doubles the risk of stroke by making blood vessels stiff.
- ✓ **Race:** African Americans have nearly twice as many fatal strokes as whites and more than twice as many as other minorities. Hypertension and diabetes are the suspected causes. American Indians, Alaska natives, and Mexican Americans have a higher than average risk.

- ✓ **Lifestyle:** These factors can be controlled: high-fat, high-cholesterol diet; alcohol or cocaine abuse; smoking; and sedentary lifestyle.
- ✓ Recent studies indicate that the risk of stroke may be higher in women during pregnancy and the 6 weeks following childbirth.

To reduce your risk of stroke:

- ✓ Exercise regularly.
- ✓ Keep blood pressure at optimal or normal level.
- ✓ Do not smoke.
- ✓ Keep diabetes under control if you have diabetes.
- ✓ Be evaluated by a sleep specialist if you have sleep apnea.
- ✓ Keep homocysteine levels at optimal levels by consuming plenty of produce and grains.
- ✓ Keep infection and inflammation down. Be tested for C-reactive protein, a marker for inflammation in the blood.
- ✓ Reduce chronic stress, anger, and hostility. Exercise and meditation (or other stress management techniques) are good ways.
- ✓ Don’t drink alcohol excessively.

RISK FACTORS

Risk factors are the conditions, situations, and behaviors that increase the likelihood that an undesirable outcome (injury, illness, or death) will occur. The risk is established by multiple scientific studies. A risk factor does not cause the undesirable outcome 100 percent of the time, but among those people who engage in the behavior (or experience the condition), a certain number will experience the undesired outcome. The stronger the risk factor’s link with a negative outcome, the more likely it is that an individual will experience the undesired result.

Researchers have identified several risk factors that may lead to the development of CVD. The more risk factors you possess, the greater your chances are of developing CVD. While no one can accurately predict whether you will have a heart attack, you can estimate your odds by evaluating your risk factors. Take the *Are You at Risk for Heart Disease?* test in Lab Activity 8-1 to determine your risk and how to reduce it.

Primary risk factors are linked directly to the development of CVD; they increase the possibility of having a heart attack and stroke. Notice: *Most primary risk factors are controllable.* Even type 1 diabetes, which is generally considered uncontrollable due to its genetic link, can be managed and usually controlled. Type 2 diabetes can be prevented for many years by a healthy lifestyle (i.e., regular exercise, diet, and weight management). Notice: Only 4 of the 10 risk factors are *uncontrollable!*

The **secondary risk factors** contribute to the development of CVD, but not as directly as the primary risk factors do.

Primary	
Controllable Factors	Uncontrollable Factors
1. Inactivity 2. High blood pressure 3. High blood lipid level 4. Cigarette smoking 5. Obesity 6. Diabetes mellitus (type 1 and type 2)	1. Positive family history 2. Male gender (+ postmenopausal women) 3. Race 4. Age

Secondary	
Controllable Factors	
1. Individual response to stress 2. Emotional behavior (anger and hostility) 3. Excessive alcohol (+ some illegal drugs) 4. Metabolic syndrome 5. C-reactive protein 6. Homocysteine	

Notice: All of these are *controllable*! The choices you make and the way you live have a profound impact in reducing your total number of risk factors. If you possess several uncontrollable risk factors, it is imperative that you adopt a healthy lifestyle as soon as possible.

Primary Risk Factors (Controllable)

1. Inactivity

Inactivity is a real killer. It affects just about everything: brain, heart, blood vessels, bones, liver, gut, sleep, anxiety, mood, self-esteem, and your body's ability to process sugar.

Countless studies link inactivity to CVD. The surgeon general's report confirmed that physical inactivity is a major health problem in the United States. The report warns couch potatoes: "Beware, sitting around is hazardous to your health." Additionally, the Centers for Disease Control and Prevention (CDC) in Atlanta has named physical inactivity as our nation's most common cardiac threat. Why? Because only 25 percent of Americans engage in physical activity at intensity levels recommended for fitness and health benefits. This leaves close to 75 percent of our population either entirely sedentary or not active enough to reap health benefits. Consequently, it is not surprising to learn that approximately 250,000 deaths (12 percent of deaths) every year in the United States can be attributed to lack of exercise. Remember, the heart is a muscle, and muscles have to be used or they will atrophy. Many experts believe that today's best buy in the prevention of CVD is *exercise* (Figure 8-5). Equally important, however, is overall lifestyle and how long you have been exercising. News from the U.S. surgeon general's report provides strong support for phys-

ical activity in the prevention of heart disease, high blood pressure, high cholesterol, diabetes, obesity, and cancer.

In yet another ongoing inquiry into the relationship between physical activity and mortality, the Harvard Alumni Study continues to produce results that have led its director, Dr. Ralph S. Paffenbarger, to conclude, "There's no doubt whatever that insufficient activity will shorten your life." Even exercise of moderate intensity (brisk walking or gardening) is beneficial in improving health and well-being. It is vigorous exercise (using the FITT prescription), however, that produces the greatest health benefits and is linked to increased longevity.

The American lifestyle is sedentary. We no longer have to hunt and grow our food, build our homes, or walk to school and work. Our ancestors did not have to build physical activity into their daily lives; it was a part of their lifestyle. Modern conveniences and technology have eliminated physical activity from our lives. The culprits are the automobile, television (with remote control), elevators, escalators, riding lawn mowers, cell phones, and computers and computer games. You can probably add to this list.

University of Tennessee researchers examined the lifestyle of an Old Order Amish community in Canada who still live like most Americans did years ago (i.e., no modern conveniences like electricity, telephone, automobile, etc.). They found that the men accumulated approximately 18,000 steps per day, and the women about 14,000 steps per day. This is far and above the 2,000–4,000 average steps typical of most Americans today. The recommended step goal is around 10,000 steps in a day, which is approximately 5 miles. The lifestyle of the Amish definitely reaches this goal and more. Refer to Chapter 2 for more information on the 10,000-step lifestyle goal. Do you know how many steps you take in a day?

How much exercise do you need? The answer is, it depends on you: how fit you are, whether you are

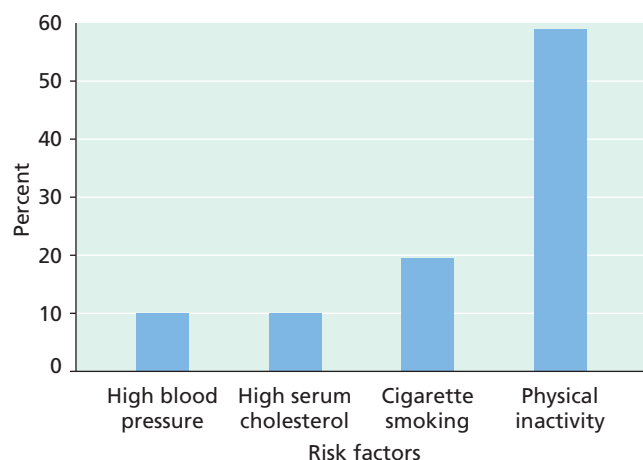


FIGURE 8-5 Estimated percentage of U.S. population having selected risk factors for CVD. More Americans are at risk for heart disease because of physical inactivity than because of any other manageable risk factor.



The Amish lifestyle has no trouble accumulating 10,000 steps a day.

overweight, and what your goals are. Here's how to figure out what is right for you:

- ✓ *For aerobic fitness*, follow the FITT prescription. Work out for 20–60 minutes at moderate to vigorous intensity (60%–80% HRR), 3 to 5 days per week. This will not only promote aerobic fitness, but deliver heart and weight management benefits, too. Jog at 5 mph (12-minute mile); walk at 4.5 mph (13- to 14-minute mile); bike at 10 mph (6-minute mile); swimming, heavy yard work (such as chopping wood, shoveling snow), and playing basketball count, also.
- ✓ *For health benefits* (to ward off chronic disease), do a minimum of 30 minutes of moderate-intensity exercise (40%–60% HRR) at least 5 days per week. It should be aerobic activity such as brisk walking at 3.5 to 4 miles per hour (15- to 17-minute mile); vigorous work such as raking and bagging leaves can also serve the purpose.
- ✓ Or, do vigorously intense aerobic exercise (60%–80% HRR, such as running), 20 minutes a day, 3 days a week. And do strength-training exercises (10 exercises, 8–12 repetitions), twice a week.
- ✓ *For weight loss*, get 60 minutes of moderate-intensity exercise (40%–60% HRR) most days of the week.
- ✓ *For weight loss maintenance* (in previously overweight people), do 60–90 minutes of moderate-intensity exercise (40%–60% HRR) most days of the week.
- ✓ It is not necessary to accumulate the total number of minutes of activity all in one bout. The cumulative effect of your activity throughout the day is what counts, including all types of activity, not just doing aerobics or going for a jog. Pulse in 10 minutes of exercise, three times throughout the day, 5 days a week.

The old saying “Use it or lose it!” is true. You don’t have to run marathons to be physically active. Small increases in daily activity can significantly burn up excess calories, make the heart muscle a stronger and more efficient pump, lower blood pressure, alleviate stress, increase

HDL levels, and build self-confidence. Exercise does more than build strong muscles and help prevent heart disease. New science shows that it also boosts brain power and may offer hope in the battle against Alzheimer’s.

The American Heart Association reports that regular vigorous exercise protects against coronary heart disease and even improves the survival rate after a heart attack. That is life insurance that money cannot buy. The most important thing you can do to improve your health and well-being is to *exercise*.

Exercise is so important for several reasons. It

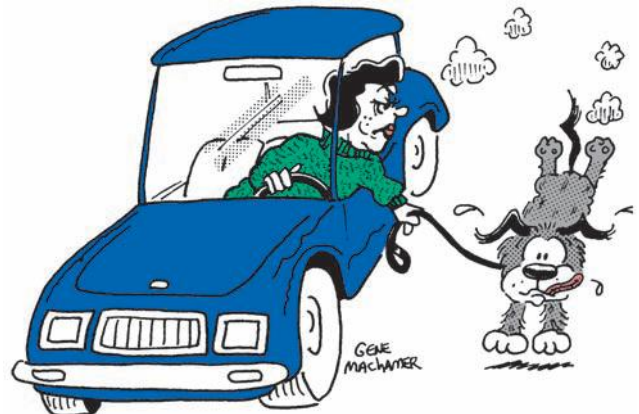
- ✓ lowers both systolic and diastolic blood pressure
- ✓ lowers LDL (the “bad”) cholesterol
- ✓ raises HDL (the “good”) cholesterol
- ✓ decreases inflammation
- ✓ helps in weight management
- ✓ reduces stress
- ✓ reduces risk of type 2 diabetes
- ✓ evens out emotional behaviors
- ✓ calms feelings of hostility and anger
- ✓ reduces risk of metabolic syndrome

The message is this: 30 minutes of moderately intense exercise nearly every day is essential for significant health benefits. Exercising for 20 to 60 minutes a day at a higher intensity level provides a higher level of fitness and health benefits and achieves the IOM and government guidelines, too. The point is that to get to 60 minutes, you have to get to 30 minutes first. Get moving!

Ride your bike, walk to school, and play tennis instead of watching others doing these activities. Park at the back of the parking lot instead of right next to the building. Get a step pedometer and try to accumulate 10,000 steps in a day. There are many ways to add activity to your daily life. Remember, it doesn’t have to be exhausting!

2. High Blood Pressure (Hypertension)

Blood pressure is the term used to define the pressure exerted by blood on the inner walls of the arteries. It is also the force exerted by the heart while pumping blood through the body.



Americans are ingenious at avoiding activity.

TABLE 8-1 *Blood Pressure Stages (Adults 18 Years Old or More)*

Blood Pressure Classification	Systolic Blood Pressure (mmHg)	Diastolic Blood Pressure (mmHg)	Recommendation
Normal	119 or less	79 or less	Encourage or maintain lifestyle modifications (healthy diet, maintain healthy weight).
Prehypertension	120–139	80–89	Begin lifestyle modifications and monitoring and possibly treatment. (Begin weight reduction, healthy diet such as DASH, increase activity, limit alcohol.)
Stage 1 Hypertension	140–159	90–99	Lifestyle modifications, medical evaluation, and possibly drug treatment.
Stage 2 Hypertension	>160	>100	Lifestyle modifications, medical evaluation, and drug treatment.

What was once considered normal blood pressure (120/80) is now labeled prehypertension, and treatment is recommended. Hypertension nearly triples CVD risk for men and doubles it for women. Also, CVD risk doubles with each 20/10 mmHg measure over 119/79.

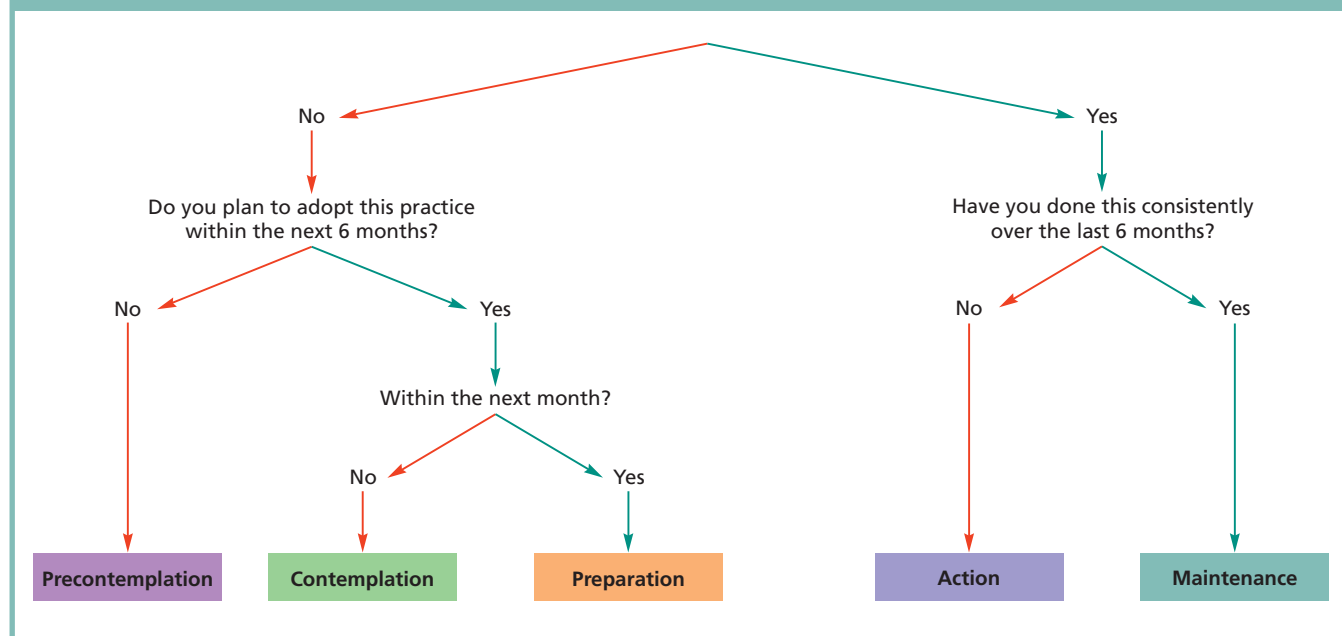
There are two blood pressure levels, recorded as two separate numbers in fraction form (for example, 120/80). When the heart contracts and pumps blood into the arteries, the pressure increases. This is the **systolic**, or pumping, **pressure**, recorded as the upper number. The **diastolic**, or resting, **pressure** is the force of the blood against the arteries when the heart relaxes and fills with blood between beats. It is recorded as the lower number. Both the systolic and diastolic numbers are important. High levels of either or both mean greater risk for heart attack and stroke.

Normal blood pressure is 119/79 or below. However, *many experts contend that the new gold standard or*

“optimal” blood pressure should be 115/76 because damage to the arteries from the pressure of blood pounding through them begins to increase at this point. This means your risk of CVD increases! **Prehypertension** is acknowledged as blood pressure between 120/80 and 139/89, which until 2003 was considered normal but now is considered to be in the “danger zone” before full-blown hypertension develops. This unsafe condition calls for lifestyle changes and monitoring. **Hypertension**, or high blood pressure, measures 140/90 or more and requires medical treatment. Look at the stages of hypertension listed in Table 8-1.

What Stage of Change Are You In?

Do you check your blood pressure on a regular basis?
(i.e., at least once per year)



High blood pressure causes the heart to overwork. Over time, the overworked heart weakens, enlarges, and has difficulty keeping up with the demands of the body. High blood pressure also causes blood vessels to become inelastic, severely reducing the amount of blood flow to the body's vital organs. Decreased levels of oxygen and other nutrients can produce heart, brain, and kidney damage. Remember, high blood pressure also leads to heart attacks and strokes.

One in three American adults has high blood pressure, and about 38 percent have prehypertension. In 90 percent of the cases there is no known cause. However, factors that can increase your chances of developing high blood pressure are heredity, cigarette smoking, male gender, age, being an African American, obesity, sensitivity to sodium, heavy alcohol consumption, use of oral contraceptives, stress, and a sedentary lifestyle. In a small number of cases, hypertension is caused by a specific condition, such as kidney disease, a tumor of the adrenal gland, or a defect in the aorta. This is called **secondary hypertension**. The cause of secondary hypertension can be identified and treated successfully.

How do you know if your blood pressure is too high? The only way to know is to have it checked. You cannot feel high blood pressure—and usually there are no symptoms until complications develop. That is why hypertension is called the “silent killer.” You can be hypertensive for years and be unaware of the damage occurring. Even warning signs associated with advanced hypertension may go unnoticed but may include headaches, sweating, rapid pulse, shortness of breath, dizziness, nosebleeds, and visual disturbances. It is imperative that you know your blood pressure, because high blood pressure, while it cannot be cured, can be controlled or prevented through specific lifestyle changes. See the Top 10 “Nondrug Approaches for Reducing Blood Pressure.”

3. High Blood Lipid Profile (Cholesterol and Triglycerides)

Research has firmly linked high levels of cholesterol and other blood fats to the development of arterial plaque, a major cause of atherosclerosis and CVD. About half of all Americans have elevated cholesterol levels. Only 35 percent of those with high levels are aware of it, and only 12 percent are being treated for it.

Cholesterol is not a true fat but a waxy substance found in the bloodstream. Because it is soluble in fats rather than in water, it is classified as a lipid, as fats are. About 80 percent of total body cholesterol is manufactured in the liver, while 20 percent comes from dietary sources—mainly from foods of animal origin.

From all the bad press cholesterol gets, you would think cholesterol is our body's enemy. Not true. It is vital for our existence. Cholesterol is necessary for healthy

TOP 10 LIST

Nondrug Approaches for Reducing Blood Pressure

1. *Maintain a healthy weight.* Losing even 5 or 10 pounds, if you are overweight, can reduce blood pressure.
2. *Exercise regularly.* Exercise helps you lose weight and keep it off. See specific recommendations described earlier in the chapter.
3. *Do not smoke.* Smoking does not cause hypertension but does promote CVD. A hypertensive who smokes is at serious risk.
4. *Keep your sodium intake low (below 2,000 milligrams daily—about 1 teaspoon).* Many people are salt-sensitive, meaning that salt (sodium chloride) elevates their blood pressure.
5. *Avoid alcohol; if you drink alcohol, do so in moderation.* Have no more than one drink daily if you are a woman or two if you are a man.
6. *Eat a well-balanced diet rich in fruits, grains, and vegetables.* This will help you cut back on the consumption of fats and high-calorie foods and lose some excess weight. Reduce caffeine intake. See the DASH eating plan described in Chapter 9.
7. *Increase your calcium intake.* Calcium has been linked to reduction in blood pressure. A daily consumption of 800–1,500 milligrams is recommended. (One glass of milk has approximately 300 mg.)
8. *Increase your intake of potassium.* Studies document that an increased potassium intake in people with mild hypertension can lower blood pressure. Do not exceed 6,000 mg. per day. (Bananas are high in potassium.)
9. *Increase fiber intake.* Plant fiber has been observed to lower blood pressure in hypertensive individuals by an average of four to eight points.
10. *Practice a stress management technique such as meditation.* Harvard Medical School studies confirm the value of stress management in the reduction of high blood pressure.

cell membranes, brain cells, digestion, and adrenal glands. The problem with cholesterol is that your body makes most of what it needs, and the normal American diet adds much more. Health experts recommend that we keep dietary cholesterol consumption to less than 300 milligrams per day (less than 200 if you have high blood cholesterol). **Hypercholesterolemia** is the term for high cholesterol levels in the blood. See the Diversity Issues box “Who Has High Cholesterol?”

When evaluating your blood lipid profile for risk of CVD, consider two factors: (1) the total amount of cholesterol/triglycerides found in the blood and (2) the way cholesterol/triglycerides are transported in the bloodstream.



DIVERSITY ISSUES

Risk Factors for Cardiovascular Disease

Who Uses Tobacco Products?

White	32.0%
African American	28.8%
American Indian/Alaska Native	44.3%
Native Hawaiian/Pacific Islander	28.8%
Hispanic/Latino	25.2%
Asian	18.6%

Studies show that smoking prevalence is several times higher among those with less than 12 years of education than it is among those with more than 16 years of education.

Who Has High Blood Pressure (HBP)?

- Men have a greater risk of HBP than do women until age 45. From ages 45–54, the percentage of men and women is similar. Beyond that age, the percentage of women is much higher.
- African Americans, Puerto Ricans, and Cuban and Mexican Americans are more likely to suffer from HBP than are whites.
- The prevalence of hypertension in African Americans in the United States is among the highest in the world and is increasing.
- 42.6% of African American males and 46.6% of African American females have HBP.
- 32.5% of white males and 31.9% of white females have HBP.
- 28.7% of Mexican American males and 31.4% of Mexican American females have HBP.

Who Is Physically Inactive?

- People with lower incomes and less than a 12th-grade education are more likely to be sedentary.
- Men (64.2%) are more likely than women (59%) to engage in at least some leisure-time activity.
- Adults with a graduate degree are about twice as likely (80.6%) as adults with less than a high school diploma (41%) to engage in at least some leisure-time activity.

Prevalence of Physical Activity (%)

White males	33.4
White females	31.8
Black males	29.5
Black females	19.6
Mexican American males	24.9
Mexican American females	21.8

Who Is Overweight or Obese?

	Prevalence of Overweight and Obesity (%)	Prevalence of Obesity (%)
White males	69.4	28.2
White females	57.2	30.7
Black males	62.9	27.9
Black females	77.2	49.0
Mexican American males	73.1	27.3
Mexican American females	71	38.4
Hispanic/Latinos (men & women)	38.9	24.7
American Indian/Alaska Native males	76.6	
American Indian/Alaska Native females	61.1	

Overweight in adults is BMI = 25.0 to 29.9.

Obesity in adults is BMI = 30.0 or higher.

Who Has Metabolic Syndrome?

- Mexican Americans 31.9%
- Whites 23.8%
- African Americans 21.6%
- Other 20.3%
- Among African Americans, women had a 57% higher prevalence than did men.
- Among Mexican Americans, women had a 26% higher prevalence than did men.

SOURCE: American Heart Association, 2007 *Heart and Stroke Facts Statistical Update* (National Center, 7272 Greenville Ave., Dallas, TX 75231–4596).

Total Amount of Lipids Knowing your total cholesterol level provides you with a *rough* estimate of your heart disease risk. Blood cholesterol is measured by analyzing a small blood sample in a laboratory. Total cholesterol level includes the amount of cholesterol carried by high-density lipoprotein, low-density lipoprotein, and very low-density lipoprotein. The National Heart, Lung, and Blood Institute relates blood cholesterol level to CVD risk, as illustrated in Table 8-2.

Transportation of Lipids Like oil and water, cholesterol and blood (because it is mainly water) do not mix. Cholesterol must attach to a protein molecule to be carried through the bloodstream. This combination is called a *lipoprotein*. This amazing system is also in place to assure that cholesterol is circulated wherever it is needed. However, some cholesterol-carrying lipoproteins play central roles in the development of atherosclerotic plaque and CVD. The action begins in the liver where cholesterol



DIVERSITY ISSUES

Who Has High Cholesterol?

	Total Cholesterol 200 mg/dl or Higher	Total Cholesterol 240 mg/dl or Higher	LDL Cholesterol 130 mg/dl or Higher	HDL Cholesterol Less Than 40 mg/dl
Total	48.4%	16.8%	32.5%	16.7%
White males	47.9%	16.1%	31.7%	26.2%
White females	49.7%	18.2%	33.8%	8.8%
Black males	44.8%	14.1%	32.7%	15.5%
Black females	42.1%	12.5%	29.8%	6.9%
Mexican American males	49.9%	16.0%	39.0%	27.7%
Mexican American females	50.0%	14.2%	30.7%	13.0%

SOURCE: 2007 Heart Disease and Stroke Statistics, American Heart Association.

is packaged for delivery. The two main types of lipoproteins basically work in opposite directions. The first is **low-density lipoprotein (LDL)** cholesterol, and the second is **high-density lipoprotein (HDL)** cholesterol. Additional information about LDLs and HDLs follows:

1. **Low-density lipoprotein (LDL).** LDLs are considered “bad” because they carry a large amount of cholesterol. They carry cholesterol from the liver out to the rest of the body. The lower density of the lipoprotein allows it to attach easily to the inner wall of the blood vessel, thus accelerating the atherosclerotic process. A *high* LDL cholesterol level increases your risk for CVD and stroke (Table 8-2). It is recommended that LDL levels be kept below 100 mg/dl. How can you lower LDLs?
 - ✓ Don’t smoke.
 - ✓ Manage stress.
 - ✓ Reduce consumption of saturated and trans fats.
 - ✓ Lose weight, if necessary.
 - ✓ Consume more fiber and omega-3 fats.

Very low-density lipoproteins (VLDL) are even more dangerous.

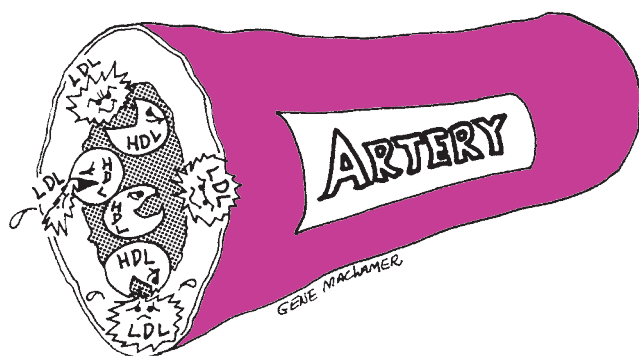
2. **High-density lipoprotein (HDL).** HDL carries cholesterol from the blood back to the liver where it is broken down for elimination from the body or sent out again as needed. It is considered the “good” cholesterol because of the dense structure of the lipoprotein. It is thought that HDL acts as a garbage collector in clearing away plaque and other debris as it flows through the bloodstream to the liver to be excreted from the body. The higher your HDL cholesterol level, the better and the more protection from CVD it provides. In general, the higher your LDL, the greater your risk for atherosclerosis. See Table 8-2. HDL levels above 40 mg/dl are recommended. How can you increase your level of HDL?

- ✓ Exercise regularly.
- ✓ Don’t smoke.
- ✓ Reduce weight and/or maintain a normal weight.
- ✓ High-fiber and low-fat diets may also increase the HDL cholesterol level.
- ✓ Use monounsaturated fats (e.g., olive oil, canola oil, sunflower oil) as primary fat, while keeping total fat intake low.

TABLE 8-2 *Interpreting the Numbers: Cholesterol Guidelines*

Total Cholesterol	Risk Category
Below 200 mg/dl	Desirable
200–239 mg/dl	Borderline high
240 mg/dl and above	High
LDL Cholesterol	
Below 100 mg/dl*	Optimal
100–129 mg/dl	Near optimal
130–159 mg/dl	Borderline high
160–189 mg/dl	High
190 mg/dL and above	Very high
HDL Cholesterol	
Below 40 mg/dl	Bad
40–59 mg/dl	Better
60 mg/dL and above	Best
Triglycerides	
Below 150 mg/dl	Desirable
150–199 mg/dl	Borderline high
200–499 mg/dl	High
500 mg/dl or above	Very high

*Achieving a goal of less than 170 is recommended if there is a high risk for CVD. SOURCE: National Heart, Lung, and Blood Institute. Cholesterol levels are measured in milligrams (mg) of cholesterol per deciliter (dl) of blood.



HDL cholesterol clearing away plaque in arteries.

A lipoprotein analysis gives a more accurate picture of your CVD risk than does total cholesterol alone. A lipoprotein analysis breaks down the total cholesterol into its components, or lipoproteins. Problems occur when there is too much LDL cholesterol for the HDLs to pick up promptly, or if there are not enough HDLs to do the job.

What causes LDL and HDL to get out of balance in some people? There is genetic variability in how efficiently (or inefficiently) a person metabolizes dietary saturated fat and cholesterol. Some people can eat almost anything and their blood cholesterol levels remain stable. Others find that even a small amount of dietary fat makes their blood cholesterol levels increase. Most of us are somewhere in between on this spectrum. An unhealthy combination of “good” and “bad” cholesterol quadruples the risk of heart attack.

Drs. Michael Brown and Joseph Goldstein won the 1985 Nobel Prize in Medicine for their discovery of **LDL cholesterol receptors**. Located primarily in liver cells, these receptors bind and remove cholesterol from the blood. The more cholesterol receptors you have, the more efficiently you can remove cholesterol from the blood. The number of cholesterol receptors is in part genetically determined. Lifestyle factors also influence the number. A diet high in saturated fat and cholesterol produces what Brown and Goldstein termed “double trouble.” It not only saturates the receptors, it also decreases their number—a bad combination. So, to lower your level of LDLs, reduce your consumption of saturated and trans fats. Only about 5 percent of the population has genetically high cholesterol levels that remain elevated regardless of lifestyle.

Total Cholesterol/HDL Ratio Scientists believe that the ratio of total cholesterol to HDL cholesterol is a better indicator of risk for cardiovascular disease than is the total value alone. To determine your ratio, take a laboratory blood test that will reveal your total cholesterol and HDL cholesterol levels. Next, divide the total cholesterol level by the HDL cholesterol level to find the ratio. For example, if the total cholesterol measures 160 and the HDL cholesterol 40, your ratio would be

TABLE 8-3 *Ratio of Total Cholesterol to HDL Cholesterol*

Optimal ratio (very low risk)	3.5:1
Near optimal ratio (low risk)	4:1

four to one (4:1) ($160 \div 40 = 4$). This would place you in the near optimal category, as you can see in Table 8-3. Everyone should strive for a ratio that is 4:1 or lower. The lower this ratio, the lower the risk for CVD. A ratio above 4:1 increases your CVD risk.

Average HDL levels in adult Americans are about 45 to 65 mg/dl, with women averaging higher values than men. The female sex hormone estrogen tends to raise HDL levels, which may explain why premenopausal women are usually protected from heart disease. Studies suggest that HDL levels above 70 may protect against heart disease, while those below 35 signal coronary risk.

Triglycerides **Triglycerides** are manufactured in the body to store excess fats. They are also known as *free fatty acids*, and in combination with cholesterol, they accelerate the formation of plaque. Triglycerides are carried in the bloodstream by very low-density lipoprotein (VLDL). These fatty acids are found in poultry skin, lunch meats, and shellfish. However, they are mainly manufactured in the liver from alcohol, starches, and refined sugars (honey included). Alcohol, starches, and sugars are not fats, but the body can convert them into fats and then dump those fats into the bloodstream. To lower triglycerides,

- ✓ Decrease consumption of alcohol, sugar, and refined carbohydrates.
- ✓ Reduce weight if overweight.
- ✓ Reduce consumption of animal fats in the diet (poultry skin, lunch meats, shellfish).
- ✓ Get regular aerobic exercise.
- ✓ If necessary, take prescribed medications.

As a general rule, you should keep your triglyceride level below 150 mg/dl of blood. However, some reports indicate that triglyceride levels over 100 should be cause for concern, especially if you have other CVD risk factors. See Table 8-2.

You should know your cholesterol level and have it checked annually, especially if you have a positive family history of CVD. The best way to do this is to have a 12-hour fasting blood test that is analyzed by a reputable laboratory. Over-the-counter tests that don't require fasting are not as reliable. Since cholesterol levels are greatly influenced by diet and lifestyle, follow these guidelines to reduce high levels:

- ✓ A diet rich in cholesterol—or, worse, one rich in saturated fat (saturated fat is highest in vegetable

oils such as tropical and palm, in meat, and in high-fat dairy products) and trans fats (hydrogenated oils in many crackers, cookies, cakes, pies, and pastries)—can increase your blood cholesterol level. Keep total fat less than 30 percent of total calories per day and dietary cholesterol below 300 mg per day. This small modification in dietary fat can reduce cholesterol levels by 10 to 15 percent. (See Chapter 9 for other dietary strategies that affect heart health.)

- ✓ Reduce body weight if overweight. Weight reduction alone can lower cholesterol and triglyceride levels.
- ✓ Lowering your stress level also helps offset high cholesterol.
- ✓ Increase daily aerobic exercise. Try to walk more, use escalators and cars less, and be a participant rather than a spectator.
- ✓ Reduce alcohol, sugar, and caffeine consumption.
- ✓ Increase consumption of fiber-rich foods such as oatmeal, dried beans and peas, whole-grain breads and cereals, raw fruits and vegetables.
- ✓ Take your medication, if prescribed.

4. Cigarette Smoking

Cigarette smoking is a primary risk factor. Nicotine increases heart rate and blood pressure and constricts blood vessels. Carbon monoxide also creates cardiovascular stress by impairing the transport of oxygen in the blood. Smoking kills more than 400,000 Americans a year, and 35 percent of those deaths are CVD-related. About one in five deaths from CVD is attributable to smoking. Some health professionals are calling tobacco use a “weapon of mass destruction.” Every cigarette package is required by law to carry a consumer warning. One such warning is “Cigarette Smoking Can Kill You.”

Even Ann Landers, the nationally syndicated columnist, gave a warning: “Beware, cigarettes are killers that travel in packs.” Numerous studies have proved that cigarette smoking causes oral cancer, lung cancer, and emphysema, and in women it is linked to cervical cancer, early menopause, and damage to the fetus during pregnancy. It also leads to the development of wrinkles in men and women. The number of Americans killed each year from smoking is greater than the number killed during World War II and the Vietnam War combined. No level of smoking is safe!

The AHA reports that smokers have more than twice the risk of heart attack of nonsmokers. Even limited smoking (four to five cigarettes per day) increases CVD risk. Also, smoking increases the risk of developing peripheral vascular disease (narrowing blood vessels in the arms and legs), which may lead to developing gangrene and, eventually, to amputation.

Passive smoke, synonymous with secondhand smoke, is the cigarette smoke inhaled by nonsmokers from environmental air. The U.S. surgeon general’s new report provides conclusive evidence of the alarming public health threat posed by secondhand smoke. It declares smoking bans are the only way to protect nonsmokers. The research reveals that secondhand smoke is remarkably effective in damaging the cardiovascular system:

1. Nonsmokers may be *more* susceptible to heart and vascular damage from secondhand smoke than smokers are even though they absorb much smaller doses of the smoke’s toxins. That is because smokers develop compensatory responses to some of the adverse cardiovascular effects of cigarette smoke—but nonsmokers do not get the “benefit” of these adaptive responses.
2. Carbon monoxide, a substance in secondhand smoke (and in inhaled cigarette smoke), damages (causes injuries or “nicks”) the smooth inner lining of blood vessel walls. This accelerates the atherosclerotic buildup. Carbon monoxide, higher in the blood of smokers but also found in nonsmokers, decreases the amount of oxygen carried in the blood. It also reduces the heart’s ability to use the oxygen it does receive.
3. Even low levels of secondhand smoke increase the stickiness of blood platelets in nonsmokers, making it more likely that a clot will form in the narrowed arteries, which can ultimately lead to a heart attack or stroke.
4. Secondhand smoke increases atherosclerosis by lowering HDL cholesterol and increasing LDL cholesterol buildup.
5. It increases chronic inflammation.
6. It increases cell-damaging free radicals.



The science is clear: secondhand smoke is not mere annoyance—it’s lethal. Some states ban smoking outdoors—from within 15 to 30 feet of all public buildings. They even post signs to indicate the specific distances. Others ban smoking on beaches and in parks.



Smoking is the only legal form of suicide.

7. It decreases the body's levels of antioxidants, which help protect against free radicals.
8. Nonsmokers who live with smokers or work where environmental smoke is present have a 58 to 91 percent higher risk of dying from CVD than do other nonsmokers.
9. It increases insulin resistance.
10. Secondhand smoke is a human carcinogen, killing about 3,000 nonsmokers a year through lung cancer. Smoking is everyone's business!
11. The population burden associated with passive smoking and CVD is estimated to be 65,000 deaths annually in the United States. The simplest and most cost-effective control measure to reduce cost is to *mandate* smoke-free workplaces, schools, and public places.

While studies show that smoking has declined by more than 49 percent since 1965, this downward trend appears to be leveling off. There are still 4,000 new smokers every day. About 80 percent of people who use tobacco begin before age 18 (see Figure 8-6). A non-smoker should not begin to smoke. Smokers should

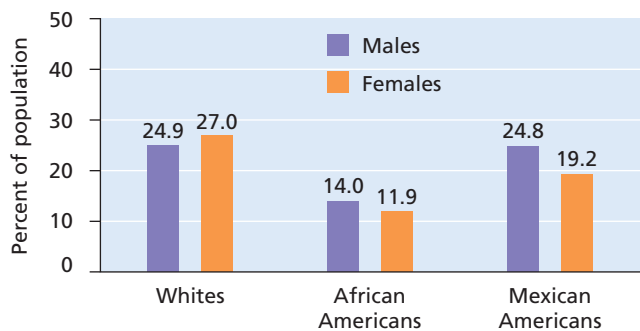


FIGURE 8-6 Prevalence of high school students smoking cigarettes by race/ethnicity and sex: United States, 2005. SOURCE: CDC/NCHS.

stop *now*. Don't hesitate, do it! Ninety percent of smokers who quit do so on their own!

5. Obesity

Obesity has escalated to epidemic proportions in the United States and is continuing to increase at an alarming rate. See the Diversity Issues box on page 250. Obesity is uncomfortable; increases the burden on the vital organs, especially the heart; and is directly linked to CVD. Obesity is expensive, too. Annual medical costs for an obese person are 37.7 percent more than those for someone of normal weight.

It is especially risky to have excess body fat in the waist and abdominal area. Abdominal obesity more than doubles the risk of dying of heart attack (and even of cancer). Abdominal fat, called visceral fat, is located deep within the abdomen, around the internal abdominal organs. Visceral fat appears to be metabolically more active than fat elsewhere. It interferes with liver function, hampers processing of cholesterol and insulin, and may compromise the functions of other systems and tissues. Visceral fat is linked to insulin resistance (a precursor to diabetes) and blood vessel inflammation.

Waist measurement and body mass index (BMI) are recommended ways to estimate one's body fat. A high-risk waistline is 35 inches or more for women, 40 inches or more for men—even if you are at normal weight. See Chapters 1 and 10 for instructions on how to measure your waist and BMI. Skinfold calipers (discussed in Chapter 1) more accurately measure percent of body fat. The CDC considers anyone above 30 pounds over target weight to be obese.

Besides all the other negative aspects of obesity, too much fat unleashes a flood of molecules called cytokines that trigger systemwide inflammation. Obesity is a pro-inflammatory state. Chronic inflammation causes widespread tissue damage. The plumper and more abundant a person's fat cells, the greater the number of cytokine-releasing macrophage cells in the fat tissue. Macrophages play an important role in the development of fatty plaques that lead to atherosclerosis. Visceral fat is thought to be a high producer of cytokines—another reason to lose the belly fat.

More than 65 percent of the U.S. population is now obese or overweight. In 1980 the number was only 46 percent, up steadily from the 1970s. Childhood obesity rates have more than tripled since the late 1970s. Ninety percent of people with type 2 diabetes are overweight. Obesity, considered a chronic disease, causes more than 300,000 premature, preventable deaths per year.

In addition, obesity puts women in particular at increased risk of CVD. A study conducted by the Harvard Medical School of 115,000 women ages 30 to 55 found that of all the women in the 8-year study who developed CVD, 40 percent had no other risk factors except being 20 percent or more over their ideal weight. Women who



Health experts recommend that school-age children get at least 60 minutes of exercise daily. Today, too many children spend their time in nonphysical activities such as playing video games. Former President Bill Clinton states, “Our children may grow up to be the first generation with shorter life spans than we had.”

had been slim at age 18 and gained weight in adulthood seemed to be at increased risk. The first step in medical treatment for these conditions is usually weight reduction. Obesity is controllable and can be reversed. You can eliminate the obesity risk factor by maintaining a reasonable weight (see Chapter 10). Even modest weight reduction (5 to 10 percent of body weight) can help reduce your risk of CVD and stroke.

Physical inactivity is a major factor in the development of obesity in men, women, and children. Watching too much television is one of the main culprits. The number of television hours watched per person in this country averages about 4 per day. Americans should limit TV viewing to about 1 hour or less a day to prevent physical and mental inactivity. Of course, consuming more calories than are used in daily activity also contributes to obesity. NOTE: Accumulating 10,000 steps expends approximately 500 calories!

6. Diabetes Mellitus (Type 1 and Type 2)

What do blindness, gangrene, kidney failure, heart attack, and stroke have in common? They can all result from diabetes, which eventually strikes one in three people in the United States.

Diabetes mellitus (which includes both type 1 and type 2) is a disease that affects how the body uses *glucose*, a sugar that is the body’s main source of fuel. This chronic disease is characterized by the body’s inability to produce enough of the hormone *insulin* or use it properly. In the normal digestive process, the food you eat is changed to glucose. Insulin (which is produced in the pancreas) carries the glucose in the blood to the body’s cells so that the body gets the energy it needs. In diabetes, this normal process is interrupted. When glucose doesn’t reach the cells, it accumulates in the blood and the underfueled cells are starved for energy. This surplus glucose is eliminated by the kidneys, which pass it off in the urine. Too much sugar in the urine and in the blood is a classic sign of diabetes.

Diabetes is found in two forms, type 1 and type 2. Genes have a hand in both types, but more so in type 1. Yet, research on identical twins reveals that just because one twin develops type 1 diabetes the other twin doesn’t always develop it. The other twin has only a 30–50 percent chance of coming down with it. If genes were the only factor involved as a type 1 diabetes cause, both identical twins should get it. Something else, in addition to genes, has to be at work. Individuals with a genetic tendency to develop type 1 diabetes appear to be fine until something “triggers” the onset of the disease. It may be a virus that attacks the pancreas that triggers the onset, or it may be something in the environment. Type 2 results from a combination of environmental and genetic factors and is heavily influenced by obesity. Scientists believe that a genetic predisposition for type 2 can be warded off,



Diabetes has increased at an alarming rate in the United States in the last decade due to escalating obesity rates. Health experts are blaming the wired-up, couch potato culture of the 1990s for this escalation.

even prevented, by lifestyle interventions of weight management and exercise.

Insulin-dependent diabetes, also known as type 1 or juvenile onset, occurs when the immune system attacks and permanently disables the insulin-making cells in the pancreas. In this form, the pancreas makes little or no insulin. The diabetic must receive insulin injections every day to stay alive and must carefully watch his or her diet and exercise regularly. It occurs most often in children or young adults. Symptoms develop rapidly, usually within a period of months or even weeks. Approximately one million Americans have type 1 diabetes. Medically supervised medication and lifestyle strategies are key to controlling (or managing) type 1.

More common (90 to 95 percent of diabetics) is non-insulin-dependent diabetes, once known as adult-onset or type 2, in which the pancreas makes insulin but either the amount is insufficiently released or the body cannot properly use what is available. This type of diabetes can often be controlled without insulin injections through other medications, diet, and weight management. This form of the disease usually occurs in people over 40 years old and is associated with aging and obesity. New data, however, show a dramatic rise of type 2 in children and young adults, making the term “adult-onset diabetes” obsolete. Because the onset of type 2 is gradual, the disease may go undetected for years. Diabetes seriously increases the risk of developing cardiovascular disease. About 75 percent of people with diabetes die of some form of heart, stroke, or blood vessel disease. Part of the reason for this is that diabetes affects cholesterol and triglyceride levels by producing a different kind of LDL that is even worse for the arteries than is ordinary LDL. This accelerates atherosclerosis. Even so, type 2 diabetes can be delayed or averted by weight management and physical activity. One condition shared almost universally by type 2 diabetics is obesity. Not all obese people become diabetic, but *90 percent of people with type 2 diabetes are overweight or obese.*

The surge in youth obesity in this country has paralleled a rise in childhood type 2 diabetes. At one time type 2 diabetes was almost unheard of in children. They almost always had type 1. A new advisory from the American Academy of Pediatrics and the American Diabetes Association (ADA) calls for diabetes testing of overweight children with any two other risk factors starting at age 10 or at puberty, if it comes earlier. See the projected diabetes rates for those born in 2003 in Figure 8-7.

Many people know their blood pressure and cholesterol levels, but few know their glucose level. A substantially elevated glucose level is the chief diagnostic sign of diabetes. Unfortunately, far too few people are properly tested. As a result, researchers say that millions of people who have type 2 diabetes don't know it.

Now we have identified a condition called **prediabetes** (or insulin resistance), which is a precursor to diabetes. It is defined as a fasting blood glucose between 100 and

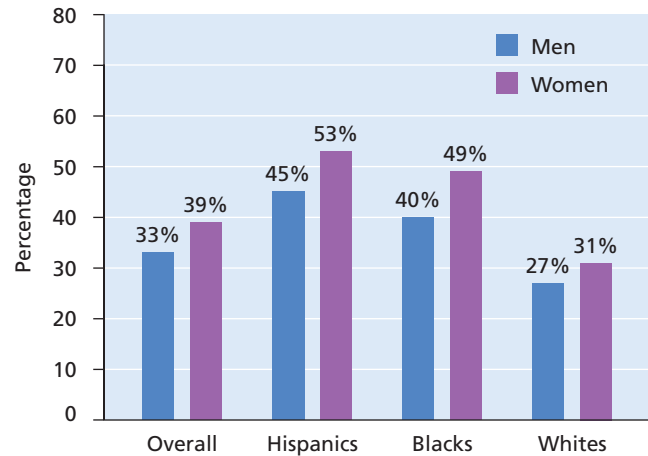


FIGURE 8-7 *Children born in 2003: Who will have type 2 diabetes? A third of the people born in the United States in 2003 will develop diabetes. The chances of developing diabetes are highest among women and minorities. Minorities have a combination of genetic predisposition and higher obesity rates that puts them at risk.*

125 mg/dl. Millions of Americans have this metabolic condition where the blood-glucose level is only slightly elevated. Prediabetes should not be taken lightly. It means you are on course to develop type 2 diabetes, heart disease, and stroke. People with prediabetes can be protected from developing full-blown diabetes—and its life-threatening complications—by losing weight and, if necessary, taking medications to lower their blood sugar.

The main reason why public health experts are urging wider glucose testing is that it is the only way to catch diabetes early. The disease usually causes no symptoms for a decade or more even though it is silently festering the entire time. That's 10 to 12 years during which diabetes quietly eats away at your vision, injures your kidneys and nerves, and sets the stage for CVD. This is damage that would be preventable if only people learned sooner that they have type 2 diabetes.

According to the American Diabetes Association's new guidelines, all people age 45 and older should have their fasting blood-glucose level tested at least every 3 years. Several groups of people are at greater risk and should be checked for diabetes at least once a year. Get tested, starting at age 35, if you

- ✓ Are overweight, especially with extra belly fat.
- ✓ Have a brother, sister, or parent with diabetes.
- ✓ Are not white (i.e., African American, Hispanic, and Native American, especially the Pima tribe of Arizona).
- ✓ Had a baby weighing more than 9 pounds or had gestational diabetes (diabetes during pregnancy).
- ✓ Have an HDL cholesterol of 35 or less or a triglyceride level of 250 or more.
- ✓ Have hypertension or take antihypertension drugs.
- ✓ Had a minimally elevated glucose level on a previous test.

TABLE 8-4 *Blood-Glucose Levels*

<i>Normal</i>	65 to less than 100 mg/dl
<i>Prediabetes:</i> Impaired fasting glucose or insulin resistance	100–125 mg/dl
<i>Diabetes</i>	126 mg/dl or more

Two readings of *126 mg/dl or more* on a fasting blood-glucose test taken on different days means you have diabetes. Less elevated reading, from *100 to 125*, indicate impaired fasting glucose, which means you have prediabetes or are insulin resistant and face a sharply increased risk of diabetes (see Table 8-4). Regardless of your glucose level, you are probably prediabetic if you have low HDL, high triglycerides, high blood pressure, or excessive abdominal fat (i.e., a waist measurement of more than 35 inches for a woman and 40 inches for a man).

Certain lifestyle changes such as

- ✓ regular moderate exercise,
- ✓ losing weight (5 percent to 7 percent of body weight),
- ✓ stopping smoking,
- ✓ eating a high-fiber diet, and
- ✓ eating a diet low in simple carbohydrates (sugar and other sweets) and alcohol or following the DASH diet

can improve insulin resistance; they may also help improve the associated HDL, triglyceride, and blood pressure problems. Those steps can also help people who have type 2 diabetes (and sometimes even those with type 1) control their glucose level.

Two symptoms that occur in many people with diabetes are increased *thirst* and *frequent urination*. That's because excess glucose circulating in your body draws water from your tissues, making you feel dehydrated. To quench your thirst, you drink a lot of water and other beverages, and that leads to more frequent urination. Other signs and symptoms of type 2 diabetes are

- ✓ Flu-like symptoms. Since glucose is not reaching your cells, you may feel tired and weak.
- ✓ Weight loss or weight gain
- ✓ Blurred vision
- ✓ Frequent hunger
- ✓ Dry skin
- ✓ Slowly healing wounds
- ✓ Itching, tingling, or numbness in the extremities
- ✓ Frequent vaginal or skin infections
- ✓ Combinations of these symptoms

Unless detected and controlled, diabetes can ultimately lead to stroke, heart disease, kidney failure, blindness, amputation of limbs from gangrene, and death. See

Table 8-5. According to the ADA, the disease is a leading cause of death in this country and diabetics are two to four times as prone to heart attack and stroke as are non-diabetics. Three out of every five people with type 2 diabetes suffer at least one significant complication of the disease. Assess your risk of developing diabetes by completing “Are You at Risk for Diabetes?” Lab Activity 8-4.

Primary Risk Factors (Uncontrollable)

1. Positive Family History

A family history of heart disease in brothers, sisters, parents, or grandparents increases your risk of developing CVD. Tendencies toward high blood pressure, stroke, peripheral blood vessel disease, rheumatic fever, high blood lipid levels, obesity, and early heart attack appear to be somewhat hereditary. This is why your physician is so interested in your family history. A family's lifestyle also may contribute to heart disease and stroke. For example, family members may be overweight, smoke, eat large amounts of cholesterol and saturated fat, or be physically inactive. You should find out as much as possible about your family's medical history. You can be alerted early to a possible risk and take preventive measures.

2. Male Gender (+ Postmenopausal Women)

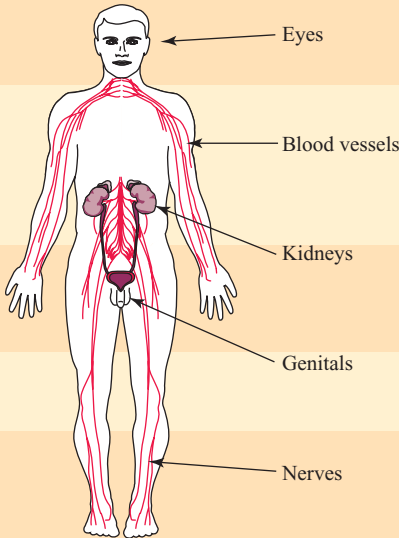
Although CVD is the leading cause of death for both men and women, males have a higher risk of heart attack, especially earlier in life. The gender factor exists because men have heart attacks 10 years earlier than women. Until age 55, men also have greater risk for hypertension than women do. The incidence of stroke is higher for males than females under age 65. The increased male risk is not clearly understood. Some credit the increased risk to the male sex hormone testosterone, which triggers the production of low-density lipoproteins, thereby clogging blood vessels. Others say a male's lifestyle may be the culprit.

We do know that a female's hormonal makeup is protective until menopause. Female hormones signal the liver to produce more “good” cholesterol (HDL) and make blood vessels more elastic than a male's blood vessels, especially during childbearing years. Once women reach menopause (usually in their early to middle 50s), their rates of heart-related problems equal or surpass those of men. Part of the explanation for this is that women tend to go up in waist size after menopause due to increased visceral fat (the kind that promotes inflammation). We know that hormones are involved in this occurrence as well.

It is imperative that males and postmenopausal women modify other risk factors to protect their cardiovascular systems (i.e., increase physical activity, maintain a healthy weight, don't smoke, keep blood pressure

TABLE 8-5 *Complications of Diabetes*

Over time, untreated or poorly controlled diabetes can cause debilitating and even life-threatening complications. Diabetes quadruples the risk of heart attack for women and doubles it for men.

	What happens	Complications
	Retinopathy. The small blood vessels of the retina become damaged. Also, cataracts and glaucoma are more likely to develop.	Decreased vision and ultimately blindness. Diabetes is the leading cause of blindness in people 20 to 74.
	Plaque builds up and blocks arteries in major organs, such as the heart and brain. The walls of blood vessels are damaged so that they cannot transfer oxygen normally.	Poor circulation causes wounds to heal poorly and can lead to heart disease, stroke, gangrene of the feet and hands, and infections. Diabetics have two to four times the usual rate of CVD.
	Nephropathy. Blood vessels thicken; protein leaks into urine; blood isn't filtered normally.	Poor kidney function; kidney failure. Nearly one-half of new cases of end-stage kidney disease stem from diabetes.
	Poor circulation in blood vessels in genitals can lead to impotence.	Eighty percent of diabetic men experience impotence.
	Neuropathy. Nerves are damaged because excess glucose injures the walls of the tiny blood vessels that nourish the nerves and interferes with the blood supply to them.	Leg weakness; reduced sensation, tingling, and pain in the hands and feet; chronic damage to nerves. Nerve damage and poor blood vessel circulation may lead to leg amputations.

and cholesterol levels at recommended levels, manage stress, modify emotional behaviors, and don't drink excessive amounts of alcohol).

3. Race

According to the AHA, African Americans have the greatest risk of all races for heart attack and stroke. High blood pressure develops earlier in life in blacks than in whites and is generally more severe (see Figure 8-8). One explanation for this higher incidence is that many



African Americans have increased risk for heart attack, stroke, and diabetes.

African Americans share a mutation in a gene that helps control blood pressure. A hereditary intolerance to sodium may also account for the danger. African Americans' and Mexican Americans' risk of diabetes and obesity is twice that of any other ethnic group in the United States (see Figure 8-7). Social and economic stresses may also contribute to increased cardiovascular disease risk. It is paramount that early heart health

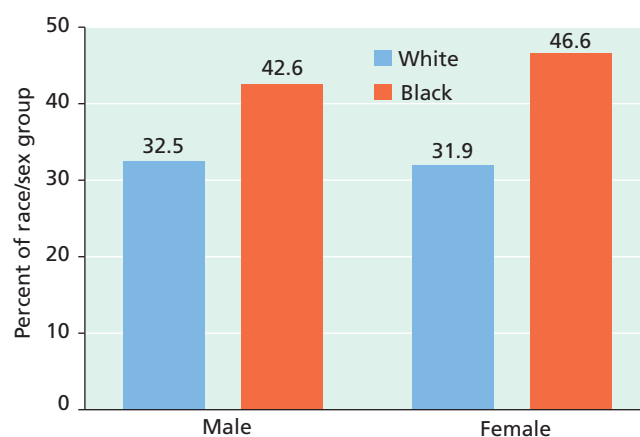


FIGURE 8-8 Estimated percentage of population with hypertension by race and sex among U.S. adults. Hypertensives are defined as persons with a systolic level ≥ 140 and/or a diastolic level ≥ 90 or those who reported using antihypertensive medication.

intervention and education programs be supported for African American populations. Also, being aware of these risks, African Americans should adopt a healthy lifestyle early. See the Diversity Issues box on page 250 for additional population information.

Heart disease and stroke risks are also high among Mexican Americans, American Indians, and Native Hawaiians. Again, this increased risk is due to higher rates of obesity and diabetes.

4. Age

Being older has some advantages (wisdom and experience), but protection from CVD is not one of them. As you age, your risk for developing heart disease increases. This does not mean that coronary heart disease is *only* a disease of the old. You don't suddenly drop dead one day at age 45 from a "heart attack." At any age and certainly at age 18, you have atherosclerotic plaque in your arteries. It accumulates over time, and by the time you've gained "age," you've also increased the private stash of cholesterol in your arteries. There is little that can be done to stop the calendar. Adopting a healthy lifestyle early in life may add years to your life and life to your years.

Secondary Risk Factors (All Controllable)

These factors are associated with increased risk of CVD, though not as directly as the primary risk factors.

1. Individual Response to Stress

We all feel stress, but we each feel it in different amounts and react in different ways. Too much stress over a long time and unhealthy responses to it can damage our health. Stress is unavoidable. It includes happy, wonderful, and positive events as well as sad, destructive, and negative ones. For example, the death of a family member and the birth of a child, while perceived differently, are stressors that produce the same physiological response in the body. Job stress may be particularly unhealthy. High blood pressure is three times more common among people who have jobs with high demands but little control (assembly line worker, waitress), or people who are unrecognized for their efforts. Stress has been found to cause a rise in heart rate, blood pressure, depression, and blood cholesterol, and it can lead to excessive smoking or eating—all linked to CVD. Stress (and depression) almost triples the risk of heart attack. Note these examples: Indianapolis 500 race car drivers have higher cholesterol levels after they race than before; tax accountants have increased cholesterol around April 15; and students have higher cholesterol levels during exams. Research shows that social isolation increases feelings of stress and its negative health consequences. One of the most important antidotes for dealing with social isolation



Performing several tasks at the same time is an excellent example of how hectic life in the twenty-first century has become.

is a good social support system (i.e., family and friends, church membership, etc.). Low educational and socioeconomic levels may also increase stress for many, due to causes such as dangerous living environment, poor access to health care, unhealthy lifestyle, and poor nutrition.

Stress causes chemical wear and tear on the body by releasing stress hormones into the bloodstream. Large amounts of stress hormones are found in the bloodstreams of people who react to stressful situations with hostile and angry behavior. However, low levels of stress hormones are found in the bloodstreams of people who react normally to stressful events. How you respond to stress seems to be the critical factor. You should recognize stress in your life (the positive and the negative) and learn to handle the stressful situations in a healthful manner. Coping with stress successfully is vital in today's hectic, in-the-fast-lane lifestyle. Exercise, relaxation techniques, and behavioral modification are excellent methods for reducing stress.

We need to change the way we look at or perceive stressful situations. Problems are to be solved, not worried about.

2. Emotional Behavior (Anger and Hostility)

Several studies have linked emotional behavior to increased risk of heart disease. Until recently there were just three emotional behavior patterns or **personality types—Types A, B, and C**. Now a newly coined personality type, **Type D** (which stands for "distressed"), has been identified and may be the type with a dangerous risk for CVD. The Type A individual exhibits aggressiveness, competitiveness, and impatience and is a workaholic.

Type As demonstrate a high degree of time urgency—a tendency to do two or three things at the same time. The Type B individual is more relaxed, noncompetitive, patient, and slow to anger. Type Cs are actually classified as Type As but learn to cope with emotional stress by using the five Cs: control, commitment, challenge, choices in lifestyle, and connectedness. Such people welcome change, considering it a challenge. They are committed to goals, gaining confidence as a result. Type Cs are called “hardy” stress resisters.

Early studies identified Type A people as the ones at greater risk of having heart attacks. However, more recent research indicates that it is only when a Type A person exhibits the behaviors of *hostility* and *anger* that a serious risk is apparent. These behaviors arouse the fight-or-flight response, significantly elevate blood pressure, overstimulate the production of stress hormones, and have been documented to increase coronary artery atherosclerosis. Some studies found that hostility levels are a more accurate predictor of heart disease than high cholesterol, hypertension, smoking, or obesity. The other Type A behaviors do not seem to be as significant but may eventually lead to hostile, angry reactions to stress. That’s why Type A behavior should be recognized. Types B, C, and D will also suffer adverse health consequences when angry, hostile behaviors are exhibited.

Type D people possess negative emotions and tend to be depressed, anxious, irritable, insecure, and distant. They have a joint tendency toward “negative effectivity” (worry, irritability, gloom) and “social inhibition” (discomfort in social interactions, reticence, and a lack of social poise). Some scientists believe that the social and emotional problems associated with Type D personality can increase the chances of developing cardiovascular disease. Hypertension and CHD have been linked to those identified as Type Ds. They seem to have more inflammation throughout the body and exaggerated blood pressure and other negative reactions to stress. Among people who already have heart conditions, those with Type D personalities are less responsive to treatment, have poorer quality of life, and also are more likely to die prematurely.

Twenty percent of apparently healthy people experience extreme surges in blood pressure when confronted with the challenges of everyday life. They are called **hot reactors** because their systolic blood pressure can rise from 120 to a deadly 300 when they are stressed. They often go untreated until felled by a stress-induced heart attack or stroke. Hot reactors can be found in all emotional behavior types.

We are not born with hot reacting, angry, and hostile behaviors. These behaviors are learned, and for the sake of our health, we can unlearn them. Learning to modify negative emotional behaviors with antistress methods (such as exercise, yoga, etc.) is not difficult and may add years to your life. How does a “hostile heart”

become less angry and cynical—and become a “trusting heart”?

One way is to carry a notebook and record every time you feel angry and/or hostile. Once you have done this for a while, you will start to recognize the situations that provoke these reactions and be able to head off the troublesome behavior. Other suggestions follow:

1. *Stop angry, cynical thoughts.* Every time you have a cynical thought, think to yourself, “STOP!” This is called *thought stopping* and is an effective behavior modification technique when practiced regularly.
2. *Practice laughing at yourself.* Once you realize how silly your anger is in many situations, laughing at yourself will quickly replace fuming.
3. *Be empathetic.* Put yourself in the other person’s shoes. Often the other individual is a victim of circumstances, too.
4. *Reason and understand your anger.* There will be times when anyone would be angry in the same situation, but you must say, “I have this trait, and it is bad for my health.” Cognitively decide if the situation warrants your attention and if you have an effective response. If not, take a “time out” from the situation.
5. *Learn to relax.* Practice “stress busters” (such as exercise, meditation, etc.).
6. *Practice patience and trust.* Instead of getting irritated while standing in a line, concentrate on a relaxing word (such as “quiet”) until your anger subsides. Trust that others are not out to cheat you.
7. *Become a good listener.* Pay attention to what others are saying and do not interrupt. This may help you understand the situation better *before* you jump to an angry response.
8. *Live as if you had a serious disease.* You will soon see that the little problems that once riled you up aren’t really so important.
9. *Learn to forgive.* Compassion is the strongest medicine for anger. Blame leads to anger; forgiveness heals.

3. Excessive Alcohol (+ Some Illegal Drugs)

Drinking too much alcohol raises blood pressure and triglyceride levels, damages the heart muscle, and increases risk of stroke and heart failure. The American Heart Association reported recently that binge drinking in college raises C-reactive protein levels and may lead to heart disease later in life.

Alcohol consumption, especially of red wine, has received attention as a protective factor against CVD because it is thought to raise HDL cholesterol in the blood and might help prevent clotting that leads to plaque buildup inside arteries. “Moderate” consumption of alcohol (one drink for women per day and two drinks for men per day) is the amount associated with a reduc-

tion in the rate of CVD. The following amounts are examples of one drink:

- ✓ 1½ oz. of bourbon, scotch, vodka, gin
- ✓ 4 oz. wine
- ✓ 12 oz. beer

If you don't drink, don't start. A protective effect of alcohol consumption has not been proven, but many adverse effects are well documented. Besides causing automobile accidents and social disruption, excess intake of alcohol can cause diseases of the liver, pancreas, and nervous system, and increase breast and colon cancer risk. To put the benefit of moderate drinking in perspective, the reduction in heart disease risk is comparable to what you might achieve by exercising regularly or by cutting blood cholesterol levels through a low-fat diet.

Stimulant illegal drugs such as cocaine, methamphetamine ("meth"), and MDMA ("Ecstasy") can also cause serious CVD problems, including heart attack, stroke, and sudden cardiac death. Fatalities have been recorded even in first-time users of cocaine. Intravenous drug use carries a high risk of infections of the heart (endocarditis) and stroke.

4. Metabolic Syndrome (Syndrome X)

Also known as syndrome X, insulin-resistance syndrome, and prediabetes syndrome, **metabolic syndrome** is a dangerous cluster of symptoms that raise the risk of heart disease, stroke, diabetes, and some cancers. It is defined as having three or more of the following five risk factors:

- ✓ Elevated blood pressure: blood pressure higher than 130/85
- ✓ Elevated glucose: fasting blood sugar of at least 100 mg/dl (a sign of insulin resistance)
- ✓ High triglycerides: triglycerides of 150 or higher
- ✓ Low HDL ("good") cholesterol: HDL cholesterol less than 40 for men and 50 for women
- ✓ Obesity: a waist measurement of more than 35 inches for women and 40 inches for men

Do you have metabolic syndrome? It is a silent disease that affects approximately 25 percent of white Americans and even more African Americans, Mexican Americans, and Native Americans. Scientists know a lot about the components that make up metabolic syndrome, but they know less about the overall syndrome. The key element seems to be insulin resistance, but that is largely a result of obesity (especially abdominal or visceral fat) and lack of exercise. Thus, the root cause is hard to determine.

The best treatment for metabolic syndrome is a healthy diet, regular exercise, and weight loss, even if you don't lose much. See the Diversity Issues box on page 250.

5. C-Reactive Protein (CRP)

Scientists have known for some time that inflammation in the blood vessels can trigger heart attacks and strokes

by causing the plaque buildup in the arteries to become inflamed and unstable. This can result in the plaque rupturing and a clot developing that induces a heart attack or stroke. Inflammation can be measured with a blood test that checks for a substance called **C-reactive protein**, a marker for this inflammation. CRP is produced by the liver in response to inflammation somewhere in the body and is now recognized as an important factor in heart disease, Alzheimer's, cancer, and diabetes. Elevated levels of CRP are linked to an increased risk for heart attack and stroke. A person can have no outward signs of inflammation but still have subtle inflammation and hence elevated CRP.

Twenty-five percent of Americans who have heart attacks have no identifiable risk factors. That is why scientists have been searching persistently for another piece of the puzzle; CRP looks to be one of the missing pieces.

Doctors are not recommending universal blood testing for CRP because even something as simple as the common cold (or minor injuries) can boost it. What causes the inflammation?

- ✓ Unhealthy diet, especially high in saturated and trans fats
- ✓ Obesity (fat cells release proteins that cause low-level inflammation) and excessive eating (the bigger the meal, the higher CRP levels climb)
- ✓ High LDL and low HDL
- ✓ High blood pressure and smoking (both damage the lining of blood vessel walls)
- ✓ Lingering infections (such as chronic gum disease, sinus infections, urinary-tract infections, and sexually transmitted diseases).

What can be done?

- ✓ Regular exercise. Physically fit people have lower CRP levels.
- ✓ Cholesterol-lowering drugs called statins also reduce CRP, as do aspirin and some other medications. Low doses of aspirin (e.g., a "baby" aspirin) are recommended for patients with coronary disease who are not taking other anticoagulants and do not have contraindications to aspirin. Also, antibiotics work.
- ✓ Not smoking. Smoking harms the entire cardiovascular system.
- ✓ Diet. People who eat a diet with a high-glycemic load have higher CRP. See Chapter 9 for information on a high-glycemic diet. Also, eat foods rich in omega-3 fatty acids (salmon, tuna, sardines, flax seeds, lots of fruits and vegetables, and whole grains).
- ✓ Brush and floss your teeth thoroughly, and get dental checkups.
- ✓ Tame stress and depression.

- ✓ Protect against irritants (minimize unprotected exposure to the sun, drink alcohol in moderation).
- ✓ Rein in infections. Get vaccinated against flu, pneumonia, hepatitis B, and HPV (for women), and treat sexually transmitted disease and gum and sinus infections.

6. Homocysteine

Homocysteine is an amino acid in the blood and a natural by-product of protein metabolism. The consumption of protein from meat or vegetable sources (such as soy) starts a series of biochemical reactions that ultimately lead to the production of homocysteine. Normally homocysteine is converted into non-damaging amino acids by folacin (often called folate or folic acid) and vitamins B₆ and B₁₂. However, in some individuals these processes are impaired, and homocysteine accumulates in greater quantities than it would normally. Studies have shown that too much homocysteine in the blood is related to a higher risk of CHD, stroke, peripheral vascular disease, and cognitive decline (or dementia). Further, it is known that homocysteine causes injuries (or “nicks”) and inflammation in cells lining the arteries, makes the blood more prone to clotting, and promotes the oxidation of low-density lipoprotein which makes it more likely that cholesterol will be deposited as plaque in the blood vessels. A high homocysteine level is considered to be a risk factor for CVD and to be in the same league as cholesterol.

Homocysteine levels in the blood are strongly influenced by diet as well as genetic factors. The dietary components with the greatest positive effects are folic acid and vitamins B₆ and B₁₂. Folic acid and the B vitamins help break down homocysteine and thus lower concentrations in the blood. Also, studies reveal that low blood levels of folic acid are linked with a higher risk of fatal CHD and stroke.

Along with diets high in protein and low in B vitamins, heavy smoking has been linked to high homocysteine levels. Heavy smokers have up to 50 percent higher homocysteine levels than nonsmokers. Homocysteine levels above 15.8 micromoles/liter have a three-fold greater risk of heart attack than do lower levels. You should aim for a level of 9 mg/dl or less.

Although evidence for the benefit of lowering homocysteine levels is lacking, people with high risk should be strongly advised to get enough folic acid and vitamins B₆ and B₁₂ in their diets. Foods high in these nutrients include

- ✓ Folacin: leafy greens, broccoli, wheat germ, beans, whole grains, fortified oatmeal
- ✓ Vitamin B₆: whole grains, bananas, potatoes, beans, fish, meat, poultry

- ✓ Vitamin B₁₂: meat, poultry, liver, eggs, dairy, fish, fortified cereals, soy products

It has been suggested that laboratory testing for homocysteine levels can improve the assessment of CHD risk. It may be particularly useful in people who have a personal or family history of CVD, but in whom the well-established risk factors (inactivity, smoking, high blood pressure, obesity) do not exist.

TREATMENT FOR BLOCKED CORONARY ARTERIES

As you have discovered, most of the risk factors linked to coronary heart disease can be controlled. The way you live, the choices you make, can have a profound impact on the health of your cardiorespiratory system. When coronary arteries become blocked, usually the first treatments prescribed are diet modification (low fat) and exercise therapy. These are two major areas of one's life that, if maximized, can have positive results. When these methods are unsuccessful, the following procedures may be required.

Drug Therapy

This involves drug treatment affecting the supply of oxygen to the heart muscle or the heart's demand for oxygen. Some drugs (coronary vasodilators) cause the blood vessels to relax, enlarging the opening inside them. Blood flow then improves, and more oxygen reaches the heart. Nitroglycerine is the most commonly used drug in this category. Another category of drugs (beta blockers) slows



Many U.S. companies are adopting “Shape-Up or Pay-Up” programs where employers penalize their unfit employees by requiring them to pay higher health insurance premiums (than their more fit coworkers) if they smoke, are overweight, or don't control blood pressure, diabetes, or cholesterol. Do you support this idea? Why or why not?

down the heart rate or reduces blood pressure, thus decreasing the heart's need for oxygen, reducing its workload. There are many other classifications of drugs used to treat CVD as well (e.g., the statins).

Angioplasty (or Balloon Angioplasty)

The AHA describes this treatment as a nonsurgical procedure that improves the blood supply to the heart by dilating a narrowed coronary artery. The blocked part of the coronary artery must be identified before this technique is performed. During this process (cardiac catheterization), a doctor guides a thin plastic tube (catheter) through an artery in the arm or leg into the coronary arteries. A liquid dye, visible in X rays, is injected into the catheter, and X-ray movies are taken as the dye flows through the arteries. Doctors can identify obstructions in the arteries by tracing the flow of the dye. Once obstructions are identified, a catheter having a balloon tip is inserted inside the first; the balloon tip is inflated at the obstruction site. This compresses the plaque and enlarges the opening of the blood vessel. The balloon is deflated, and both catheters are removed. The process injures the vessel wall, causing the area to grow new cells. Some people grow too many cells, reclogging the artery. About 20 percent of people who have this treatment have renarrowed arteries within 6 months. The introduction of stents (cylinders that prop the arteries open) has substantially reduced the risk of arteries closing again. However, the reclosure risk is still 10 to 20 percent within the first year.

Coronary Bypass Surgery

This is a surgical technique in which doctors take a blood vessel from another part of the body (usually the leg) and use it to detour around a blockage in the coronary artery. Blood flow to the heart is restored.

THE FUTURE . . . FOCUS ON LIFESTYLE

The cost of treating cardiovascular diseases in this country is staggering. Many scientists believe we will be more successful if we focus on prevention rather than rely on expensive, high-tech treatments. “An ounce of prevention is worth a pound of cure” will in all likelihood be the slogan of the twenty-first century. Heart disease prevention in our future will focus primarily on lifestyle changes and approaches that involve “mind and body” concepts. Many scientists are already substantiating these trends in their research and medical practices.

One example is Dr. Dean Ornish, cardiologist, clinical professor of medicine at the University of California at San Francisco, and pioneer in the treatment of CVD. He found that after treating his patients with the current, recommended medical procedures—medication, angioplasty (balloon technique), and coronary bypass surgery, all expensive and dangerous—most did not stay well. Despite the procedures, some died and many returned for further treatment. He began to question the wisdom of such dramatic medical care for heart disease. He found it interesting that lifestyle factors could trigger all mechanisms known to cause CVD. The lifestyle choices we make each day, such as what we eat, how we respond to stress, how much we exercise, and whether we use tobacco, have a profound impact on the heart's health. With this concept in mind, he developed a plan that focuses on lifestyle. His program, “Reversing Heart Disease,” is having significant success in reducing atherosclerosis without medication or surgical procedures. The program involves the following lifestyle changes:

1. A special diet is recommended. The Reversal Diet is 10 percent fat, 70 to 75 percent carbohydrate, 15 to 20 percent protein, and 5 milligrams of cholesterol per day. In comparison, the typical American diet is 40 to 45 percent fat, 25 to 35 percent carbohydrate, 25 percent protein, and 400 to 500 milligrams of cholesterol per day. The Reversal Diet allows, but does not encourage, moderate alcohol consumption (less than 2 oz. per day). It excludes caffeine, allows moderate use of salt and sugar, and is not restricted in calories.
2. Smoking is prohibited.
3. Thirty minutes a day or 1 hour every other day of moderate exercise is prescribed.
4. Stress management methods are prescribed every day. These include yoga stretches, progressive relaxation, abdominal breathing, meditation, and imagery.
5. Psychological support should be enhanced. This involves increased time spent talking about feelings with friends and family and participating in spiritual and religious activities.

Mind and Body Connection

The traditional risk factors explain only a portion of the known causes of heart disease. Why do some people develop heart disease while others do not? Clearly, all the risk factors are important, but could there be something more? Are there common psychological—and perhaps even spiritual—factors that lead to or prevent coronary heart disease? Is there an unconscious connection between mind, body, and spirit that would explain the unknown causes of heart disease?

Scientists are examining these questions: Is laughter good for you? Can prayer bring down blood pressure? Does a bad marriage or a divorce suppress your immune system? Does listening to others lower blood pressure? Is a cynic more likely to have heart trouble? To each of these questions there is a scientist able to answer “YES!” and provide data to back it up. There is a whole field of mind–body research tapping into the interaction between our immune systems and our bodies, minds, moods, and spirit. Just as we learned the importance of exercise and nutrition to our health, we are discovering ways to go deeper into inner wellness. Ponder these studies that support the mind–body concept:

- ✓ Norman Cousins, author, philosopher, and former professor at the Department of Psychiatry and Bio-behavioral Sciences at UCLA Medical School (now deceased), found that laughter heals because it replaces fear and stress with serenity and homeostasis. He taught others never to underestimate the capacity of the human mind and body to regenerate, even when the prospects seem most dismal. His research confirmed that positive emotions boost health.
- ✓ Larry Scherwitz, professor of psychology at the University of California, found that people who overuse the self-centered pronouns “I,” “me,” and “mine” are twice as likely to have heart attacks. These people are hostile, have a low level of trust in others, and put their self-centered interests and pleasures ahead of others.
- ✓ Redford Williams of Duke University found that cynics, being full of contempt for other people, and angry hostile people have more than their share of heart trouble.
- ✓ Many scientists have developed psychological tests to measure levels of anger that bring on heart attacks. Studies linking social support (i.e., loving family, happy marriage, one or two close friends, support groups) to vitality, longevity, lowered blood pressure, and healthier immune systems confirm that emotions may regulate health. These head and heart factors are powerful medicine.
- ✓ Dean Ornish, M.D., is convinced that one cause of blocked coronary arteries stems from three kinds of loneliness (or isolation): (1) we feel isolated from ourselves, (2) we lack “connectedness” and intimate relationships with others, and (3) we have a cosmic loneliness of the spirit (or higher part of ourselves). He feels that isolation leads to chronic stress and to illnesses such as heart disease and that real intimacy and feelings of connectedness with

others can be healing. He argues that the ability to be intimate with ourselves, with others, and with a higher spirit—within ourselves—is the key to emotional health and essential to the health of our hearts as well.

- ✓ Mind–body connection authority Jon Kabat-Zinn, author of *Full Catastrophe Living*, advocates meditation as a technique to bridge the gap between the mind and the heart to improve health, ease pain, and reduce stress.
- ✓ Another authority on the mind–body connection, Bill Moyers, author of *Healing and the Mind*, explored the latest research in the field of medicine known as psychoneuroimmunology. He found evidence supporting the ways in which thoughts, feelings, and emotions influence our health. Moyers documents the importance of mind–body interactions in the prevention and treatment of illness.



PRESCRIPTION FOR ACTION

You’ve read the chapter. Now go do one or more of these:

- ✓ Write down the top two reasons your last fitness program didn’t work. Then, write down what you’ll do this time to avoid those same pitfalls.

Reasons failed:	Strategies to counter:
•	•
•	•
- ✓ Get your blood pressure checked.
- ✓ Do two of the following to maintain a healthy blood pressure or reduce hypertension:
 - Have a high-fiber snack (something with at least 5 or more grams of fiber).
 - If you smoke, cut in half the number of cigarettes smoked today.
 - Avoid alcohol.
 - Reduce caffeine.
- ✓ Measure your waist.
- ✓ Calculate your BMI.
- ✓ Read food labels and avoid all trans fats (anything hydrogenated or partially hydrogenated).
- ✓ Get 30 minutes of exercise today.
- ✓ Reflect on the meaningful people in your life. Connect with two of them today via e-mail or telephone, or write a letter.



Frequently Asked Questions

Q. True or false? Your good lifestyle choices counteract your bad ones.

A. False. Sorry, but eating lots of fruits and vegetables or being at your target weight, for example, cannot compensate for smoking or not exercising. You have to look at all your risk factors and address each one individually.

Q. The United States is such a diverse nation with many different ethnic populations. Are the leading causes of death the same for each?

A. Look at Figure 8-1. You can see at a glance that CVD disease is by far the number one killer of all people in the United States, regardless of ethnicity. Far down the list is cancer, followed by accidents. Every 36 seconds someone in this country dies of CVD, whereas every 56 seconds someone dies of cancer.

Q. I recently had my cholesterol tested. Why didn't the figures for LDL and HDL cholesterol add up to the total cholesterol number?

A. Because the total includes several other substances. About 10 to 15 percent of the total consists of other particles, notably very low-density (VLDL) and intermediate-density lipoprotein (IDL). While these also contribute to clogged arteries, there hasn't been enough research to correlate specific VLDL and IDL numbers with heart risk, so doctors generally don't consider them. As you know, more important than total cholesterol, since it is a combination of different substances, are the HDL and LDL numbers. The isolated LDL and HDL numbers, with diametrically different effects on the heart, are the best indicators of coronary risk. Ask your doctor for those scores, available on a blood test called total lipid profile.

Q. My friend, who just had a full body scan, suggested that I should get one too. Is a full body scan recommended? What are the pros and cons?

A. Full body scans are CT (computed tomography) examinations of the entire body that are being offered to healthy people to look for early signs of disease. Diagnostic CT scanning to examine specific parts of the body when there is a problem has been used for decades. But scanning almost the entire body for screening is a new concept.

Full body CT screening is controversial. The potential benefit is the early detection of significant disease, such as tumors or plaque in the coronary arteries. The risk is that of radiation exposure. X rays can cause damage to cells in your body. Even at low doses there is a risk of causing cancer. That's too high a risk for a test that is not medically necessary, especially if you have one every few years.

Another downside is the likelihood that the scan will reveal some abnormality in the body that is benign or inconsequential. But because the abnormality has been "seen" on the scan, you may have to have additional anxiety-provoking tests. The exam also has its limitations—it can't detect every abnormality, so it does not absolutely rule out the possibility of cancer or other disease.

Cost is a factor, too. These scans are not cheap, and they are not covered by health insurance. The American College of Radiology does not sanction full body scans for screening healthy people.

Q. Is it really OK to eat eggs two or three times a week even though I'm on medication to keep my cholesterol down?

A. Yes, it is. Research shows that two or three eggs weekly are not apt to raise blood cholesterol. The real villain is saturated animal fat, found in whole milk, fatty meat, cheese, and butter. A Harvard study of 120,000 men and women found that a daily egg did not boost the risk of heart disease or stroke. Eggs are rich in choline, needed for proper brain functioning, and the antioxidant lutein, believed to help protect eyes from macular degeneration.

Q. Why does exercise prevent heart disease?

A. Here's at least part of the answer. In addition to lowering blood pressure, cholesterol, and body fat, certain components in the bloodstream called cytokines act to either promote atherosclerosis (atherogenic) or prevent it (atheroprotective). Research published in the *Journal of the American Medical Association* studied the effect of long-term exercise on those blood factors. The participants worked out for an average of 2½ hours per week for 6 months. After the exercise program, production of the atherogenic blood factors fell by 58.3 percent and the level of atheroprotective factors rose by 35 percent. In any individual, the amount of change was proportional to the level of activity. In other words, the participants who exercised more enjoyed more of the beneficial effects in their blood levels. Those who exercised less had a smaller response. It appears that with every extra minute you exercise, your body is producing more protection and causing less destruction of your arteries. Although there is likely an upper limit (or point of diminishing returns), this study gives you one more reason to exercise.

Q. Don't more women die from breast cancer than heart disease?

A. No. Across nearly all racial and ethnic groups, heart disease is the number one killer of women just as it is the number one killer of men.

Q. How often should I have my blood cholesterol measured?

A. Adults should be screened at *least* once every 5 years, but more frequently if the total cholesterol is elevated, HDL is low, and/or they have other cardiac risk factors.

Q. How many people in the United States adhere to a lifestyle that reduces the risk of coronary heart disease?

A. It is somewhat difficult to pinpoint the exact number, but findings from the Nurse's Health Study (involving more than 80,000 women) may give us some insight. The study revealed that women in this low-risk category make up only *3 percent of the population*, a pitifully low number. That means 97 percent of the U.S. population does not! The study confirmed that the risk of heart disease can almost be eliminated if we follow a few rules. The heart-healthy lifestyle defined in this study involves

- Engaging in moderate to vigorous physical activity for at least half an hour per day
- Not smoking
- Eating healthy and consuming a diet
 - Low in saturated fat (found in animal products) and trans fat (found in cookies, crackers, pies, cakes, donuts, candy, margarine)
 - High in fiber
 - High in folate (found in green leafy vegetables, orange juice, fortified cereals, legumes, and whole grains)

- High in omega-3 fatty acids (found in fish)
- Low in glycemic foods (found in sweets, etc., which raise glucose levels)
- Averaging at least half a drink of an alcoholic beverage a day
- Avoid being overweight

Q. How long do most people have type 2 diabetes before it is diagnosed?

A. On average, people have diabetes for 8 years before it is diagnosed. Regular visits to your doctor and regular fasting blood sugar tests can help detect the disease early (see Tables 8-4 and 8-5).

Q. I can find all kinds of information on high blood pressure but not much on low blood pressure. How low is too low?

A. Within limits, the lower your blood pressure, the better. For most people, blood pressure is not too low unless it causes signs and symptoms such as lightheadedness or fainting. Normal blood pressure is less than 120/80 millimeters of mercury (mmHg). Unusually low blood pressure should be evaluated by a physician. Unlike high blood pressure, there are no clear-cut standards for the diagnosis of low blood pressure. Low blood pressure is not a specific disease. It is usually a sign of an underlying problem.

Summary

Heart disease is the number one killer in the United States. Extensive studies have identified 16 factors that increase the risk of developing coronary heart disease. These factors lead to the development of atherosclerosis. The most significant factors are inactivity, high blood pressure, a high blood lipid profile, cigarette smoking, obesity, and diabetes. These 6 are labeled *primary* and all can be controlled. Four additional primary risk factors for CVD are positive family history, male gender (+ postmenopausal women), race, and age. These primary risk factors are all controllable. There are 6 more CVD factors labeled *secondary*. These are all controllable. They are stress, emotional behavior (especially negative emotional behaviors such as hostility and anger), excessive alcohol consumption (+ some illegal drugs), metabolic syndrome, C-reactive protein, and homocysteine. The more risk factors you have and the longer they are present, the greater the chance you have of developing heart disease. By age 20, you already have fatty deposits in your

coronary arteries. If your risk of CVD is low, keep up the good work by maintaining a healthy lifestyle. However, if your coronary risk is high, now is the time to act. You can't do anything about your race, heredity, sex (gender), or age. However, you can choose to act on the 12 risk factors under your control.

Several treatments are available for coronary arteries that become blocked due to advanced atherosclerosis. These include exercise and diet modification, drug therapy, angioplasty, and coronary bypass surgery. The cost of treating CVD continues to spiral upward every year. To counter this trend, many scientists are convinced that preventing CVD through lifestyle change is the key to maximizing heart health.

Adopting a healthy lifestyle early in life can add years to your life and life to your years. In addition, great discoveries await us as the field of mind and body research gains wider acceptance in the quest for increased well-being.

Let the words of Don Ardele inspire you to maximize your potential to be the best you can be: “Excellence ain’t easy. If it were, everyone would be

doing it and it would be ordinary. Know that in lots of ways, the deck is stacked against anyone who wants to excel. Do it anyway.”



Internet Resources

America On the Move

www.americaonthemove.org

Help to add 2,000 steps a day and reduce calories by 100 calories a day.

American Diabetes Association

www.diabetes.org

National nonprofit organization providing diabetes research, information, and advocacy.

American Heart Association

www.americanheart.org

Includes statistics and information on heart disease and stroke risk information.

American Stroke Association

www.strokeassociation.org

Provides information on strokes.

Centers for Disease Control and Prevention

www.cdc.gov

Provides links to health and disease information. Lead federal agency for enhancing and promoting disease prevention and health education. Can find information about how the United States is doing on *Healthy People 2010* goals.

Cooper Institute for Aerobics Research

www.cooperinst.org

Has exercise and health research information.

DASH: Dietary Approaches to Stop Hypertension

www.nhlbi.nih.gov/health/public/heart/hbp/dash

Provides dietary information to lower high blood pressure.

Harvard Medical School Health Publications

www.health.harvard.edu

Consumer-friendly site features a Heart Letter, Mental Health Letter, Women’s Health Letter, Men’s Health Letter, and special health reports.

Health A to Z

www.healthatoz.com

You can search for information on general health topics.

Healthfinder, U.S. Government

www.healthfinder.gov

Lists government health resources and offers links to over 500 consumer health sites.

Healthy People 2010

www.healthypeople.gov

Provides information on the goals, objectives, leading health indicators, and priority areas in the federal government’s publication *Healthy People 2010*.

Healthy People 2020

www.health.gov/healthypeople

Has information and guidelines for a healthy America.

Journal of the American Medical Association

www.ama-assn.org

Provides abstracts and news update summaries of latest *JAMA* reports.

Mayo Clinic

www.mayohealth.org

You can search by major health/disease subject area.

MedlinePlus

www.nlm.nih.gov/medlineplus

National library of medicine.

National Coalition for Women with Heart Disease

www.womenheart.org

Provides CVD information for women.

National Heart, Lung, and Blood Institute

www.nhlbi.nih.gov/index.html

Gives information and statistics about heart and lung disease.

National Institutes of Health

www.nih.gov

Has links to a vast number of health sites and provides up-to-date research about disease prevention and treatment. Part of the U.S. Department of Health and Human Services.

National Library of Medicine

www.nlm.nih.gov

You can search for published scientific medical literature.

National President’s Challenge

www.presidentchallenge.org

Provides a personal activity log with exercise programs to pick from, encouragement to exercise for 30 minutes, and more advanced programs for those who want a more strenuous workout.

Smoke Clinic

www.smokeclinic.com

Helps people stop smoking. Provides a structured program similar to those used in real-world smoking clinics.

U.S. Surgeon General

www.surgeongeneral.gov/topics/obesity

Provides information on weight management.

Web MD

www.webmd.com

Has news items, advice, and articles on health.

Your Disease Risk

www.yourdiseaserisk.harvard.edu

An interactive site to assess your disease risk factors.

LAB Activity 8-1

Name _____ Class/Activity Section _____ Date _____

Are You at Risk for Heart Disease?

Your chances for developing CVD depend on a variety of habits and risk factors. Smoking, physical activity, stress management, blood pressure, and cholesterol are some of the important prognosticators for heart disease. Read each question and circle the most appropriate response as it relates to your lifestyle. Finally, add the points associated with your response to obtain your total score and risk of developing heart disease.

1. Do you smoke cigarettes?	Yes No	12 0
2. Do you use other tobacco products (pipe, cigars, chewing, snuff)?	Yes No	3 0
3. Do you usually exercise vigorously at least three times a week for 20 to 60 minutes?	Yes No	0 10
4. How would you describe your lifestyle?	Sedentary (inactive) Somewhat active Very active	6 2 0
5. What is your blood pressure?	High 140/90+ Normal Don't know	9 0 2
6. What is your total cholesterol?	High 240 mg/dl+ Desirable Don't know	9 0 2
7. Has anyone in your family ever been told he or she had any form of heart disease (parents or siblings <55 years)?	Yes No	5 0
8. Have you ever had any of the following?		
a. Pain or discomfort in chest and surrounding areas?	Yes No	2 0
b. Unaccustomed shortness of breath with mild exertion?	Yes No	2 0

9. What is your gender?	Female	0
	Male	4
10. Have you ever been told you have diabetes?	Yes	4
	No	0
11. Have you suffered a personal loss or misfortune in the past year that had a serious impact on your life? (e.g., job loss, disability, separation/divorce, jail term, or the death of someone close to you)?	No	0
	Yes, 1 serious loss or misfortune	1
	Yes, 2 or more	2
12. Do you feel you handle everyday stress well?	Yes	0
	No	2
13. Would you describe yourself as a type D or an angry/hostile person?	Yes	4
	No	2
14. If you are male, what is your age?	Under 40	1
	40+	3
If you are female, what is your age?	Under 50	0
	50+	3
15. What is your race?	White	0
	African American	3
	Hispanic	1
	Other	1
16. How would you describe your weight?	Normal/below	0
	Normal to +30 lb.	1
	+30 lb. or more	2
17. Do you consume meat, eggs, cheese, butter, whole milk, and fried foods?	0 to 5 times/week	0
	5–10 times/week	2
	2 to 3 servings/day	3
	Over 3 servings/day	<u>6</u>
Your Total Score		<u> </u>

SCORING

Scores of 0 to 16

Your risk is **low** for developing heart disease at this time. Evaluate your risk every year since risk factors such as blood pressure, cholesterol levels, and age change from year to year. If you have any uncontrollable risk factors, you would be wise to modify other risk factors to protect your cardiorespiratory system.

Scores of 17 to 29

Your risk is **average** or moderate. Your score indicates there is room for improvement on some risk factors. If you have any uncontrollable risk factors, it is imperative to modify other risk factors to protect your cardiorespiratory system.

Scores of 30+

You have a **high** risk of developing heart disease. You should take action **immediately** to modify all controllable risk factors.

LAB Activity 8-2

Name _____ Class/Activity Section _____ Date _____

Evaluation of “Are You at Risk for Heart Disease?”

After completing the *Are You at Risk for Heart Disease?* assessment, answer the following questions:

1. List the factors you identified that contribute to your risk of coronary heart disease.
2. List at least five personal lifestyle changes you can make to lower your risk for heart disease. Be specific; don't say, “Eat better,” for example.
3. Take the *Are You at Risk for Heart Disease?* assessment for a parent or friend. What is his or her score? What advice would you give to help to lower his or her score?
4. List **your** personal controllable risk factors. How can you make changes in each one to become more heart healthy?

5. List **your** personal *uncontrollable* risk factors.
6. What if some physicians refused to treat people when they discover that they smoke or don't exercise or have diets high in fat. Discuss how you feel about this decision.
7. "You've got to die of something, so why worry about a healthy lifestyle?" Argue against.
8. "My grandmother lived to be 90 years old and never thought about a healthy lifestyle. So I won't either." Why is this *not* such a good idea?
9. "I don't smoke cigarettes, so cigarettes don't affect me." Respond and explain your response.
10. Do you have more than one alcoholic drink per day (if you are female) or more than two per day (if you are male)? Do you ever binge drink (more than four for women and more than five for men in a 2-hour period)? Discuss how alcohol impacts your personal risk for CVD.

LAB Activity 8-3

Name _____ Class/Activity Section _____ Date _____

Lifestyle Scenario: Critical Thinking

Read the opening scenario concerning Rob at the beginning of this chapter. You were the physician on call when he was brought in. Complete a medical history on this patient and answer his wife's questions.

1. List Rob's five primary risk factors for heart disease given in the scenario.
2. List Rob's two secondary risk factors for heart disease.
3. What three or four lifestyle changes will you tell Rob to make to reduce his heart disease risk?

Rob's wife has read the chart. She is distraught and has several questions for you. Please respond.

4. "Doctor, I really don't understand some of the words used on the chart. What is angina? Myocardial infarction? What is atherosclerosis, and will it ever go away?"

5. "I saw that his cholesterol was 280, his HDL level was 28, and his LDL level was 174. His cholesterol and HDL ratio was 10, and his triglycerides were 325. What do each of these mean? What is normal or desirable for each?"
- a
- b
- c
- d
- e
6. "Rob doesn't want to quit smoking—he's smoked for 20 years. Why is smoking bad for his heart?"
7. "A nurse said Rob needs a special exercise program to aid in recovery. Won't exercise strain his heart? What good will it do?" (Give three benefits.)
8. "Rob enjoys having an occasional glass of wine. Will he have to give this up?"

LAB Activity 8-4

Name _____ Class/Activity Section _____ Date _____

Are You at Risk for Diabetes?

Directions: Answer the questions in Part I to evaluate your risk for developing diabetes. Complete Part II to learn more about diabetes and the connection it has to heart disease.

PART I

Yes	No	
_____	_____	1. I am overweight (body mass index greater than 27; to calculate your BMI, multiply your weight in pounds by 705, divide the result by your height in inches, then divide that result by your height in inches again). What is your BMI? _____.
_____	_____	2. I get little or no exercise.
_____	_____	3. I have a parent with diabetes.
_____	_____	4. I am African American, Hispanic American, or Native American.
_____	_____	5. I am over 40 years of age (counts as one “yes” answer; if over 65 years of age, counts as two “yes” answers).
_____	_____	6. I am a woman who had diabetes during pregnancy or delivered a baby weighing more than 9 pounds.
_____	_____	7. I have a brother, sister, or parent with diabetes.
_____	_____	8. I have high blood pressure and/or high cholesterol.
_____	_____	9. I had a minimally elevated glucose level on a previous test (100–125 mg/dl)

Scoring: Each “yes” answer increases your risk of developing diabetes.

PART II

- How many “yes” answers did you have? _____
- Discuss your potential risk for developing diabetes.

3. List the warning symptoms of type 1 and type 2 diabetes.
4. Discuss the difference between type 1 and type 2 diabetes.
5. What can you do to prevent or reduce your risk of developing diabetes?
6. Why is diabetes such a serious disease?
7. Why does diabetes increase the risk for heart disease?
8. What segments of the U.S. population are at increased risk of diabetes?
9. How does diabetes affect the eyes, blood vessels, kidneys, genitals, and nerves?



Eating for Wellness

9

*Let your food be your medicine,
and your medicine be your food.*
—Hippocrates

Study Questions

You will have successfully mastered this chapter if you can answer the following questions:

1. What are the nine *2005 Dietary Guidelines for Americans*?
2. Can you list the six major nutrients and describe their main function in the body?
3. What are the percentages of calories recommended in the diet for carbohydrates, proteins, and fats?
4. Can you identify the health benefits of fiber and list good food sources of fiber?
5. What are the differences between complex and simple carbohydrates?
6. Can you identify the correct descriptions of cholesterol, saturated fats, monounsaturated fats, polyunsaturated fats, and trans fats and state the recommended daily limits of each?
7. Are you able to calculate fat gram allowances for specific daily calorie intakes?
8. Can you describe the role phytochemicals and antioxidants play in nutritional health, and identify foods high in these compounds?
9. What are four preventive factors relating to osteoporosis?
10. Can you describe the USDA's MyPyramid food guidance system?
11. Can you give 10 specific examples of small changes that you can incorporate into daily food selections and preparations that could make a significant change in your nutritional wellness?
12. Are you able to look at a food label and identify the largest ingredient; calculate the percentage of calories that come from fat, carbohydrate, and protein; and identify the sources of fat?
13. Can you identify three ways to eat nutritiously in a fast-food restaurant?

You will find the answers as you read this chapter.



Visit the Online Learning Center for *A Fit Way of Life*, www.mhhe.com/robbinsfit2e, for additional quizzes and other study aids.

Terms

- antioxidants
- carbohydrates
- cholesterol
- complex carbohydrates
- fat
- fat-soluble vitamins
- fiber
- free radicals
- glycemic index (GI)
- glycogen
- hydrogenation
- insoluble fiber
- ketone bodies
- lactovegetarian
- macrominerals
- minerals
- monounsaturated fat
- nutrient density
- omega-3
- osteopenia
- osteoporosis
- ovo-lactovegetarian
- phytochemicals
- phytoestrogens
- polyunsaturated fat
- protein
- saturated fat
- semivegetarian
- simple carbohydrates
- soluble fiber
- strict vegetarian (or vegan)
- trace minerals
- trans-fatty acids (trans fats)
- vitamins
- water-soluble vitamins

In a world where so many things seem out of our hands, taking control of what you eat is an important personal way to affect how you feel. Fundamental knowledge about nutrition can make a tremendous contribution to your level of wellness. It can help you make food choices that will enhance your health and vitality. This knowledge can also help you decipher social influences and messages related to eating. This is another step toward assuming self-responsibility for your well-being and health. Learning about nutrition can be exciting. Eating is a daily activity, so you have many opportunities to affect your wellness in a positive way. Food not only sustains life but also has a clear link to *disease prevention*. Scientists are finding that certain foods (especially fruits, vegetables, and whole grains) are directly associated with the prevention of cardiovascular disease and certain cancers—the leading causes of death in our country. We are fortunate to live in a country where food is plentiful; we have wide and varied choices. We must learn, however, to make healthy choices because we live in an environment where unhealthy choices are also plentiful.

We tend to see diet as affecting only the physical dimension of wellness. Food, however, can be associated with all the dimensions. Much of our social life revolves around food. Providing food is an important sign of caring. Eating and being fed are intimately connected with our deepest feelings. Table 9-1 gives examples of how food relates to all seven dimensions of wellness. Perhaps you can think of other connections.

After reading this chapter, you should be able to make responsible food choices in your pursuit of high-level wellness. You have heard it before, but it is remarkably true: You are what you eat.

CHANGING TIMES

In the agricultural lifestyle of the past, most people grew and prepared their food. Foods were fresh and simple. Early Americans consumed much greater amounts of fresh fruits, vegetables, and grains and lesser amounts of salt, fats, refined sugars, and processed foods than Americans do today. Today's fast-paced technological society has contributed to drastic changes in the way we eat. Dual-career and single-parent families are commonplace.

TABLE 9-1 *Food Is Associated with Every Dimension of Wellness*

Dimension	How Food Is Associated
Physical	Food is required for physiological nourishment, genetic growth, and survival.
Emotional	Food is often used as a reward, to please, to soothe feelings, and to ease depression or stress.
Social	Food is often at the heart of social events, celebrations, and family interactions.
Intellectual	Having a healthy relationship with food requires informed consumerism, knowledge about the science of nutrition and sound dietary principles, and the ability to read food labels.
Spiritual	Food is used in rituals and is part of spiritual cleansing. Abstinence from eating or from eating particular foods often accompanies spiritual growth experiences. Food is used in many death rituals throughout the world.
Environmental	The human need for food demands food and crop quality and protection from contamination, protection of the food chain, and strategies for combating world hunger.
Occupational	Food is often a part of business meetings and social gatherings and breaks at work. Also, the income generated by our occupations determines our food choices. Institutional food preparation is big business. The business of "food" provides a lot of jobs.

As parents juggle careers, child care, social and professional meetings, education, and recreation, they often skip meals, eat on the run, or throw meals together quickly. More than ever, they consume meals behind the wheel of a car, in what food industry experts call "dashboard dining." Even most gas stations have become mini-foodmarts. As a result, the food preparers are often fast-food restaurants or manufacturers of frozen, processed, or snack foods. In the last 30 years our daily intake of food has dramatically shifted from at-home sit-down meals to snacking, with chips, sodas, hamburgers, french fries, and pizza leading the charge. Food preparation and advertising are big business, and the purpose of mass advertising is to sell products, not necessarily to enhance our nutrition. Supermarket shelves are lined with packaged food products bearing little resemblance to the original farm product. Most are highly processed, often stripped of key nutrients. The result is a new form of



Eating is one of life's pleasures, and the choices we make can have a dramatic impact on our present and future well-being.

malnutrition—not caused by a lack of food, but by our eating too much of the wrong foods. As we have progressed from eating wheat and berries to consuming tacos and french fries, the incidence of heart disease, obesity, type 2 diabetes, and cancer has increased. This progression has also cost us our vitality and seriously compromised our immune systems.

Poor diet is said to contribute to 4 of the top 10 leading causes of death in our country. Studies repeatedly identify five shortfalls in our eating habits:

1. Too few fruits and vegetables
2. Too little fiber
3. Too much fat
4. Too many refined sugars
5. Too much food overall (i.e., calories)

Take a serious look at these habits. How many of them relate to you?

A U.S. Department of Agriculture survey revealed some interesting facts about nutrition knowledge and behavior in this country. Although public awareness of the importance of nutrition continues to grow with the help of all types of media and educational materials, only 23 percent of Americans declare an interest in improving their diet. The majority know that their diet is poor but believe that healthful eating is too complicated or that

they'll have to give up their favorite foods. According to government statistics, only 10 percent of the population can be classified as having a "good" diet. Television contributes to the problem by presenting mixed messages about diet and nutrition. We are exposed to hundreds of commercials for sugary, high-fat snacks, often featuring enchanting music, jingles, and appealing characters. In prime-time programming, nutrition is anything but balanced—grabbing a snack is the norm.

In college, you are faced with the perhaps new responsibility of buying and preparing your meals or making daily cafeteria or food court selections. Unfortunately, many college students are unaware of or apathetic about the implications of poor dietary habits on the future development of chronic diseases. Many young adults have been raised in the "happy meal" world of snacks and fast foods. Studies show that a majority of college students do not consume the recommended five to nine servings of fruits and vegetables a day, do not eat enough fiber, and eat too much saturated fat. In one study, 59 percent of students said they know their diet is worse since they started college. Unfortunately, many of these habits often continue into later adulthood. Since maintaining healthy dietary habits is essential to lifelong wellness, the college years can be a crucial time to develop healthy practices.

Healthful eating *can* be enjoyable and is easier to sustain than most people think. The underlying approach for dietary choices should be to combine basic nutrition *knowledge* with positive and practical *action*. Small, gradual changes can collectively produce substantial and sustainable dietary improvements. The purpose of this chapter is to help you begin adopting these improvements.

Dietary Guidelines for Americans

As a service to the American people, the U.S. Department of Health and Human Services publishes the *Dietary Guidelines for Americans*. Revised every 5 years, these guidelines (Table 9-2) help answer the question, "What should we eat to stay healthy and prevent



We have become a "snack food nation," consuming over \$50 billion in snacks each year.

TABLE 9-2 2005 Dietary Guidelines for Americans***1. Balance nutrients with calories.**

Many people eat too many calories yet fail to eat enough nutrient-dense foods. Limit the intake of saturated and trans fats, cholesterol, added sugars, and salt. Choose foods high in vitamins, minerals, and fiber. The USDA's MyPyramid and the DASH eating plan are good plans that translate nutrient recommendations into food choices. (Both plans are covered in this chapter.)

2. Manage weight.

With overweight and obesity becoming a major public health problem in the United States, most Americans need to reduce the number of calories they consume. By making small daily decreases in food intake and increasing activity, gradual weight gain over time can be avoided.

3. Be physically active.

To prevent chronic diseases, engage in moderate-intensity physical activity at least 30 minutes on most days. To prevent weight gain, engage in approximately 60 minutes of moderate-intensity activity. For sustained weight loss, aim for 60–90 minutes daily of moderate-intensity activity. You can do the activity all at once or spread it out in shorter bouts throughout the day.

4. Food groups to encourage.

Eat 5–9 servings of fruits and vegetables every day. Each week aim to get a variety from all vegetable subgroups (dark green, orange, legumes, starchy vegetables, etc.). Make half of all grains eaten “whole” grains. Consume 3 cups of low-fat dairy per day.

5. Eat the right fats.

Consume less than 10 percent of calories from saturated fats and less than 300 mg/day of cholesterol. Keep total fat intake between 20 percent and 30 percent of calories with most coming from sources of polyunsaturated and monounsaturated fatty acids, such as fish, nuts, and vegetable oils. Limit intake of trans fats.

6. Make your carbohydrates count.

Choose fiber-rich fruits, vegetables, and whole grains often. Choose foods with fewer added sugars and artificial sweeteners.

7. Get less sodium; more potassium.

Consume less than 2,300 mg (approximately 1 teaspoon of salt) of sodium per day. Choose and prepare foods with little salt. At the same time, consume potassium-rich foods such as fruits and vegetables.

8. Go easy on alcoholic beverages.

If you drink, do so in moderation (no more than one drink a day for women; two for men).

9. Keep food safe to eat.

Wash hands and surfaces; keep raw and cooked foods separate; chill and defrost foods properly; avoid raw or undercooked foods.

*Recommended for healthy Americans age 2 and over.

SOURCE: U.S. Department of Health and Human Services. U.S. Department of Agriculture. *Dietary Guidelines for Americans 2005*. January, 2005. www.healthierus.gov/dietaryguidelines

chronic diseases?” The guidelines reflect the newest research on diet and health relationships, with the purpose of giving *practical* suggestions on how to make healthy diet adjustments. It is impossible to specify the perfect diet for every individual. However, these guidelines point out positive directions for everyday food selections that can help you maintain optimal health. The newest guidelines also recognize the value of physical activity and the importance of weight management by giving specific guidelines for exercise and calories. In 2002, the Institute of Medicine (the scientific advisory group to the National Academy of Sciences) identified specific guidelines for us to follow (see Table 9-3).

Nutritionists concur that simply issuing guidelines and disseminating recommendations is obviously insufficient to produce change in most people's eating behavior. As in making most lifestyle changes, you need

- ✓ *Knowledge* (to identify problem diet behaviors and how to improve them)
- ✓ *Motivation* (to make healthy changes)
- ✓ *A supportive environment* (to maintain changes in restaurants, supermarkets, worksite and school food services, nutrition labeling, and nutrition education in the schools)

TABLE 9-3 Daily Diet Recommendations

Cholesterol	Less than 300 mg
Carbohydrate	45–65% of calories
Protein	10–35% of calories
Total fat	20–35% of calories
Saturated fats/trans fats	Less than 10% of calories
Fiber	25 grams for women, 38 grams for men
Added sugars	Less than 25% of calories

SOURCE: National Academy of Sciences, Institute of Medicine. “Dietary Reference Intakes for Energy, Carbohydrates, Fiber, Fat, Fatty Acids, Cholesterol, Protein and Amino Acids.” September 5, 2002.

For many, the dietary guidelines seem difficult to attain in this fast-food, grab-it-and-go world. Rather than viewing them as impossible and unrealistic, let them inspire you, not intimidate you! Remember that these are *goals*. Look for ways to shift from wherever you are now, up a few notches. For example, add an extra serving of fruit to your day; try a new vegetable at dinner; substitute low-fat yogurt for cake as a dessert; walk an extra 15 minutes after classes.

So, where are the trans fats? What constitutes a “serving” of vegetables? What qualifies as a “whole” grain? Where are the “good” fats? How do you eat out healthfully? These questions are addressed in the following sections, and we give practical suggestions for making daily food choices that will enhance your nutritional wellness and get you closer to reaching the *Dietary Guidelines*.

NUTRITION BASICS

Your body is a priceless machine that needs fuel. This fuel should be comprised of six major nutrients: carbohydrates, proteins, fats, vitamins, minerals, and water. These nutrients fulfill three main functions in the body:

1. Provide energy
2. Build and repair body tissues
3. Regulate body processes

Only the carbohydrates, fats, and proteins contribute energy or calories (kcal) to your diet. To function at optimal efficiency, you need a balance of all six of the essential nutrient groups.

Carbohydrates

Carbohydrates are the major source of energy for the body. They are the body’s preferred form of energy. In fact, some cells, like brain cells, use only carbohydrates for fuel. Carbohydrates are stored in the liver and in muscles in the form of **glycogen**. It is recommended that our daily caloric intake be 45 to 65 percent carbohydrate. Carbohydrates have mistakenly earned the reputation of being fattening even though they provide only 4 calories per gram. Of course, any calories consumed in excess of body energy needs are stored as body fat. If we analyze the two types of carbohydrates, this unearned reputation can be understood. Carbohydrates, with the exception of milk sugar, come from plants. The two types are **simple carbohydrates** (sugars) and **complex carbohydrates** (starches).

Simple Carbohydrates (Sugars)

When you see the suffix *-ose* as an ingredient on a package label (as in sucrose, fructose, dextrose, and maltose) or see *corn sweetener*, *corn syrup*, *molasses*, *sorbitol*, or *honey*, think *sugar*. The presence of these refined and processed sugars in our diet accounts for carbohydrates’ “fattening” reputation. Instead of consuming the natural simple sugars found in fruits and milk, we consume too much of these hidden processed sugars.

The major sources of added sugars in Americans’ diets are

1. Soft drinks
2. Cakes, cookies, pies

3. Fruit ades and drinks, such as fruit punch and lemonade
4. Dairy desserts, such as ice cream
5. Candy

These refined sugars have been extracted from their natural sources and have little nutritional value other than the calories they contain—hence the name “empty calories.” Excess sugar throws the entire body chemistry off balance, causes fatigue, and dramatically weakens the immune system for up to 6 hours after ingestion. Even if you profess not to eat sweets, you probably consume more sugar than you realize because it is hidden in so many processed foods, such as chocolate milk, ketchup, barbecue sauce, cereals, and juice drinks. Proclaimed “low-fat” foods are often loaded with added sugars. One average 12-ounce cola drink contains 10 teaspoons of sugar. Eight ounces of low-fat fruit yogurt contain 7 teaspoons of sugar. *Jell-O* is 83 percent sugar. Check your breakfast cereal. Some are nothing more than “candy” fortified with vitamins. Look for cereals with no more than 5 or 6 grams of added sugar per serving.

Complex Carbohydrates (Starches)

The starches are potatoes, rice, whole grains, beans, and vegetables. These foods are low in calories. They are nutritionally dense, a rich source of vitamins and minerals that provides a steady amount of energy for many hours. What *is* fattening are the calorie-rich additives we often add to these foods (butter, sour cream, jams, gravies, sauces). Complex carbohydrates should constitute 35 to 55 percent of our total caloric intake, while simple sugars should be limited to only 10 percent. Carbohydrates supply many vital nutrients, such as vitamins, minerals, and water. In addition, they supply an important nonnutrient: dietary fiber. **Fiber** is the part of plant food that is not digested in the small intestine, where most other foods are digested and absorbed into the bloodstream. Fiber is



Whole-grain products are better for your health than those made with refined flours.

not a single substance but a large group of widely different compounds with varied effects on the body. Formerly called *roughage* or *bulk*, fiber was once thought of primarily as a filler—it takes up room, leaving less space for high-fat, high-calorie items. That is still one of fiber’s potential benefits. Even though fiber does not provide vitamins or minerals, foods that are high in fiber are often rich in vitamins and minerals. Researchers recognize that fiber plays a role in reducing the risk of heart disease, diabetes, obesity, and some types of cancer. Look at the Top 10 “Reasons to Eat More Fiber.” As you can see, a high-fiber diet contributes to health in a multitude of ways. There are two types of fiber: insoluble and soluble. Both play important roles in your nutritional health.

Insoluble fiber comes from the cell walls of plants and is not digested by the body. Insoluble fiber absorbs water as it passes through the digestive tract, increasing fecal bulk. It quickens the passage of food through the system, helping to prevent constipation. This type of fiber may act as a deterrent to digestive disorders, including possibly cancers of the colon and rectum. Whole-wheat bran is the richest source of insoluble fiber. This valuable bran is lost when whole-wheat flour is refined to produce white flour and wheat flour (used in most breads, crackers, and cereals). Lentils, skins of fruits and root vegetables, and leafy greens are other good sources of insoluble fiber.

Soluble fiber travels through the digestive tract in a gel-like form, pacing the absorption of carbohydrates. This prevents dramatic shifts in blood sugar levels and can help control diabetes. A diet rich in soluble fiber has also been shown to reduce blood cholesterol levels, especially LDL, thus reducing the risk of cardiovascular diseases. However, this effect occurs primarily when fiber is coupled with a diet low in saturated fats. Oat bran, beans, vegetables, and fruits are rich sources of soluble fiber, though most plant foods contain both types of fiber. Animal foods never contain fiber.

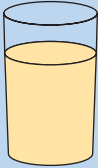
According to the American Cancer Society, approximately one-third of cancer deaths are related to what we eat. Eating between 25 and 38 grams of fiber daily is recommended (about double the amount in the current American diet). Not enough is known about how each kind of fiber (soluble and insoluble) works, so there is no set recommended dietary ratio for either type. How much is 30 grams of fiber? If you were to eat 1 cup of bran cereal, $\frac{1}{2}$ cup of carrots, $\frac{1}{2}$ cup of beans, a medium-size apple, and a medium-size pear in 1 day, you would have consumed 30 grams of fiber. Table 9-4 shows the fiber content of some common foods.

For busy students and adults, breakfast is one of the best meals to get a jump start on fiber consumption for the day. Check the labels of various breakfast cereals. Many have 5 or more grams of fiber per serving. Add some fresh fruit and you have a great start toward those 25 to 38 grams.

TOP 10 LIST

Reasons to Eat More Fiber

1. It curbs overeating. Because fiber-filled foods take up more room in your stomach than other foods, you feel full faster.
2. It decreases your hunger. Fiber is slower to digest, so it keeps hunger at bay longer.
3. It whisks away calories. Because most fiber leaves the body undigested, the calories in fiber-rich foods are less accessible to the body. For each gram of fiber you consume, you absorb about 7 fewer calories from food.
4. It reduces the risk for heart disease, hypertension, and high cholesterol.
5. It cuts the fat. Fiber-rich foods are naturally low in fat.
6. It may reduce the risk for type 2 diabetes. Eating fiber while reducing sugar in the diet has been linked to a more stable blood sugar and insulin control.
7. It helps keeps you regular. Fiber is called the body’s “broom” because the insoluble fiber binds with water to usher waste out of the body.
8. Its sources are nutrient-dense. Fruits, vegetables, and fortified high-fiber breads and cereals are filled with tons of vitamins, minerals, and antioxidants.
9. It may protect against breast cancer. Fiber binds to estrogen—an important breast-cancer risk factor—reducing blood levels of this hormone.
10. It may protect against colon cancer. Fiber binds with and removes carcinogens from the body and speeds movement through the digestive tract.

		
Apple juice 3/4 cup 0.2 grams fiber	Applesauce 1/2 cup 2.1 grams fiber	Whole apple with peel 3.6 grams fiber

A fiber profile.

Whole Grains Versus Refined Flours

Whole grain consists of three parts: bran (outer layer), endosperm (middle layer), and the germ (core). When grains are refined through processing, the bran and germ are removed. This takes away most of the nutrients and fiber. These refined flours are then used to make white bread,

TABLE 9-4 *Fiber in Selected Foods*

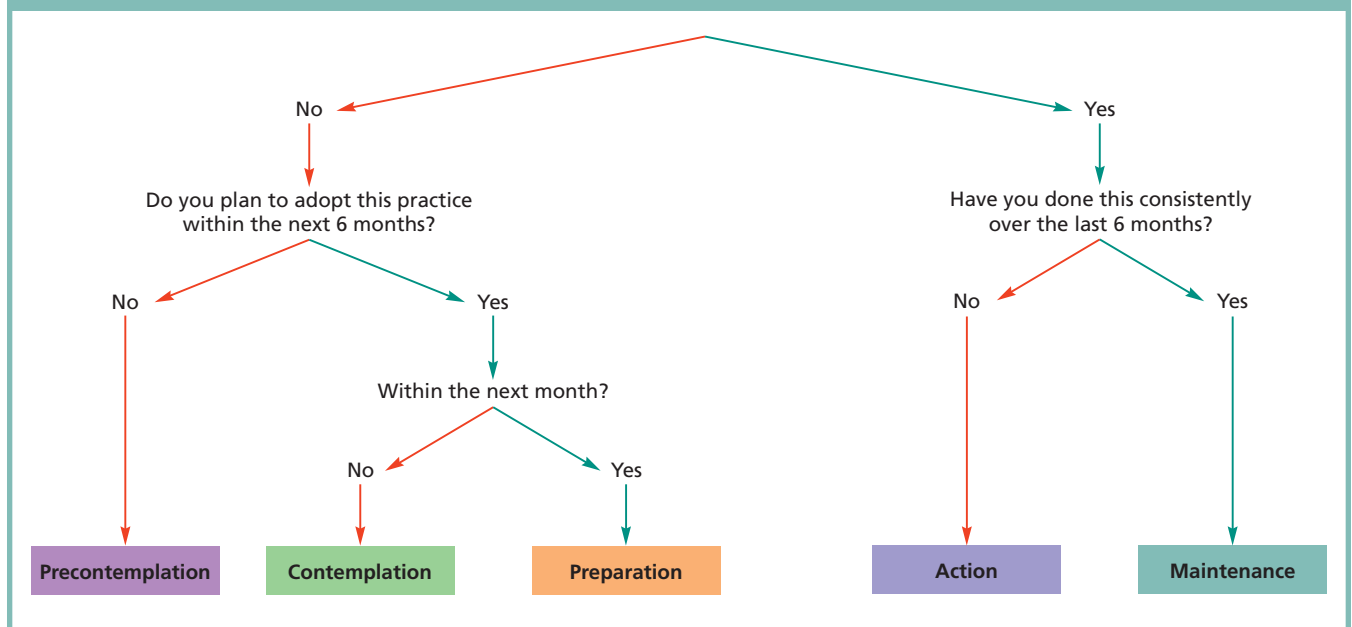
Food	Fiber (grams)
Bran cereal (1/2 c.)	10
Beans, lentils, peas (1/2 c.)	6–9
Spaghetti, whole wheat (1 c.)	6
Mini-wheat cereal (1 c.)	5
Chex cereal (1 c.)	5
Cauliflower (1/2 c. cooked)	5
Pear (1 med.)	5
Sweet potato (1 med.)	5
Peas, frozen (1/2 c.)	4.5
Quick oatmeal (1/2 c. dry)	4
Popcorn (6 c.)	4
Potato, baked (1 med.)	4
Brown rice (1/2 c. cooked)	4
Berries (1/2 c.)	4
Pork and beans (1/2 c.)	4
Almonds (1/4 c.)	3.9
Apple (1 med.)	3.5
Whole-wheat bread (1 slice)	3
Broccoli (1/2 c. cooked)	3
Orange (1 med.)	3
Triscuit crackers (7 crackers)	3
Spinach, canned (1/2 c.)	3
Banana (1 med.)	3
Cheerios (1 c.)	2
Corn, canned (1/2 c.)	2
White bread (1 slice)	.6
Iceberg lettuce (1 c.)	.5
Cornflakes (1 c.)	.5

rolls, pasta, rice, bread sticks, pizza crusts, crackers, cereals, cookies, pretzels, etc. As a result, not all grains are created equal. Whole-grain products are nutritional powerhouses, whereas refined flours have little nutritional value. Many experts believe that Americans' overconsumption of refined flours is contributing to the explosion of obesity and type 2 diabetes, since these refined products play havoc with our insulin levels. Unfortunately, fiber has been eliminated from most snack and fast foods. Americans average less than one serving a day of whole grains.

Since the *Dietary Guidelines* emphasize increased consumption of whole grains, look for whole-grain breads, bagels, pasta, cereal, crackers, and rice. Even though the outer package of a product may say "multi-grain," "seven-grain," "made with whole grain," or even "wheat," carefully check the ingredient list. Look for the words "whole grain," "whole wheat," "whole oats," "wheat bran," "oat bran," "bulgur," or "oatmeal" as the first ingredient. These are whole grains! Wheat flour, enriched wheat flour, unbleached flour, and oat flour *are not* whole grains. Enriched wheat flour is a refined grain to which the manufacturer has added back some of the vitamins that were lost during the refinement. The term "enriched," however, does not mean that fiber or other nutrients were restored. Don't be fooled by the color, also. Dark-colored breads are not always whole wheat. Manufacturers often add food coloring to refined flours to make the product darker. This does not mean refined flours are bad for you. Simply put, whole grains are a far healthier choice.

What Stage of Change Are You In?

Do you consume at least 25 to 38 grams of fiber every day?



Most Americans meet or exceed the amount of protein needed. (Average consumption is about 100 grams per day.) Excessive protein (especially excessive red meat consumption) has been linked to kidney disease and some cancers.

Good sources of protein are found in animal and plant foods. Meat, poultry, fish, eggs, and milk products are good sources of animal protein. Many of these sources also contain high amounts of fat and cholesterol, so you are wise to select some plant sources of protein: legumes (beans and peas), whole grains, pastas, rice, and seeds. These plant proteins are also a great source of fiber.

Fats

Fat is the most concentrated form of food energy, providing 9 calories per gram, more than twice the energy provided by carbohydrates and proteins. Fat adds texture and flavor to food. It helps satisfy the appetite because it is digested more slowly. Also known as *lipids*, fats are necessary for growth and healthy skin and for transporting fat-soluble vitamins in the body. Fats are also linked to hormone regulation. Because of their concentrated form, fats are an efficient way to store energy. Like protein, however, fats are not a good *single* source of energy. Fats burned for energy in the absence of carbohydrates produce a toxic waste product called *ketone bodies*. *Ketosis*, a buildup of poisonous **ketone bodies**, causes fatigue and nausea and overtaxes the kidneys. Extreme cases can cause brain damage. Fat is burned more completely in the presence of carbohydrates, another reason to have a diet high in complex carbohydrates (and to avoid weight-loss diets that promote very low carbohydrate and calorie intake).

An important distinction should be made among the three types of fatty acids. Dietary fats comprise a combination of three forms—saturated, monounsaturated, and polyunsaturated. Even though they are complex mixtures, they are classified simplistically by their overall saturation and chemical structure. Canola oil, for example, is classified primarily as a monounsaturated fat, even though it is also made up partially of polyunsaturated fatty acids. Table 9-5 identifies and compares types of fats according to their primary fatty acid structure.

An easy observation shows that with a few exceptions, **saturated fats** are primarily in foods of animal origin (e.g., red meats, cheese, whole milk, hot dogs, luncheon meats), whereas most vegetable fats are unsaturated. Additionally, all animal fats contain cholesterol. (Vegetable foods have no natural presence of cholesterol.) Diets high in saturated fat have a strong link to heart disease and stroke. They elevate blood cholesterol levels, which in turn can lead to clogged arteries (atherosclerosis). **Polyunsaturated fats** come mostly from plant foods and are a healthier fat to consume. **Monounsaturated fats** also come from plant foods. When “mono” fats replace saturated fats in the diet, they not only



Our love for fats contributes to heart attacks, strokes, and some cancers.

decrease total and LDL cholesterol but also appear to raise HDLs—an added benefit.

Regardless of the types of fats, we need to be more discriminating in our selections. We have a tendency to eat too much total fat, saturated fat, and trans fats. Most nutritionists recommend that our daily calories consist of only 20–35 percent fat, keeping saturated and trans fats under 10 percent of our calories. The excessive fat in our diet is the main reason Americans have so many heart disease deaths. Thirty to 40 percent of cancers in men and 60 percent of cancers in women have been attributed to diet, with excessive saturated and trans fats being prime culprits. The amount and type of dietary fat eaten—not the amount of cholesterol consumed—have the greatest impact on the blood cholesterol level. Dietary cholesterol also affects the level of blood cholesterol but to a lesser and more variable extent than does the fat content of the diet.

Monounsaturated fat and polyunsaturated oils are often turned into solid unhealthy saturated fats by a manufacturing process called **hydrogenation**. This technique adds hydrogen atoms to these fats as a way to prolong the shelf life of a product and improve the texture of some foods (e.g., pastries, pie crusts, cookies, etc.). Avoid completely and partially hydrogenated oils! Like saturated fats, they elevate the blood cholesterol level. During the process of hydrogenation, some fatty acid molecules become rearranged and convert to a **trans-fatty acid** (sometimes called **trans fats**). Trans fats are linked to coronary artery disease and some cancers. Scientists now believe that trans fats may be more harmful than saturated fats to artery health because they raise “bad” LDL cholesterol and lower “good” HDL cholesterol in the blood—the worst possible combination! In studies at the Harvard School of Public Health, researchers discovered that persons who consumed the most trans-fatty acids had a 50 percent greater risk for heart attacks than those who consumed the least. Trans

TABLE 9-5 *Comparison of Fats*

		Characteristics	Examples
Limit in the Diet	Saturated	Raises total cholesterol. Raises “bad” LDL cholesterol. Increases risk of heart disease. Increases risk of some cancers.	Red meats; poultry skin; coconut and palm oils; butter; cheese; luncheon meats; whole milk; hot dogs; chocolate; bacon; lard
	Trans	Raises total cholesterol. Raises “bad” LDL cholesterol. Lowers “good” HDL cholesterol. Increases risk of heart disease. Increases risk of some cancers.	French fries and other deep-fried foods; many fast foods; stick margarine; shortenings; cookies; crackers; doughnuts; candy; pies and cakes; dips; some boxed foods like ramen noodles
Use Only Small Amounts	Polyunsaturated	Lowers total cholesterol. Lowers “bad” LDL cholesterol. May reduce risk of heart disease.	Corn, soybean, safflower, and sunflower oils; tub margarines; mayonnaise; salad dressings
Preferred Choices, But Use in Moderation	Monounsaturated	Lowers total cholesterol. Lowers “bad” LDL cholesterol. May raise “good” HDL cholesterol. May reduce risk for heart disease. May reduce risk for some cancers.	Olive, peanut, and canola oils; avocado; olives; most nuts; peanut butter (without added hydrogenated oils)
Preferred Choices	Omega-3 (considered a special type of polyunsaturated fat)	Lowers total cholesterol. Lowers risk for heart disease and stroke. Inhibits atherosclerosis and inflammation in blood vessels. May lower blood pressure. Reduces blood clots. Can reduce occurrence of cancerous tumors.	Cold-water fish (salmon, tuna, halibut, mackerel, sardines, herring). Lesser amounts: walnuts; flaxseed and flaxseed oil; green leafy vegetables; canola oil; wheat germ; soybeans

fats were also linked to increased waist size—another risk factor for heart disease. Regardless of the number of calories consumed, trans fats appear to affect the body in a specific way to increase this harmful abdominal fat. Foods typically high in trans fats include margarine, crackers, cookies, doughnuts, pies, french fries, chips, cakes, taco shells, frostings, peanut butter, some cereals, and candy. And because foods can still be called “cholesterol-free,” implying a certain healthfulness, this is misleading if they contain hydrogenated oils and trans-fatty acids. Because trans-fatty acids are present in so many manufactured foods, the U.S. Food and Drug Administration mandated that a food’s level of trans fats be listed on its label beginning in 2006. The Institute of Medicine has not established a safe or recommended level of trans fat intake. However, people are urged to eat as little as possible. Many manufacturers have already begun eliminating heart-hazardous trans fats from their products as evidenced by the margarines, snacks, and baked goods that advertise on their labels “zero trans fats.”

Be a wise consumer and watch out for “hidden” fats in commercially prepared foods. Whereas it is obvious that butter, oils, and the visible fat on meats have a high fat content, the fat in crackers, peanut butter, pastries, dips, sauces, and deep-fried fast foods is less obvious. It is important to be able to decipher food labels and understand where the fats are in our heavily processed food supply. Remember, “completely” or “partially hydrogenated oils” equals trans-fatty acids.

Fat substitutes (such as Olestra and Simplesse) are being used in many commercially prepared foods. These substitutes are made from soybeans or various milk and egg proteins with the purpose of duplicating the taste and texture of fat—without the caloric fat content. Read the food labels for any side effects or contraindications from these substitutes. Some can cause abdominal distress.

Regardless of the source, it is important to moderate your overall fat intake because all fats are high in calories. If a little oil is needed in food preparation,

TABLE 9-6 *Determining Your Fat Gram Allowance*

It is recommended that we consume no more than 35 percent of our daily calories from fat. For better artery health and weight loss, 20 to 30 percent consumption is preferred. If you know your approximate daily caloric intake, it is easy to calculate your desired fat grams.

Example: Terry consumes 2,000 calories per day. He wishes to stay at a 30 percent fat-calorie guideline.

$30\% \times 2,000 \text{ calories} = 600 \text{ fat calories}$
 $600 \text{ calories} \div 9 \text{ (calories per gram of fat)} = 66.6 \text{ or } 67 \text{ grams of fat}$

An easy way to estimate your fat gram limit per day is to divide your ideal weight in half. Keep your number of fat grams per day under this number. (If your ideal weight is 140 lb., your fat gram limit should be 70 g per day.) For people with higher weight this estimate is not quite as accurate (e.g., someone whose ideal weight is 220 lb. should probably *not* be eating 110 grams of fat each day).

FAT GRAMS PER DAY FOR SPECIFIC CALORIE INTAKES AND PERCENTAGES

Daily Calories	20%	25%	30%	35%
1,200	27g	33g	40g	47g
1,400	31g	39g	47g	54g
1,600	36g	44g	53g	62g
1,800	40g	50g	60g	70g
2,000	44g	56g	67g	78g
2,200	49g	61g	73g	86g
2,500	56g	69g	83g	97g
2,800	62g	78g	93g	109g

choose small amounts of olive oil or canola oil. Choose fish over red meat. And remember that a small handful of nuts can supply health benefits. Table 9-6 shows you how to figure your daily fat allowance to adhere to recommended fat-calorie guidelines.

With so much emphasis on low-fat eating, some people may try to cut their fat grams to almost zero. Remember that a little dietary fat is necessary for basic metabolic functions, especially for the absorption of fat-soluble vitamins. A minimum of 10 to 20 grams per day should satisfy these requirements.

Fish Oils

Studies of the diets of Eskimos and Asian fishers have revealed interesting information about fats. Their diets provide 40 percent of daily calories from fats. Yet Eskimos are listed among the people with the lowest rates of heart disease in the world. Why? They eat lots of fish, and fish are rich in **omega-3** fatty acids. A diet rich in omega-3 fatty acids inhibits atherosclerosis in coronary arteries and can reduce the blood cholesterol level. Populations in countries that consume high amounts of omega-3 fatty acids from fish have lower incidences of breast, prostate, and



Cold-water fish like salmon are rich in omega-3 fatty acids.

colon cancer than people in countries that consume less omega-3s. The American Heart Association recommends eating fish twice a week to get heart-healthy omega-3 fatty acids. The best omega-3 sources are salmon, mackerel, herring, tuna, and sardines. Omega-3s are also available from plant sources such as flaxseed and walnuts.

Cholesterol

Cholesterol is not a true fat. It is a fatlike waxy substance found in animal tissue. It plays a vital role in the body's functioning. Your liver manufactures all the cholesterol that you physically need. However, most of us consume more cholesterol by eating animal products (meat, egg yolks, cheese, dairy products, shrimp, liver). A diet high in fats and cholesterol has been linked to atherosclerosis; therefore, you are prudent to limit animal products in your diet. It is recommended that you restrict cholesterol consumption to 300 milligrams per day. (One egg yolk equals approximately 213 mg cholesterol; a hamburger patty or chicken breast has approximately 80 mg.) Remember, vegetable foods contain no cholesterol unless it is added in processing or food preparation.

Vitamins

Vitamins are the organic catalysts necessary to initiate the body's complex metabolic functions. Although these chemical substances are vital to life, they are required in only minute amounts. Because of our adequate food supply, symptoms of vitamin deficiencies are rare. However, some factors may alter one's requirements (aging, illness, stress, pregnancy, smoking, dieting). Vitamins fall into two categories: fat soluble and water soluble. Vitamins A, D, E, and K are **fat-soluble vitamins**, which means they are transported and stored by the body's fat cells and liver. They are stored in the body for relatively long periods (many months). Vitamin C and the B complexes are **water-soluble vitamins**. They remain in various body tissues for a short time (usually only a few weeks). Excesses are excreted.

TABLE 9-7 *Vitamins and Minerals*

Vitamins	Functions	Sources	Daily Value (DV)*	Upper Level (UL) [†]
Fat Soluble				
A (Retinol)	Promotes growth and repair of body tissues; keeps skin cells moist; builds resistance to infection; promotes bone and tooth development; aids in vision	Green leafy vegetables, yellow fruits and vegetables, eggs, butter, margarine, cheese, milk, liver	5,000 IU [‡] or 1,500 mcg	10,000 IU
D	Regulates absorption of calcium and phosphorus; promotes normal growth of bone and teeth	Vitamin D-fortified milk products, fish, eggs, fortified margarines, sunlight (absorbed through the skin)	400 IU	2,000 IU
E (Alpha-tocopherol)	Essential in preventing oxidation of other vitamins and fatty acids; maintains cell structure	Vegetable oil, green and leafy vegetables, whole grains, egg yolks, nuts, wheat germ	30 IU	1,100 IU (synthetic) 1,500 IU (natural)
K (Phylloquinone)	Aids in blood clotting	Cabbage, cauliflower, spinach, green vegetables, liver, cereals	80 mcg	30,000 mcg
Water Soluble				
C (Ascorbic acid)	Builds resistance to infection; aids in tissue repair and healing; involved in tooth and bone formation	Citrus fruits, strawberries, tomatoes, potatoes, melons, broccoli, peppers, cabbage	60 mg	2,000 mg
B ₁ (Thiamin)	Needed to convert carbohydrates into energy; promotes normal function of nervous system	Whole grains, fortified grain products, milk, pork, legumes, nuts, meats	1.5 mg	50 mg
B ₂ (Riboflavin)	Combines with proteins to make enzymes that affect function of eyes, skin, nervous system, and stomach	Meat, dairy products, whole grains, green leafy vegetables	1.7 mg	200 mg
B ₃ (Niacin)	Aids in energy production from fats and carbohydrates	Meat, poultry, fish, liver, nuts, whole grains, legumes	20 mg	35 mg
B ₆ (Pyridoxine)	Aids in protein metabolism and red blood cell formation	Whole grains, meat, fish, poultry, legumes, milk, green leafy vegetables	2.0 mg	100 mg
Folic acid (Folacin)	Aids in red blood cell formation; aids in synthesizing genetic material	Meat, poultry, fish, eggs, broccoli, asparagus, legumes	400 mcg	1,000 mcg
B ₁₂ (Cobalamin)	Aids in function of body cells and nervous system	Animal foods only; meat, poultry, fish, eggs, dairy products	6 mg	3,000 mcg

Minerals

Minerals are inorganic substances that are critical to many enzyme functions in the body. Two groups of minerals are necessary to the diet: macrominerals and trace minerals. **Macrominerals** are needed in large doses (more than 100 mg daily). Examples are calcium, phosphorus, magnesium, potassium, and sodium. **Trace minerals** are needed in much smaller amounts. Examples are iron, zinc, copper, iodine, fluoride, and selenium. Table 9-7 lists vitamins and minerals,

their functions, good food sources of each, and adult recommendations.

Three minerals deserve special attention: calcium, iron, and sodium.

Calcium

Calcium is the body's most abundant mineral and is critical to many body functions. If the calcium supply in the blood is too low, the body withdraws calcium from the bones. This inadequate supply of calcium is a major

TABLE 9-7 *Vitamins and Minerals (continued)*

Minerals	Functions	Sources	Daily Value (DV)*	Upper Level (UL) [†]
Macrominerals				
Calcium	Aids in bone and tooth formation, aids in use of phosphorus, helps muscle contraction and heart function	Dairy products, green leafy vegetables, broccoli, fish	1,000 mg	2,500 mg
Phosphorus	Aids in metabolism and energy production	Dairy products, eggs, meat, fish, poultry, legumes, whole grains	1,000 mg	4,000 mg
Magnesium	Activates important enzyme reactions	Whole grains, nuts, legumes, green vegetables	400 mg	350 mg from supplements only
Potassium	Regulates body fluids and the transfer of nutrients across cell walls	Citrus fruits, juices, bananas, potatoes, spinach	4,700 mg	None
Sodium	Regulates fluid balance in cells; aids in muscle contraction	Table salt, milk, seafood (abundant in most foods except fruits)	1,500 mg	2,300 mg
Trace				
Iron	Essential for oxygen transport in the blood	Liver, meat, poultry, fish, dried fruit, whole grains, legumes, green vegetables	18 mg	45 mg
Zinc	Aids in metabolism and growth of tissue	Seafood, poultry, eggs, whole grains, vegetables	15 mg	40 mg
Copper	Involved with iron in the formation of red blood cells, affecting overall metabolism	Liver, nuts, shellfish, meat, poultry, vegetables	2 mg	10 mg
Iodine	Forms thyroid hormone	Iodized salt, seafood	150 mcg	1,100 mcg
Selenium	Necessary for normal growth and development, and for use of iodine in thyroid function; has antioxidant properties	Seafood, meat, liver, grains	70 mcg	400 mcg
Chromium	Works with insulin to help the body use blood sugar	Whole grains, bran cereals, meat, poultry, seafood	120 mcg	1,000 mcg

*Daily Value (DV): These levels, also called U.S. Recommended Daily Allowances (USRDA), appear on food and supplement labels. There is only one DV for everyone over age 4.

[†]Upper level (UL): These levels are the highest levels that pose no risk. As intake increases above the UL, so does the risk of adverse effects.

[‡]IU = International Units.

SOURCE: National Academy of Sciences, 2002, 2004.

factor contributing to **osteoporosis**, an age-related condition of insufficient bone mass. Healthy bone is living tissue that is continuously being replenished. Most of the adult skeleton is replaced about every 10 years. In osteoporosis, the formation of bone fails to keep pace with lost bone tissue. The result is porous, brittle bones susceptible to fracture. Women are more susceptible to osteoporosis because they have smaller, less dense bones. However, men are also at risk. In fact, one in four men over age 50 will break a bone as a result of osteoporosis.

According to a report from the Surgeon General, roughly 10 million Americans over age 50 have osteoporosis (brittle bones). Another 34 million have **osteopenia**—a bone density that is lower than normal. “The bone health status of Americans appears to be in jeopardy, and left unchecked it is only going to get worse

as the population ages,” says the surgeon general. By 2020, it is predicted that half of all Americans over age 50 will be at risk for fractures from weakened bones. Osteoporosis is a “silent” condition because many are unaware that their bones are thinning until one breaks. Some bone loss is normal with aging in both males and females. However, osteoporosis is *not* part of normal aging. Therefore, it is vitally important that you build strong bones during young adulthood. Strong bones begin in childhood. With good nutrition and physical activity, bones can remain strong throughout a lifetime. Consumption of adequate dietary calcium from preadolescence through young adulthood is one critical factor in building bone mass. Current calcium consumption is dangerously low. It’s estimated that most Americans consume only 500 to 800 milligrams of calcium daily.



Dairy products are not the only sources of calcium in the diet.

Your current habits determine your bone density later in life. Up to about age 25, as calcium is added to the diet, the rate at which bone is replaced is greater than the rate at which it breaks down. By age 25 to 30, you've reached your peak bone mass—the point at which your bones are as dense and strong as they'll ever be. Forty to 60 percent of this peak bone mass is built during the teenage years. By age 40, bone mass begins to decline slowly in both men and women. After menopause, women lose bone mass rapidly due to a drop in the estrogen level. Osteoporosis cannot be cured—it can only be prevented, or its progression delayed. That is why it is critical that teens and young adults take action to build as much bone mass as possible while they are young to slow the rate of bone loss later in life. The number of cases of osteoporosis will continue to skyrocket if today's young adults don't adjust their diets and exercise habits. See Table 9-8 for the recommended calcium intake for various age groups. A negative balance of only 50–100 mg of calcium per day over a long period of time is sufficient to produce osteoporosis.

Recent studies show that calcium isn't the only factor in creating strong bones. Other dietary and lifestyle habits contribute to bone health. Check out the Top 10 list for ways to keep your bone “banks” filled.

Iron

Iron deficiency is a nutritional problem for some people, particularly women, teenagers, and endurance athletes. Due to menstruation, women need to ingest more iron than men do. Iron deficiency may cause chronic fatigue and listlessness. To increase your iron intake, take the following steps:

1. Eat foods rich in iron (lean meats, poultry, fish, fortified cereals and grains, green vegetables, beans, peas, and nuts).

TABLE 9-8

Optimal Calcium Requirements (Recommendations of the National Institutes of Health)

Age	Calcium (mg/day)
1–3	500
4–8	800
9–18	1,300
19–50	1,000
51 and older (men)	1,200
51 and older (women)	1,500

For your information:

1 cup yogurt = 300 mg	1 cup cottage cheese = 150 mg
1 cup milk = 300 mg	1½ oz hard cheese = 350 mg
1 cup cooked broccoli = 90 mg	3 oz sardines = 370 mg
1/2 cup ice cream / frozen yogurt = 100 mg	4 oz tofu = 145 mg
1/2 cup spinach = 100 mg	1 slice whole-wheat bread = 25 mg
8 oz orange juice with calcium = 350 mg	1 packet instant oatmeal = 150 mg
1/3 cup nonfat dry milk = 300 mg	1 cup kale = 180 mg
3/4 cup Total cereal = 1,000 mg	1 Viactiv soft chew = 500 mg

Note: Your body absorbs only 500 mg of calcium at a time, so spread your intake throughout the day.

Food labels list calcium content as “% Daily Value.” To convert to milligrams (mg) of calcium add a zero. For example, if one serving has 15% DV for calcium, it has 150 mg.

2. Consume iron-rich foods with foods high in vitamin C to triple iron absorption (a hamburger and tomato; cereal and orange juice).
3. Keep consumption of tea and coffee under 3 cups per day (caffeine reduces the absorption of iron).
4. Use cast-iron cookware (iron is absorbed into the food in a form readily assimilated into the body).

Iron supplementation should not be done indiscriminately. Prolonged consumption of large amounts can cause a disturbance in iron metabolism for some people, contributing to atherosclerosis and heart attacks. This excessive iron buildup is more prevalent in men than in women, because women lose blood through menstruation each month. Individuals concerned about their iron level should consult a physician.

Sodium

Many people can reduce their chances of developing high blood pressure by consuming less salt. The American Heart Association and the National Academy of Sciences recommend no more than 1,500 milligrams of sodium per day for healthy adults. (One teaspoon of table salt contains 2,400 milligrams of sodium.) Most Americans consume much more than that daily, some up to 8,000 milligrams! We consume sodium most commonly in the

TOP 10 LIST

Ways To Keep Your Bone “Banks” Filled

1. Eat calcium-rich foods every day—low-fat dairy products, spinach, hard cheeses, broccoli, fish with edible bones (salmon, sardines). Sprinkle nonfat dry milk into casseroles, soups, meat loaf, and sauces.
2. Get regular vigorous exercise. Exercises that create muscular contraction and gravitational pull on the long bones, or create weight-bearing impact are the best (jogging, aerobics, weight training, tennis, jumping rope).
3. Ingesting an adequate amount of vitamin D is essential for bones to absorb calcium. Recent research has found that 1,000–1,500 mg of calcium combined with 800–1,000 IU of vitamin D not only helps bones but plays an important role in reducing cancer risk.
4. Do not smoke. Smoking reduces the production of estrogen and negatively affects calcium absorption.
5. Avoid excesses of alcohol and sodium. Both increase urinary loss of calcium.
6. Watch your protein intake. Eating excessive protein can cause urinary calcium excretion if calcium and vitamin D intake is low. Because of this, the popular high-protein, low-carbohydrate diets can contribute to dissolution of bone if inadequate amounts of calcium and vitamin D are consumed.
7. Limit consumption of soft drinks. Today’s young adults have tripled their consumption of soft drinks and cut their consumption of milk by more than 40 percent, robbing them of bone-building calcium during this critical stage of bone formation. The risk? More bone fractures and a future of osteoporosis.
8. If you have lactose intolerance (trouble digesting dairy products), lactose-free products are available at some stores. Or experiment with dairy foods lowest in lactose: ricotta, mozzarella, Parmesan, American, and cheddar cheeses; tofu; some yogurts; sherbet; 1 percent low-fat cottage cheese.
9. Look for calcium-fortified foods such as orange juice and cereals.
10. Consider a calcium supplement—ideally in the form of calcium citrate, the most readily absorbed form.

form of table salt and in the processed foods we eat. Even if you never salt your food, 90 percent of processed foods contain sodium—even milk does. In this way, sodium becomes “hidden” in our diet. Boxed rice dishes, pizza, soups, frozen dinners, luncheon meats, and many snacks are loaded with salt. Sodium is also present in other popular condiments, such as monosodium glutamate (MSG), meat tenderizer, ketchup, salsa, soy sauce, mustard, barbecue sauce, and salad dressings. It is even present in many medications—antacids, for instance. Fast-food restaurants are “salt mines.” Eating a breakfast biscuit with

egg and sausage adds up to 1,200 mg of sodium. Excess sodium consumption has been one factor linked to hypertension in some sodium-sensitive individuals. Excesses of sodium also increase calcium loss in urine, which is detrimental to bone density. Excess salt in the diet has also been linked to stomach cancer. Therefore, be conscious of your sodium intake and try to keep it within the recommended range.

Water

Water is often called the forgotten nutrient. However, it is *the most important* nutrient because it serves as the medium in which the other nutrients are transported. Almost all the body’s metabolic reactions occur in this medium. Water also helps rid the body of wastes, aids in metabolizing stored fat, and helps control body temperature. Water composes approximately two-thirds of your body weight. Your exact percentage of water weight varies depending on your body composition. Lean tissue contains more water than does fat tissue. Lean muscle tissue is about 73 percent water; fat tissue is only 20 percent water. Being dehydrated can result in feelings of fatigue, stress, headaches, constipation, and hunger. You should drink before you feel thirsty, because thirst is a sign that you’re already dehydrated. One’s water needs vary, dependent on body size, activity level, and climate. Drinking water is important, but also remember that water is a component of many foods (apples, lettuce, melons, potatoes, soups, tomatoes, fruit juices, etc.). Caffeinated beverages such as coffee, tea, and colas have a slight diuretic effect but also count. Alcohol, however, dehydrates you because your body uses up water to metabolize it. Are you getting enough water? If so, your urine is clear, almost colorless. (See Chapter 6 for more information on water consumption.)



The average teenager consumes three cans of carbonated soft drinks every day. Twice as much soda as milk is consumed today; 20 years ago the reverse was true. The result? Fat teens and brittle bones.

PHYTOCHEMICALS AND ANTIOXIDANTS: DISEASE FIGHTERS

Research is exploding in a new area of dietary study: examining the power of specific food components to ward off chronic diseases. These food components, known as **phytochemicals** (meaning “plant chemicals”), are present in foods such as fruits, vegetables, grains, legumes, and seeds. Phytochemicals are also in garlic, licorice, soy, and green tea. Phytochemicals have been associated with the prevention and treatment of at least four of the leading causes of death in the United States: cancer, cardiovascular diseases, diabetes, and hypertension.

There are hundreds of helpful phytochemicals. These plant pigments and enzymes interact with hormone receptors, suppress malignant changes in cells, enhance immune function, and reduce cholesterol levels. Excitement is building in this new area of nutrition research as scientists continue to uncover the relationship between these plant chemicals and disease prevention. Phytochemicals, with peculiar names such as carotenoids, pectins, lignins, flavonoids, indoles, lycopene, quercetin, and lutein, translate into a cornucopia of fruits and vegetables. Eating a wide variety of colorful fruits and vegetables gives you a full range of these powerful internal bodyguards that help fight off everything from cataracts to cancer to arthritis.

One particular group of phytochemicals, called **phytoestrogens** (plant estrogens), have a structure similar to that of the body’s own hormones. Found particularly in soy products (soy milk, soy nuts, tofu, etc.), they may reduce the long-term harmful effects of the body’s own hormones, commonly associated with breast, colon, and prostate cancers. Soy products may also be linked to the reduction of blood cholesterol.

Phytochemicals, along with certain vitamins (A, C, E, and selenium), are known as antioxidants. **Antioxidants** are compounds that come to the aid of every cell in the

body that faces an ongoing barrage of damage because of the normal aging and oxygenation process (living and breathing), environmental pollution, chemicals and pesticides, additives in processed foods, stress, and sun radiation. As aging and exposure occur, our body creates **free radicals**, singlet oxygen molecules that damage our cells and tissues. This free radical assault on the body contributes to a number of chronic diseases, such as atherosclerosis, arthritis, cancer, cataracts, heart disease, stroke, and an array of other degenerative diseases. Antioxidants (phytochemicals, carotenoids, vitamins C and E, etc.) that are plentiful in fruits and vegetables neutralize these free radical chemical reactions, thereby suppressing cell deterioration and slowing the aging process.

Realizing the power of these substances, Americans need to take action by eating a wide variety of fruits and vegetables—at least five servings per day. Check out these antioxidant “all-stars”:

✓ apples	✓ grapes
✓ broccoli	✓ strawberries
✓ green and red peppers	✓ kale
✓ cantaloupe	✓ brussels sprouts
✓ spinach	✓ blueberries
✓ carrots	✓ sweet potatoes
✓ tomatoes	✓ cabbage
✓ raspberries	✓ raisins and grapes
✓ onions	✓ oranges

How many of these have you eaten in the last 3 days? Remember, an apple a day may indeed keep the doctor away!

Nutritional Supplements

Are vitamin supplements necessary? Vitamins do not contain energy or calories. Therefore, extra vitamins will not provide more energy or power. Eating a variety of foods is a preferred way to maintain an adequate intake of vitamins, minerals, fiber, and other nutrients. However,



Fruits and vegetables are true “disease fighters.” Yet a majority of adults admit to eating only one or two servings per day.

with today's lifestyle, most people are not consuming a varied and balanced diet. Manufacturers' processing and preserving, food irradiation and chemical pollution, nutrient-depleted soil, and shipping and storage practices have significantly reduced the nutritional value of foods. Other lifestyle factors, such as smoking, consuming alcohol, stress, and using drugs such as aspirin and oral contraceptives, may increase the need for vitamin or mineral supplementation. Most medical authorities have been reluctant to recommend supplements on a broad scale for healthy people who eat healthy diets. After all, the benefits from food are more complex than merely delivering so many milligrams of this or that nutrient. However, the accumulation of research in recent years has shown that extra amounts of certain vitamins (especially the antioxidants) may play a significant role in preventing chronic diseases such as heart disease and cancer. Also, because most Americans aren't eating enough fruits, vegetables, and whole grains, supplements of vitamin B₁₂, vitamin D, folic acid, vitamin E, and calcium are most common. And frankly, some of these nutrients are hard to get in sufficient quantities from food alone. Anyone with irregular diet patterns, those on a weight-reduction regimen, pregnant or lactating women, strict vegetarians, and elderly people should consider a nutritional supplement or multivitamin. This could offer some nutritional insurance.

In fact, the *Journal of the American Medical Association* issued a report based on a review of more than 30 years of scientific studies that acknowledged that all adults should take a daily multivitamin. This statement is a startling reversal of the medical community's past denial of the need for dietary supplements. However, it is also important to realize that not all supplements are created equal. Not only are people taking vitamin and mineral supplements, but herbs, enzymes, amino acids, human growth hormones, energy and sexual enhancers, and diet pills are flying off drugstore shelves. In the United States supplements are not considered "drugs," thereby escaping the scrutiny of the U.S. Food and Drug Administration (FDA). However, a 2003 ruling by the FDA forces manufacturers to label their products accurately to ensure that what's written on the label is what's actually contained in the product. In the past, approximately 15 percent of supplements contained either too much or too little of the stated ingredients or contained contaminants. Companies are also now prohibited from making disease claims in their advertising or on their labels, such as "cures cancer" and "lowers cholesterol." More regulations are pending in Congress because illnesses and deaths have occurred as a result of people misusing supplements. Remember that dietary supplements are not a substitute for a healthy diet. Nutrient and nutrient-food interactions are so complex that merely relying on pills to fill in all the gaps would be a mistake. Therefore,



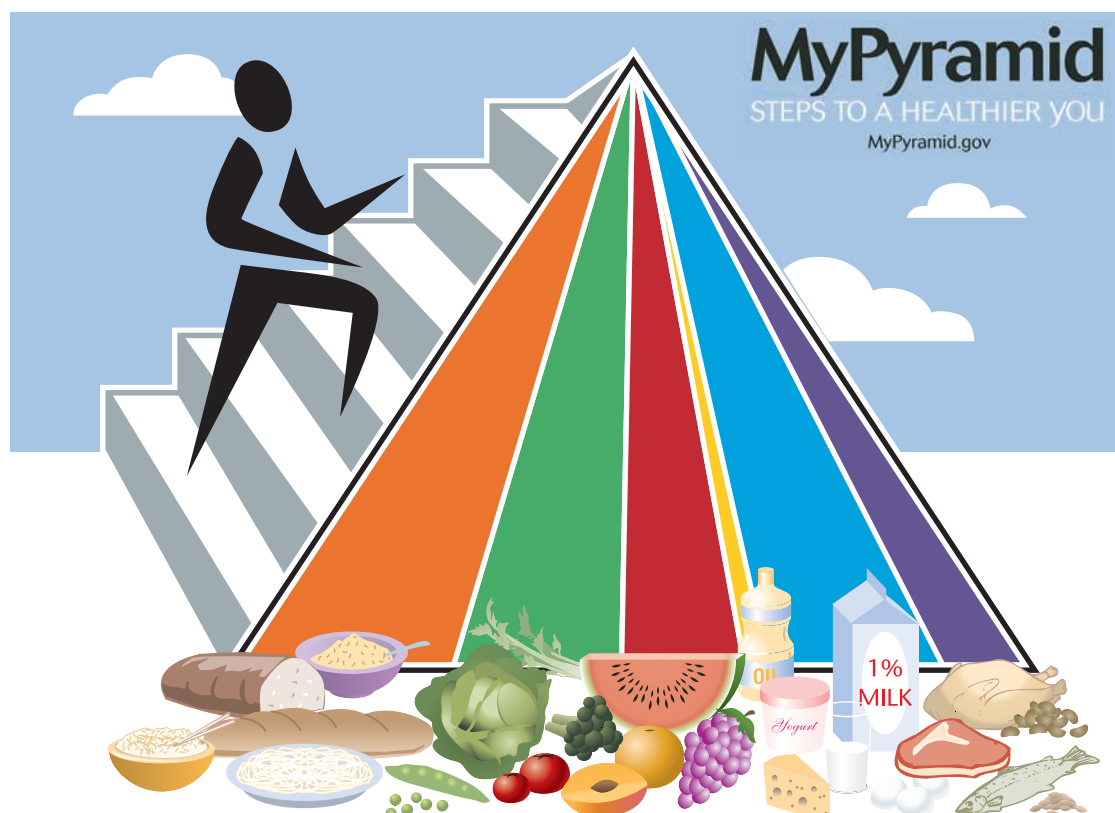
Taking supplements cannot replace a balanced diet but can fill some specific nutritional gaps for some people.

consider the following suggestions if you choose to take a supplement:

1. Look for the seal from the United States Pharmacopoeia (USP) that sets safety and purity standards.
2. Buy from an established company rather than from a late-night infomercial provider.
3. Check the label for a company website or telephone number. Does the company have a Current Good Manufacturing Practices (CGMP) certification and/or a National Nutrition Foods Association (NNFA) rating?
4. Educate yourself about the supplements you take (see Internet Resources at the end of this chapter).
5. Talk to your physician, since some supplements may interact with the prescription medicines you are taking.

THE WELL-BALANCED DIET

Eating healthy is exciting. Nutritious eating does not doom you to "nutrition martyrdom"—eating flavorless foods, counting grams, or passing up favorite desserts. Eating right means having a wide variety of foods, some in moderation, throughout the week. There are no "forbidden" or "bad" foods—only bad eating habits. If you have a high-fat snack one day, make sure to balance it with low-fat foods at other meals. Eating should remain one of life's pleasures. Americans are fortunate to have food choices that are varied, plentiful, and safe to eat. Nutritionists often refer to three words when attempting to simplify the principles of good nutrition: *variety*, *moderation*, and *balance*. Do you eat the same thing for breakfast every day? For lunch? For snacks? Despite our access to diverse foods, we have a tendency to consume relatively few types of foods and often become locked into standard meals that often are culturally influenced. Why not have rice, chili, or pizza for breakfast rather than eggs,



	GRAINS	VEGETABLES	FRUITS	MILK	MEAT & BEANS
	Make at least <i>half</i> your grains "whole".	Eat a variety of vegetables: dark green; orange; beans peas, and lentils.	Choose fresh, frozen, canned, or dried fruits rather than fruit juices.	Choose fat-free or low-fat milk, yogurt, and cottage cheese. Choose lower-fat cheeses.	Choose lean meat, poultry, or fish—baked, broiled, or grilled.
	1 oz. is equivalent to : 1 slice bread; 1 c. dry cereal; ½ c. cooked rice, cereal, or pasta; ½ bagel, English muffin, or bun; 1 4½" pancake; 3 c. popcorn; 1 6" tortilla; 1 small muffin	A ½ c. equivalent is: ½ c. raw or cooked vegetables; 1 c. raw leafy vegetables; ½ c. vegetable juice	A ½ c. equivalent is: 1 small whole fruit; ½ c. canned, frozen or fresh fruit; ½ c. 100% fruit juice; ¼ c. dried fruit	1½ oz. cheese is equivalent to 1 c. milk	1 oz. is equivalent to: 1 oz. cooked meat; 1T. peanut butter; ¼ cup dry peas, beans or lentils; 1 egg; ½ oz. nuts
2,000 calorie diet =	6 oz. daily	2½ c. daily	2 c. daily	3 c. daily	5½ oz. daily
2,400 calorie diet =	8 oz. daily	3 c. daily	2 c. daily	3 c. daily	6½ oz. daily
2,800 calorie diet =	10 oz. daily	3½ c. daily	2½ c. daily	3 c. daily	7 oz. daily

Oils:

The USDA recommendation that corresponds to the thin, yellow stripe is that "most of your fat sources come from fish, nuts, and vegetable oils" and that you "limit solid fats like butter, stick margarine, shortening and lard."

Physical activity:**Find your balance between food and physical activity**

- Be sure to stay within your daily calorie needs.
- Be physically active for at least 30 minutes most days of the week.
- About 60 minutes a day of physical activity may be needed to prevent weight gain.
- For sustaining weight loss, at least 60 to 90 minutes a day of physical activity may be required.
- Children and teenagers should be physically active for 60 minutes every day, or most days.

FIGURE 9-1

The USDA MyPyramid. Specific pyramids for 12 different caloric levels are available at www.MyPyramid.gov. SOURCE: U.S. Department of Agriculture, Center for Nutrition Policy and Promotion, April 2005.

bacon, and donuts? The *2005 Dietary Guidelines* provide a sound framework for helping us make food choices.

USDA's MyPyramid

In 2005, the U.S. Department of Agriculture (USDA) introduced a new food guidance system to be a graphic companion to the *2005 Dietary Guidelines for Americans*. Called MyPyramid, the graphic replaces the old food guide pyramid. The multicolored stripes that run from the bottom of the pyramid up to its apex represent the spectrum of food choices, with the width of each stripe approximating the quantity of food each of us should consume from each group (e.g., the green “vegetables” stripe is much wider than the purple “meat & beans” stripe). By showing a person climbing the steps at the side of the new pyramid, physical activity is emphasized as an essential link with healthy eating as key components of healthy living. MyPyramid is actually twelve different pyramids. It was designed to be personalized, based on varying ages, genders, and activity levels.

The website, www.MyPyramid.gov, allows you to enter your personal data and then view your customized pyramid. Figure 9-1 shows the USDA MyPyramid with a few example guidelines—based on 2,000-, 2,400-, and 2,800-calorie diets. In viewing the pyramid, pay attention to the recommended serving sizes. For an example, a single restaurant serving of pasta may actually be 5 ounces of grains (2½ cups)! And, if it is made of refined flour, it does not count as a “whole” grain. MyPyramid.gov has many interactive tools to help you plan your diet—lists of foods in each striped category, tracking worksheets, specific serving size guidelines, and more. Visit MyPyramid.gov to learn more about your personalized eating plan. Lab Activity 9-2 allows you to explore your pyramid in depth.

MyPyramid is not meant to be a rigid prescription but a general guide for eating a variety of foods. Fats and sugars are sometimes added to grains, fruits, and vegetables (with sauces, toppings, and preparation methods), making them less healthy choices. For example, having a buttery alfredo sauce on pasta is not as healthy as having a tomato-rich marinara sauce. In the dairy group, a glass of skim milk would be healthier than a milk shake. For a fruit, apple pie has more fat and calories than an apple. Also remember that there are “good” fats such as omega-3s and that whole-wheat grains are healthier than white flour grains. Thus, it is up to you to make wise choices within each food group.

As you evaluate your diet, use the Top 10 list on how to add more fruits and vegetables to your day. Also, since most people underestimate the size of their food portions, train your eye to estimate what a cup, an ounce, or a tablespoon is. By using Table 9-9, “Eyeball Your Servings,” you can get a quick estimate of what portions should be on your plate without carrying around measuring cups.

TOP 10 LIST

Answers to “How Am I Supposed to Eat All Those Fruits and Vegetables?”

To further promote healthy eating, the National Cancer Institute initiated a national campaign encouraging all Americans to eat five to nine servings of fruits and vegetables every day. Contrary to what most people say, with some planning it is surprisingly easy to do. Here are some suggestions for adding produce to your life:

1. Start your day with a glass of 100 percent fruit juice (not fruit “drink”). Six ounces is a serving.
2. Top your cereal or pancakes with sliced bananas, berries, apples, or raisins.
3. Create a veggie omelette, pizza, pita sandwich, or burrito.
4. Iceberg lettuce is the least nutritious of vegetable greens. Try romaine, spinach, red leaf, chicory—add other veggies.
5. Add chopped fruits to yogurt or pudding and as an ice cream topping; make a fruit smoothie using skim milk and fruit.
6. Add tomatoes, carrots, zucchini, peppers, spinach, or broccoli to pasta and rice salads and pasta sauces. Frozen or canned veggies work fine.
7. Top baked potatoes with assorted cooked veggies or salsa.
8. Fortify stews, soups, and casseroles with extra veggies (e.g., add broccoli, peppers, or peas to your standard macaroni and cheese).
9. Replace chips with raw veggies for dipping.
10. Keep dried fruits, raw veggies, and fresh fruits available for quick snacks.

TABLE 9-9 *Eyeball Your Servings*

Use these common references for estimating standard serving sizes:

- 1 cup of pasta = closed fist
- 3-ounce serving of meat = palm of your hand or a deck of cards
- 1 ounce cheese = size of your thumb or four dice
- 1 medium potato = computer mouse
- 2 tablespoons peanut butter = golf ball
- 1/2 cup rice or cooked vegetables = an ice cream scoop
- 1 standard bagel = hockey puck
- 1 teaspoon margarine = the tip of your thumb
- 1 medium orange or apple = baseball
- 1 muffin or dinner roll = plum
- 1 small cookie or cracker = poker chip

DASH Eating Plan

Because high blood pressure affects nearly one in three American adults, the National Heart, Lung, and Blood Institute has developed an eating plan that is a slight modification of MyPyramid. Called DASH (Dietary Approaches to Stop Hypertension), this eating plan has received accolades from the medical community for its

effectiveness in lowering blood pressure. Since individuals with *normal* blood pressure at age 55 have a 90 percent lifetime risk of developing hypertension, the DASH plan should be considered seriously by everyone. DASH is based on the following principles:

- ✓ Reduction of overall fat, saturated fat, and cholesterol

TABLE 9-10 The DASH Eating Plan

The DASH eating plan is based on 2,000 calories a day. The number of daily servings in a food group may vary from those listed, depending on your caloric needs. Use this chart to help you plan your menus, or take it with you when you go to the store.

Food Group	Daily Servings (except as noted)	Serving Sizes	Examples and Notes	Significance of Each Food Group to the DASH Eating Plan
Grains and grain products	7–8	1 slice bread 1 oz dry cereal* 1/2 cup cooked rice, pasta, or cereal	Whole-wheat bread, English muffin, pita bread, bagel, cereals, grits, oatmeal, crackers, unsalted pretzels and popcorn	Major sources of energy and fiber
Vegetables	4–5	1 cup raw leafy vegetable 1/2 cup cooked vegetable 6 oz vegetable juice	Tomatoes, potatoes, carrots, green peas, squash, broccoli, turnip greens, collards, kale, spinach, artichokes, green beans, lima beans, sweet potatoes	Rich sources of potassium, magnesium, and fiber.
Fruits	4–5	6 oz fruit juice 1 medium fruit 1/4 cup dried fruit 1/2 cup fresh, frozen, or canned fruit	Apricots, bananas, dates, grapes, oranges, orange juice, grapefruit, grapefruit juice, mangoes, melons, peaches, pineapples, prunes, raisins, strawberries, tangerines	Important sources of potassium, magnesium, and fiber
Low-fat or fat-free dairy foods	2–3	8 oz milk 1 cup yogurt 1½ oz cheese	Fat-free (skim) or low-fat (1%) milk, fat-free or low-fat buttermilk, fat-free or low-fat regular or frozen yogurt, low-fat and fat-free cheese	Major sources of calcium and protein
Meats, poultry, and fish	2 or less	3 oz cooked meats, poultry, or fish	Select only lean; trim away visible fats; broil, roast, or boil instead of frying; remove skin from poultry	Rich sources of protein and magnesium
Nuts, seeds, and dry beans	4–5 per week	1/3 cup or 1½ oz nuts 2 Tbsp or 1/2 oz seeds 1/2 cup cooked dry beans, or peas	Almonds, filberts, mixed nuts, peanuts, walnuts, sunflower seeds, kidney beans, lentils	Rich sources of energy, magnesium, potassium, protein, and fiber
Fats and oils†	2–3	1 tsp soft margarine 1 Tbsp low-fat mayonnaise 2 Tbsp light salad dressing 1 tsp vegetable oil	Soft margarine, low-fat mayonnaise, light salad dressing, vegetable oil (such as olive, corn, canola, or safflower)	DASH has 27 percent of calories as fat, including fat in or added to foods
Sweets	5 per week	1 Tbsp sugar 1 Tbsp jelly or jam 1/2 oz jelly beans 8 oz lemonade	Maple syrup, sugar, jelly, jam, fruit-flavored gelatin, jelly beans, hard candy, fruit punch, sorbet, ices	Sweets should be low in fat

*Equals 1/2 to 1½ cups, depending on cereal type. Check the product's Nutrition Facts label.

†Fat content changes serving counts for fats and oils. For example, 1 Tbsp of regular salad dressing equals 1 serving; 1 Tbsp of a low-fat dressing equals 1/2 serving; 1 Tbsp of a fat-free dressing equals 0 servings.

SOURCE: U.S. Department of Health and Human Services. National Heart, Lung, and Blood Institute.

- ✓ Increased fruits, vegetables, and low-fat dairy foods
- ✓ Increased fiber by including whole grains
- ✓ Restriction of sodium
- ✓ Increased magnesium, potassium, and calcium (which help the body excrete excess salt)

Check out Table 9-10, which describes the DASH eating plan. Everyone could benefit by adopting many of the DASH guidelines.

Mediterranean Diet

There has been increasing interest in the health benefits of eating a Mediterranean-style diet, but there is no one, typical “Mediterranean diet.” At least 16 countries border the Mediterranean Sea, and diets vary among these countries based on culture, ethnic background, and agricultural production. Nevertheless, the Mediterranean-style diet is typically high in fruits, vegetables, whole grains, beans, nuts, and seeds. Olive oil is an important source of fat. Fish and poultry are eaten rather than red meat, processed meats, dairy, or eggs. Red wine is consumed in moderation.

Studies have shown that this diet dramatically reduces the risk of death from both cardiovascular disease and cancer. Since there is convincing evidence that red meat and processed meats like bacon, sausage, ham, salami, and hot dogs contribute to the development of

colorectal, pancreatic, stomach, and prostate cancer, following a Mediterranean-style diet gives you a good chance of avoiding the common chronic diseases that afflict many Americans.

Making Positive Changes

All this information about nutrition can seem confusing and sometimes appear contradictory; for example, how do you consume enough meat for iron yet reduce saturated fat? Eggs are a good source of protein, but how do you make sure daily cholesterol milligrams don’t exceed 300? You certainly hear enough about what *not* to eat. We believe in a positive approach to a wellness lifestyle, and Table 9-11 gives many general tips to help you eat more nutritiously in today’s fast-paced world. These suggestions are ways to incorporate the dietary guidelines into sensible and simple practices. Significant improvements in your nutritional health can be accomplished with *simple* changes. For example, using Prochaska’s transtheoretical model for behavior change (see Chapter 5), participants in a research study were successful in lowering and maintaining their dietary fat intake to below 30 percent of their calories by using five specific action-based techniques:

1. Switching to low-fat or nonfat cheeses and dairy products
2. Eating whole-grain breads, rolls, pancakes, and muffins without butter or margarine

TABLE 9-11 *Twenty Tips for Nutritional Wellness*

1. Use fresh, unprocessed foods whenever possible.
2. Remove the skin from poultry (the source of most of the saturated fat).
3. Eat low-fat dairy products.
4. Eat fish once or twice a week (baked or broiled, *not* fried or breaded).
5. Instead of focusing a meal on a meat, use a small amount of meat (diced, shaved, chopped, sliced) to mix in with vegetables and rice or pasta.
6. Steam, bake, broil, or roast foods, using a cooking rack to allow fat to drain from the food.
7. Select salad oils, cooking oils, and margarines made with unsaturated fats. Soft, tub margarines with liquid oil listed as the first ingredient are good choices.
8. Use a nonstick vegetable oil spray for sautéing.
9. Use deli luncheon meats such as shaved chicken breast and turkey instead of high-fat bologna, salami, beef, or hot dogs.
10. Use applesauce in place of the oil in brownie, cake, and quick-bread recipes.
11. Use plain low-fat yogurt as a substitute for sour cream in dips and on baked potatoes. Fat-free sour cream and cream cheese are also available. Evaporated skim milk can substitute for cream in recipes.
12. Eat a meatless dinner several nights a week.
13. Use ground turkey or soy-based crumbles in casseroles, chili, spaghetti sauce, tacos, and skillet dinners that normally require ground beef.
14. When making scrambled eggs, separate the eggs, eliminating half the yolks. If a recipe calls for one egg, substitute two egg whites to reduce the cholesterol.
15. Decrease at least by half the margarine or butter called for in preparing packaged rice and pasta mixes (with minimal effect on taste).
16. Take advantage of nonfat chips, dips, snacks, cereals, cookies, and crackers that are appearing on grocery shelves almost daily. (Remember, however, that “no fat” doesn’t necessarily mean “no calories.”)
17. Try canned fruit with natural juices as a tasty topping for pancakes and french toast, rather than butter and syrup.
18. Top pizzas, baked potatoes, and stuffed burritos with broccoli, mushrooms, zucchini, peppers, salsa, or onions rather than meats.
19. Try powdered “nonbutter” sprinkles or “butterlike” sprays as toppings for vegetables.
20. Use breads and cereals that list 100 percent whole wheat or “whole grain” as the first ingredient.

3. Eating a variety of fruits and veggies with every meal and as snacks
4. Using low-cal or nonfat salad dressings
5. Taking the skin off chicken

You may want to go back and review Prochaska's behavior change theory to help identify your current stage of change in regard to some of your dietary practices. Look at the specific behavior change strategies that could help you make a healthy dietary change. See Table 9-12 for one example.

People eat food, not numbers. So rather than focusing on constant measuring, counting, and weighing, dietary change should involve practical changes that can become lifetime habits. It is not advisable or possible to do a complete overhaul of your diet. It is easier,

TABLE 9-12 *Tips for Behavior Change:*
**Eating Five to Nine Servings of Fruits/
Vegetables Every Day**

STAGES OF CHANGE: IN WHAT STAGE ARE YOU?

1. Precontemplation: "I don't like fruits and vegetables, and I'm in good health. So why would I want to eat them?"
2. Contemplation: "I realize fruits and vegetables have a lot of nutritional value and could probably cut my risk of future chronic diseases."
3. Preparation: "I've been spending more time in the produce section of the grocery store, learning more about different fruits. I have even started buying and trying some new kinds."
4. Action: "I have been eating five servings every day for about 2 months."
5. Maintenance: "I eat at least seven servings (sometimes more!) every day and have done so for over 6 months. I can't imagine not eating them every day!"

PROCESSES OF CHANGE

After identifying your current stage, try using some of the following selected processes and behavior strategies appropriate for your particular stage to facilitate your transition into the next stage (refer to Figure 5-2).

- **Consciousness-raising:** Read about health benefits of eating fruits and vegetables.
- **Social liberation:** Investigate new fruits and vegetables at the grocery and try new recipes.
- **Self-reevaluation:** Write down pros and cons of making this major dietary change.
- **Self-liberation:** Map out a plan (e.g., drink a glass of juice and slice a banana onto cereal at breakfast; carry an apple in backpack for a snack; have a green vegetable at dinner every night; snack on grapes, carrot sticks, or other fruits/veggies while studying).
- **Reward:** Treat yourself to a rich fruit dessert once a week (cobbler, pie, etc.).
- **Environment control:** Have plenty of fruits/vegetables available in room/apartment.

and usually more lasting, to make small and gradual changes. Realize that no one is perfect or eats perfectly all the time. You do have choices, though. If nothing else, try to select foods high in **nutrient density**. Nutrient-dense foods provide substantial nutrients (vitamins, minerals, phytochemicals, fiber, etc.) with relatively few calories, fat, and sugar. Examples of nutrient-dense foods are fruits, vegetables, legumes, and whole grains. These foods allow you to meet your nutritional needs without overconsuming calories. They fill you up (as opposed to "empty calorie foods" like pastries, chips, sodas, and alcohol, which are high in calories and lack many nutrients).

A good way to assess your nutritional habits is to record everything you eat for 3 to 7 days in a log. By observing types and quantities of food consumed, you can best judge if your diet is nutritionally sound—that is, if it conforms to the *Dietary Guidelines* and mimics your Pyramid. Keeping a food log can help you set goals for making positive dietary changes. (There is a sample Food Log form in the Lab Activities section at the end of this chapter.) You may prefer to use one of the many computer programs, websites, or the tools that accompany www.MyPyramid.gov for dietary assessment. At the end of this chapter are helpful websites with links to nutritive values of foods, even fast foods. It may be tedious to keep records for several days, but this experience creates an awareness of food choices and quantities as well as of where improvements can be made.

Nutrition Labeling

Now that you understand the basics of nutrition, how do you find out the nutritional content of the foods you are eating? You do this by reading labels. Read about what you are eating. Part of self-responsibility is becoming a nutrition-wise consumer. The federal government regulates food labeling and requires processed and packaged foods to have uniform labels. This uniformity can help consumers make healthy choices. Study the sample label in Figure 9-2 to learn how to read a label.

When reading labels remember these points:

1. Check serving size. If not careful, you may eat two to three servings if the stated serving size is skimpy.
2. Watch for hidden sugars added to a product: syrup, sucrose, molasses, corn sweetener, dextrose, maltose, honey, and so on.
3. Check fat content. Avoid hydrogenated fats.
4. Some crackers, pastries, cookies, candies, and instant cocoas are made with coconut and palm oil, which is more saturated than beef fat.
5. Select *whole*-wheat bread ("wheat flour" means refined *white* flour—the bran and wheat germ have been removed). All whole-wheat bread is brown, but not all brown bread is whole wheat.

Serving sizes are standardized to reflect the amounts of foods people actually eat. They are also expressed in common household and metric measures. (You should note whether you are consuming more than one serving.)

With only 5g of saturated fat, and 1.5 g of trans fat, where is the rest of the 13 total grams of fat? It could be unsaturated fats which are not currently required on a label.

This mandatory list of nutrients includes those most important to today's consumers. In the past, the concern was vitamin and mineral deficiencies. Now the worries pertain to fat, cholesterol, sodium, types of carbohydrates, and protein amounts.

This means that in a 2,000 calorie diet 65 grams is equal to 30 percent fat.

This information can help you calculate what percentage of calories of this food comes from fat, carbohydrates, and protein.

CHECK YOURSELF:

What % of calories of this food comes from fat? carbohydrates? protein?

FAT: 13 grams X 9 cal/gram = 117 fat calories. $117/261 = .45$ This macaroni and cheese is 45% fat.

CARBOHYDRATES: 31 grams X 4 cal/gram = 124 carbohydrate calories. $124/261 = .47$. This macaroni and cheese is 47% carbohydrate.

PROTEIN: 5 grams x 4 cal/gram = 20 protein calories. $20/261 = .08$ This macaroni and cheese is 8% protein.

MACARONI AND CHEESE

Nutrition Facts

Serving Size 1/2 cup (114g)
Servings Per Container 4

Amount Per Serving

Calories 261 Calories from Fat 117

	% Daily Value*
Total Fat 13g	20%
Saturated Fat 5g	25%
Trans Fat 1.5g	10%
Cholesterol 30mg	10%
Sodium 660mg	28%
Total Carbohydrate 31g	11%
Sugar 5g	**
Dietary Fiber 1g	4%
Protein 5g	**

Vitamin A 4% • Vitamin C 2% • Calcium 15%
• Iron 4%

* Percents (%) of a Daily Value are based on a 2,000 calorie diet. Your Daily Values may vary higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Fiber		25g	30g

1g Fat = 9 calories
1g Carbohydrates = 4 calories
1g Protein = 4 calories

**** No daily values have been determined for sugars and protein intake.**

Ingredients: Enriched wheat flour (contains niacin, reduced iron, vitamin B₁, vitamin B₂, folic acid), cheddar cheese cultures, partially hydrogenated soybean and/or cottonseed oil, non-fat milk, salt, corn syrup, monosodium glutamate, citric acid, natural and artificial flavors, yellow 5 and 6.

% Daily Value shows how a food fits into the overall daily diet. For each item, it shows the percentage or recommended daily consumption for a person eating 2,000 calories a day (e.g., 5 grams of saturated fat is 25 percent of the *recommended* daily value of 20 grams).

No Daily Value for trans fats has been established. If a product lists 0 grams trans fat, it could still contain up to 0.5 grams per serving (but still be advertised as "trans free").

Percentage of daily requirements for selected vitamins and minerals

Recommended daily amounts of each item for two average diets. (If you eat less than 2,000 calories, you will have to adjust the Daily Values.)

Based on 10 percent consumption

Based on 60 percent consumption

Voluntary components that will be allowed on labels are calories from saturated fat, polyunsaturated fat, monounsaturated fat, potassium, soluble and insoluble fiber, sugar, alcohol, other carbohydrates, and other essential vitamins and minerals.

Ingredients are listed in descending order by weight. The ingredient in the largest quantity is always listed first.

How to read to food label.

FIGURE 9-2



Knowing how to read a food label helps you understand how a particular food fits into your daily allowances.

6. Fortified foods contain added vitamins and minerals not originally in the food or present in lower amounts. Breakfast cereals are commonly fortified. Can you name the vitamin with which milk is commonly fortified?
7. Enriched foods have lost nutrients during processing and then have had them replaced by the manufacturers. For instance, when wheat is turned into white flour, it loses at least 50 to 80 percent of many nutrients. Of these, iron, niacin, thiamin, and riboflavin are replaced, but other nutrients lost in the milling process, such as fiber, zinc, and copper, are not restored.

EATING OUT

Eating out has become routine for many of us. Americans now spend more money in restaurants than in grocery stores. Meal preparation time at home has decreased due to changing lifestyles, and it is evident this trend will not reverse. In this fast-paced world, people want food fast. Many fast-food restaurants pride themselves on the ability to have a meal in your hands 90 seconds after you place your order. The fast-food industry is a multi-billion dollar industry, and there is considerable emphasis by food companies in getting the consumer to form an emotional bond with their products. Even though most people know the connections between diet and health, many still rate price, convenience, and taste of food as the main factors affecting their food choices. For every dollar spent by the World Health Organization on preventing the diseases caused by our industrialized, Western diet, more than \$500 is spent by the food industry promoting their unhealthy foods! Most fast-food chains supply nutrient

information on their food products on their websites, or in brochures. What has this information revealed about the nutrient value of fast food? Are fast foods “junk” foods? Nutritionists have found that fast-food items do have significant amounts of some nutrients (especially protein), but many tend to be low in fiber and high in calories, sodium, and fat. The questions are, How often do you rely on these foods? What other foods are you eating during the day? Occasional visits to fast-food restaurants will have little effect on the nutritive value of your total diet. In response to consumer demand, many chains have become diversified and have added many more items to their menus. Many offer healthier items such as salads and fruits. However, it is still up to you to make a wise selection. For many, it is difficult to get ample amounts of fruits, vegetables, and whole grains by eating consistently at fast-food establishments. A fast-food meal can easily total 1,600 calories, 65 grams of fat, and 1,500 milligrams of sodium. Check out the Top 10 list of suggestions for healthy eating at fast-food restaurants.

Restaurant eating in general (not only eating fast foods) has become a way of life for many. Many restaurants offer low-fat, low-calorie dishes, often identified on the menu. Some list fat grams and other nutritional information. Having nutritional knowledge can help you make healthy selections. Ask the server how foods are prepared. Are they baked or fried? Can lower-fat sauces or condiments be substituted? Can the vegetable of the day be substituted for french fries? Salads are not always healthy if loaded with bacon, high-fat cheeses, and full-fat dressings. Check out the à la carte menu. Baked potatoes, salads, vegetables, and soups can often be ordered to make up a meal. Watch portion sizes. Restaurants have a tendency to feed us too much food! Split a meal



We spend 50 percent of our food dollars taking out, driving through, or sitting down for a restaurant meal. In comparison, in 1980 eating out accounted for only 25 percent of our budgets.

TOP 10 LIST

Fast Tips for Fast Foods

1. At sub shops choose lean meats and avoid tuna salad, bacon, oils, regular mayonnaise, and high-fat cheeses. Try the all-veggie sub.
2. Salad bars are a wise choice for vitamins A and C and fiber; go easy on the dressings, high-fat cheeses, bacon, olives, sour cream, and refried beans. If the bar has pita bread, tacos, or tortillas, why not stuff them with veggies?
3. Potato bars are another good choice if you avoid the heavy cheese and butter-type sauces, bacon, and sour cream.
4. Chicken and fish sound healthy, but many are coated with fat. Select the baked or grilled ones without breading or skin.
5. Pizza is a great choice, especially if the toppings are vegetables; avoid pepperoni, sausage, bacon, and olives.
6. Hamburgers—order the small one instead of the “jumbo” burger. Try the veggie burger.
7. Drink skim milk or juices instead of a shake or soda.
8. When eating Mexican food, emphasize soft corn tortillas, beans, chicken, and vegetables (easy on the cheese).
9. For breakfast, avoid croissants, biscuits, sausage, bacon, butter, and the Danish. Better choices are pancakes, English muffins, bagels, bran muffins, and whole-grain cereals.
10. Ask for salad dressings “on the side” and use sparingly. Select fat-free or low-fat dressings.

with a friend or utilize the “doggie bag.” When looking at your overall diet, keep your entire day’s and week’s intakes in perspective. No foods should be totally forbidden. Everyone enjoys an occasional burger and fries, cheesecake, or pepperoni pizza. Try to live by the “80-20 rule”: 80 percent of the time eat nutritionally dense, healthy foods; 20 percent of the time indulge! Remember: *variety, moderation, and balance.*

SPECIAL NUTRITIONAL CONCERNS

High-level wellness means adjusting to life changes and seeking information for special situations. This section discusses dietary considerations for vegetarians, pregnant mothers, the elderly, and those engaging in regular, vigorous exercise.

Vegetarian Diet

For a variety of health and moral reasons, many people prefer a vegetarian diet. A vegetarian diet can be nutritious and healthy. From not eating animal foods, vegetarians normally have lower body fat, blood cholesterol, blood pressure, and rates of coronary heart disease than do meat eaters. They also have a lower than average risk of various cancers and type 2 diabetes because of their high consumption of beans, fruits, and vegetables. There are different vegetarian diets, however. Careful planning and food selection are important to avoid nutritional deficiencies. All vegetarian diets emphasize the use of vegetables, fruits, and grains as main staples. Some diets exclude all animal products, while some include dairy products and eggs.

Here are the types of vegetarians:

1. **Strict vegetarian** (or **vegan**) consumes only plant foods. (Vitamin B₁₂ supplementation is recommended because it is not in any plant foods.)
2. **Lactovegetarian** will consume plant foods and dairy products. (No meat or eggs.)
3. **Ovo-lactovegetarian** will consume plant foods, dairy products, and eggs.
4. **Semivegetarian** excludes only red meat.

Meat is not essential to your diet, but protein is. Therefore, following a vegetarian diet requires careful planning and food selection to consume sufficient vitamins and minerals (especially the B vitamins, vitamin D, calcium, zinc, and iron). Search for good-quality protein sources such as legumes (beans), nuts, grains, seeds, and soybean products. A thorough knowledge of nutrition is essential. For example, combining a good source of vitamin C with whole grains and legumes will greatly enhance iron absorption from grain and legumes. Drinking fortified soy milk will help you obtain calcium and vitamin B₁₂. Vegetarians can easily adapt MyPyramid by substituting beans, nuts, tofu, peas, and veggie/soy meats in the meat category. Those who do not consume dairy can obtain calcium from soy milk, broccoli (and other green leafy vegetables), fortified orange juice, tofu, and almond butter. By also consistently selecting whole grains rather than refined flours, vegetarians can consume adequate vitamins and minerals. With care, the vegetarian diet can be nutritionally complete.

Pregnancy

Many women become more nutritionally aware and eat more wisely during pregnancy. This makes sense. It is an enormous responsibility to be in control of the nutritional well-being of another human. Good nutritional habits before conception give the baby an even healthier start. Good nutrition can improve infant birth



DIVERSITY ISSUES

Ethnic Food Choices

America loves more than burgers and fries. Ethnic foods are popular. Check out these suggestions. (Remember, any foods in huge portions can contribute extra fat, calories, and salt.)

MEXICAN	CHOOSE rice and beans, salsa, soft tacos, chicken or bean burritos, chicken or vegetable fajitas, corn tortillas, grilled chicken or seafood, fat-free or low-fat refried beans, black bean soup	AVOID refried beans made with lard, taco chips and shells, cheese sauces, sour cream, guacamole, fried appetizers, chimichangas, nachos, tostadas, fried ice cream, chili con queso
CHINESE	wonton soup, steamed rice, soft noodles (lo mein), chicken, shrimp, stir-fries, vegetables, Hunan or Szechuan dishes, steamed spring rolls	breaded and deep-fried meats, fried rice, fried noodles, egg rolls, fried wontons, General Tso's chicken, crab Rangoon
ITALIAN	marinara and tomato-based sauces, grilled fish and chicken, minestrone or fagioli (bean) soup, pasta primavera, pasta with red clam sauce, vegetable pizza, steamed clams, marsala or cacciatore	alfredo, carbonara, or other cream sauces, parmigiana dishes, cannelloni, ravioli, manicotti, garlic bread, fried calamari, deep-crust pepperoni pizza, sausage pizza, cannoli
INDIAN	baked breads (chapati), tandoori chicken or fish, yogurt-based curry dishes, dal (lentils), rice pilaf, hummus, kabobs, basmati rice	fried breads (bhatura, poori, paratha), ghee (clarified butter), fried appetizers (pakoras), samosa, korma (meat in cream sauce)
THAI	chicken and seafood dishes (larb, po tak), broiled beef with onions (yum neua), tofu and vegetables, Thai salad	fried fish, chicken or duck, curries, peanut sauces, yum koon chaing (sausage with peppers), crispy noodles, coconut milk curries
GREEK	dolmas (rice wrapped in grape leaves), tzatziki (yogurt and cucumbers), shish kabob, pita bread	moussaka, gyros, baklava, vegetable pies (spanakopita)

weight and reduce infant mortality. It has become recognized that a deficiency in folic acid (a B vitamin) is linked to neural tube birth defects. Therefore, the U.S. Public Health Service has issued a public health recommendation that all women of childbearing age should consume 0.4 milligram (or 400 mcg) of folic acid per day. The evidence is so clear and the concern so great that the FDA has mandated that folic acid be added to “enriched” grain products.

Pregnancy is not a time to diet. Weight gain and some increased fat deposition are necessary and healthy. Be sure to increase calcium, iron, and protein. Your physician may recommend a vitamin supplement because many vitamin needs are increased. Although some additional vitamins and minerals are needed, only about 300 extra calories per day are necessary for fetal growth and metabolic expenditure. A woman may be

“eating for two,” but normal energy expenditure is not double. Therefore, it is important to eat nutritionally dense foods. Twinkies, chocolate chip cookies, and potato chips offer few nutrients to a growing baby. Alcohol and caffeine should be limited because they increase nutrient excretion and adversely affect fetal development.

Aging

Many factors may interfere with good nutrition in older adults: economics, isolation, dentures, chronic health disorders, loss of taste, and medications. Nutrient absorption may decrease, especially for calcium and zinc. The widow or widower whose partner had always prepared the meals might start eating fast foods or frozen dinners. The depressed and lonely surviving partner may eat very little. Proper nutrition throughout life and

into later life can minimize degenerative changes and help you maintain productivity and wellness. However, your 65-year-old body will not be the same one you fed at age 25. If you decrease activity and your body composition changes (increase in fat, decrease in lean), caloric intake should be decreased. Maintaining an active lifestyle can keep energy requirements from decreasing drastically. Although energy needs may drop as you age, nutrient needs do not diminish significantly. You must make your calories count. Be sure to eat adequate fiber and calcium and fewer fats and refined sugars. In many ways good nutrition (along with proper exercise) can help slow the aging process.

Sports and Fitness

Do you play competitive soccer? Are you training for a half-marathon? Is lap swimming every morning your fitness routine? Nutrition complements physical activity as you pursue a wellness lifestyle. However, the basic nutritional needs of an active person vary little from those of the more sedentary. *Everyone* needs a wide variety of healthy foods. If you are physically active, you burn more calories and have less chance of gaining weight (while eating more). Nevertheless, you do not need a special diet. There are many myths surrounding athletic performance and nutrition. An athlete (even a body builder) does not benefit from consuming massive amounts of protein. The typical American diet contains adequate amounts of protein—even to support an athletic lifestyle. Athletes who train heavily may need a little more. (See Frequently Asked Questions.) These increased protein needs can be satisfied easily through small adjustments in the normal diet—skim milk, yogurt, skinless chicken breast, and beans can provide excellent high-quality protein.

The main fuel for exercising muscles, glycogen, comes from carbohydrates. The best are the complex ones (breads, pastas, cereals, potatoes, rice, fruit), which provide plenty of vitamins and minerals. Persons engaged in fitness activities should consistently follow a 55 to 65 percent carbohydrate diet-proportion guideline.

For those engaging in heavy exercise training, a diet with 65 to 70 percent of its calories from carbohydrates may be necessary to refuel glycogen stores. High-sugar snacks consumed before exercising can decrease performance. Carbohydrate loading (that is, manipulating diet and training to increase glycogen stores in the muscles) has not been shown to be effective for athletes participating in events requiring less than 1½ to 2 hours of continuous, noninterrupted effort.

The benefits of vitamin and mineral supplementation is a current area of study in regard to nutrition for competitive athletes. Large doses of the antioxidant vitamins C, E, and beta-carotene have shown promise in minimizing muscle damage and soreness in hardworking athletes. However, there is no evidence that consuming supplements containing vitamins, minerals, herbs, protein, or amino acids will build muscle or improve sports performance. Muscle overload through training, not supplementation, builds muscle. Research continues to explode in this area.

In regard to nutrition, the key to sports and fitness performance is the same as the key to general wellness and vitality: a balanced diet.



PRESCRIPTION FOR ACTION

You've read the chapter. Now go do one or more of these:

- ✓ Eat a whole-grain cereal for breakfast and top it with fruit.
- ✓ Substitute skim milk, water, or 100 percent fruit juice for a sweetened soft drink.
- ✓ Make sure your dinner plate has two different-colored vegetables on it.
- ✓ Try an all-veggie pizza, burrito, wrap, or sandwich.
- ✓ Choose fruit for dessert or for a snack.



Frequently Asked Questions

Q. I work out quite a bit: endurance biking and weight training. Don't I need a lot more protein than a casual exerciser does?

A. Many athletes overestimate the amount of protein they need, thinking that more is better. Some studies indicate that more grams of protein than the normal

recommendation (i.e., weight in pounds multiplied by 0.36) may help somewhat, while other studies show no improvement in workload capacity or strength. In the studies that recommend more protein, weight in pounds multiplied by 0.54 to 0.64 is the additional amount sufficient for strength and

endurance athletes. If you are typical, you probably eat more than enough protein. For example, if you weigh 180 pounds, your recommended protein intake is approximately 65 grams ($180 \text{ lb.} \times 0.36$). If you increase to $180 \text{ lb.} \times 0.54$ or $180 \text{ lb.} \times 0.64$, the result is 97 to 115 total grams of protein. To put this in food perspective, 70 grams of protein would be 8 oz of skinless chicken breast and 2 cups of skim milk. An addition of 1 cup oatmeal, 1 cup cottage cheese, and 2 tablespoons peanut butter brings the total to 115 grams of protein. As you can see, the typical American diet contains a sufficient amount of protein to support even the most active lifestyle. Remember, more carbohydrates, *not* protein, are needed for energy fuel, and excessive protein does not build muscle faster. Excessive protein intake puts extra strain on the kidneys.

Q. I hate milk and know I don't get enough calcium. Can't I take a calcium supplement? If so, what kind?

- A. It is best to get enough calcium in the diet, but like you, many people struggle with this. There are many types of calcium supplements, some more absorbable than others. The most absorbable form of calcium is calcium citrate, and it can be taken without food. Avoid oyster shell calcium, coral calcium, dolomite, and bone meal products due to possible lead contamination. Calcium carbonate (the type found in antacids) is less absorbable than calcium citrate. Also, you absorb more from divided doses (500 mg or less) than from taking a high dose of calcium all at once. In addition to calcium, it is important to get the recommended levels of magnesium, zinc, and vitamin D to enhance the absorption of calcium. Remember, you can also obtain calcium from nondairy foods: calcium-fortified orange juice, sardines, oatmeal, whole grains, broccoli, and tofu.

Q. I keep seeing more foods labeled "organic" in my grocery store. What does that mean?

- A. In the past, "organic" was never officially defined. Growers and manufacturers could slap "organic" on any food they wanted and not be breaking any regulations. This has changed. Under the new federal regulations, "organic" indicates that a food has been made with ingredients grown without chemical fertilizers, genetic engineering (scientific tinkering with a plant's DNA), and irradiation (a process that uses low levels of radiation to kill bacteria). "Organic" meat denotes that the animals have not been administered antibiotics, have had access to outdoor land, and have been fed organically grown feed. On packaged foods: "100% organic" means all ingredients are organic; "organic" means at least 95 percent of the ingredients are organic; "made with organic ingredients" means at least 75 percent of the ingredients are organic.

Q. Which is better to eat, butter or margarine?

- A. It is best to limit consumption of *all* fats, including butter and margarine. Butter is high in saturated fat, which raises "bad" LDL cholesterol. Regular margarine is high in trans-fatty acids (hydrogenated oils), known to increase the "bad" LDL cholesterol *and* decrease the "good" HDL cholesterol. Therefore, if you must use a spread, look for lower-fat or lighter kinds of margarines that say "trans-free" on the label. These are better for you. Both margarine and butter have the same number of calories, approximately 100 calories per tablespoon. You may want to try some of the butter sprinkles, butter-flavored mixes, and butter sprays, which are fat-free.

Q. I don't like many vegetables. Is it okay to get all my phytochemicals strictly from fruit?

- A. If you absolutely cannot stand vegetables, eating extra fruit can compensate to some degree, but fruits and vegetables are not nutritionally identical. Both fruits and vegetables contain about the same vitamins and minerals, but vegetables offer a wider array of phytochemicals and carotenoids that help fight cancer, heart disease, and more. How about trying to add some new sauces or spices to vegetables to make them more flavorful? Or add shredded carrots, zucchini, or spinach to pasta sauces or meat loaf. Add steamed broccoli or peas to macaroni and cheese. Throw a handful of veggies into soup. They make great pizza toppings. There are many creative ways to add vegetables to your diet. And you may find you like them!

Q. I love pizza. Is it considered an unhealthy "junk food"?

- A. It all depends on the toppings you choose. Ordering a vegetable-topped pizza is generally a pretty healthful choice. Also, a thin crust is better than a thick crust. When you load a pizza with pepperoni, sausage, bacon, or extra cheese, the fat and calories skyrocket. Since an entire large veggie pizza rarely contains even one cup of vegetables, why not add some more on your own? In the 10 minutes you wait for a pizza to be delivered or preheat the oven, you can sauté some mushrooms, onions, peppers, broccoli, or spinach to add to the pizza. Chopped tomatoes or even canned vegetables will do. Use your imagination!

Q. Are fresh fruits and vegetables more nutritious than frozen, canned, or dried?

- A. Not really. Most frozen, canned, and dried fruits or vegetables can be as nutritious as fresh produce. The frozen and canned versions are usually processed quickly using fresh-picked produce. To maximize vitamin content, use little water in preparation. Eating fruits and vegetables in a variety of forms will ensure a balance of important nutrients. When choosing frozen, canned, or dried versions, try to choose products without added sauces, sodium, or sugars.

Q. Since I have classes during midday, I never have time for lunch. What healthy and filling items can be packed in a backpack to get me through the day?

A. Many of us are busy or on-the-go during lunchtime. The following items can be packed in a backpack, office drawer, or car to fill an empty stomach: fresh

or dried fruits, 100% fruit juices, bagels, carrots or celery sticks, granola or cereal bars, snack-size boxes of cereal or crackers, soy nuts, whole-wheat fig bars, almonds, peanut butter- or cheese-filled whole-wheat crackers.

Summary

Although diet is not singled out as a specific risk factor for coronary heart disease, dietary factors are often interrelated with patterns of physical activity as major contributors to heart disease, stroke, obesity, atherosclerosis, osteoporosis, and some types of cancer. While many dietary components are involved in diet and health relationships, a primary factor is our high consumption of fats (especially saturated fats). These fats are often consumed at the expense of fruits, vegetables, and complex carbohydrates that may be more conducive to health.

Like many, you may admit to having some poor nutritional habits. You may rationalize this with some of the following:

- I'll do better after I get out of school and have more time. (Frankly, you will probably be busier after graduation.)
- But I feel fine! (Like smoking, poor eating habits may not noticeably affect your health for years.)

- I don't have any control over what the cafeteria serves. (However, you do have *choices* in the cafeteria and between meals.)
- I don't have enough money to buy the right foods. (On the contrary, milk is cheaper than soft drinks; a bunch of bananas costs less than a bag of potato chips.)
- I'm going to die anyway, so I might as well eat what I like. (Yes, we are all going to die. However, lifetime dietary habits significantly affect the *quality* of the last 10 to 20 years of your life.)

Wellness involves making informed choices rather than rationalizing. Improved eating habits can positively affect your health—now and later in life. Therefore, learn about the foods you are eating. Read food labels. The heart of good nutrition is *nine dietary guidelines*, a *pyramid of choices*, and *three simple words: variety, moderation, and balance*.



Internet Resources

3-a-Day of Dairy

www.3aday.org

Emphasizes the importance of dairy products as a means for healthier bones, weight loss, and overall health. Includes articles, research, recipes, and tips.

American Dietetic Association

www.eatright.org

Provides a vast amount of reliable, objective food and nutrition information, including fact sheets, position papers, and healthy eating tips.

American Heart Association: Delicious Decisions

www.deliciousdecisions.org

Provides basic information about nutrition, tips for shopping and eating out, and healthy recipes.

Ask the Dietitian

www.dietitian.com

Thoroughly covers all areas of nutrition, food, weight issues, and fitness in a question-and-answer format.

Center for Nutrition Policy and Promotion

www.usda.gov/cnpp

Promotes healthy eating and provides dietary guidance that links scientific research to consumer issues: food plans, dietary guidelines, nutrition insights, and up-to-date reports.

Center for Science in the Public Interest

www.cspinet.org

Features the *Nutrition Action Newsletter*, a watchdog of the fast-food and restaurant industry whose mission is to educate the public on healthy eating.

Eat Better America

www.eatbetteramerica.com

Has a terrific database of healthy recipes and tips on how to eat healthier.

Fast Food Facts

www.foodfacts.info

Has a database of fast-food restaurants with comparisons and the nutritional content of their foods, sorted by calories, fat, cholesterol, and more.

Fruits and Veggies Matter

www.fruitsandveggiesmatter.gov

Emphasizes the importance of fruits and vegetable in the diet for prevention of chronic diseases. Gives benefits, recipes, resources, tips, and Q&A.

Harvard School of Public Health

www.hsph.harvard.edu/nutritionsource

Covers current research on all aspects of nutrition, providing tips on healthy eating and dispelling myths. Addresses everything from fiber to weight management to exercise.

MyPyramid

www.MyPyramid.gov

A U.S. Department of Agriculture interactive site that helps you choose the foods and amounts that are right for you according to the current *Dietary Guidelines*. Provides tips, tracking sheets, resources, and guidelines for healthy eating.

National Dairy Council

www.nationaldairycouncil.org

Provides timely and reliable nutrition information on the health benefits of dairy foods.

National Osteoporosis Foundation

www.nof.org

Covers facts, risk factors, information, and news related to fighting osteoporosis and promoting bone health.

Nutrition.gov

www.nutrition.gov

Everything you need to know about nutrition issues, dietary guidelines, weight management, supplements, and food safety. Provides science-based guidance and reliable information for all ages from a multitude of federal agencies.

Nutrition Data

www.nutritiondata.com

Provides complete nutritional information for any food or recipe and helps you select foods that best match your dietary needs.

Office of Dietary Supplements

<http://ods.od.nih.gov>

An office of the National Institutes of Health, this site helps consumers, health-care providers, and educators find credible scientific information on a variety of dietary supplements.

The Vegetarian Resource Group

www.vrg.org

Covers all issues and topics regarding vegetarianism.

USDA Food and Nutrition Information Center

www.nal.usda.gov/fnic

Covers a wide array of information, including dietary guidelines, food composition tables, dietary supplements, healthy eating tips, and fitness/food/body calculators.

U.S. Food and Drug Administration

www.fda.gov

Provides information about the safety and effectiveness of food, drugs, cosmetics, weight-loss products, and any medical devices intended for human use.

The following restaurants have nutritional information for their foods online:

www.arbys.com	www.krispykreme.com
www.blimpie.com	www.longjohnsilvers.com
www.bostonmarket.com	www.mcdonalds.com
www.burgerking.com	www.panerabread.com
www.carlsjr.com	www.popeyes.com
www.chick-fil-a.com	www.papajohns.com
www.churchs.com	www.pizzahut.com
www.dairyqueen.com	www.schlotzskys.com
www.dominos.com	www.sonicdrivein.com
www.dunkindonuts.com	www.steakshake.com
www.fazolis.com	www.subway.com
www.hardees.com	www.tacobell.com
www.jackinthebox.com	www.whitecastle.com
www.kfc.com	

LAB Activity 9-1

Name _____ Class/Activity Section _____ Date _____

Food Log

Write down everything you eat and drink for 3 to 5 full days. Make copies of the log as needed. Be sure to note the approximate quantity of food and assess combination foods (e.g., pizza, casseroles, tacos, salads) to list the foods in them. Use the columns at the right to record calories, sodium milligrams, fat grams, cholesterol milligrams, or other information, as desired by you or your instructor. (Your instructor may ask you to enter this data into a computer program of his/her choice for further analysis.)

Date _____
(12:01 A.M. to 12:00 midnight)

Other possible categories: calcium, cholesterol, sodium, fiber, etc.

Major Food Groups (list amounts)

	Time	Food	Grains	Vegetables	Fruits	Meat and beans	Milk	Fats, oils, sweets	Fat grams	Calories				
EXAMPLES:	11:45 A.M.	Cheeseburger	2 oz.			4 oz.	1½ oz. cheese	1 tbsp. mayo	36	490				
	11:45 A.M.	Apple			1 med.				0	80				
	11:45 A.M.	Soda						12 oz.	0	160				
	Totals =													

Vitamin Supplements:

Date _____
(12:01 A.M. to 12:00 midnight)

Other possible categories: calcium, cholesterol, sodium, fiber, etc.

**Major Food Groups
(list amounts)**

[illegible]

Vitamin Supplements:

LAB Activity 9-2

Name _____ Class/Activity Section _____ Date _____

Analyze Your Diet

After completing the *Food Log*, analyze your diet as follows.

1. Looking at the nine *2005 Dietary Guidelines for Americans*, how do you measure up to *each* guideline?

1. _____ 6. _____

2. _____ 7. _____

3. _____ 8. _____

4. _____ 9. _____

5. _____

2. Go to www.MyPyramid.gov and enter your personal data. Print your recommended plan. Then compare your average daily diet to what is recommended in MyPyramid. (See Figure 9-1 for serving size equivalencies.)

MyPyramid recommendations

GRAINS: _____

VEGETABLES: _____

FRUITS: _____

MILK: _____

MEAT/BEANS _____

My average consumption

Are half your grains “whole grains”? _____

According to MyPyramid, what are your estimated daily calorie needs? _____

Do you feel you balance your calorie intake with your calorie output most days? _____

3. Identify three positive dietary changes you could implement that would help you come closer to complying with the *Dietary Guidelines* or your Pyramid. Include *what* you could do and a *specific strategy* for how to do it.

Example: *What?* Eat two more servings of fruit every day.

Strategy? Slice a banana on my cereal every morning; put an apple in my backpack for an afternoon snack each day.

a.

b.

c.

LAB Activity 9-3

Name _____ Class/Activity Section _____ Date _____

How Much Fat?

1. Lisa consumes 2,100 calories per day. To keep her percentage of fat at 30 percent of her calories, figure out how many *grams* of fat she can consume per day. _____ (Show your work.)

If Lisa wants to eat even *healthier* and limit her fat percentage to 20 percent of her daily calories, how many fat grams per day can she consume? _____ (Show your work.)

2. Robert consumes 2,700 calories per day. To keep his percentage of fat at 30 percent of his calories, how many *grams* of fat can he consume per day? _____ (Show your work.)

If Robert wants to eat even *healthier* and limit his fat percentage to 25 percent of his daily calories, how many fat grams per day can he consume? _____ (Show your work.)

WHAT ABOUT YOU?

(Multiply your body weight by 15 to approximate your caloric intake for a day.)

_____ lb. $\times$ 15 = _____ calories

Number of daily fat grams at 30 percent of calories = _____ (Show your work.)

Number of daily fat grams at 25 percent of calories = _____ (Show your work.)

Number of daily fat grams at 20 percent of calories = _____ (Show your work.)

LAB Activity 9-4

Name _____ Class/Activity Section _____ Date _____

Label Reading Assignment

HONEY WHEAT MUFFIN MIX

Directions

Combine mix with:
1/3 c. whole milk
1 T. oil
1 egg

Stir and pour into prepared muffin tin.
Bake 15 minutes at 400°.

Nutrition Facts

Serving Size 1 muffin (from 31g mix)
Servings Per Container 6

Amount Per Serving	Mix	Prepared
Calories	123	162
Calories from Fat	27	54
% Daily Value**		
Total Fat 3g*	4%	10%
Saturated Fat 0.5g	3%	7%
Trans Fat 0.5g		
Cholesterol 0mg	0%	12%
Sodium 210mg	9%	9%
Potassium 15mg	<1%	1%
Total Carbohydrate 23g	8%	8%
Dietary Fiber <1g	2%	2%
Sugars 12g		
Other Carbohydrate 11g		
Protein 1g		
Calcium	0%	2%
Iron	2%	2%

Not a significant source of vitamin A and vitamin C.

*Amount in mix. As prepared, one serving provides 6g fat (1.5g saturated fat; 1.0g trans fat), 35mg cholesterol, 220mg sodium, 45mg potassium, 24g total carbohydrate (12g sugars) and 3g protein.

**Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

Calories:	2,000	2,500
Total Fat	Less than 65g	80g
Sat Fat	Less than 20g	25g
Cholesterol	Less than 300mg	300mg
Sodium	Less than 2,400mg	2,400mg
Potassium	3,500mg	3,500mg
Total Carbohydrate	300g	375g
Dietary Fiber	25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Ingredients: Enriched Wheat Flour, Sugar, Hydrogenated Vegetable Oil (Coconut and/or Palm Kernel), Corn Syrup, Salt, Cellulose Gum, Dextrose, Rice Flour, Artificial Flavor

Look at the muffin mix label and complete the following:

1. What constitutes one serving?
2. Why are there two columns (mix, prepared)?

3. How many grams of total fat are there in two prepared muffins? _____
4. In one prepared muffin, figure out the
 - a. percent of calories from fat: _____
 - b. percent of calories from carbohydrates: _____
 - c. percent of calories from protein: _____
5. Give one source of complex carbohydrate in this product:
6. Give one source of simple carbohydrate in this product:
7. Name the source of cholesterol in this prepared product:
8. Name and comment on the sources of fat in this prepared product:
9. What alternatives or substitutes could be made in preparing these muffins to make them healthier?
10. What is your overall assessment of this food (i.e., nutritional density; sodium, fat, cholesterol content; types of carbohydrates; fiber content)?

LAB Activity 9-5

Name _____ Class/Activity Section _____ Date _____

Can You Eat Healthy at a Fast-Food Restaurant?

Using the websites of various fast-food restaurants listed in the Chapter 9 Internet Resources, put together breakfast and lunch/dinner meals that would be typical for many consumers (perhaps like one of your “non-health-conscious” friends). Use the nutritional information on the restaurant’s website that is available for each food item selected. Record and total the calories, fat grams, and sodium content for each meal. In step 2, put together “healthy” meals from the same restaurant. Record and total the nutritional information. Then answer the discussion questions on the back of this page.

STEP 1 Typical breakfast meal

Choose a restaurant _____

Food item	Calories	Fat grams	Sodium mg.
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
TOTALS =			

Typical lunch/dinner meal

Choose a restaurant _____

Food item	Calories	Fat grams	Sodium mg.
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
TOTALS =			

STEP 2 “Healthy” breakfast meal

(Same restaurant as above)

Food item	Calories	Fat grams	Sodium mg.
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
TOTALS =			

“Healthy” lunch/dinner meal

(Same restaurant as above)

Food item	Calories	Fat grams	Sodium mg.
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
TOTALS =			

1. Comment on the nutritional differences in the meals.

Calories:

Fat:

Sodium:

2. Do you think it is possible to healthy (i.e., meet nutritional needs) by eating regularly in fast-food restaurants?
Why or why not?

3. What specific tips for food selections would you give someone who must eat in fast-food restaurants regularly?

LAB Activity 9-6

Name _____ Class/Activity Section _____ Date _____

Select and Analyze a Food Label

Select a label from a food that you commonly eat. Make sure the ingredients are listed on the label. Attach the label to this form. Analyze the food as follows:

Food: _____ Manufacturer: _____

Serving size: _____ In your opinion, is this an appropriate portion size?

Total calories per serving: _____ Why or why not? _____

Total fat grams per serving: _____

Total trans fats per serving: _____ Percentage of calories from fat: _____

Total carbohydrate grams per serving: _____ Percentage of calories from carbohydrates: _____

Total protein grams per serving: _____ Percentage of calories from protein: _____

Comment on the amount of cholesterol in this food: _____

Comment on the amount of sodium in this food: _____

Comment on the types of carbohydrates in this food (i.e., complex or simple). Is this food a good source of fiber?

List any source(s) of added sugar: _____

What is your overall assessment of this food (i.e., nutritional value, nutritional density, etc.)? _____



Achieving a Healthy Weight

10

More die in the United States of too much food than of too little.
— John Kenneth Galbraith

Study Questions

You will have successfully mastered this chapter if you can answer the following:

1. What is the difference between overweight and obesity?
2. Can you identify the percentages of adults over age 20 who are overweight and the percentage who are obese?
3. Can you explain the purpose of the body mass index (BMI) and identify a BMI associated with health problems?
4. What are six health conditions associated with obesity?
5. How is the location of fat on the body linked to health risks?
6. Are you able to calculate waist-to-hip ratios and identify a risky waist-to-hip ratio and a high-risk waist circumference for both men and women?
7. How do each of the following factors contribute to obesity: energy balance, fat cells, set point, heredity, and metabolism?
8. Can you define basal metabolic rate (BMR), and identify five factors that affect it?
9. Are you able to list guidelines that distinguish a healthy weight-loss program from a fad/diet program?
10. What are the three major components of effective lifetime weight management?
11. How does exercise help in weight management?
12. Can you compare and contrast these eating disorders: bulimia nervosa, anorexia nervosa, binge eating disorder, and disordered eating?

You will find the answers as you read this chapter.



Visit the Online Learning Center for *A Fit Way of Life*, www.mhhe.com/robbinsfit2e, for additional quizzes and other study aids.

Terms

- anorexia nervosa
- basal metabolic rate (BMR)
- behavior modification
- binge eating disorder
- body fat
- body mass index (BMI)
- bulimia nervosa
- calorie (kcal)
- cellulite
- disordered eating
- eating disorder
- essential fat
- fat cells (adipose cells)
- fat-free mass
- glycogen
- lean-body mass (muscle mass)
- liposuction
- obesity
- overweight
- set-point theory
- storage fat
- weight cycling (yo-yo syndrome)

Americans are preoccupied with weight. This preoccupation has made weight control a multi-billion-dollar business. Americans spend approximately \$40 billion yearly on weight-loss products, programs, and diet aids. The diet-food industry is the fastest-growing food market. Bookstore shelves and magazine racks are crammed with diet plans guaranteed to help you lose those extra inches. Television, radio, and newspapers further advertise a multitude of weight-loss options. Advertisements promise: “lose 30 pounds in 30 days.” “Before” and “after” photos touting the benefits of pills, diets, and creams are scattered throughout magazines. In fact, losing weight is so important that 88 percent of dieters say they would give up a job promotion, retirement, or a dream house if they could only reach their target weight!

With all this attention and effort, one would predict that the American population would be getting leaner. Paradoxically, obesity rates are climbing in all populations in our country. Overweight and obesity account for over 100,000 U.S. deaths per year, second only to tobacco as the most preventable cause of death. And obesity is increasing in prevalence in both developed and developing countries throughout the world.

The latest national statistics reveal that an alarming 67 percent of American adults age 20 or older are overweight or obese. Among those persons, almost 40 percent are classified as obese. And, the

prevalence of obesity is increasing at an alarming rate (see Figure 10-1). Consistent with the data for adults, the prevalence of overweight among children ages 6–11 rose from 6.5 to 18.8 percent between 1976 and 2004, and more than tripled among adolescents ages 12–19 from 5 to 17.4 percent during the same time period. Because of this substantial increase in the prevalence and severity of obesity, officials predict that the steady rise in life expectancy in the United States during the past two centuries may soon come to an end.

However, there are disparities in overweight and obesity in some segments of the population (see Diversity Issues).

Because the obesity trend is increasing so rapidly, most health professionals believe that obesity is the most serious health threat to Americans.

Although there is tremendous interest in diets and dieting, many dieters fail to achieve their weight goals, and over 90 percent of those who do lose weight are unable to keep the weight off. On the far other extreme, the incidence of eating disorders is at an epidemic level. The paradoxes of these facts reveal the complexity of America’s weight issues.

Maintaining a reasonable body weight is a definite wellness issue. Your body is the vehicle by which you function in society. Being overweight can affect you physically, emotionally, socially, and occupationally. The purpose of wellness is to strive toward full

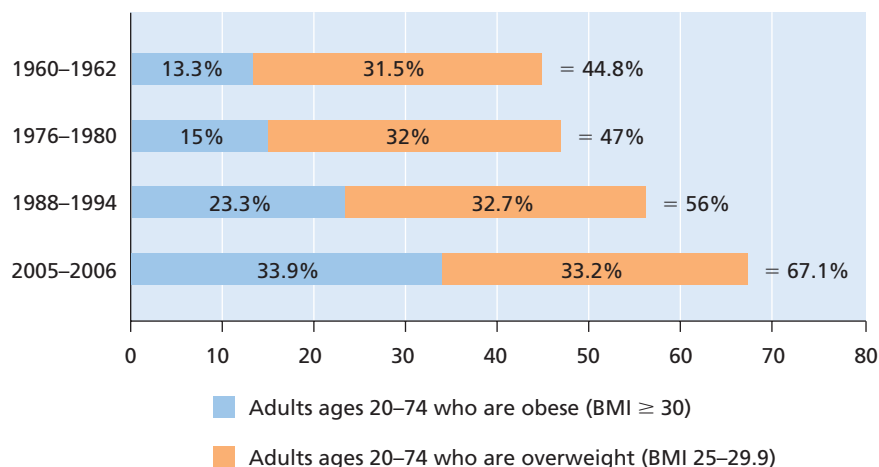


FIGURE 10-1

Americans are getting bigger. SOURCE: Centers for Disease Control and Prevention, 2007.

potential, so maintaining a reasonable body composition is one step toward achieving wellness. Knowledge gives you the tools to plan your lifetime weight-management scheme. It is important that you under-

stand body composition facts, effective weight-loss principles, weight-management guidelines, and the influence of culture, heredity, environment, and behavior on weight control.

UNDERSTANDING BODY COMPOSITION

Your body is composed of body fat and fat-free mass. **Fat-free mass** includes muscle, bone, body fluids, and organs. Muscles, part of fat-free mass, are often specifically

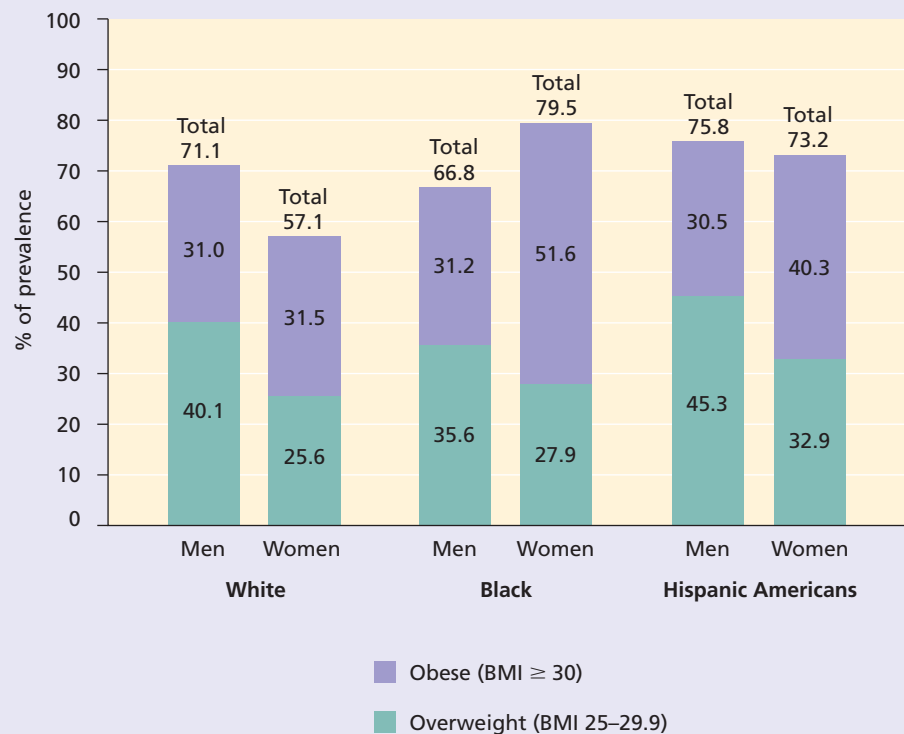
referred to as **lean-body mass** or **muscle mass**. **Body fat** is classified as either essential fat or storage fat. **Essential fat**, required for normal body functioning, is stored in major body organs and tissues such as the heart, muscles, intestines, bones, lungs, liver, spleen, and kidneys and throughout the central nervous system. Females have additional essential fat in the breasts and



DIVERSITY ISSUES

Weight Differences Among Various Ethnic Groups

- Although overweight and obesity are rising in all age groups, they are substantially more prevalent in women who are members of racial and ethnic minority populations than in white women.
- Among men, Hispanic Americans have a higher prevalence of overweight and obesity than do whites or blacks.
- Smaller surveys indicate a higher prevalence of overweight and obesity in American Indians, Alaska Natives, and Pacific Islander Americans and a lower prevalence in Asian Americans compared with the general population.



Prevalence of overweight and obesity by sex and racial group (Ages 20–74). SOURCE: Centers for Disease Control and Prevention, *Health, United States*, 2007.

pelvic region for childbearing and other hormone-related functions. **Storage fat** is the extra fat that accumulates in adipose cells (or fat cells) around internal organs and beneath the skin surface to insulate, pad, and protect the body from trauma and extreme cold. As you learned in Chapter 1, there are different ways to assess body composition. Knowing your body composition (especially your percentage of body fat) can help you set realistic weight goals.

Overweight Versus Obesity

Too often, the terms *overweight* and *obesity* are used interchangeably. **Overweight** refers to a body weight in excess of a recommended range for good health. **Obesity** refers specifically to having an excessive accumulation of body fat.

Because these explanations are somewhat vague, the National Institutes of Health has adopted the **body mass index (BMI)** as a method of classifying overweight and obesity. BMI is a direct calculation based on height and weight and has been universally adopted



Although people seem concerned about their weight, obesity is on the rise.

by health professionals to determine healthy weights and risky weights. BMI is computed from the following equations:

$$\text{BMI} = \frac{\text{weight in kilograms}}{(\text{height in meters})^2}$$

or

$$\text{BMI} = \frac{\text{weight in pounds}}{(\text{height in inches})^2} \times 703$$

Table 10-1 allows you to determine your BMI quickly. Note the classifications below the chart. These standards have been adopted worldwide. In this way, overweight and obesity are clearly defined. Notice that BMI is not gender specific. For example, a 5'6" woman who weighs 155 pounds is considered overweight. If she weighs 186 pounds, she is classified as obese. A 6'0" man weighing 184 pounds is overweight. At 221 pounds, he is considered obese.

One disadvantage of using the BMI is that it remains a measure of weight and height, not fatness (i.e., it doesn't distinguish between body fat and muscle mass). Nor does it take into account the *location* of fat. Therefore it may not be appropriate for an athlete or body builder with a lot of muscle mass. Also, for the elderly who have lost a lot of muscle mass, their BMI may reflect a "healthy weight," when in actuality they have reduced nutritional reserves. Therefore, an analysis of your body fat percentage using the skinfold calipers gives a more accurate body composition assessment (i.e., body fat versus lean body mass). A woman over 30 percent body fat and a man over 25 percent are considered obese. (See Chapter 1 for more on skinfold measuring and body composition.)

Risks Associated with Obesity

Obesity is rapidly becoming the most serious public health issue for both adults and children. The health implications of excess weight have become quite clear. Obesity is identified as a risk factor in 4 of the 10 leading causes of death. The major killers associated with obesity are heart disease, several types of cancer, stroke, type 2 diabetes, and atherosclerosis. Obesity contributes to cardiovascular disease by causing changes in the body that increase the risk factors:

- ✓ Raises levels of LDL ("bad") cholesterol
- ✓ Raises levels of triglycerides (fats in the blood)
- ✓ Reduces levels of HDL ("good") cholesterol
- ✓ Elevates blood pressure

Obesity can aggravate liver disorders and arthritis, and is often found in conjunction with gallbladder disease. Recent statistics show a staggering increase in the number of cases of type 2 diabetes, paralleling the increasing obesity rates in the United States. Although it

TABLE 10-1 Find Your Body Mass Index (BMI)

Find your height, then look across that row. Your BMI is at the top of the column that contains your weight.

		BODY MASS INDEX (BMI)													
		19	20	21	22	23	24	25	26	27	28	29	30	35	40
		Weight (pounds)													
Height	4'10"	91	96	100	105	110	115	119	124	129	134	138	143	167	191
	4'11"	94	99	104	109	114	119	124	128	133	138	143	148	173	198
	5'0"	97	102	107	112	118	123	128	133	138	143	148	153	179	204
	5'1"	100	106	111	116	122	127	132	137	143	148	153	158	185	211
	5'2"	104	109	115	120	126	131	136	142	147	153	158	164	191	218
	5'3"	107	113	118	124	130	135	141	146	152	158	163	169	197	225
	5'4"	110	116	122	128	134	140	145	151	157	163	169	174	204	232
	5'5"	114	120	126	132	138	144	150	156	162	168	174	180	210	240
	5'6"	118	124	130	136	142	148	155	161	167	173	179	186	216	247
	5'7"	121	127	134	140	146	153	159	166	172	178	185	191	223	255
	5'8"	125	131	138	144	151	158	164	171	177	184	190	197	230	262
	5'9"	128	135	142	149	155	162	169	176	182	189	196	203	236	270
	5'10"	132	139	146	153	160	167	174	181	188	195	202	207	243	278
	5'11"	136	143	150	157	165	172	179	186	193	200	208	215	250	286
	6'0"	140	147	154	162	169	177	184	191	199	206	213	221	258	294
	6'1"	144	151	159	166	174	182	189	197	204	212	219	227	265	302
	6'2"	148	155	163	171	179	186	194	202	210	218	225	233	272	311
	6'3"	152	160	168	176	184	192	200	208	216	224	232	240	279	319
	6'4"	156	164	172	180	189	197	205	213	221	230	238	246	287	328
		NORMAL					OVERWEIGHT					OBESE			

INTERPRETING YOUR BMI

- **≤18.9 Underweight**
- **19–24.9 Healthy weight (little health risk)**
- **25–29.9 Overweight (increased health risk)**
- **≥30 Obesity (greatest health risk)**

SOURCE: National Institutes of Health; National Heart, Lung and Blood Institute.

was once considered an adult disease, the number of overweight children now being diagnosed with type 2 diabetes is staggering. This diabetes and obesity combination can lead to blindness, nerve damage, kidney failure, and cardiovascular disease.

Obesity complicates surgery and pregnancy. Pulmonary problems, sleep apnea, heat intolerance, and reduced fertility are more prevalent in the obese. In fact, after smoking, obesity is the biggest risk factor for cancer. The evidence that overweight and obesity increase the risk of a number of cancers is now even more impressive than in the mid-1990s. Among obese women there is an increased risk of cervical, uterine, colon, breast, and pancreatic cancers. Obese men face an increased chance of colon, stomach, rectal, and prostate cancers. In fact, according to the Institute for Cancer Research, excess weight may account for as much as 20 percent of all cancer deaths in women and 14 percent in men. Obesity restricts mobility, increases fatigue, and decreases overall body efficiency. Figure 10-2 shows the percent increase in the risk of various conditions related to specific BMIs.

The high prevalence of obesity in the United States not only is linked to numerous chronic diseases but is responsible for a substantial portion of total health-care costs. According to the surgeon general's report, obesity health-care costs are \$117 billion per year. This figure does not include the psychosocial costs of obesity—from lowered self-esteem to eating disorders to severe depression. The psychological and social consequences of obesity are often overlooked. Obese people also face a tremendous amount of prejudice and discrimination. Their educational and professional opportunities often suffer.

Until recently, modest weight gains throughout adulthood in initially lean individuals were overlooked and even culturally expected. Results from the ongoing Harvard Nurses' Health Study (a 25-year tracking of more than 100,000 nurses) have revealed that even *modest* (11 to 17 lb.) weight gains after 18 years of age increase one's cardiovascular disease risk. The researchers concluded that a large fraction of the population is falsely reassured that their weight is not a health concern because they are not "overweight." The study found that a

	Body mass index (BMI)									
	26	27	28	29	30	31	32	33	34	35
Death/All causes (vs. BMI<19)		60%			110%			120%		
Death/Heart disease (vs. BMI<19)		210%			360%			480%		
Death/Cancer (vs. BMI<19)			80%					110%		
Type 2 diabetes (vs. BMI 22–23)		1,480%		2,660%		3,930%		5,300%		
High blood pressure (vs. BMI<23)		180%		260%				350%		
Degenerative arthritis (vs. BMI<25)							400%			
Gallstones (vs. BMI<24)		150%					270%			
Neural birth defects (vs. BMI 19–27)						90%				

FIGURE 10-2 Weighing the risks: Percent increase in risk by level of obesity. At BMIs of 27 and higher, one's risk for various disorders increases significantly. SOURCES: New England Journal of Medicine, Annals of Internal Medicine, American Journal of Clinical Nutrition, Journal of the American Medical Association.

person's weight at midlife (30 to 55 years) has the greatest influence on heart disease risk. Those with a BMI of 23 to 27 had a 31 percent increased risk; those with the lowest risk had a BMI below 21. Those with a BMI ≥ 30 have a 50 to 100 percent increased risk of death from *all* causes, compared with those with healthy BMIs (19 to 24.9).



The percentage of obese children in the United States has almost tripled in the last 20 years. The 20-plus hours per week the average child spends watching TV and videos is one of the contributing factors.

Location of Fat

Studies suggest that not only are body fat percentage and BMI related to health, the location of excess fat is a comparable risk factor as well. Fat distributed primarily in the abdominal area (called *apple-shape obesity*) is characteristic of many men (but is also present in some women). This “visceral fat” is deep in the belly and intermingled around the internal organs and is linked to increased risk for coronary heart disease, hypertension, high cholesterol, type 2 diabetes, and several forms of cancer. Fat distributed in the lower extremities, around the hips, buttocks, and thighs (called *pear-shape obesity*), does not present as great a risk. Pear-shape obesity is more common in women. The two types of fat have biochemical differences. Abdominal fat experiences much more enzyme, hormone, and chemical activity, dumping more fatty acids into the bloodstream and increasing the prevalence of LDL cholesterol. Hip-thigh fat activity is more stagnant. Unfortunately, this hip-thigh fat is more difficult to lose than is abdominal fat. Many obesity experts now think that one's waist-to-hip ratio is more important than the BMI is in predicting potential weight-related health problems because abdominal fat is so heavily linked to diseases. A worldwide study revealed that abdominal obesity accounts for 90 percent of the risk for heart attack. A large amount of belly fat is a risk factor for cardiovascular disease even if the rest of the physique is skinny! This was true for men, women, all ages, and in all ethnic groups. According to some scientists, if waist-to-hip ratios (rather than BMIs) were currently used to assess the risk of chronic disease, the number of people classified as obese worldwide would increase substantially. Waist-to-hip ratio can be calculated by dividing the number of inches around the waistline by the circumference of the hips. See Table 10-2 for examples of waist-to-hip ratios. For example, someone who has a 30-inch waist and 40-inch hips has a ratio of 0.75. A woman whose ratio is 0.80 or higher is at risk, as is a man whose ratio is 0.95 or above.



For a man or a woman, having a large amount of abdominal fat substantially increases the risk of heart disease, stroke, type 2 diabetes, and several forms of cancer.

TABLE 10-2 *Sample Waist-to-Hip Ratios*

Waist-to-Hip Ratio = $\frac{\text{Waist circumference}}{\text{Hip circumference}}$ (see Chapter 3 for specific measuring instructions)	
$\frac{\text{waist}}{\text{hip}} = \frac{28''}{38''} = 0.74$	$\frac{\text{waist}}{\text{hip}} = \frac{40''}{42''} = 0.95$
$\frac{\text{waist}}{\text{hip}} = \frac{32''}{40''} = 0.80$	$\frac{\text{waist}}{\text{hip}} = \frac{45''}{39''} = 1.15$
$\frac{\text{waist}}{\text{hip}} = \frac{38''}{42''} = 0.90$	$\frac{\text{waist}}{\text{hip}} = \frac{50''}{40''} = 1.25$
Higher risk is associated with a ratio >0.8 for women and >0.95 for men.	

Some researchers believe that the waist circumference *alone* can be a predictor of risk. Men with a waist circumference over 40 inches and women with a waist circumference over 35 inches are classified as high risk no matter what their BMIs are. Men with a waist circumference over 40 inches are twelve times more likely to develop type 2 diabetes. An excess of abdominal fat in women has been linked to breast cancer, colon cancer, and heart attack. Whereas the distribution of fat has a genetic link, a comprehensive program of a low-fat, reduced-calorie diet and regular exercise can help reduce body fat stores regardless of where they are located.

THE SURGEON GENERAL STEPS IN

One of the health goals in the government's publication *Healthy People 2010* was to reduce the number of obese people to 15 percent of the population by 2010. Unfortunately, current body weight trends are leading us away from this goal. Due to the alarming increase in weight in the United States, the government issued *The Surgeon General's Call to Action to Prevent and Decrease Overweight* in 2001. This document establishes five overarching principles to combat this critical public health issue:

1. Promote the recognition of overweight and obesity as major public health problems.
2. Assist Americans in balancing healthful eating with regular physical activity to achieve and maintain a healthy or healthier body weight.
3. Identify effective and culturally appropriate interventions to prevent and treat overweight and obesity.

4. Encourage environmental changes that help prevent overweight and obesity.
5. Develop and enhance public-private partnerships to help implement this vision.

This burden is not trivial. Strategies that involve schools, communities, restaurants, health professionals, and the media must be developed to attack this problem. A good start is to become educated about what causes obesity.

WHAT CAUSES OBESITY?

For years the simplistic explanation for obesity was that people became obese because they ate too much. Obesity was viewed as a condition resulting from a lack of self-control around food. In scientific terms, obesity occurs when a person's caloric intake exceeds the amount of energy that person burns. What causes this imbalance between consuming and burning calories is unclear. Evidence suggests that obesity is a complex combination of metabolic, genetic, psychological, behavioral, social, and environmental factors—not solely a result of a lack of individual willpower. It is clear that no single factor results in obesity. In an attempt to explain the causes of obesity, several factors have to be examined. They include energy balance, fat cells, set point, heredity, and metabolism.

The Energy Balance Equation

The energy balance equation states that energy input (calories consumed) must be equal to energy output (calories expended) for body weight to remain constant. Any imbalance in energy input or energy output will result in a change in body weight. If you eat more calories daily than your body expends in activity, you will store the excesses as fat. If you eat fewer calories than you burn, you will lose weight. It is unrealistic to assume that the equation must be exactly equal every day to maintain your weight. Some days you eat more; some days, less. Some days you are more active than you are on other days. Several days of imbalance in one direction will produce a change in body weight.

This explanation assumes that a calorie is a calorie, whether it is from candy or from a vegetable. A **calorie** (actually a **kcal**) is a measure of energy. One pound of body fat equals 3,500 calories of stored energy. Therefore, consuming an extra 3,500 calories will cause you to gain 1 pound of fat. If you burn an extra 3,500 calories with activity, you will lose 1 pound. To cause a reduction in body weight, you (1) reduce calorie intake below the energy requirement, (2) increase the calorie output through additional physical activity above energy requirements, or (3) combine the two methods by reducing calorie intake and increasing calorie output. So how

do you lose 10 pounds? By creating a calorie deficit of 500 calories daily (by increasing exercise or decreasing food intake) for 7 days, you will lose 1 pound (3,500 calories). By maintaining this deficit, you will be 10 pounds lighter in 10 weeks.

However, weight loss is not necessarily this simple. For some people, cutting calories causes feelings of fatigue, resulting in a decrease of energy expenditure. As body weight is reduced, the energy costs of movement go down proportionately, thus reducing caloric output. Also, individual differences in resting metabolic rates, cellular makeup, and lean tissue need to be considered. That is why knowledge about other factors is necessary to fully understand the complexities of weight loss.

Regardless of the problems that come with relying on the energy balance equation as the only way to understand weight loss and weight gain, this equation is the best way of explaining why, in this age of modernization and decreased physical demands, so many Americans are too fat. As Figure 10-3 shows, many factors contribute to

our growing girth. Most are not active enough to use the calories consumed. Food in America is plentiful, available, and relatively inexpensive. It is also high in sugar, calories, and fat. More frequent eating is encouraged by numerous societal changes: The growth of the fast-food industry, 24-hour supermarkets, “pop-in” pantries, the increased incidence of snacking rather than sitting down to eat meals, the number of “all you can eat” buffets, and the growing tendency to socialize with food and drink have all added calories to our day. Although many people are consciously trying to eat lower-fat food items, *low fat* doesn’t necessarily mean *low calorie*. Surveys indicate that our daily caloric intake is increasing, while our caloric expenditure is decreasing. Countless labor-saving devices at home and at work and our passive leisure-time activities (television, Internet, computer games, videos) have contributed to creeping obesity. Phoning, faxing, e-mailing, online shopping, and express mail don’t burn many calories (unless you’re the express mail delivery person!). Many neighborhoods lack sidewalks or bike

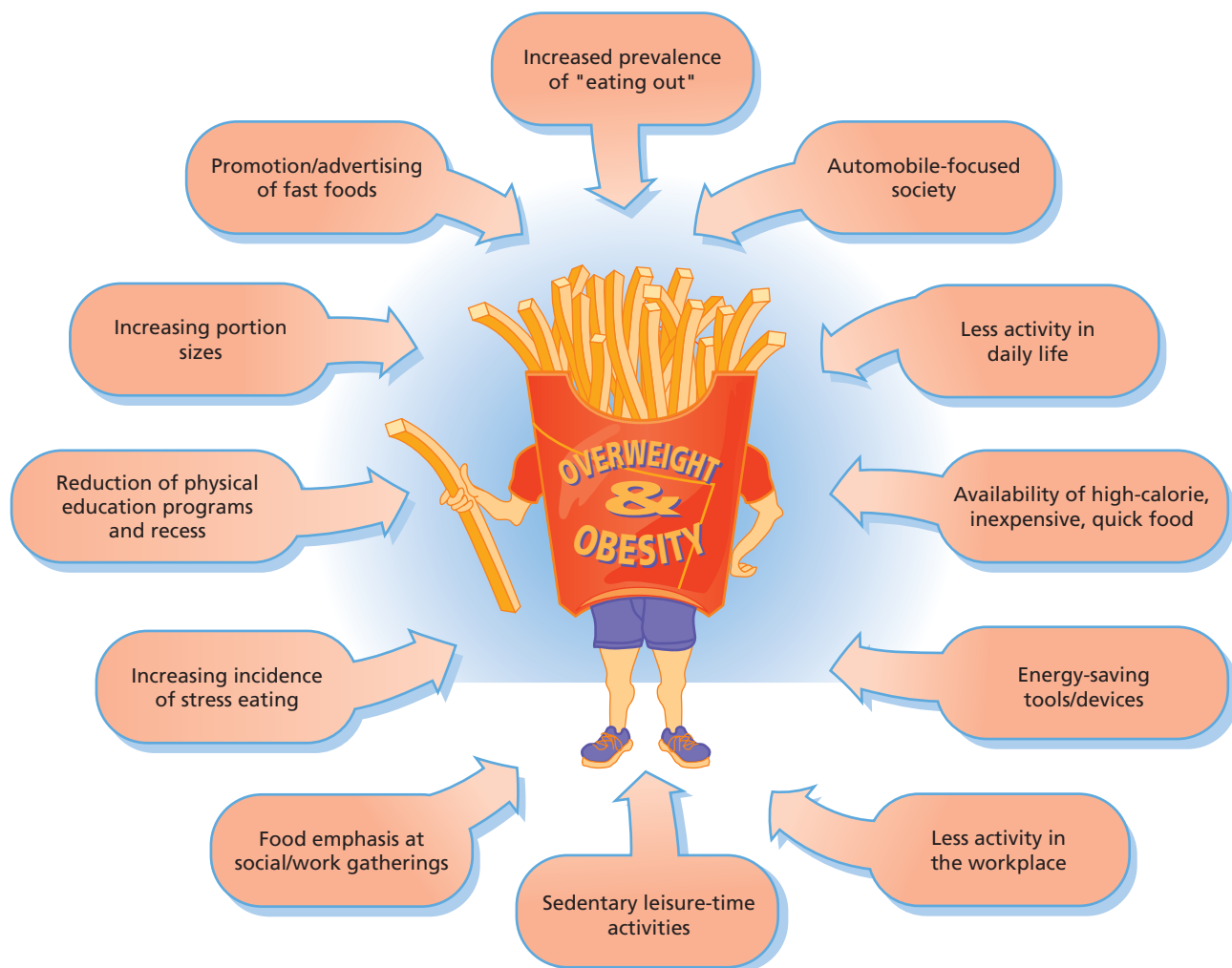


FIGURE 10-3

Many societal factors contribute to overweight/obesity.

TABLE 10-3 *Determining Your Daily Caloric Needs*

The following is a method for estimating the caloric needs for healthy, nonpregnant adults. Older individuals (over age 50) should further reduce calories by 10 to 20 percent. These are only estimates. Individual activity factors and body frames vary from person to person.

Formula: $\text{Weight} \times \text{Activity level} = \text{Calories needed daily}$

Activity Level	Calories Needed per Pound per Day	
	Female	Male
Inactive (little or no regular exercise; desk job; light work)	$\times 12\text{--}13$	$\times 14\text{--}15$
Moderately Active (30 minutes of exercise at least 3–4 times per week; or job dictates moderate activity)	$\times 14\text{--}15$	$\times 16\text{--}17$
Very Active (45 minutes–1 hour of vigorous, sustained exercise 5–7 times per week; or job dictates considerable activity)	$\times 16$	$\times 18$
Example: female = $140 \text{ lbs} \times 14.5$ (moderately active) = 2,030 calories per day male = $180 \text{ lbs} \times 14.5$ (inactive) = 2,610 calories per day		

lanes for safe walking and riding, and the automobile is used to travel even the shortest distances. There are fewer opportunities in daily life to burn calories. We live increasingly sedentary lives.

How many calories do you need to maintain a desirable body weight? Table 10-3 helps you estimate your daily caloric need based on your activity level. Remember, this is only an approximation and may vary between individuals. To lose or gain weight, the calorie intake must be adjusted upward or downward. Remember, however, a woman should not eat fewer than 1,200 calories a day, and a man no fewer than 1,600 calories a day. It is difficult to obtain a balanced diet with fewer calories.

Fat-Cell Theory

The size and number of fat cells in the body determine degrees of fatness. **Fat cells** (also known as **adipose cells**) are storage sites for energy. The body increases fat storage in two ways: by increasing the *number* of fat cells and by increasing the *size* of fat cells. As might be expected, the body increases its number of fat cells during infancy and puberty growth spurts. Fat cells also expand

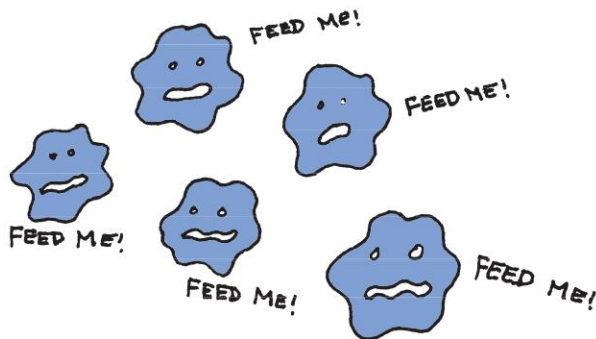
and contract as energy is stored or burned. They can expand to two to three times their normal size, but they cannot enlarge endlessly. At some point, new fat cells can be created in response to the body's need to store more excess energy. This can occur in extremely obese individuals. This capacity to increase cell numbers when a maximum cell size is reached depends on the age and sex of the person and the site of the fat tissue. Unfortunately, once a fat cell has been created, it exists for life. Fat cells seem to be indestructible. An individual of normal weight has 30–50 billion fat cells, while an obese person can have as many as 60–100 billion fat cells.

Therefore, the fat-cell theory proposes that weight reduction in adults is a result of decreasing the size of the fat cells, shrinking them by using the energy stored in them or not filling them at all. This theory also explains why people who grow a large number of fat cells during childhood have a predisposition to obesity as adults. They can reduce the amount of fat stored in the cells, but the excess number of fat cells is still there, waiting to be filled again.

It is important to realize that fat tissue is not an inert storage depot. Fat is actually a dynamic organ that produces a multitude of hormones and inflammatory proteins. These chemical messengers travel throughout the body and contribute to a multitude of chronic diseases.

Set-Point Theory

The **set-point theory** maintains that every individual is programmed to be a certain weight and that the body regulates itself to maintain that “set” weight. Studies of people in alternating states of semistarvation and gorging have shown that once intervention ceases, they return to their former weights. What determines your set point? The hypothalamus in the brain may act as a body weight thermostat, lowering body metabolism and increasing



Fat cells are with you forever.



THE NUMBERS

40–59	The age span in which obesity is most prevalent.
\$1,000	The additional annual medical costs for an obese person versus someone of normal weight.
50%	Portion of kids who walked to school in 1970. (Today only 15% walk to school.)
90,000	The number of yearly deaths from cancer that could be avoided if every U.S. adult could maintain a BMI under 25.0 throughout life.
\$117 billion	The direct and indirect costs associated with obesity per year in the United States.
8	The average number of hours Americans age 13 years and older spend sitting each day.
2058	The year when everyone in the United States is predicted to be obese (if current obesity rates continue to rise as they have over the past 25 years).
20%	Cancer deaths in women attributed to obesity. (14% for men.)
22%	Reduction in life span for persons in their 20s who are obese.

hunger if fat levels fall below the set point. Here is where the set-point theory and fat-cell theory merge. The set-point mechanism is thought to respond to signals sent out by the fat cells as to the amount of fat in storage. The weight at which this occurs may depend on the number of fat cells. Consider two 180-pound women. Sara has a normal number of fat cells, which are enlarged. Mary has an excessive number of fat cells of normal size. Sara has a greater chance of weight loss, because she can reduce her cell size and still sustain adequate fat volume. Mary faces a harder battle because her body will work to maintain her cell size. This theory also helps explain why attempts at permanent weight loss by crash dieting are not successful. The body naturally fights against this starvation state.

The set-point theory is based on survival. How else could populations endure famine or our ancestors survive periods of food shortages? Heredity influences the set point, too. Some people have naturally higher set points, causing maintenance of higher levels of body fat, whereas other individuals have naturally low set points.

Can you change your set point? Some studies show that sustained consumption of a diet high in fats, refined carbohydrates, and perhaps even artificial sweeteners (the typical American diet?) raises the set point and that regular, vigorous exercise can lower the set point. Exercise stimulates changes in metabolism, causing the body to use fat rather than protect against its losses. Knowing this, it is easy to see how our sedentary lifestyles and dietary habits are connected to America's obesity problem more than are brain thermostat alterations. We've gone from lean to fat because we eat more and exert ourselves less.

Heredity

"I can't lose weight; it's in my genes!" Many would view this exclamation made by many obese persons as an excuse for their physical state. Research about genetic influences on obesity lends some (but not *total*) credibility to this exclamation. Children with obese parents do have a greater tendency to become obese adults. Is this an inherited tendency or a result of inappropriate behaviors learned and reinforced at home? Studies of families (especially twins) have provided insights into this question. A classic study conducted by Claude Bouchard showed that adult identical twins were similar in *total* fat gain and *distribution* of fat gain when consistently overfed for 100 days. There were huge differences between pairs of twins in body weight gains, body composition changes, and waist/hip circumference changes. Between twins, however, there were striking similarities. Similar research shows that adult twins tend to be similar in body weight and body mass index regardless of whether they were raised together in the same home or separated in early childhood and raised in different environments. Heredity seems to influence the number of fat cells in the body, how much fat is stored, where it is stored, and metabolic rates. However, scientists have concluded that genetics is responsible for only 25 percent of these factors.

Some of the body's hormones may also be linked to obesity. One of those hormones, leptin, is secreted by fat cells and informs the brain about how large or small the body's fat stores are. As a result, the brain regulates appetite and metabolism accordingly. These studies give us more insight into the body's chemistry

but do not fully explain the massive increases in weight across all age groups. Cases of obesity based solely on hormone abnormalities are rare. Centers for Disease Control and Prevention (CDC) former director Jeffrey Koplan, M.D., concurs: “Genes related to obesity are clearly not responsible for the epidemic of obesity, because the gene pool in the U.S. did not change significantly after 1980.”

Although these facts address the role heredity plays in obesity, heredity is only a *tendency* or predisposing factor that can be influenced by environmental components and behaviors. Those people predisposed to be overweight or obese will have more difficulty controlling their weight, but it is certainly not impossible for them to attain and maintain a healthy weight with healthy eating habits and regular exercise.

Metabolism

Every individual expends a certain amount of energy, even at rest, to sustain vital functions of the body such



Doing resistance training exercises increases muscle mass, which in turn increases metabolism.

as brain activities, organ function, and temperature regulation. This energy requirement is called the **basal metabolic rate (BMR)** and accounts for approximately 65 to 75 percent of the calories burned in 1 day. A true measure of basal (resting) metabolism is taken when you have been lying quietly but awake and without food for 12 to 15 hours. Most men have a BMR requirement of 1,600 to 2,000 calories daily; most women need 1,200 to 1,500 calories daily. Lab Activity 10-2 provides an opportunity to determine your BMR. BMR is the largest component of your daily energy expenditure, so it can significantly affect body weight over time.

Your BMR is a result of several interrelated factors, including age, gender, body size, nutritional status, musculature, activity level, and genetics. Pay particular attention to Table 10-4, which shows how BMR is affected by each of these factors.

TABLE 10-4 *Factors That Affect Basal Metabolic Rate*

Gender	Women generally have lower BMRs than do men (about 5 to 10 percent lower) due to smaller size, more body fat, and less muscle mass.
Musculature	Increased muscle mass or tone increases BMR. Muscle tissue is more metabolically active than is fat. As muscles atrophy from inactivity, BMR declines.
Age	For both men and women, BMR declines by about 2 to 3 percent per decade after age 25. Loss of lean muscle mass typically occurs with aging as well. Maintaining a regular exercise program (including resistance training) can help prevent a decline of lean muscle mass and BMR as you age.
Body size	Smaller body surface area, smaller build, or short height result in lower BMR.
Nutritional status	Fasting, very low-calorie diets, and long-term undernutrition lower BMR.
Activity level	BMR increases during exercise and may remain elevated somewhat after exercising. The more vigorous the exercise, the longer your metabolism stays elevated.
Genetics	We inherit physiological tendencies, and as a result, BMR is inherently higher in some people and lower in others.

Although some of your BMR is genetically inherited, you can affect it with exercise. An aerobic workout that includes resistance training (free weights, machines, or exercise bands) can increase muscle mass. The more muscle mass you have, the higher your BMR. Fat, being storage tissue, has a low metabolism, whereas muscle tissue is active and has a high metabolism. Women especially can counteract a slow metabolism by participating in exercise programs that include resistance training. In this way, they can increase their muscle mass. Middle-aged women often experience a dramatic slowdown of their metabolisms due to hormonal changes. They too can keep their “energy burners” fired up with regular exercise. The actual workout burns calories too! Your total daily caloric expenditure is influenced by

1. Basal Metabolism = 65 to 75 percent.
2. Digestion = 10 percent (e.g., if you consume 2,000 calories a day, you burn 200 of them by digesting the food).
3. Physical Activity and Exercise = anywhere from 15 to 30 percent (*you* control this!). Remember, *all* physical activity burns calories.

WHAT ABOUT “DIETING”?

Most people who want to lose weight think immediately of going on a diet. This notion is reinforced by the number of new fad diets advertised each year. In this connotation, the word *diet* implies a distinctive way of eating that involves special foods or food combinations; caloric or food restrictions; or special powders, pills, or shakes. In reality, the word *diet* should imply a way of eating for a lifetime. Popular weight-loss diets are viewed by the user as a temporary

inconvenience that will be discontinued as soon as the weight goal has been reached. “Going on” a diet implies “going off” it. Dieters assume that weight will be lost quickly and immediately. Chances are, however, that the excess pounds have accumulated gradually over a period of years. These pounds are maintained by ingrained habits. Most fad diets rely on rigid food choices. Food becomes the enemy, and mealtime a battle to be fought. Continual deprivation can result in food cravings, binges, guilt, and self-deprecation. Many popular diets do not emphasize physical exercise. More than half the overweight adults trying to lose weight are doing so by restricting calories. Yet fewer than one-third are increasing physical activity. This is a reflection of our sedentary lifestyle and the emphasis on “going on a diet” as a means to control weight rather than increasing exercise. Diets have special appeal and sound easy. Many of them, however, are nutritionally inadequate, are too low in calories, are potentially dangerous, and, most important, fail to teach lifelong eating habits. Even with programs that result in weight loss, the results are often short-term—and regaining weight is common if habits have not been permanently changed.

If you go on a very low-calorie diet, up to 70 percent of the weight loss during the first 3 days is water. This is predictable because your body needs carbohydrates for energy. Being starved of carbohydrates, it uses **glycogen** (stored carbohydrates) for energy. As you use this glycogen, you lose water, because each gram of carbohydrate is stored with 3 grams of water. Your body also uses protein for energy, resulting in a loss of muscle tissue. Crash dieting can cause headaches, ketosis, and loss of bone mineralization. If you go on a very low-calorie diet (less than 800 calories per day), your body slows its metabolism (BMR) significantly. After all, your body doesn’t know that there is a grocery store a block away. It reacts as if you were suffering from starvation. Therefore, your body saves energy by burning fewer calories. This conservation of energy causes the diet to be even less effective. Depression, irritability, fatigue, and feelings of deprivation often follow. The survival urge to eat eventually wins out and weight is regained.

There has been some debate in recent years (suggested primarily by proponents of low-carbohydrate diet plans) that the increasing obesity in the United States can be blamed on a shift to a low-fat, high-carbohydrate emphasis in the past few decades. A recent long-range study shows that carbohydrates themselves do not cause weight gain. Excessive *calories* cause weight gain—whether they come from carbohydrates, protein, fats, jelly beans, or soda! Table 10-5 reviews some of the most popular diet plans. It is important to know the facts before trying any specialized plan.



Be wary of diet aids that focus on a “quick fix.”

TABLE 10-5 *Diet Plans: Claims and Reality*

Diet Plan	Claims	Reality
Commercial weight-loss companies (Weight Watchers, L.A. Weight Loss, Jenny Craig, NutriSystem, etc.)	Adheres to balanced eating. Provides advice on portions, food choices, calorie intake. Moderate loss of 1–2 lb. per week. Some individual counseling and group support. (Note: Some commercial companies require purchase of their prepackaged foods, which can be expensive.)	Can be safe and effective if healthy lifelong eating habits and portion control are learned. The support system and personalized counseling are helpful.
Meal-replacement drinks/bars (Slim-Fast, etc.)	A liquid shake or bar replaces one or two meals a day. Contain sugar, protein, and vitamins. Some are low in calories; others are not so low.	May still be hungry; less satisfying. Often high in sugar. Lacks fiber. Weight often regained when stopped because proper food selection has not been learned. Some bars are “candy” in disguise.
“Fat-burning” diets (cabbage soup diet, grapefruit diet, etc.)	Certain foods can accelerate the body’s ability to burn fat. Eating large quantities of these foods results in fast weight loss.	No foods exclusively burn fat. Low in calories (which causes the weight loss). Boring and not nutritionally balanced. Weight is regained easily.
Low-carbohydrate/high-protein diets (Atkins, South Beach, Carbohydrate Addicts, etc.)	Restricts carbohydrates such as bread, cereals, starchy vegetables. Claims that carbs increase insulin, which promotes fat accumulation. Eat a lot of protein and fat. Transitions to phases that add complex carbohydrates and some fruits and vegetables.	Early phase is hard to stick with. Low calories. Loss of water and muscle causes the weight loss. High fat and low calcium can contribute to future diseases. May cause bad breath, fatigue, dizziness, muscle weakness, headaches, and constipation in early phases. Final phases are better balanced.
Low-fat diets (Ornish, Volumetrics, Pritikin)	Fat-free and low-fat foods and a lot of fruits, vegetables, whole grains, beans. Promotes foods high in fiber and water. Weight loss occurs despite eating ample amounts of low-calorie foods.	Healthy for heart and cancer prevention. Effective for weight loss but hard for some to adhere to due to lack of fats. May be low in calcium and iron if not careful. Exercise is emphasized.
Diet pills	Claim to burn fat, absorb extra fat, increase metabolism, and/or suppress appetite.	Promoted as a “quick fix.” May contain amphetamine-like substances (ephedra, yerba mate, caffeine, guarana, bitter orange), which may cause heart irregularities and jitters. Some herbs may help with appetite in some, but safety is an issue. Lifelong eating habits not learned.
Glycemic index (“The Glucose Revolution,” “Good Carbs, Bad Carbs”)	Carbohydrates that break down quickly (i.e., have a high glycemic index—GI) cause a quick blood sugar and insulin rise, resulting in fat storage. Slow-release carbohydrates (low GI) fill you up, cause a slower release of glucose, decrease blood sugar fluctuations, and burn body fat.	Is a balanced approach of consuming adequate protein, low fat (under 30%), and 60% carbohydrate (of low GI: whole grains, legumes, vegetables, fruits) and reducing refined breads, cereals, rice, potatoes, and snacks). Is sensible and healthy, but requires distinguishing high-GI from low-GI foods.
Blood type (A, B, O, etc.)	Blood type determines what food should and should not be eaten for health, leanness, and overall immune health.	No scientific evidence backs this theory.

Weight Cycling

Weight cycling is the repeated loss and regaining of body weight. When weight cycling is the result of low-calorie or fad dieting, it is often called the **yo-yo syndrome**. There have been claims that weight cycling

may make it more difficult to lose weight or keep it off, increase fat stores, slow metabolism, or even contribute to an increased risk of death from heart disease. Studies have not yet supported these claims conclusively. Most obesity experts believe that obese individuals should continue efforts to lose weight. Any weight loss is better

than facing the potential risks of remaining obese or experiencing weight cycling.

Weight cycling should not affect the success of future weight-loss efforts. As with any attempt at changing behavior, you may experience cycles of success and lapses before finally succeeding. All people, whether they have dieted or not, experience a slowing of metabolism with aging. And a substantial weight loss results in a reduction in caloric needs. Therefore, it is important to monitor caloric intake and exercise habits to prevent weight cycling. This information accentuates even more dramatically the need to learn *skills* for maintaining weight loss and to *prevent* obesity from occurring altogether. Losing weight—and maintaining a healthy weight—is a lifelong commitment.

Reliable Weight-Loss Programs

Are there any reliable weight-loss programs? Yes. There are some good programs available, as long as the dieter understands the purpose and limitations of commercial plans. Enrolling in a weight-control program is an investment of time, energy, and money. Ask yourself if you are ready to lose the weight *and* do what it takes to keep it off. Losing the weight is only half the battle. Keeping it off demands lifestyle changes that are lifelong. It is especially important for the morbidly obese to seek professional help in losing weight. These persons would be wise to consult one of the hospital-based programs available in many communities or meet with a registered dietitian. New fad diets appear almost weekly and disappear almost as quickly, so it is unrealistic to assess every particular diet for strengths and weaknesses. Instead, look at the Top 10 “Guidelines for Evaluating a Weight-Loss Program.” Many weight-management specialists view Weight Watchers as a reliable weight-loss program because it incorporates many of the principles that contribute to success: balanced eating, portion control, counseling and support, regular exercise, and teaching lifelong eating behaviors. It has been around since 1963 and was developed by registered dietitians and specialists in weight management.

The goal of weight loss is fat loss, which takes time and long-term lifestyle change. Remember: It is not necessary for an overweight or obese person to reach an optimal body weight in order to begin experiencing health benefits. Even modest increments of weight loss are associated with improvements in blood pressure and other health parameters. Many diets are variations on the food restriction theme, are unpleasant, and fail to teach modification of eating behavior. Scarcity and deprivation often lead to bingeing and subsequent feelings of guilt and despair. Just about any type of food restriction will result in weight loss. The key is keeping the weight off by learning to live with food—forever!

TOP 10 LIST

Guidelines for Evaluating a Weight-Loss Program

1. It should use real, regular food available in supermarkets.
2. It should provide an energy deficit to allow slow, safe weight loss of 1 to 2 pounds per week.
3. It should encourage the reduction of saturated fat and trans fats in the diet.
4. It should encourage a safe, personalized exercise program.
5. It should not promise a quick fix or advertise claims that sound too good to be true.
6. It should teach lifelong changes that allow freedom and flexibility for individual lifestyles and not list “forbidden” foods. Allows for “favorite” foods in moderation.
7. It should make possible the enjoyment of social situations such as eating out, holidays, and special occasions.
8. It should allow for basic energy needs (never under 1,200 calories daily) and be nutritionally balanced.
9. It should not be too costly.
10. It should teach techniques and strategies for *maintaining* positive behavior change.

A final question to ask yourself when considering a diet plan should be, “Can I live with this program for the rest of my life?”

LIFETIME WEIGHT MANAGEMENT: STAYING LEAN IN FATTENING TIMES

The factors that contribute to obesity are so numerous and complex that it is impossible to pinpoint one cause. Having knowledge of the theories of obesity should help you understand some of these complexities. Fat cells, metabolism, set points, genetics, and energy expenditure all play a role. Behaviors that have developed over time are also intricately involved. One unrefuted truth emerges in nearly all weight-control studies: *Permanent weight control involves a lifelong commitment to good eating habits and regular exercise.*

Dr. James O. Hill, director of the University of Colorado Center for Human Nutrition, states, “You need to use your intellect to *not* gain weight today. Social forces that promote overeating and our modern sedentary lifestyle are so persuasive that you always need to think about what you’re buying, what you’re eating, and how active you are.” Weight management is

a *lifestyle*. Maintaining a reasonable body composition is, rather than isolated bouts of crash dieting or sporadic exercise, a result of lifelong integration of three management components:

1. Food management
2. Emotional management
3. Exercise management

(1) Food Management

We must eat to sustain life, and eating is one of life's pleasures. To lose or maintain weight, it is essential to have a good framework for making sensible, well-balanced food choices. Basic weight-management principles are not different from general good nutritional recommendations (low saturated fat, sugar, and salt and high complex carbohydrates, fruits and vegetables, and fiber). Cutting back on the fat in your diet reduces a tremendous number of calories. "I lost weight without eating less!" is often the exclamation of persons who substitute fiber-rich grains, fruits, and vegetables for fat in their diets. Fiber fills you up and slows the absorption of food, which regulates blood sugar and insulin levels.

This eating plan not only helps with weight, it helps prevent disease while ensuring adequate intake of all essential nutrients. The *2005 Dietary Guidelines for Americans* and MyPyramid (see Chapter 9) describe such an eating plan.

By consistently consuming more calories than are needed, creeping obesity occurs. This is happening in most industrialized countries in the world. Managing food intake in our modern world is a definite challenge. Understanding the following factors that contribute to this caloric imbalance may help you monitor your own food intake.



As restaurant portions become larger, Americans are "supersizing" their way to obesity.

Recognizing Portion Distortion

A European tourist stared with disbelief at his plate while eating in an American restaurant. "That's not a burrito," he said. "It's a log!"

Many foreign visitors are shocked at the portion sizes in America. Portion and serving sizes have increased tremendously in the past 25 years. As confirmed by a study published in the *Journal of the American Medical Association*, portion sizes since the 1980s have doubled, and in some cases tripled or quadrupled, for most foods served in restaurants and at home. Restaurant plates are larger and are overfilled with pasta, nachos, and chicken wings. Parking lots at all-you-can-eat buffets are packed. And research shows that the more food that is put in front of us, the more we will eat. In 1957, a fast-food hamburger weighed 1 ounce and had 210 calories. Today's average burger is 6 ounces and has 618 calories. A typical serving of a soft drink used to be 8 ounces. Today, a small serving is 12 ounces, and a large serving is 32 ounces. A typical restaurant serving of pasta exceeds the federal recommended serving size by 480 percent! And, with the introduction of fat-free foods, many people erroneously believe that they can eat the entire box of fat-free cookies, neglecting the fact that these foods have calories too. Overall calorie consumption cannot be ignored! Therefore, be aware of recommended serving sizes (see Chapter 9, Figure 9-1). It may be helpful to actually weigh and measure your food for several days to increase your awareness and help you monitor your intake. Some companies now make prepackaged 100-calorie snacks that are helpful in monitoring calorie intake.

Avoiding Mindless Eating

"I hardly eat anything! Why can't I lose weight?" This question is a common complaint voiced by frustrated dieters. Because we have a culture of snacking and



Be aware of recommended serving sizes. Using common everyday references (see Chapter 9, Figure 9-1 and Table 9-9) can help you manage your portion sizes.

eating on the run, many people underestimate the calories they consume since they seldom sit down for a real meal. The donut in the break room, the mocha coffee from the coffee stand, the chocolate kisses from the candy dish, the taste-testing at the grocery store, and the sack of chips while watching television all count! The 2,000 calories consumed a day from a plate are reasonable, but another 1,000 calories nibbled, grazed on, or grabbed mindlessly throughout the day add up. Even though Americans are consciously consuming less fat as a percentage of total calories, today's average daily calorie intake is up about 500 calories as compared to 1980. Keeping an *honest* food journal for several days (see Lab Activity 10-1 for a sample journal) can help you see what and how much food/calories you are eating and drinking. By becoming conscious of everything you put into your mouth you can begin to eat *mindfully* rather than *mindlessly*!

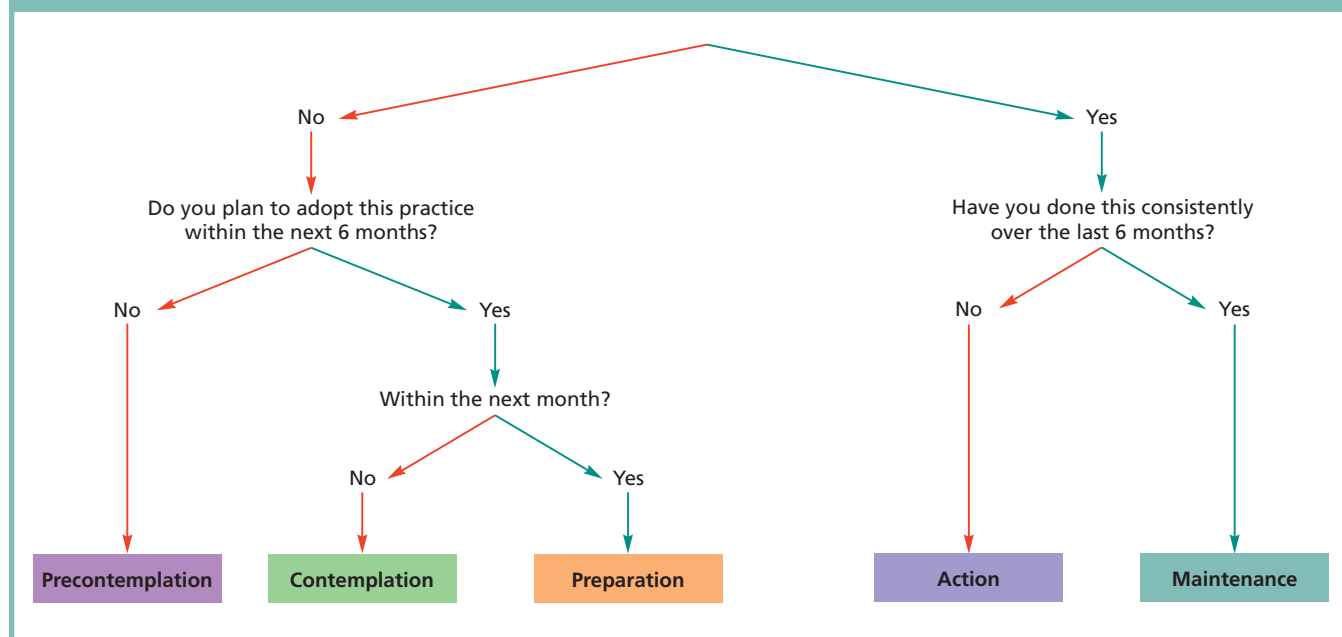
Understanding Our "Toxic" Environment

We live in an environment that provides food most everywhere and at any time of the day. It's conveniently packaged, inexpensive, good-tasting, and served in ample portions. Unfortunately much of it is poor quality in terms of nutrition. Dr. Kelly Brownell, director of the

Yale Center for Eating and Weight Disorders, has termed our food environment as "toxic." We are surrounded by temptations to eat wherever we go—on street corners, along highways, at gas stations, at the office, at the malls, and in school hallways. We are barraged by over 10,000 food advertisements each year on television—most of which are from fast-food chains or from soft drink and snack food companies. The commercials say, "Eat, eat, eat" but show an actress who is so thin that it appears she never eats! Food messages often drown out health messages. For example, more than \$33 billion per year is spent on advertising sugary soft drinks, candy, and fatty snacks. In contrast, it is rare to see an advertisement for fruits or vegetables. So, what can you do? First of all, tune into your natural hunger signals and vow not to eat just because you are driving past the donut shop, walking past a vending machine, or talking with friends who are snacking. Pay attention to the social and environmental influences that confront you, and do not accept cultural reality as a license to splurge! And finally, become an advocate for environmental change. Education and public information are not enough to change the environment. Support new laws that regulate advertising, prohibit the sale of fast foods and soft drinks in schools, subsidize healthy foods, and require the posting of nutrition information in restaurants.

What Stage of Change Are You In?

Do you monitor your consumption of high-calorie foods in order to keep your daily caloric intake balanced with your energy output?



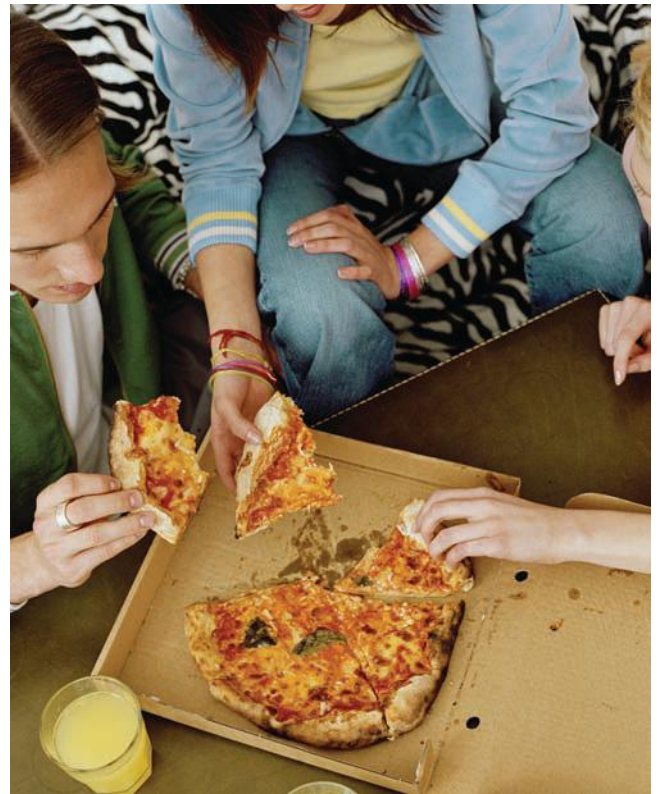
Whereas many people look to structured weight-loss diets for their “food management,” such programs often feature a lot of “can have” and “cannot have” foods. Sensibility in food choices does not mean that you will never again eat chocolate cake. There should never be guilt or forbidden foods. Instead, lifetime food management means seeing how much or where chocolate cake fits into your total diet. Reduce, don’t eliminate, certain foods. Balance your food choices over time. Gradual rather than drastic changes in dietary patterns lead to successful maintenance. Healthful eating does not happen by accident, and it is not always easy. In our “land of plenty” it is essential to learn about the nutritive value of foods, portion sizes, and why we are eating, and devise strategies for making good choices over the course of each day.

(2) Emotional Management

Why do you eat? “Because I am hungry!” you answer. If all people ate only when they were in the physiological state of hunger, few would have a weight problem. Not only are we surrounded with opportunities to eat more than we need to, eating behavior is strongly influenced by psychological, social, and emotional factors. We eat out of emotional needs. We eat when we’re happy; we eat when we’re sad. Food becomes a substitute for other things. We confuse physical hunger with emotional hunger. Whereas it is true that food affects the brain’s production of certain “feel good” chemicals, habitually using food as a “drug” to cope with emotional feelings can be destructive.

Controlling eating habits begins with understanding why you eat and what cues trigger eating. Do you eat when you are bored? Lonely? Angry? Stressed? Do you eat when you turn on the television? Read? Do you eat when something smells good? When others are eating? To avoid studying? Even positive feelings can trigger eating—earning an A on a paper, celebrating the end of final exams, looking forward to the weekend. For emotional eaters, food serves as a comfort. Their “fix” is food, a means of self-nurturing.

For emotional management, spend time observing your eating behavior. Keep a journal, recording the food you are eating and the feelings that accompany that moment. (There is food journal in Lab Activity 10-1 at the end of this chapter.) Learn to recognize the cues and connections between your thoughts, feelings, and behaviors. Before you eat, ask yourself, “Why am I reaching for food at this time?” Learn to differentiate between hunger and appetite. *Hunger* is an actual physical need for food. *Appetite* is a desire for food that is usually triggered by anxiety, boredom, depression, stress, habit, or the mere availability of food. No diet plan works if it doesn’t help you understand and resolve the reasons you turn to food when you aren’t physically hungry. If



Many times we overeat in social situations even when we’re not really hungry.

you are one of those people who experience occasional food cravings, try using the 3 D’S.

- ✓ *Delay* at least 10 minutes before you eat so that your action is conscious, not impulsive.
- ✓ *Distract* yourself by engaging in an activity that requires concentration (e.g., play the guitar, surf the Internet, do a crossword puzzle, read a magazine, etc.).
- ✓ *Distance* yourself from the food.
- ✓ *Substitute* a small portion or healthier version of the craved food (e.g., a chocolate kiss instead of a whole candy bar, frozen yogurt rather than premium ice cream, veggie pizza instead of pepperoni, etc.).

Using behavior modification strategies can help emotional eaters. **Behavior modification** is the use of techniques to enhance awareness or consciousness of a behavior and subsequently alter that behavior. Behavior modification is based on the premise that all behaviors are learned responses to environmental cues or antecedents. In using these techniques, people make eating a more conscious act, and healthier behavior patterns are integrated into the day-to-day routine. These patterns include slowing the act of eating, altering susceptibility to the cues (separating eating from other activities, such as watching TV), and breaking behavior chains. Set yourself

TABLE 10-6 *Behavior Modification Techniques*

1. Keep a food journal to maximize awareness of eating.
2. Eat in one room only; sit at a table—don't stand.
3. Prepackage healthy snacks or meals and take them with you.
4. Keep a weight, fat gram, or calorie graph.
5. Never read or watch TV while eating.
6. Use smaller plates.
7. Always leave some food on your plate.
8. Drink a lot of water throughout the day and during meals.
9. Prepare, serve, and eat one portion at a time.
10. Do not place serving dishes on the table.
11. Grocery shop from a list and never on an empty stomach.
12. Leave the table after eating and clear dishes directly into the compost pile or garbage; brush your teeth immediately or chew gum.
13. Keep problem food out of sight or not in the house.
14. Keep healthy food accessible and visible.
15. Make eating a conscious experience (i.e., eat slowly; chew each bite thoroughly; put utensils down between bites; eat with your nondominant hand; cut food into smaller pieces).
16. Rehearse strategies in advance for eating out, special occasions, and high-risk situations.
17. Substitute alternative activities for eating (do a sudoku puzzle; go for a walk; sew; play an instrument; call a friend; etc.).
18. Don't do non-food-related activities in the kitchen; stay out of the kitchen as much as possible; close the kitchen down after a meal.
19. When eating out, plan to share large portions with a companion. Or take extras home for another meal.
20. Eat and snack from a plate, not the package, so you don't absentmindedly eat more than you realize.

up for success by managing your environment. For example, throw out the cookies stashed in your desk drawer, the chips in your cabinet, and the candy in your glove compartment. It is true that our “food frenzy” culture is a temptation-rich environment, but it is an environment over which *you* have control! Table 10-6 gives examples of some behavior modification techniques.

Changing eating behavior demands commitment and perseverance (unlike the magic potions or easy pitches delivered in many popular magazines). Too often, commercial weight-loss programs reward persons for the total number of pounds lost, creating undesirable behaviors such as going on crash diets, skipping meals, and using drugs and diuretics. According to some weight-management researchers, the use of rewards for weight loss is inappropriate because weight loss is not a behavior. It is the outcome of a complex interaction of emotions and behaviors over time. As discussed in Chapter 5, behavior change is a complex process that involves stages and coping techniques within each stage. You may want to go back to Chapter 5 and review the Transtheoretical Model of Behavior Change to see

TABLE 10-7 *Tips for Behavior Change: Losing Weight*

STAGES OF CHANGE: IN WHAT STAGE ARE YOU?

1. Precontemplation: “As far as I’m concerned I’m not too heavy. I’m just big-boned.”
2. Contemplation: “I think I should probably lose some weight; maybe after the holidays I’ll try.”
3. Preparation: “I am currently planning my weight-loss program.”
4. Action: “I have been making the lifestyle changes I need to make to lose weight (dietary change and exercise) for 3 months, and it is working.”
5. Maintenance: “I have been successful at losing weight and maintaining that loss for over 6 months.”

PROCESSES OF CHANGE

After identifying your current stage, try using some of the following selected processes and behavior strategies that are appropriate for your particular stage—to facilitate your transition into the next stage (refer to Figure 5-2):

- **Consciousness-raising:** Read about people who have lost weight.
- **Social liberation:** Check out low-fat and low-calorie options at your favorite lunch/dinner spots.
- **Self-reevaluation:** Assess and write down your feelings and disappointments due to your dependence on food.
- **Reward:** Treat yourself to a low-fat frozen yogurt or a small piece of chocolate every Saturday after a week of healthy food choices.
- **Environment control:** Throw out junk-food snacks stored in desk drawer/shelves.
- **Helping relationships:** Ask roommate to refrain from storing/eating snacks in your room; invite a friend to join you in making dietary/exercise changes.

which techniques can be incorporated into managing emotional eating. Table 10-7 may help you identify your stage of change in terms of weight loss. Some example techniques are listed with selected processes as well. To continue with or maintain weight loss, you must be able to identify your high-risk situations in which difficulties with feelings or social situations can lead to a relapse. Developing and practicing coping strategies for dealing with these situations is an essential part of emotional management. Remove yourself from former patterns of behavior and develop new rituals that will ensure your success. Food stops taking on the role of nurturer when people learn to nurture themselves. Long-lasting change can occur only through kindness to yourself, mindfulness about what you are doing and why, and a willingness to act on your own behalf.

(3) Exercise Management

Dieting alone may help you lose a few pounds, but long-term weight loss requires regular physical activity. Exercise is crucial to losing weight and maintaining



Participating in regular vigorous exercise is essential for lifelong weight management.

weight. Americans have become fatter because calorie output has declined drastically. Most of our work, daily activities, and even some of our leisure pursuits do not burn many calories. Television viewing, which substantially decreases activity levels and may influence diet, is a strong factor in obesity, especially among children and adolescents. In adults there is a direct relationship between the number of hours spent watching television and a person's level of obesity. The Internet, computers, video games, and home movies have decreased overall activity levels. American technology has been ingenious in discovering ways for us to save energy, thus throwing off our energy balance. Electric garage door openers, riding lawn mowers, elevators, and drive-up banks are a few examples of activity-robbing conveniences.

The importance of physical activity in the prevention and treatment of obesity receives less attention than restrictive "dieting." There is certainly no scarcity of diet books and programs. However, for lifetime weight management to occur, exercise (accompanied by dietary management) is imperative. According to the National Weight Control Registry, a group of women

and men who have lost at least 30 pounds and maintained that weight loss for at least 1 year, regular exercise is a common trait of successful "losers." This group reports that they average 1 hour or more of moderate- to vigorous-intensity physical activity every day. Although the immediate effects of exercise are sometimes limited, the long-term cumulative effects of small changes in activity level are key components in lifetime weight management. By reengineering some physical activity back into our daily routine (called "lifestyle physical activity") and by fitting in 30–60 minutes of moderate-intensity activity every day, lifetime weight goals can be reached. Plus, living a physically active lifestyle substantially reduces the risk for a variety of other chronic diseases! Look at how regular exercise contributes to fat loss.

- ✓ **It Burns Calories** Table 10-8 shows how many calories you burn per minute in various activities. Note that the larger person burns more energy than does the lighter person engaged in the same activity. Also notice how aerobic activities burn considerably more calories per minute than do light, day-to-day tasks. Most people burn approximately 100 calories per mile whether walking or jogging. If this does not seem like a lot, look at it this way: You burn only about 1 calorie per minute while sitting. Remember that weight gain does not occur overnight; nor does weight loss. A pound of fat is lost by burning 3,500 calories. No one ever said it must all be done at once and only by jogging. Liberating large amounts of energy from body reservoirs requires time—typically measured in months, if not years. Whereas 30 minutes of exercise per day is recommended for overall health, recent research reveals that to lose weight and maintain weight loss, much more caloric expenditure from exercise is necessary. Studies indicate that burning approximately 2,800 calories a week with exercise (about 400 calories daily) should be the goal if weight is an issue. This would equate to about 1 hour of moderate-intensity activity per day or walking 4 miles. If more vigorous exercise is preferred (e.g., jogging, aerobic dance, lap swimming, etc.), about 40 minutes per day is recommended. As exercise intensity becomes more vigorous, an added benefit is that your metabolism (rate of calorie burning) is increased for several hours after you have completed the exercise bout. However, regardless of intensity level, doing regular, sustained exercise on a consistent basis (on most days of the week) is the best strategy for maintaining weight. And don't forget that doing intermittent activity throughout the day also burns calories. Find ways to weave

TABLE 10-8 *Caloric Expenditure per Minute for Selected Activities*

The figures in this table are only for the *time* you are engaged in the activity (not standing, waiting, resting). Variances may occur if you are running uphill, walking with hand weights, biking into a strong head wind, and so on. There may be small differences between males and females, but not enough to make a significant difference. You can approximate your expenditure if you are between the body weights listed. For information on calories burned in a more expansive list of activities, go to www.caloriesperhour.com or www.caloriecontrol.org.

Body Weight	120	150	180	210
Sitting and writing	1.5	1.9	2.3	2.7
Standing with light work, cleaning, etc.	3.3	4.1	4.9	5.7
Aerobic dance	7.3	9.1	10.9	12.7
Basketball (recreational)	6.0	7.5	9.0	10.5
Bicycling (10 mph; 6 min/mile)	5.1	6.4	7.6	8.9
Bicycling (15 mph; 4 min/mile)	8.7	10.9	13.1	15.3
Dancing (active; square; disco)	5.4	6.8	8.2	9.5
Deep water treading/running	12.0	15.0	18.0	21.0
Golf (foursome, carrying clubs)	3.3	4.1	4.9	5.7
Racquetball	7.8	9.8	11.7	13.7
Roller skating (9 mph)	5.1	6.4	7.6	8.9
Running (6 mph; 10 min/mile)	8.7	10.9	13.1	15.4
Running (7 mph; 8:35 min/mile)	10.2	12.8	15.4	17.9
Running (8 mph; 7:30 min/mile)	11.6	14.6	17.6	20.5
Skiing, downhill; cross country (4 mph; 15 min/mile)	7.8	9.9	11.9	13.8
Soccer	7.2	9.0	10.8	12.6
Stair step machine	5.7	7.0	8.7	10.2
Stationary cycling (vigorous)	7.8	9.7	11.7	13.6
Swimming (crawl, 35 yds/min)	5.9	7.3	8.8	10.2
Swimming (crawl, 45 yds/min)	6.9	8.7	10.4	12.2
Tennis (recreational singles)	6.0	7.5	9.0	10.6
Walking (3 mph; 20 min/mile)	3.3	4.1	4.9	5.7
Walking (4 mph; 15 min/mile)	5.1	6.4	7.6	8.9
Walking (5 mph; 12 min/mile)	6.5	8.2	9.8	11.5
Water aerobics	7.2	9.0	10.8	12.6
Weight training	6.2	7.8	9.4	11.2

increased energy expenditure into day-to-day living: Walk to work or during breaks, take stairs instead of elevators, ride a bike on errands.

Wear a pedometer and try to accumulate the recommended 10,000 steps per day.

- ✓ **It Prevents Loss of Lean Muscle Mass** As you age, you lose about 2 percent of your muscle mass each year. By the time you are 55, you could be down 15 pounds of muscle and burning about 600 fewer calories per day. Exercise builds and helps maintain muscle tissue. And since muscle cells are metabolically active, they burn more calories in basal metabolism (at rest) than do fat cells. At rest, muscle tissue burns approximately 40 calories per day per pound. At rest, fat tissue burns approximately 2 calories per day per pound. As a result, someone with a lot of muscle mass burns more calories throughout the day *outside* the exercise session. This is a key factor especially for women of all ages (who typically have less muscle mass and more fat than men) and for *both* men and women during middle age, when metabolism can slow down due to loss of muscle tissue. Doing resistance training exercises 2 to 3 days per week

using free weights, machines, or an exercise band, along with daily aerobic exercise can accelerate weight loss.

- ✓ **It Decreases Abdominal Fat** Excessive fat in the abdominal area (apple-shape obesity) is linked to increased risk of heart disease, many cancers, and type 2 diabetes. Studies show that most of the positive effects of physical activity on heart disease risk factors (especially blood pressure and cholesterol) have to do with reductions in this intra-abdominal fat. This is true for both men and women. Since fat around the abdominal area is easier to mobilize than is fat in the hip/thigh area, regular physical activity attacks abdominal fat very effectively.
- ✓ **It Is a Natural Appetite Suppressor** Moderate exercise has a tendency to decrease the appetite for a time after the workout because blood is diverted from digestive organs to skeletal muscles. You may feel thirsty but not usually hungry. This is why exercising during a lunch break helps you control weight. After exercising, you feel satisfied with a light lunch. Extremely intense exercise tends to lower blood sugar, which may stimulate



Regularly taking the stairs rather than the elevator is one way to add more activity to your day.

appetite. To burn fat, keep your exercise at a moderate intensity and work to increase the duration. (Be sure not to view exercise as an excuse for eating more!)

- ✓ **It May Lower Your Set Point** Set-point theorists believe that regular, vigorous exercise is the one sure way to lower your body's fat level. Maintaining an active lifestyle stabilizes the set point at this lower level.
- ✓ **It Helps Maintain Weight Loss** Most health professionals agree that losing weight is easy; keeping it off is more difficult. To avoid the negative consequences of weight cycling, more attention is being given to *maintenance* of weight loss. Exercise has been shown to be one of the few factors correlated with long-term weight maintenance. A change in lifestyle that includes a consistent exercise regimen across the life span is the fundamental key to successful weight-loss maintenance.
- ✓ **It Improves Self-Esteem** For overweight, sedentary individuals, exercise may not be a richly reinforcing experience at first. It may be difficult for them to get out and exercise in public. They may feel self-conscious about their bodies. They may have negative feelings about exercise because of past embarrassing experiences. As exercise becomes a satisfying habit, the individual begins

to experience a new sense of well-being and power. Anxiety and depression are reduced. As weight comes off, self-image is enhanced. Self-esteem and self-confidence are improved. These psychological benefits received from regular participation in physical activity often supply the additional impetus necessary for adhering to a weight-loss/maintenance program. This positive self-concept helps reinforce all other areas of weight management, including food selection, feelings of anxiety, and feelings of control.

As you incorporate food management, emotional management, and exercise management into your life, you'll forget the "dieting mentality" and incorporate a set of behaviors and attributes that are necessary for permanent weight control. This "non-diet mentality" incorporates looking at your body intelligently (i.e., developing a positive but realistic image of yourself), eating intelligently, and moving your body intelligently (i.e., finding ways to weave daily activity into your life). Check out the Top 10 tips from people who have lost weight and maintained that loss for many years. Like them, when you structure and program your environment and life for success, managing your weight becomes part of your lifestyle. Through deliberate actions and specific strategies you can learn to quash the saboteurs and temptations that our environment presents.

Gaining Weight: A Healthy Plan for Adding Pounds

While many overweight people face the challenge of shedding extra pounds, those who are underweight face the challenge of trying to hold on to each pound and perhaps add more. The key to gaining weight is shifting the body weight equation so that you take in more calories than you burn. Add two to three substantial snacks between three moderate-size meals. Rather than eating high-fat and sugary foods, choose "calorie-dense" foods packed with nutrients. Even skinny people need to be concerned about heart disease and cancer. Here are some dietary suggestions:

- ✓ Mix beans, nuts, cheese, peas, or lean meats into casseroles, side dishes, and pasta.
- ✓ Combine yogurt, fruit, wheat germ, peanut butter, and ice in a blender to make a shake or smoothie.
- ✓ Spread peanut butter on bananas, apples, toast, or bagels.
- ✓ Replace sodas with fruit juices or skim milk.
- ✓ Replace cookies and doughnuts with nuts, raisins, dried fruits, bran muffins, yogurt, puddings, and fruit.
- ✓ Replace hamburgers and fries with thick-crust vegetable-topped pizza.

TOP 10 LIST

Tips from Successful Losers and Maintainers

People succeed at weight loss through conscious effort. These tips from successful losers and maintainers address *lifetime* weight management—how to lose weight and keep it off forever!

1. Focus on an overall *healthy* eating style, not a specialized “diet.”
2. Choose low-fat over higher-fat foods when available (e.g., dairy, salad dressing, sauces, sour cream, cream cheese, cooking spray).
3. Control portions. Everything has calories, even fat-free foods. Take half of that huge restaurant portion home with you or split it with your dining partner.
4. Plan for up to an hour of exercise every day (include both aerobic and resistance training exercises). Look for ways to add additional activity to daily life.
5. Allow favorite foods—in moderation.
6. Fill up on fiber (fruits, vegetables, whole grains) and eat a little protein with each meal.
7. Don't skip meals (especially breakfast). “Grazing” or eating smaller but more frequent meals or snacks improves metabolism and blood sugar levels and reduces cravings and bingeing.
8. Set realistic goals. Working on losing 5 pounds at a time is easier than focusing on losing all 50 pounds.
9. Evaluate your relationship with food. Are you truly physiologically hungry, or are you eating because of stress, boredom, anxiety, or habit? Develop coping and problem-solving strategies.
10. Keep a written or mental record of what is eaten each day and the amount of exercise that is done each day.

Note: If you've eaten one too many chocolate chip cookies or haven't made it to the gym for a few days, don't give up. Take lapses in stride. Try to ascertain why the lapse occurred, learn from it, and move on. Weight management is a lifelong process, not an all-or-nothing contest. Remember, small changes can bring big results.

- ✓ Prepare hot cereals with milk instead of water; add nuts, peanut butter, fruit, and wheat germ.
- ✓ Top cold cereal with bananas or raisins.
- ✓ Eat hearty soups.
- ✓ Add garbanzo beans, seeds, tuna, croutons, cottage cheese, and lean meat to salads.

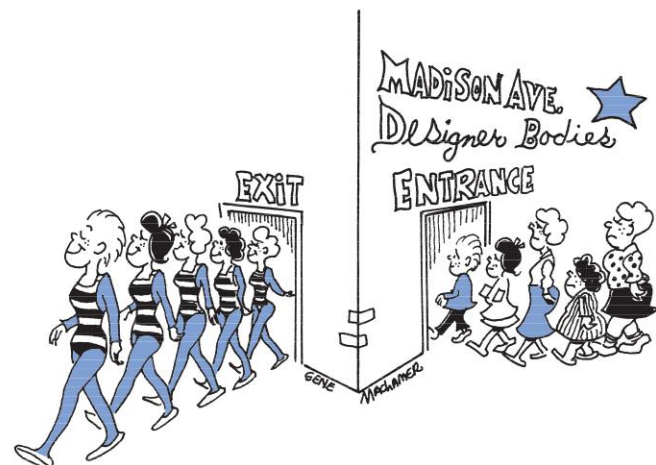
In addition to dietary alterations, adding strength-training exercises two to three times a week will add muscle mass to your frame. (See Chapter 4 for suggestions.)

CULTURE AND WEIGHT

Why people diet and other weight-related issues are shaped by cultural environments. In earlier times, the female figures painted by Renoir and other artists were soft and fleshy. Rounded bellies and dimpled thighs were the feminine ideal. For both men and women, a surplus of fat was equated with wealth and success. The twentieth century brought about a decline in fatness as a social asset. Insurance companies began observing the increased death rate among the overweight. The socially elite began diminishing the enormity of banquet menus. Corsets gave way to exercise and raised hemlines. Hollywood stars became the ideals. Thinness became equated with glamour, success, and desirability. As weight reduction became a national pastime, mail-order companies began making large profits with their weight-loss gimmicks. The market eventually gave way to new low-calorie foods and drugs designed to fool the body's hunger sensations. At the same time, labor-saving machines reduced the energy output necessary in daily life. The message that emerged by the 1960s was “Thin is in.” The desire for an unrealistic slimness, particularly among women, has caused many to be preoccupied with their bodies and with dieting. Diet books become instant best-sellers.

There She Is . . . Miss Unrealistic America

Open up any fashion magazine or clothing catalog. The models are thin. This thin standard is perpetuated in all channels of social influence: families, peers, and the media. The message is pounded home over and over: “You can never be thin enough.” This notion has been documented in studies of *Playboy* centerfolds and Miss America Pageant contestants from 1959 to the present, indicating a shift toward a thinner ideal shape for women in our culture. At the same time there has been



Many feel pressured to pursue a model-like body.

a significant increase in diet articles in popular women's magazines. The cultural "ideal" for women's body size keeps getting thinner, though the average woman weighs 144 pounds and wears a size 12 to 14. This cultural index of the "ideal" woman's body is 13 to 19 percent below the expected weight for age and height. A body weight below 15 percent of expected weight is one of the criteria for diagnosing anorexia nervosa, so what does this say about our cultural ideals?

With extreme slimness as a cultural obsession, it becomes clear why fear of fat, fad dieting, surgical fat removal, and eating disorders abound. In a society that puts such a premium on thinness, overweight, obese, and even normal-weight individuals evaluate themselves in that society's mirror, defining themselves as unattractive and as failures. Such harsh evaluations are a result of an acceptance of society's distorted concept of the ideal body. Every day we see pictures of models in magazines that are air brushed and electronically altered—a "manufactured ideal." The readers, however, have "real-life" bodies! One study found that 3 minutes spent looking at models in a fashion magazine caused 70 percent of women to feel depressed, guilty, and shameful. Advertisements suggest that we invest money, time, and hope in trying to reach this ideal. Unfortunately, the results are often feelings of despair and inferiority. The first step toward a healthy weight is acceptance of your body type. Only about 5 percent of the population can look like the models and actresses we are exposed to daily. Twenty-five years ago fashion models weighed 8 percent less than the average woman; today they weigh 23 percent less. Our bodies are genetically programmed to be a certain build—tall, skinny, stout, short, muscular, big-boned, and so on. Everyone needs to accept his or her body type and then maximize it to be the best it can be rather than trying to achieve the impossible.

The media and the fashion industry need to take responsibility for using models who depict fitness and health rather than emaciation. Some already have. With the popularity of fitness and wellness programs in our country, we hope the image is changing. The "one size fits all" standard *must* change.

Men Are Joining In

Body image concerns are no longer confined to women. Millions of teenage boys and men are worried that their muscles aren't big enough or their bodies aren't lean enough. Bombarded with images of muscular half-naked men on the covers of men's magazines and in advertisements, men are facing the cultural pressures that women have felt for decades. Whereas both men and women experience a similar degree of body dissatisfaction, women universally want to lose weight while men tend to be evenly split between those wanting

to lose weight and those desiring larger muscle mass. As a result, an increasing number of men are dieting, compulsively weight training, and abusing supplements and steroids as they strive for this ideal. This obsession for some goes beyond working out for health. It can affect schoolwork, jobs, personal relationships, and self-esteem and become a full-blown eating disorder.

EATING DISORDERS

Obsession with weight and the desire to be thin begin early in life. Even third-graders are dieting and fretting about their weight. Our culture especially socializes girls to be concerned about their physical appearance. For them, thinness equates with attractiveness and social approval. The message is, "Work hard in school, but be popular and pretty." In contrast, a male's self-concept is linked to physical dominance, power, and sports competence.

Few measure up to the fashion industry's ideal, so dieting is commonplace. At the same time, obesity is dramatically rising. The dilemma of preventing obesity yet avoiding a fostering of "thin mania" presents a tremendous challenge.

The frequency of dieting among young women is alarming. It is estimated that two-thirds of adolescent girls in the United States have dysfunctional or abnormal eating behaviors. One survey of teenage girls revealed that most were more afraid of becoming fat than they were of cancer, nuclear war, or losing their parents! Fear of fat, obsessive dieting, and a distorted body image can lead to a psychological eating disorder. An **eating disorder** is defined as a disturbance in eating behavior that jeopardizes a person's physical or psychosocial health. Bear in mind that preoccupation with weight and dieting are not synonymous with an eating disorder. An eating disorder is an extremely serious psychopathological state. Most professionals agree, however, that dieting precedes the onset of an eating disorder. Eating disorders are viewed as multidimensional in cause and nature. Factors that increase vulnerability can be genetic, biological, psychological, personality, sociocultural, and familial. Thus, the treatment must include all components. Here are some of the general causes for eating disorders:

1. Society's definition of the "perfect body" as unrealistically thin and lean
2. Family characteristics such as overinvolvement and high expectations; overvaluing physical appearance; rigid and cold emotionally
3. Personality traits like "perfectionism"; the desire to achieve; feelings of inadequacy and loneliness
4. A genetic propensity to being overweight



The fashion industry perpetuates the unrealistic ideal of extreme thinness, especially to women.

5. Pressure from others to lose weight, including media images
6. Appearance-obsessed friends (dance troupes, school cliques, sororities, cheerleaders)
7. An inherent presence of low self-esteem

It is estimated that 8 to 10 million Americans struggle with eating disorders. One million are men. All segments of society are affected—including minorities—and 86 percent report onset by age 20. However, eating disorders have been reported in children as young as age 6 and individuals as old as 76. Certain populations are especially at risk. They include gymnasts, dancers (especially ballet), cheerleaders, pom-pom performers, distance runners, and models. Although more women than men suffer from eating disorders, there is a higher than normal incidence of eating disorders in certain subgroups of males where slenderness is encouraged: models, dancers, wrestlers, and distance runners.

High school and college-age students are also vulnerable due to academic and social stresses and peer pressure to conform. Most social events take place around eating and drinking: parties, dates, late-night

snacks. Physical attractiveness is important, and the stresses of growing up and leaving home intensify these pressures. Rather than a strict addiction, eating disorders are a response to societal influences, dieting culture, fat discrimination, overachieving perfectionism, and media images. Two of the most common eating disorders are bulimia nervosa and anorexia nervosa, which may occur separately or together. A third eating disorder is called binge eating disorder.

Bulimia Nervosa

Bulimia is a Greek word meaning “ox” and “hunger.” The disorder was so named because the sufferer eats like a hungry ox. That is, **bulimia nervosa** is characterized by a compulsive need to eat large quantities of food (bingeing) to the point of gorging, followed by purging through vomiting, use of laxatives, or fasting. Often, the binge is a response to an intense emotional experience, such as stress, loneliness, or depression, rather than the result of a strong appetite. Nevertheless, most bulimics are not aware of what precipitates these uncontrollable binges, and are not able to stop them. The diagnostic criteria for bulimia are

1. Recurrent episodes of binge eating (rapid consumption of a large amount of food in a discrete period).
2. A feeling of lack of control over eating behavior during the eating binges.
3. Self-induced vomiting, misuse of laxatives or diuretics, strict dieting or fasting, or excessive exercise to prevent a weight gain.
4. Two binge episodes a week for at least 3 months.
5. Self-evaluation unduly influenced by body shape and weight.
6. The bingeing and purging are not accompanied by anorexia nervosa.

Bulimia frequently starts as normal, voluntary dieting that later becomes compulsive, uncontrollable, and pathological. The bulimic’s eating binge involves a rapid gulping of enormous quantities of food. Preferred foods are high in calories and sweet-tasting and can be eaten rapidly without preparation: ice cream, cookies, candy, bread, cheese, chips, doughnuts. The consumption of this food is not a pleasurable pastime but a compulsion. Up to 10,000 calories can be consumed in one sitting, followed by abdominal pain and discomfort. The binge generates guilt, depression, and anxiety. Purging follows, reducing the anxiety and fear. Then the cycle begins again.

The bulimic is aware of his or her abnormal behavior and has great fear of not being able to stop. He or she has feelings of guilt and shame about the behavior. Bulimia is a secret habit and can continue for many years undetected. The weight of most bulimics is normal or fluctuates within 10 pounds as a result of the binge-purge cycle.

The physical effects of bulimia include electrolyte imbalance (especially potassium), low blood sugar, esophageal lacerations, dehydration, and nerve and liver damage from low potassium. Tooth enamel is eroded by the stomach acid brought up with vomiting. Severe abdominal pain is common. In rare cases, actual rupture of the stomach has occurred. Bone density is lost if the disorder continues for many years.

People with bulimia need professional help and are often tearful and desperate when they finally seek help. Psychotherapy is necessary to understand the underlying cause of the disorder and to help restore the bulimic's feelings of self-worth and self-confidence. Bulimics tend to be extroverted perfectionists—high achievers—and are often academically or vocationally successful. Yet bulimics have troubled interpersonal relationships, low self-esteem, poor impulse control, and high levels of anxiety and depression and are self-critical and sensitive to rejection. It is not uncommon to see other impulsive behaviors among bulimics, including kleptomania, alcohol and drug use, and sexual promiscuity. The treatment goal is to get bulimics to cope with their stresses and body image insecurities through less destructive ways and to feel more comfortable with who they are. Bulimia is difficult to cure, and some struggle with this disorder for life.

Anorexia Nervosa

Far less common than bulimia, **anorexia nervosa** is a psychological disorder in which self-inflicted starvation leads to a drastic loss of weight. Although anorexia is less prevalent than bulimia, it is associated with more frequent physical problems and greater mortality. The mortality rate from anorexia—estimated at 10 to 20 percent—is the highest of any mental disorder. Whereas the bulimic has a general dissatisfaction with his or her body weight, the anorexic is obsessed with achieving thinness. Individuals with anorexia nervosa have an iron determination to become thin and an intense, irrational fear of becoming fat. They vehemently deny their impulse to eat, their appetite, and their enjoyment of food. The term *anorexia* is a misnomer, because loss of appetite is usually rare until late in the illness. While bulimics feel shameful about their abnormal behavior, anorexics justify their weight-loss efforts.

Found primarily in early and middle adolescent females, anorexia may result in physical deterioration to the point of hospitalization or even death. Anorexia carries a 19:1 female-to-male ratio, with a prevalence estimated at 1 percent among adolescent girls. The diagnostic criteria for anorexia are

1. Refusal to maintain body weight at or above a minimal normal level for age and height (i.e., a body weight that is 15 percent below normal).
2. Intense fear of weight gain or becoming fat despite being significantly underweight.
3. A disturbed perception of body weight, size, or shape (i.e., feeling “fat” although emaciated).
4. In females, amenorrhea (lack of menstrual periods) for at least three consecutive cycles.

Anorexia often starts as innocent dieting that turns into irrational behavior characterized by severe caloric restriction, fasting, relentless exercising, diuretic and laxative use, and, in some cases, self-induced vomiting. The anorexic pursues and maintains thinness despite an emaciated appearance that is apparent to others.

Anorexics display an extraordinary amount of energy for exercise and schoolwork in spite of their starvation state. However, they avoid social relationships, have low self-esteem, and are fearful of change. Despite an aversion for eating, anorexics are preoccupied with food. They may prepare elaborate meals for others, collect recipes, carry or hide snacks, and memorize the caloric content of various foods. Bizarre eating habits are commonplace. Anorexics have been known to cut a raisin in two and chew each half for several minutes. In many situations, they may pretend to be eating while putting food into a napkin or feeding the dog under the table.

Family stress and social pressure contribute to this disorder. Most anorexics come from middle- to upper-class families that place a high premium on achievement, perfection, and physical appearance. Their families are often overcontrolling and overprotective. Anorexics exhibit extreme perfectionism accompanied by a profound sense of ineffectiveness. Only by restricting food intake do they feel a sense of control and feel capable of coping with life's stresses.

Anorexia causes the physiological complications that accompany any malnouritive state: chronic fatigue, dry and scaly skin, hair falling out, lack of menstruation, drops in blood pressure, and cardiac complications. Constipation is commonplace. Bone growth is retarded, increasing the risk of fractures and osteoporosis. Anorexics have an unusual sensitivity to cold due to their low body-fat percentage.

Treatment for anorexia nervosa involves medical, psychological, and nutritional help. The major obstacle to treatment is the patient's denial that any problem exists. The entire family must be involved, because the anorexic's behavior has deep psychological origin: low self-esteem, struggle for control and independence, and fear of physical sexual development.

Binge Eating Disorder

Classified separately from anorexia or bulimia, binge eating disorder (sometimes called compulsive overeating) has become a serious problem. It is now the most common eating disorder. **Binge eating disorder (BED)** is defined as recurrent episodes of eating characterized by eating, in a discrete period, an amount of food much larger

than most people would eat in a similar period and accompanied by a sense of lack of control or a feeling that one cannot stop. The criteria for this disorder include

1. Eating much more rapidly than normal.
2. Eating until uncomfortably full.
3. Eating large amounts of food when not hungry.
4. Eating alone because of embarrassment about how much is eaten.
5. Feeling disgusted with oneself, depressed, or guilty about eating.
6. The binge eating occurs, on average, at least 2 days a week for 6 months.

Most people overeat from time to time, and many think that they eat more than they should. Compulsive overeaters, however, experience marked distress regarding their bingeing behavior and engage in binge eating on average at least 2 days a week for 6 months. They tend to overeat when home alone, while normal eaters tend to overeat in restaurants and social situations that are associated with positive feelings.

In some ways, people with binge eating disorder are similar to bulimics. Both engage in frequent binges, are preoccupied with food and body weight, experience intense feelings of body dissatisfaction, and set unrealistically high dieting standards. Both use food to fill an emotional void. However, some important differences distinguish bulimics from people with BED. People with BED do not regularly compensate for their behavior by dieting or purging. Whereas bulimics dwell on the importance of thinness, serious binge eaters would be happy to have an average body weight. Individuals with BED are usually very overweight, and most seek treatment for obesity. Approximately 15 percent of obese people are compulsive overeaters. They eat even if they aren't hungry. Whereas bulimics engage in the extremes of severe dieting and eventual bingeing, people with BED rarely restrict food. Table 10-9 will help you assess whether you have a problem with compulsive overeating.

The goal in treating binge eaters is to normalize eating—to help them say no to overeating. They need help in adopting a plan of healthy eating and overall moderation *without* rigid rules. Binge eaters need help in learning to cope with the underlying emotions that perpetuate this eating problem—anxiety, loneliness, depression, shame, inferiority, and fear of criticism. Finally, binge eaters need to learn to accept that which cannot be changed about their bodies.

Eating Disorders Not Otherwise Specified (EDNOS)

The fact that a person does not meet the exact diagnostic criteria for anorexia, bulimia, or binge eating disorder does not mean that that person does not have an eating problem. As a matter of fact, most people will not

TABLE 10-9 *Are You a Compulsive Overeater?*

1. Do you eat when you're not hungry but don't know why?
2. Do you constantly think about food throughout the day?
3. Do you go on eating binges for no apparent reason and find yourself unable to stop?
4. Do you have feelings of guilt and remorse after overeating?
5. Do you look forward with pleasure and anticipation to the time when you can eat alone?
6. Do you eat sensibly in front of others and then binge when you're alone?
7. Is your weight affecting the way you live your life?
8. Do you eat to escape from worries or trouble?
9. Does your eating behavior make you or others unhappy?
10. Have you tried "dieting," only to fall short of your goal?

If you answered yes to over half these questions, you may want to think seriously about your relationship with food and consult a professional.

meet the full criteria. For example, a person with EDNOS may purge after eating, but with less frequency or intensity than will someone diagnosed with bulimia. Or a person may exhibit occasional anorexic-type behaviors yet be near normal in weight. These varied types of behaviors are called **disordered eating**. The incidence of disordered eating is increasing and far exceeds that of the clinically diagnosed eating disorders. Exact statistics are unavailable because most of these behaviors are unreported, secretive, and difficult to define. Since about 80 percent of American women are dissatisfied with their weight, disordered eating behaviors have become a popular way of dealing with food issues. Those who exhibit disordered eating may diet, binge, purge, fast, exercise excessively, eat in secret, or gain and lose weight off and on. A considerable proportion of their lives is consumed by preoccupation with weight, body image, and food. If disordered eating becomes long-lasting and interferes with normal life, help should be sought.

What Can Be Done?

Eating disorders appear to be increasing in incidence, and so implementation of prevention programs is desperately needed. The most obvious and effective site for prevention is the schools. However, all segments of society need to absorb some of the responsibility, including parents, coaches, advertising executives, the media, and the entertainment business. Society needs to send the message of healthy acceptance of self and body. Not everyone is meant to be a size 6. You may want to do Lab Activity 10-4 at the end of the chapter to assess your risk for developing an eating disorder.

If you suspect a friend, roommate, or relative of having an eating disorder, you probably wonder what

you can do to help. Eating disorders are not solely about food and eating but are manifestations of emotional distress. Therefore, just begging someone to start eating or put on some weight is futile. Ignoring the situation or waiting to see what happens also will not solve the problem.

The first step to recovery is indisputable: Locate professional help as soon as possible. Congress has mandated that every state establish a system of community mental health centers to assist people with a variety of psychological problems. These centers are a good source for providing treatment or helping you locate professionals who specialize in treating eating disorders. Even though psychotherapy has become more prevalent and accepted in the last 25 years, some still avoid it. For whatever reason, psychotherapy still carries a stigma with some people. Most college campuses have counseling services available as well.

Your anorexic or bulimic acquaintance may deny the condition or balk at your suggestion to seek help; therefore, it may be difficult to persuade her or him to seek help. However, both physical and psychological evaluation are crucial at the onset of treatment. You cannot force someone to get help. It is important, however,

to be direct and honest while showing sincere concern and support. You may have to be tough, even make the appointment, and insist on accompanying the anorexic or bulimic to see a specialist.



PREScription FOR ACTION

You've read the chapter. Now go do one or more of these:

- ✓ Keep a food journal to see *what, how much, and why* you are eating.
- ✓ Take a favorite recipe and investigate ways to make it less caloric and more nutritious.
- ✓ Resign from the "clean plate club." Even if it feels somewhat uncomfortable, leave a small amount of food on your plate.
- ✓ Do some form of exercise that burns a minimum of 300 calories.
- ✓ Make a rule: No TV or Internet until you've exercised for 30 minutes.



Frequently Asked Questions

Q. Is it true that anything eaten after 8:00 P.M. will be stored as fat?

A. *What and how much* you eat affect weight control, not *when* you eat. If you balance total daily calories consumed with calories burned, it doesn't matter how late you eat. This myth probably stems from the tendency for people to snack "mindlessly" in the evening on high-fat, high-calorie foods such as chips, cookies, and ice cream, which add considerable additional calories to their day. Some people eat sparingly during the day and then consume several thousands of calories at night due to built-up hunger.

Q. I have cellulite on my thighs. Is there any special way to remove it?

A. There is no such thing as **cellulite**. It is a slang term used to describe the dimpled fat found primarily on the buttocks and thighs of women. Concentrated areas of fat tend to bulge in some women because, with age, their connective fibers become taut and their skin thin. This fat is like any other fat in that only a comprehensive program of exercise and calorie reduction will remove it. No miracle creams, saunas, diets, or devices specifically break up cellulite. Buying a product that claims to do this reduces only your wallet.

Q. The only place I feel I have too much fat is on my abdomen. Is there any way to just lose fat there? How about trying one of those abdominal muscle stimulators?

A. The concept of *spot reduction* (that is, selectively burning off fat from a particular body area) is a myth. No one can dictate where body fat will accumulate or from where it will be removed. Genetics determine your body build and preferred fat storage sites. Exercising a specific body area does not burn fat in just that area. Fat stores from throughout the body are mobilized during exercise. Thus, your abdomen will lose fat only after a combined program of total-body aerobic exercise and calorie management, not solely by doing 100 crunches a day. It is possible to "spot tone," however. Those 100 crunches create stronger abdominals. As far as those abdominal stimulators go, don't waste your money!

Q. My friend had gastric bypass surgery and lost a considerable amount of weight. What about this and other surgical treatments of obesity?

A. Surgery for obesity should not be taken lightly and should be considered only as a last resort for the morbidly obese (those at least 100 pounds above ideal weight). Even the nonsurgical means of jaw

wiring and inserting balloons in the stomach are drastic measures in tackling obesity. Also, their long-term effectiveness is questionable unless a drastic lifestyle change accompanies the procedure.

Liposuction (suctioning fat from under the skin) has become popular as a method of removing body fat from selected body parts. This surgical procedure is performed by physicians who specialize in cosmetic surgery. Interestingly, liposuction performed on abdominal fat does not eliminate the risks for heart disease, type 2 diabetes, or cancer. Since liposuction removes only the subcutaneous fat, the deeper, more dangerous intra-abdominal fat remains. Therefore, abdominal liposuction does not result in the metabolic benefits that fat loss through diet and exercise accomplishes. As with any major medical procedure, these surgeries have inherent risks and medical complications.

Q. I have been faithfully exercising and monitoring my calorie intake for 6 months. As a result, I have lost 20 pounds. Even though I am sticking with my program, I have stopped losing weight. Since I have 10 more pounds to lose to reach my goal weight, I am frustrated. What now?

A. Weight-loss plateaus are common after several months of consistent progress. First make sure that your weight loss goal is realistic. Maybe your body is telling you that your weight is exactly where you need to be! If that is not the case, try logging your food intake for several days to see if your food portions have begun creeping up. Also realize that your metabolism may have changed and you may not be burning as many calories as you did at your higher weight. To kick-start your metabolism, try some alterations in your workouts: add some strength training; change to a new aerobic activity like swimming, cycling, or using a cardiomachine like an elliptical trainer; incorporate short bursts of high-intensity exercise combined with more moderate intensity throughout your aerobic session to create an “interval” effect. (For example, cycle hard for 45 seconds every 4–5 minutes.) Your body may have gotten used to the same exercise routine, resulting in a stall in excess calorie burning. Making a few changes could make a difference.

Q. I am heavily involved in competitive sports. As a result, I am very muscular. When I stop competing, how do I avoid having all that muscle turn into fat?

A. Your concern is fueled by a common misconception. Muscle can no more turn into fat than a cat can turn into a dog. Neither can fat become muscle. The cellular makeup of each is different. If you stop activity altogether, your muscles will atrophy and lose tone. Calories not needed to fuel your body will be stored as fat. To avoid this, continue doing some regular exercise and modify your calorie

consumption, being sure your energy input and output are relatively equal.

Q. I have heard that I will burn more fat if I work out at the lower end of my target heart rate range rather than at a high intensity. Is this true?

A. This low-intensity fat-burning idea is a misunderstanding based on an oversimplification. It is true that at higher exercise intensities, the body prefers to use more glycogen rather than fat for fuel. Some have interpreted this to mean that to burn fat, low-intensity exercise is best. However, the type of fuel used during exercise does not make a huge difference. You burn calories *and* fat during both types of exercise. The most important exercise variable is *total* caloric expenditure. Higher-intensity exercise does burn more calories, but you may not be able to sustain that intensity for very long. Because you don’t fatigue as quickly when exercising at a lower intensity, you may be able to work out for a longer period and feel more comfortable while doing it. The result is more total calories expended due to the longer workout time. Even though all types of exercise can help in weight management, most people find that a program of regular low- to moderate-intensity activity is easier to maintain over time. The key is doing it every day!

Q. I am concerned because my sister is very much overweight. She doesn’t act like it bothers her, but I think it does. What can I do to motivate her to lose weight?

A. Often we have relatives or friends who have health-robbing habits (smoking, being overweight, not exercising). Because we care about them, it is natural to want to help. In the case of your sister, do not nag or criticize her. Instead, set a good example and talk about why you do the things you do (select certain foods, behavior modification tricks, etc.). Try to include her in your practices. Invite her to go on a walk, bike riding, or to an aerobics class. Grocery shop or eat out together. Share recipes and food preparation ideas. Show that you care. Make a pact with her (you will try to stop biting your fingernails, while she tries to lose weight). Be there for her. However, realize that she is ultimately responsible for herself. Nevertheless, be her friend, confidant, and number one cheerleader. A strong support system is essential in any weight-management program.

Q. I am 26 years old and weigh 40 pounds more than I should. Obesity runs in my family. Is it possible for me to achieve a normal weight or am I always going to fight being overweight because of my heredity?

A. Yes, you can achieve normal weight, but you will have to work much harder than some people because of your genetics. It may seem unfair, but you will have to exercise for 60 or more minutes a day and be

vigilant in your calorie intake. Think positive, though, of the opportunity you have to also lower your risk of heart disease, cancer, and type 2 diabetes. Genetic influences are real, but diet and exercise

habits have far more impact on weight than heredity. Embrace your opportunity to take control of what you can—your lifestyle.

Summary

Obesity is acknowledged as this country's most important nutrition-related disease. It is a complex disorder that no longer is considered only a problem of overeating or lack of willpower. It is caused by multiple factors—some within your control and some beyond it. Environment, culture, and genetics combine to complicate the act of nourishing our bodies. It is important to understand body composition and be able to differentiate between overweight and obesity. Many health problems are associated with obesity, so concern with weight control should begin sufficiently early in life to reduce the risk of developing obesity. Prevention is the treatment of choice. The factors affecting obesity give us insight into the complexities of losing excess body fat.

"Monday I start my diet" is far too often the battle cry for losing weight. This diet mentality has contributed to the obesity problem. Dieting and concerns about appearance have also contributed to the increasing incidence of eating disorders. Because successful weight management has been elusive for many people, the

marketplace has provided many legitimate as well as unfounded claims about products and services. Therefore, consumer education is essential. Effective weight management involves food management, emotional management, and exercise management. Whereas dieting is temporary, restrictive, and negative, lifestyle weight management is a positive, flexible means of dealing with food for life. It is a lifestyle of calorie-controlled, nutritious eating and regular exercise amid established cultural patterns and social and economic forces. No gimmick or gadget can replace this lifestyle approach.

Regular exercise is the key ingredient in maintaining a healthy body composition. Technological advances have increased the quality of our lives in many ways but have eliminated much daily physical exertion. It is a challenge to find ways to fit activity into your life. However, lifelong weight management and total wellness depend on it. Only when we start considering food as fuel, regarding exercise as a daily necessity, and accepting a range of healthy body weights will weight concerns finally disappear.



Internet Resources

Calorie Control Council

www.caloriecontrol.org

Loaded with articles on cutting calories and weight management. Has many interactive tools: calories burned during various exercises, BMI, caloric content of foods.

Calories Per Hour

www.caloriesperhour.com

Calculates calories burned for any activity as well as BMI and BMR. Also features a nutrition calculator for food items and a Q & A about diets and dieting.

Food Nutrition Information Center/Weight and Obesity

www.nal.usda.gov/fnic/reports/obesity.html

A government site that features numerous reports and studies on obesity, as well as current statistics.

Medline Plus/Weight Loss

www.nlm.nih.gov/medlineplus/weightcontrol.html

From the U.S. National Library of Medicine, this site has the latest research and studies on all weight-management topics.

National Association of Anorexia Nervosa and Associated Disorders

www.anad.org

Provides comprehensive information and resources (including treatment referrals) on eating disorders.

National Center for Chronic Disease Prevention and Health Promotion—Overweight and Obesity

www.cdc.gov/nccdphp/dnpa/obesity

Covers definitions, BMI, trends, contributing factors, health consequences, and resources for overweight and obesity.

National Eating Disorders Association

www.nationaleatingdisorders.org

A not-for-profit organization working to prevent eating disorders. Offers information on a variety of eating disorders, including body image issues, athletes, prevention, and treatment.

The National Weight Control Registry

www.nwcr.ws/

A registry of over 5,000 individuals who have lost significant amounts of weight and kept it off for long periods of time. Includes research findings and success stories.

Obesity in America

www.ObesityinAmerica.org

A very thorough site covering all aspects of overweight and obesity—facts, trends, causes, surgical options, myths, medications, etc.

Shape Up America

www.shapeup.org

Provides a wide range of information on exercise, healthy eating, lifestyle change, and weight management.

Small Step

www.smallstep.gov

From the U.S. Department of Health and Human Services, gives helpful hints in making lifestyle changes related to weight management.

Something Fishy

www.something-fishy.org

Covers anorexia, bulimia, and compulsive overeating with news, research, dangers, treatment, options, and cultural issues.

The Calorie King

www.calorieking.com

Has a huge database with nutritional and calorie information for thousands of generic and name-brand foods, including fast foods.

The Diet Channel

www.thedietchannel.com

A terrific site loaded with information on fad diets, successful weight-loss tips, interactive tools for BMI, ideal weight, and links to over 600 reliable diet sources.

Three Fat Chicks

www.3fatchicks.com

Three sisters have collaborated to offer a wide range of obesity/overweight articles, research, news, dieting information, recipes, and support. Has a lot of information on popular diet programs.

Weight-Control Information Network (WIN)

<http://win.niddk.nih.gov/>

As an information service of the National Institute of Diabetes and Digestive and Kidney Diseases, this site features a wide range of weight-loss and weight-control topics/articles, including dieting tips, suggestions for controlling food portions, and successful weight-loss programs.

The following restaurants have caloric information for their foods online:

www.arbys.com

www.blimpie.com

www.bostonmarket.com

www.carlsjr.com

www.chick-fil-a.com

www.churchs.com

www.dairyqueen.com

www.dominos.com

www.dunkindonuts.com

www.fazolis.com

www.hardees.com

www.jackinthebox.com

www.kfc.com

www.krispykreme.com

www.longjohnsilvers.com

www.mcdonalds.com

www.panerabread.com

www.papajohns.com

www.pizzahut.com

www.popeyes.com

www.schlotzskys.com

www.sonicdrivein.com

www.steaknshake.com

www.subway.com

www.tacobell.com

www.whitecastle.com

LAB Activity 10-1

Name _____ Class/Activity Section _____ Date _____

Analyzing Your Food and Exercise Habits

PART I: FOOD

Use the following food journal to record your food intake for a day. This will allow you to see the number of calories you are eating and analyze the reasons you eat. Knowing the cues and factors that affect eating can help you manage your eating behavior. Don't forget to record "liquid" calories! (Make copies of this log as needed to record multiple days.)

Date: _____

Time of Day	Location	Companion(s) (if any)	Food	Portion Size/Quantity	Calories	Hunger Level (0-5) 0 = not hungry 5 = very hungry	Feelings/Mood (before eating)	Feelings/Mood (after eating)

What do you observe about your eating habits? (i.e., portions, hunger levels, feelings/mood, etc.):

List strategies for change:

PART II: EXERCISE

Finding the time to exercise can be a challenge. However, there are several times during a day when you can weave activity into your life (walking rather than driving, riding a stationary bike while watching TV, taking the stairs rather than the elevator, getting up 45 minutes earlier in the morning to jog). Use the following log to keep track of your activity during the day. Use Table 10-8 or go to www.caloriesperhour.com or www.caloriecontrol.org (go to “Exercise Calculator”) for the caloric expenditure for various activities. Then answer the questions. (Make copies of this log as needed to record multiple days.)

Date: _____

Activity	Time of Day	Location	Duration	Calories Expended	Positive Outcomes	Negative Outcomes (if any)

1. Assess your activity level today (was it a typical day?):
2. Describe ways you could fit more activity into your day:
3. What obstacles do you face in trying to be active?
4. What are your strategies for combating these obstacles and adhering to a lifetime of activity?

LAB Activity 10-2

Name _____ Class/Activity Section _____ Date _____

Estimating Your Basal Metabolic Rate (BMR)

Precise measurement of your BMR can be achieved only in a laboratory. However, you can compute an estimate of your BMR by using the following equation from the World Health Organization. Figured into the equation are factors that influence your BMR: age, gender, and weight.

STEP 1

Convert your body weight in pounds to kilograms (kg):
_____ lb $\div$ 2.2 = _____ kg

STEP 2

Select the appropriate formula from the table below, using your age and gender:

Age Range	Male Formulas	Female Formulas
10-18	$BMR = (17.5 \times \text{wt in kg}) + 651$	$BMR = (12.2 \times \text{wt in kg}) + 746$
19-29	$BMR = (15.3 \times \text{wt in kg}) + 679$	$BMR = (14.7 \times \text{wt in kg}) + 496$
30-59	$BMR = (11.6 \times \text{wt in kg}) + 879$	$BMR = (8.7 \times \text{wt in kg}) + 829$
60 +	$BMR = (13.5 \times \text{wt in kg}) + 487$	$BMR = (10.5 \times \text{wt in kg}) + 596$

Example: For a 23-year-old male weighing 195 pounds:

$$195 \text{ lbs} \div 2.2 = 88.6 \text{ kg}$$

$$BMR = (15.3 \times 88.6 \text{ kg}) + 679 = 2,034.5 \text{ calories/day}$$

Now figure your BMR:

$$BMR = (\text{_____} \times \text{_____ kg}) + \text{_____} = \boxed{\text{_____}} \text{ Calories/day}$$

Remember, BMR does not include any calorie expenditure from activity or exercise that you do throughout the day. This is just your basal need (i.e., calories needed *at rest* just to sustain vital functions of the body).

If you want to approximate your TOTAL caloric expenditure in a day, use Table 10-8 and accompanying websites to calculate the calories you burn in daily activities and exercise. Then:

$$\text{BMR} + \frac{\text{activity calories}}{\text{_____}} = \boxed{\text{_____}} \text{ total daily calories expended}$$

LAB Activity 10-3

Name _____ Class/Activity Section _____ Date _____

Weight Management Plan

Date: _____

Current body mass index (BMI): _____

Current weight: _____

Goal body mass index (BMI): _____

Goal weight: _____

Current body fat percentage: _____

Waist: _____ Hip: _____

Goal body fat percentage: _____

Current waist-to-hip ratio: _____ (waist $\div$ hip)

Goal waist-to-hip ratio: _____

Goal waist measurement: _____

I. FOOD MANAGEMENT

- Calories per day: _____ (goal)

- Fat grams per day: _____ (goal)

- Snack strategy:

- Food preparation adjustments/alterations:

II. EMOTIONAL MANAGEMENT

Behavior modification and coping strategies:

1.
2.
3.
4.
5.
6.

III. EXERCISE MANAGEMENT

Physical activity strategies:

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

LAB Activity 10-4

Name _____ Class/Activity Section _____ Date _____

Are You at Risk for an Eating Disorder?

Check the following statements that describe you.

- _____ I feel fat even if people tell me I'm not.
- _____ If I were thinner, I would like myself better.
- _____ If I gain weight, I get anxious and depressed.
- _____ I worry about what I will eat.
- _____ I feel extremely guilty after eating.
- _____ I am terrified of being overweight.
- _____ I often wish I were someone else.
- _____ I get anxious if I cannot exercise.
- _____ I find myself preoccupied with food.
- _____ I am preoccupied with a desire to be thinner.
- _____ I binge eat sometimes.
- _____ I have a secret stash of food.
- _____ I don't like to be bothered or interrupted when I'm eating.
- _____ I like to read recipes, cookbooks, calorie charts, and books about dieting.
- _____ I would rather eat by myself than with family or friends.
- _____ I am hardly ever satisfied with myself.
- _____ I have dieted to lose weight.
- _____ I want to be thinner than my friends.
- _____ I vomit, use laxatives, or take diet pills to control my weight.
- _____ When I eat, I worry that I may not be able to stop.
- _____ I have perfectionist tendencies.
- _____ I have a hard time saying no to others.
- _____ I avoid eating even if I am hungry.
- _____ Sometimes I feel worthless.
- _____ I have a tendency to hide my feelings or have trouble expressing them.

This questionnaire is not meant to be a diagnostic tool, but if you checked many of the statements, that may be indicative of an eating disorder. The more items you checked, the more serious your problem may be. Don't be afraid to seek the advice of a counselor or physician who has experience in treating eating disorders. It takes courage to take this initial step, but it is essential to prevent severe medical and psychological problems.

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Glossary

a

action stage is the fourth stage in the transtheoretical model of behavior change. In this stage, individuals are overtly changing their behaviors; taking conscious action; and using strategies to resist temptations, remain motivated, and cope with everyday challenges.

active stretching is a stretch in which you use your own muscle forces to stretch yourself. For example, you can stretch calves by sitting and pulling the toes back.

aerobic literally means “with oxygen.” Aerobic activities are activities that demand large amounts of oxygen, follow the FITT factors, and improve cardiorespiratory endurance.

aerobic capacity see maximal oxygen uptake.

agonist is a muscle primarily responsible for producing a movement. For example, in a biceps curl, the biceps muscle is the agonist.

amenorrhea is a menstrual abnormality that results in the absence of menses.

amphetamines (*speed, uppers, crank, bennies, meth, or crystal*) are powerful CNS stimulants. They are controlled substances legitimately used for short-term diet control in obesity and for narcolepsy. They have the ability to relieve sleepiness and fatigue and increase alertness, confidence, and short-term performance. Truck drivers, pilots, entertainers, and athletes may use amphetamines nonmedically to enhance their performance.

anabolic steroids are artificial forms of the male hormone testosterone. They are used legitimately in the treatment of anemia, hormone disorders, and multiple sclerosis. They are also used to increase muscle mass by both male and female athletes at all levels of competition, and they have numerous adverse side effects.

anaerobic means “without oxygen.”

This type of activity demands more oxygen than the body can supply while exercising, causing an oxygen debt. Start-and-stop activities, such as sprinting, are examples of anaerobic exercise.

angina pectoris is chest pain and is primarily caused by atherosclerosis.

anorexia nervosa is an eating disorder characterized by self-inflicted starvation and dramatic weight loss. An anorexic is obsessed with achieving thinness.

antagonist is a muscle opposing a movement. For example, in a biceps curl, the triceps muscle is the antagonist.

arteriosclerosis is thickening and hardening of the arteries.

atherosclerosis is a type of arteriosclerosis and is a progressive condition that results in a buildup of plaque in the blood vessels.

atrophy is the condition of diminished muscle size and strength due to lack of use.

b

ballistic stretching involves jerking and bouncing movements and is not the recommended type of stretching.

basal metabolic rate (BMR) is the amount of energy (calories) expended by the body at rest to sustain vital functions.

behavior modification is the use of techniques to enhance awareness or consciousness about a behavior and then to alter the behavior. For example, a behavior modification technique for weight management would be refraining from grocery shopping while hungry.

binge eating disorder is recurrent episodes of eating characterized by eating, in a discrete period, an amount of food much larger than most people would eat in a similar period—and accompanied by a sense of lack of

control or a feeling that one cannot stop.

blisters are inflamed burns caused by the friction of skin against a fabric or surface (such as a shoe).

body composition refers to the amount of body fat in proportion to fat-free weight.

body fat is tissue made up of billions of cells filled with varying amounts of triglyceride. If triglyceride is added to or removed from a fat cell, the cell will increase in size or shrink accordingly.

body mass index (BMI) is a ratio between weight and height. It is calculated as weight (in kilograms) divided by the square of height (in meters). BMI is used by health professionals as a measure of overweight and obesity.

bulimia nervosa is an eating disorder characterized by alternating bouts of eating large quantities of food (bingeing) and purging through vomiting, use of laxatives, or fasting.

bursitis is inflammation of a bursa, a fluid-filled sac that lies between tissues and allows tendons, ligaments, muscles, and skin to glide smoothly over one another during activity.

C

caffeine is a powerful CNS stimulant which increases alertness, banishes drowsiness, quickens reaction time, enhances intellectual and muscular effort, increases heart and respiratory rates, stimulates urinary output, reduces the risk of several diseases, helps preserve cognitive skills of older adults. It occurs naturally in coffee, tea, cocoa, and chocolate and is added to many soft drinks and to some drugs. It is probably the most commonly used drug by adults and children in our society.

calorie (kcal) is a measure of food energy. One pound of body fat equals 3,500 calories.

carbohydrates are the major source of energy for the body. Starches (such as potatoes, rice, and grains) and sugars are the main sources of carbohydrates in our diet.

cardiac output is the volume of blood pumped by the heart per minute.

cardiorespiratory endurance (CRE) is the ability to deliver essential nutrients, especially oxygen, to the working muscles of the body and remove waste products during prolonged physical exertion. It involves efficient functioning of the heart, blood vessels, and lungs.

cardiovascular disease refers to diseases of the heart and blood vessels.

cellulite is a slang term used to describe dimpled fat found primarily on the buttocks and thighs of women. It is no different from any other body fat.

cholesterol is a fatlike waxy substance found in animal tissue. Although it plays a vital role as a structural component of cell membranes, too much cholesterol has been linked to CVD.

collagen is fibrous connective tissue found within muscles. Collagen is relatively inelastic.

collateral circulation is a process in which new blood vessels develop to nourish the areas of the heart muscle that are starved of oxygen and other nutrients.

complex carbohydrates are nutritionally dense foods (grains, rice, pasta, potatoes, fruits, and vegetables) that are a rich source of vitamins and minerals and provide a steady amount of energy for many hours. Complex carbohydrates are an important source of fiber.

concentric contraction occurs when a muscle shortens as it overcomes resistance. For example, the biceps muscle contracts concentrically during arm flexion in a biceps curl.

conditioning bout is the middle part of a three-segment workout. It contains vigorous aerobic exercise that stimulates the cardiorespiratory system and should follow the FITT formula.

constant resistance exercise is exercise in which a constant resistance (weight) is used throughout the range of motion, but the force needed to move the weight varies with leverage determined by the angle of the joint. Doing a biceps curl with free weights is an example.

contemplation stage is the second stage in the transtheoretical model of behavior change. In this stage, individuals are aware of their problem behavior and are thinking about changing it—but are not ready to do that.

contraindicated exercises are exercises indicated to be injurious to some people.

cool-down is the final segment of the three-segment workout. The purpose of the cool-down is to ease your body safely back to its resting state.

cramp is a sharp, painful, involuntary muscle contraction.

C-reactive protein (CRP) is a marker for inflammation of the blood vessels. It is recognized as increasing the risk for heart attack and stroke.

cross training involves participating in two or more types of exercise in one session or alternate sessions for balanced fitness. For example, lift weights, do 20 minutes of walking, and finish by stretching.

d

diabetes mellitus is a condition characterized by the body's inability to produce insulin or use the hormone properly.

diastolic blood pressure is the resting blood pressure and is the force of blood against the artery wall when the heart relaxes between beats. It is recorded as the lower number.

disordered eating is a classification of disturbed eating behaviors (bingeing, purging, fasting, excessively exercising, etc.) that are not as common or intense as in a diagnosed eating disorder.

diuretics cause the body to pass water by increasing urine output. They are used in treating edema and mild hypertension.

dynamic flexibility is the range of motion achieved by quickly moving a limb to its limits as in a bouncing hamstring stretch.

dynamic (isotonic) exercise is exercise in which the muscle contracts, and shortens and movement occurs, such as push-ups or weight lifting.

dynamic stretching employs swinging or ballistic moves such as a high forward kick.

dysmenorrhea is painful menstruation.

e

eating disorder is a disturbance in eating behavior that jeopardizes a person's physical or psychosocial health.

eccentric contraction occurs when a muscle lengthens and contracts at the same time, gradually allowing a force to overcome muscular resistance. For example, the biceps contracts eccentrically during the lowering phase of a biceps curl.

elastic elongation, the temporary lengthening of soft tissue, occurs when muscle is stretched and returns to its resting length.

elastin is elastic connective tissue found within a muscle.

electrolytes are chemicals, such as calcium, potassium, and sodium, dissolved in blood or cellular fluids that act as a vital messenger for many bodily processes. Electrolytes are essential, for example, in maintaining heart rhythm and kidney function; dehydration and certain drugs can disrupt electrolyte balance.

endorphins are pain-relieving chemicals produced by the brain. Some individuals report experiencing their effects during aerobic exercise. They are also released during the fight-or-flight response when faced with a stressor.

essential fat is the body fat required for normal functioning. This fat is stored in major body organs and tissues such as the heart, muscles, intestines, the nervous system, and breasts.

estrogen is a female sex hormone.

ethyl alcohol (or ethanol) is the technical term for alcohol.

exercise addiction is a chronic loss of perspective on the role of exercise in a full life.

exercise tolerance test is a test of aerobic capacity in which a person exercises while heart rate and oxygen consumption are measured. A maximal effort on a treadmill or bicycle ergometer is an example. This test gives an excellent measure of overall physiological functioning.

f

fast-twitch (FT) muscle fiber contracts quickly and strongly. It is recruited and developed mainly in short-burst

anaerobic activities such as sprinting and weight training.

fat is the most concentrated form of food energy, providing 9 calories per gram—more than twice the energy provided by carbohydrates and proteins. Diets high in fat have been linked to coronary heart disease, some cancers, and obesity.

fat cells (adipose cells) are storage sites for energy. This type of cell shrinks and enlarges depending on the amount of excess calories (energy) in storage.

fat-free (tissue) mass is all body tissue except fat (muscle, bones, etc.).

fat soluble vitamins are vitamins that are stored in the fatty tissues of the body. Vitamins A, D, E, and K are fat soluble.

female athlete triad is a life-threatening syndrome marked by three disorders: eating habits disordered (inadequate food energy intake to meet metabolic demands), amenorrhea, and osteoporosis. This condition may be found in extremely physically active women.

fiber is the part of plant food that is not digested in the small intestine. It helps the movement of solid waste through the digestive tract.

FITT factors should be followed to develop cardiorespiratory endurance. The factors include recommendations about the frequency, intensity, time, and type of exercise.

flexibility refers to the movement of a joint through a full range of motion.

9

glycemic index (GI) is a scale that measures the extent to which a food affects blood sugar levels.

glycogen is the storage form of carbohydrates. It is found in the muscles and liver.

Golgi tendon organ (GTO) is a type of stretch receptor located within the muscle tendon that detects the amount of tension in a muscle. When excessive tension is placed on the muscle, the GTO triggers the inverse stretch reflex, causing the muscle to relax to prevent injury.

h

heart rate reserve is the difference between your maximal and resting heart rates.

heel spur is a bony growth on the underside of the heel.

hemoglobin is the oxygen-carrying component of red blood cells.

high-density lipoprotein (HDL) is considered to be the good form of cholesterol because of its dense structure. It cleans out plaque and debris (e.g., atherosclerotic buildup) from the blood vessel walls.

homocysteine is an amino acid in the blood and a natural by-product of protein metabolism. Too much homocysteine in the blood is related to a higher risk of CVD. Homocysteine levels in the blood are strongly influenced by diet and genetic factors.

hydrogenation is a manufacturing process in which hydrogen atoms are added to unsaturated fats, making them more saturated. Manufacturers use hydrogenated oils to extend the shelf life of products. Consumption of hydrogenated oils has been shown to increase blood cholesterol levels.

hypercholesterolemia is a term for high cholesterol levels in the blood.

hypertension is high blood pressure that is acknowledged to be equal to or greater than 140/90.

hyperthermia is a life-threatening condition in which the body temperature rises to a dangerously high level.

hypertrophy is an increase in muscle size due to enlargement of existing muscle fibers. Muscles exhibit hypertrophy when exercised.

hypokinetic diseases are lifestyle diseases resulting from inadequate physical fitness. Examples are heart disease, diabetes, osteoporosis, stroke, back pain, and cancer.

hyponatremia is water intoxication caused by drinking too much water. It can be life-threatening as it dilutes the sodium content of the blood too much. Although not common, it is seen in exercisers during extreme conditions (heat) and people who exercise 3 hours or more.

hypothermia is a life-threatening condition in which the body temperature drops to a dangerously low level.

i

ice is the street name for the crystallized (and smokable) form of crack (also known as methamphetamine). It is sometimes called *crystal meth*. The drug is more addictive than crack cocaine.

iliotibial band is a long tendon that begins in the buttocks, runs down the outside of the thigh, and attaches just below the knee. When inflamed, it causes tightness, burning, and pain on the side of the knee or hip.

insoluble fiber absorbs water as it passes through the digestive tract, increasing fecal bulk. By quickening the passage of food through the system, insoluble fiber is a good deterrent to digestive disorders, including cancer.

intervertebral disc is a fluid-filled cushion that separates each bony vertebra in the back.

inverse stretch reflex causes the muscle to relax to prevent injury when excessive tension is placed on the muscle.

ischemia means “insufficient oxygen.” It is used in reference to conditions in which cells are deprived of oxygen, resulting in pain or discomfort (heart angina, side stitch, etc.).

isokinetic exercise controls the speed of movement as force is applied through a range of motion. Cybex or Orthotron equipment employs isokinetic contraction to strengthen muscles.

k

Karvonen equation is used to determine the target heart rate (THR) for exercise. It takes into account the current fitness level of the exerciser by using his or her resting heart rate. (Karvonen was a Finnish researcher.) The formula is $THR = (HR_{max} - RHR) \times I + RHR$.

Kegel exercises strengthen the pelvic floor muscles and may prevent or cure stress incontinence. They are done by contracting the perineal muscles, which surround the bladder and vagina. The exercises are named after the physician who invented them.

ketone bodies are a toxic waste product that builds up in the body if fats are burned for energy in the absence of carbohydrates. This buildup, or *ketosis*, can result in fatigue, nausea, and nerve and brain damage.

l

lactovegetarian is the type of vegetarian who will consume only plant foods and dairy products.

LDL cholesterol receptors, primarily in the liver cells, bind and remove cholesterol from the blood.

lean-body mass (muscle mass) is specifically the *muscle* part of the fat-free body mass.

ligament is the fibrous connective tissue that binds bones together to form a joint.

liposuction is a surgical procedure in which fat is removed/suctioned from selected parts of the body.

low-density lipoprotein (LDL) is considered the bad form of cholesterol because it more easily attaches to the blood vessel wall, thereby increasing the atherosclerotic process.

m

macrominerals are minerals needed in large doses (more than 100 mg daily). Examples are calcium, magnesium, and potassium.

maintenance stage is the fifth and final stage in the transtheoretical model of behavior change. In this stage, individuals have been able to sustain their new behavior for over 6 months. Their habits are becoming automatic.

marijuana (cannabis) is a psychoactive drug that may produce both depressant and psychedelic effects. It is comprised of the leaves and flowers of the cannabis sativa plant. The principal psychoactive ingredient is delta-9-tetrahydrocannabinol (THC). It is the most widely used illegal drug.

maximal heart rate (HR_{max}) is the highest possible heart rate. Maximal heart rate can be estimated by subtracting age from 220 bpm.

maximal oxygen uptake (V_{O₂max}) is the greatest amount of oxygen that can be used by the body during intense exercise.

menarche is the start of a young female's menstrual cycle. Menarche is usually experienced between 11 and 12 years of age.

metabolic syndrome (syndrome X) is a cluster of symptoms that increase the risk of heart disease, stroke, diabetes, and some cancers.

minerals are inorganic substances critical to many enzyme functions in the body.

moderate physical activity is activity that uses approximately 150 calories of energy per day, equivalent to walking

2 miles in 30 minutes. This produces significant health benefits but not physical fitness.

monounsaturated fats are fatty acids that have one double bond between carbon atoms, thus reducing the number of hydrogen atoms attached. Monounsaturated fats are better for the heart than are saturated fats. Olive oil and peanut oil are monounsaturated.

muscle spindles are stretch receptors within the muscle cells that sense the amount and speed of stretch. If a muscle is overstretched or stretched too fast, they activate the stretch reflex to prevent injury.

muscular endurance is the ability of a muscle to exert a submaximal force repeatedly against resistance or to sustain muscular contraction.

muscular power, a function of strength and speed, is the ability to apply force rapidly. Jumping requires muscular power.

muscular strength is the ability of a muscle to exert one maximal force against resistance.

myocardial infarction is a heart attack.

n

narcolepsy is a condition involving uncontrollable attacks of deep sleep.

nitrosamines are highly carcinogenic ingredients found in tobacco products.

nutrient density is a description of foods that provide substantial nutrients with relatively few calories, fat, and sugar.

O

obesity is an excessive accumulation of body fat. A woman with over 30 percent body fat or a man with over 25 percent body fat is considered obese. Having a body mass index (BMI) of 30 or over is generally classified as obesity.

oligomenorrhea is a menstrual abnormality that results in infrequent or irregular menses.

omega-3 is a polyunsaturated fat that is prevalent in fish. Omega-3 fatty acids inhibit atherosclerosis and can reduce blood cholesterol levels.

orthotics are shoe inserts specially molded to the foot to correct foot, arch, or leg abnormalities.

osteopenia is low bone mass.

osteoporosis is an age-related condition in which the formation of bone fails to keep pace with lost bone tissue. The result is brittle, porous bone susceptible to fracture.

overpronation is a condition in which the foot rolls inward excessively on contact with the ground during walking, jogging, or running.

overuse is a condition of excessive overloading of fitness activities, resulting in nagging injuries. It often means doing too much, too soon—before the body is ready. The body and muscles must be given time to adapt gradually to new demands with *gradual* overloading.

overweight is a term that refers to an excess of body weight compared to a recommended range for good health. A body mass index (BMI) of 25 to 29.9 is considered overweight.

ovo-lactovegetarian is the type of vegetarian who will consume plant foods, dairy products, and eggs.

p

passive stretching is stretching in which someone or something else assists with a stretch. The assist could be gravity, body weight, a strap, or leverage; for example, using gravity or a slant board to assist with a calf stretch.

patellofemoral syndrome causes pain and stiffness around and under the kneecap.

physical fitness is the capacity of the heart, lungs, blood vessels, and muscles to function at optimal efficiency.

phytoestrogens are plant estrogens that have a structure similar to that of the body's hormones. Found particularly in soy products, they may help reduce the risk for some cancers.

plantar fasciitis is an inflammation of the plantar fascia—the long thick band of connective tissue on the undersurface of the foot.

plaque is an accumulation of cholesterol on the inner walls of coronary arteries.

plastic elongation, a semi-permanent lengthening of tissues, can be produced by relatively long or intense stretching.

polyunsaturated fats are fatty acids that have two double bonds between carbon atoms, thus reducing the number of hydrogen atoms attached. Corn oil,

soybean oil, and safflower oil are examples.

precontemplation stage is the first stage in the transtheoretical model of behavior change. In this stage, individuals deny any need to change or resist change.

prediabetes is a condition that is sometimes called insulin resistance. In this metabolic condition the blood-glucose level is only slightly elevated but will develop full-blown diabetes unless healthy lifestyle changes are implemented.

prehypertension is blood pressure equal to or greater than 120/80. It is considered unsafe and calls for lifestyle changes and monitoring.

preparation stage is the third stage in the transtheoretical model of behavior change. In this stage individuals are intending to take action in the immediate future and are putting together a plan of action.

P.R.I.C.E. an acronym for Protect, Rest, Ice, Compress, and Elevate, is the recommended treatment for many injuries.

primary risk factors are linked directly to the development of CVD; they increase the possibility of having a heart attack more than do the secondary risk factors. All primary risk factors are controllable.

principle of individual differences states that people vary in their ability to develop fitness components.

principle of reversibility states that changes occurring with exercise are reversible and that if a person stops exercising, the body will decondition.

principle of specificity means that only the muscles or body systems being exercised will show beneficial change.

processes of change are the covert and overt activities and experiences that individuals engage in when they attempt to modify problem behaviors.

progressive overload is a gradual increase in physical activity to stress a muscle group or body system beyond accustomed levels. Gradual adaptation occurs, resulting in improved physiological functioning. The order of overload and 10 percent increase per week rules should be followed to overload correctly.

pronation is the slight inward roll of the foot as it contacts the ground. It is natural for the foot to pronate slightly.

proprioceptive neuromuscular facilitation (PNF) is a type of flexibility exercise in which you perform a static stretch, contract the muscle to produce fatigue, and then relax while a partner stretches your limb.

protein builds and repairs tissue; maintains chemical balance; and regulates the formation of hormones, antibodies, and enzymes. Large amounts of protein are found in both animal sources (meat, dairy) and plant sources (beans, nuts, grains).

R

rate of perceived exertion (RPE) is a method of measuring exercise intensity developed by Gunnar Borg. Using this method, exercisers are able to sense (or perceive) their exercise intensity levels accurately.

reciprocal inhibition Muscles work in pairs, and when one muscle contracts, through reciprocal inhibition, its opposing muscle relaxes to permit movement. For example, during a biceps curl, the triceps relaxes to permit the biceps to shorten.

repetition (rep) is the performance of an exercise one time, such as lifting a weight once.

repetition maximum (1 RM) is the heaviest weight you can lift once with correct form.

risk factors are the conditions, situations, and behaviors that increase the likelihood that an undesirable outcome (injury, illness, or death) will occur.

roid rage is uncontrollable, aggressive behavior and can be a side effect of anabolic steroid use.

S

sarcopenia means loss of muscle and decreased quality of muscle tissue. Strength training can restore or at least slow this loss as a person ages.

saturated fats are fatty acids that have hydrogen atoms attached to every carbon atom. Consumption of saturated fats has been shown to increase blood cholesterol levels. Coconut oil, butter, cheese, bacon, and meats are high in saturated fat.

secondary hypertension is high blood pressure caused by a specific

condition, such as kidney disease, a tumor of the adrenal gland, or a defect of the aorta.

secondary prevention refers to early detection of cancer, such as by knowing cancer's warning signals and performing a monthly self-exam.

secondary risk factors contribute to the development of CVD but not as directly as do primary risk factors.

self-efficacy is a belief in the ability to successfully take action or perform a specific task.

semivegetarian is the type of vegetarian who excludes only red meat from his or her diet.

set is a group of several repetitions of an exercise. For example, lifting a weight eight times might be one set.

set point is a fat amount or weight level that the body physiologically works to maintain. It is thought that the brain regulates a "weight thermostat" for the body's metabolism. The set point can be altered, especially by engaging in regular exercise.

shin splint is a condition of pain along the front of the lower leg (shin). Involving the anterior tibialis muscle, the pain may range from mild discomfort to acute burning.

side stitch is pain that sometimes occurs on the side of the body just below the ribs during vigorous exercise. A variety of conditions may contribute to this spasm of the diaphragm—poor conditioning, shallow breathing, inadequate warm-up, and exercising too soon after eating.

simple carbohydrates are sugars that provide energy but lack much nutritional value. Honey, corn syrup, sucrose, fructose, dextrose, and brown sugar are examples.

skinfold calipers are devices that measure skinfold thickness to determine body fat percentage.

slow-twitch (ST) muscle fibers have good endurance but low power. They are recruited mainly in endurance-type activities.

soluble fiber travels through the digestive tract in a gel-like form, pacing the absorption of carbohydrates. This prevents dramatic shifts in blood sugar levels.

sprain is a partial or complete tear of a ligament. Both ankles and knees are

vulnerable to sprains because of the sudden force or twisting motion that these joints often endure.

static flexibility refers to the range of motion you can achieve through a slow controlled stretch, as in a sitting hamstring stretch that you hold for 15 to 30 seconds.

static (isometric) exercise is exercise in which the muscle contracts but does not change in length and little or no movement occurs. For example, if you push your palms together hard, your pectorals will contract but your arms will not move.

static stretching is the recommended method of stretching for flexibility. Each stretch is held for 15 to 30 seconds with no bouncing or jerking movements.

storage fat is the extra fat that accumulates in fat (adipose) cells around internal organs and beneath the skin surface to insulate, pad, and protect the body from trauma and extreme cold.

strain is a partial or complete tear of muscle fibers and/or a tendon. Sometimes referred to as a *pull*, a strain is often a result of a violent contraction of a muscle.

stress fracture is a microscopic break in a bone caused by overuse. Rather than being a result of a distinct traumatic event, a stress fracture results from cumulative overload on a bone (typically the lower leg and foot) that has not been able to adjust to the repeated force.

stress incontinence is an involuntary leakage of urine when laughing, coughing, sneezing, or exercising. It is a common problem, particularly in women over 30 who have given birth.

stretch reflex is a reflex tightening of a muscle (to protect it from injury) when it is quickly stretched. For example, when you do a bouncy stretch, the muscle reflexively tightens as you reach the limits of your range of motion to prevent muscle strain.

strict vegetarian (vegan) is the type of vegetarian who consumes only plant foods.

stroke occurs when blood flow to the brain is blocked. It is primarily caused by atherosclerosis.

subcutaneous fat is fat that underlies the skin.

systolic blood pressure is the pumping pressure of the heart as it pushes the blood out of the heart. It is recorded as the upper number.

t

talk test is used to adjust exercise intensity. You should *just* be able to talk with a friend while exercising. If you are too breathless to talk, you are exercising too hard.

target heart rate (THR) is the recommended heart rate range (or intensity level) for exercise. It is the range of intensity that assures adequate stimulation of the cardiorespiratory system yet is not so strenuous that symptoms of overtraining develop.

task specific activity is an exercise (or activity) using the same muscles that will be used in the conditioning bout. Warm-up and cool-down should be task specific. For example, if you jog during the conditioning bout, a period of jogging at a lower intensity should precede (warm-up) and follow (cool-down).

tendinitis is the inflammation of a tendon from repeated stress.

tendons are fibrous cords that connect muscle to bone. The most familiar tendon in the body is the Achilles tendon, which connects the calf muscle to the heel.

three-segment workout is the recommended pattern for exercise workouts. It should include a warm-up, conditioning bout, and cool-down.

trace minerals are minerals needed in small amounts. Examples are iron, zinc, copper, iodine, and fluoride.

training effect is the total beneficial change or physiological adaptation that results from regular aerobic exercise.

trans-fatty acids (trans fats) are a type of fat found in many processed foods. During the manufacturing process of hydrogenation, some fatty acid molecules become rearranged into trans fats. Foods typically high in trans fats include margarine, crackers, cookies, doughnuts, french fries, chips, and candy.

transtheoretical model of behavior

change is a five-stage progression that one passes through on the way to making a permanent lifestyle change. The five stages are precontemplation, contemplation, preparation, action, and maintenance.

triglycerides are known as *free fatty acids* and contribute to the atherosclerotic process. They are manufactured in the body and stored as excess fats.

u-z

underpronation is insufficient outward roll of the foot on contact with the ground.

Valsalva maneuver involves holding your breath while you strain against a closed epiglottis, as in holding your breath while lifting a weight. You should avoid doing this because it can cause a dangerous elevation of blood pressure. When you lift weights, exhale on the exertion.

variable resistance exercise is exercise in which the force needed to move a weight is changed to provide a maximum load throughout the range of motion. Using Nautilus machines is an example.

vigorous physical activity is exercise that follows the FITT formula and not only provides health benefits but also increases cardiorespiratory fitness.

vitamins are organic catalysts necessary to initiate the body's complex metabolic functions.

warm-up is the first part of the three-segment workout. It prepares the body physically and mentally for the conditioning bout.

water soluble vitamins are vitamins that remain in the body tissues for a short time. Excesses are excreted out of the body. Vitamin C and the B complexes are water soluble.

weight cycling (yo-yo syndrome)

is the repetitive cycle of weight loss and weight gain. Off-and-on fad dieters typically experience weight cycling.

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