

Fitness & Wellness

12th
EDITION

Werner W. K. Hoeger • Sharon A. Hoeger
Amber L. Fawson • Cherie I. Hoeger

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Fitness & Wellness, Inc.



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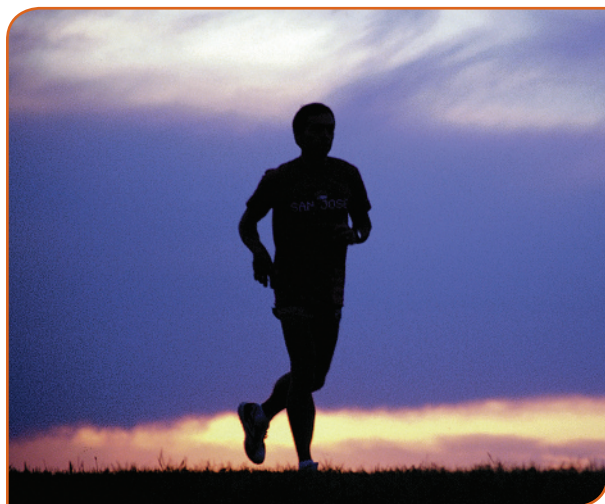
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Preface

Most people go to college to learn how to make a living. Making a good living, however, won't help them unless they live a wellness lifestyle that will allow them to enjoy what they have. Unfortunately, the current American lifestyle does not provide the human body with sufficient physical activity to enhance or maintain adequate health. As a result, the importance of a sound fitness and wellness program is of utmost importance to lead a long and healthy life and reach one's potential and quality of life without physical limitations.

Science has clearly determined that a lack of physical activity is detrimental to health. In fact, the office of the Surgeon General has identified physical fitness as a top health priority by stating that the nation's top health goals include exercise, increased consumption of fruits and vegetables, smoking cessation, and the practice of safe sex. All four of these fundamental healthy lifestyle factors are addressed in this book.

Many of the behaviors we adopt in life are a product of our environment. Currently, we live in a "toxic" health/fitness environment. We are so habituated to our modern-day environment that we miss the subtle ways it influences our behaviors, personal lifestyles, and health each day. The epidemic of physical inactivity and obesity that is sweeping across America is so harmful to health that it actually increases the deterioration rate of the human body and leads to premature aging, illness, and death.

Only about one-half of the adults in the United States meet the recommended amount of weekly aerobic physical activity, whereas less than a fourth meet the guidelines for muscular (strength) fitness. Among those who meet the guidelines, many do not reap the full benefits because they simply do not know how to implement and stay with a program that will yield the desired results.

The good news is that lifetime wellness is within the grasp of most people. We know that most chronic and debilitating conditions are largely preventable. Scientific evidence has shown that improving the quality and length of our lives is a matter of personal choice.

A regular exercise program is as close as we get to the miracle pill that people look for to enjoy good health and quality of life over a now longer lifespan. Myriad benefits of exercise include enhanced functional capacity; increased energy; weight loss; improved mood, self-esteem, and physical appearance; and decreased risk for

many chronic ailments, including obesity, cardiovascular disease, cancer, and diabetes. As stated as far back as 1982 in the prestigious *Journal of the American Medical Association*, "There is no drug in current or prospective use that holds as much promise for sustained health as a lifetime program of physical exercise."

This book offers you the necessary information to start on your path to fitness and wellness by adhering to a healthy lifestyle. The information in the following chapters and the subsequent activities at the end of each chapter will enable you to develop a personal program that promotes lifetime fitness, preventive health care, and personal wellness. The emphasis throughout the book is teaching you how to take control of your lifestyle habits so that you can do what is necessary to stay healthy and realize your optimal well-being.

What the Book Covers

As you study this book and complete the respective activities, you will learn to:

- understand the importance of good physical fitness and a wellness lifestyle in the achievement of good health and quality of life and a more productive and longer life.
- determine whether medical clearance is needed for your safe participation in exercise.
- learn behavior modification techniques to help you adhere to a lifetime fitness and wellness program.
- assess the health-related components of fitness (cardiorespiratory endurance, muscular strength and endurance, muscular flexibility, and body composition).
- write exercise prescriptions for cardiorespiratory endurance, muscular strength and endurance, and muscular flexibility.
- analyze your diet and learn the principles that govern sound nutrition.
- develop sound diet and weight-management programs.
- understand stress, lessen your vulnerability to stress, and implement a stress management program if necessary.

- implement a cardiovascular disease risk-reduction program.
- follow guidelines to reduce your personal risk of developing cancer.
- implement a smoking cessation program, if applicable.
- understand the health consequences of chemical dependency and irresponsible sexual behaviors and learn guidelines for preventing sexually transmitted infections.
- discern between myths and facts of exercise and health-related concepts.

New in the Twelfth Edition

All nine chapters in the 12th edition of *Fitness & Wellness* have been revised and updated according to recent advances published in the scientific literature and information reported at professional health, fitness, wellness, and sports medicine conferences. In addition to the chapter updates listed below, selected new figures and photographs are included in this edition. The following are the most significant chapter updates:

Chapter 1, Physical Fitness and Wellness

- Reorganization of chapter material to better highlight the importance of daily physical activity and non-exercise activity thermogenesis (NEAT)
- Updates to all statistics regarding disease risk, mortality, and healthcare costs in the United States and worldwide
- Updated information about exercise as a preventative health measure and its effectiveness as a treatment modality in comparison to drug treatments
- Exploration of the causes behind the United States' lagging life expectancy
- A new section on *Values and Behavior* that explains the way core values are formed with new information on the role of the prefrontal cortex of the brain in carrying out value-centered behavior
- Updated and expanded information about the brain and habit formation
- An introduction to mindfulness and willpower and their role in goal achievement

Chapter 2, Assessment of Physical Fitness

- An update on the benefits of cardiorespiratory endurance and muscular fitness

Chapter 3, Exercise Prescription

- New information on activity trackers under the heading *Monitoring Daily Physical Activity*
- New information on the importance of a proper cool-down following exercise
- An update on the importance of being physically active throughout the day, including the relevance of non-exercise activity thermogenesis
- The concepts of myofibrillar hypertrophy and sarcoplasmic hypertrophy are now included in this chapter
- New information on the timing, dose, and type of protein to be under the Dietary Recommendations for Strength Development
- Up-to-date information on modes of stretching and when to stretch under flexibility development

Chapter 4, Physical Fitness and Wellness

- Expanded information on high intensity interval training (HIIT) and its wide range of applications for peak performance, new exercisers, and patients with chronic illness
- Discussions of new fitness trends in areas including functional fitness, HIIT, outdoor training, cross training, and dance fitness

Chapter 5, Nutrition for Wellness

- Expanded information on the importance of a healthy diet to include less sugar, processed foods, refined carbohydrates, and unhealthy fats
- Thorough coverage of the concept of chronic low-grade inflammation
- Expanded information on the important role of adequate protein intake throughout each day for proper weight management and lean tissue development and preservation
- Additional information on the role of nutrient supplements
- Introduction to emotional eating and eating disorders not otherwise specified (EDNOS)
- Upgrades on current dietary guidelines for healthy people based on the most recent recommendations given in the literature

Chapter 6, Weight Management

- Updates to all statistics on the overweight and obesity problem in the United States based on the latest data from the Centers for Disease Control and Prevention

- Presentation of the theory on the role of light exposure and BMI
- Addition of two recent research studies on the role of strength training for proper visceral fat management in the Exercise and Weight Management section

Chapter 7, Stress Management

- New section on the damaging role of “technostress” in today’s technology dependent age, including tips on managing tech-related stress at home, school, and in the work place
- New information on the importance of proper breathing as a natural mechanism to reduce stress
- Expanded information on the benefits of mindfulness meditation for stress management

Chapter 8, Physical Fitness and Wellness

- Expanded information about the critical role of physical inactivity and excessive sitting throughout the day as a disease-promoting unhealthy behavior
- Presentation of the 2013 American Heart Association and American College of Cardiology recommendations for heart disease and stroke prevention in the *Abnormal Cholesterol Profile* section and the recommendations for saturated fat replacement in the diet
- New information detailing the way cancer develops at the cellular level has been added to help students better understand the cause and effect of cancer risk and prevention
- Updates to all statistics regarding cancer and additional important preventative recommendations, including information on spices and teas and recommendations for limiting alcohol consumption
- New information outlining the latest research on distracted driving accidents and the cognitive processes behind a variety of driving scenarios
- Enhanced section on synthetic cannabinoids (known as synthetic marijuana or Spice) which are currently the most prevalent synthetic drugs in the United States
- Expanded introductory information detailing the types and causes of common STIs and whether they are curable or treatable

Chapter 9, Relevant Fitness and Wellness Issues

- Updates and new questions that address some of the most frequently discussed issues related to physical fitness and wellness, including changing behavior, sequence of aerobic and strength training, exercise



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clothing, energy drinks, following a diet 24/7, excessive sugar in the diet, and exercise and aging

Additional Course Resources

- **Health MindTap for Fitness & Wellness.** Instant Access Code, ISBN-13: 978-1-305-86978-3.
MindTap is well beyond an eBook, a homework solution or digital supplement, a resource center website, a course delivery platform, or a Learning Management System. More than 70% of students surveyed said it was unlike anything they have seen before. MindTap is a new personal learning experience that combines all your digital assets—readings, multimedia, activities, and assessments—into a singular learning path to improve student outcomes.
- **Diet & Wellness Plus.** The Diet & Wellness Plus App in MindTap helps you gain a better understanding of how nutrition relates to your personal health goals. It enables you to track your diet and activity, generate reports, and analyze the nutritional value of the food you eat! It includes over 55,000 foods in the database, custom food and recipe features, and the latest dietary references, as well as your goal and actual percentages of essential nutrients, vitamins, and minerals. It also helps you to identify a problem behavior and make a

positive change. After completing the Wellness Profile Questionnaire, Diet & Wellness Plus will rate the level of concern for eight different areas of wellness, helping you determine the areas where you are most at risk. It then helps you put together a plan for positive change by helping you select a goal to work toward—complete with a reward for all your hard work.

The Diet & Wellness Plus App is accessed from the App dock in MindTap and can be used throughout the course for students to track their diet and activity and behavior change. There are activities and labs in the course that have students access the App to further extend learning and integrate course content.

- **Instructor Companion Site.** Everything you need for your course in one place! This collection of book-specific lecture and class tools is available online via <http://www.cengage.com/login>. Access and download PowerPoint presentations, images, instructor's manual, videos, and more.
- **Cengage Learning Testing Powered by Cognero.** Cengage Learning Testing Powered by Cognero is a flexible, online system that allows you to:
 - author, edit, and manage test bank content from multiple Cengage Learning solutions.
 - create multiple test versions in an instant.
 - deliver tests from your LMS, your classroom, or wherever you want.
- **Global Health Watch.** Instant Access Code, ISBN-13: 978-1-111-37733-5. Printed Access Card, ISBN-13: 978-1-111-37731-1.

Updated with today's current headlines, Global Health Watch is your one-stop resource for classroom discussion and research projects. This resource center provides access to thousands of trusted health sources, including academic journals, magazines, newspapers, videos, podcasts, and more. It is updated daily to offer the most current news about topics related to your health course.

- **Careers in Health, Physical Education, and Sports, 2e.** ISBN-13: 978-0-495-38839-5.

This unique booklet takes students through the complicated process of picking the type of career they want to pursue; explains how to prepare for the transition into the working world; and provides insight into different career paths, education requirements, and reasonable salary expectations. A designated chapter discusses some of the legal issues that surround the workplace, including discrimination and harassment. This supplement is complete

with personal development activities designed to encourage students to focus on and develop better insight into their futures.

Acknowledgments

This book is dedicated to Dr. Herta Kipper for the unconditional support and love provided to the authors and her lifelong commitment to health and physical activity programs for older adults in the southern region of Austria.

This 12th edition of *Fitness & Wellness* was made possible through the contributions of many individuals. In particular, we would like to express our gratitude to the reviewers of the 12th edition. Their valuable comments and suggestions are most sincerely appreciated.

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Brief Author Biographies

Werner W. K. Hoeger is a Professor Emeritus of the Department of Kinesiology at Boise State University. He remains active in research and continues to lecture in the areas of exercise physiology, physical fitness, health, and wellness.

Dr. Hoeger completed his undergraduate and Master's degrees in physical education at the age of 20 and received his Doctorate degree with an emphasis in exercise physiology at the age of 24. He is a *Fellow* of the



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American College of Sports Medicine and also of the Research Consortium of SHAPE America (Society of Health and Physical Educators). In 2002, he was recognized as the *Outstanding Alumnus* from the College of Health and Human Performance at Brigham Young University. He was the recipient of the first *Presidential Award for Research and Scholarship* in the College of Education at Boise State University in 2004.

In 2008, he was asked to be the *keynote speaker* at the VII Iberoamerican Congress of Sports Medicine and Applied Sciences in Mérida, Venezuela, and was presented with the *Distinguished Guest of the City* recognition. In 2010, he was also honored as the *keynote speaker* at the Western Society for Kinesiology and Wellness in Reno, Nevada.

Dr. Hoeger uses his knowledge and personal experiences to write engaging, informative books that thoroughly address today's fitness and wellness issues in a format accessible to students. Since 1990, he has been the most widely read fitness and wellness college textbook author in the United States. He has published a total of 62 editions of his 9 fitness and wellness-related titles. Among the textbooks written for Cengage Learning are *Principles and Labs for Fitness and Wellness*, thirteenth edition; *Lifetime Physical Fitness & Wellness*, fourteenth edition; *Fitness and Wellness*, twelfth edition; *Principles and Labs for Physical Fitness*, tenth edition; *Wellness: Guidelines for a Healthy Lifestyle*, fourth edition; and *Water Aerobics for Fitness and Wellness*, fourth edition (with Terry-Ann Spitzer Gibson).

Dr. Hoeger was the first author to write a college fitness textbook that incorporated the “wellness” concept. In 1986, with the release of the first edition of *Lifetime Physical Fitness & Wellness*, he introduced the principle that to truly improve fitness, health, and quality of life, and to achieve wellness, a person needed to go beyond the basic health-related components of physical fitness. His work was so well received that every fitness author immediately followed his lead.

As an innovator in the field, Dr. Hoeger has developed many fitness and wellness assessment tools, including fitness tests such as the Modified Sit-and-Reach, Total Body Rotation, Shoulder Rotation, Muscular Endurance, and Muscular Strength and Endurance and Soda Pop Coordination Tests. Proving that he “practices what he preaches,” he was the oldest male competitor in the 2002 Winter Olympics in Salt Lake City, Utah, at the age of 48. He raced in the sport of luge along with his then 17-year-old son Christopher. It was the first time in Winter Olympics history that father and son competed in the same event. In 2006, at the age of 52, he was the oldest competitor at the Winter Olympics in



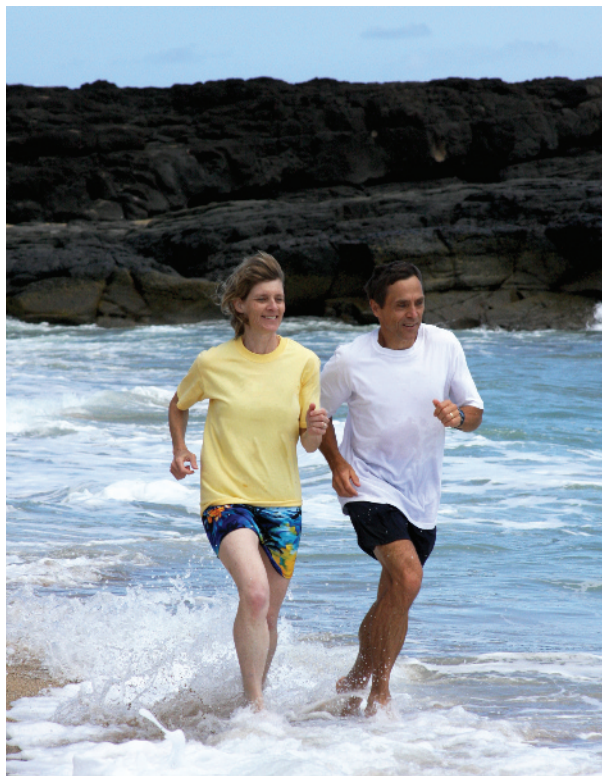
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Turin, Italy. In 2011, Dr. Hoeger raced in the 800-, 1,500-, and 5,000-meter events in track and field at the World Masters Track and Field (Athletic) Championships held in Sacramento, California. At different times and in different distances in 2012, 2013, 2014, and 2015, he reached All-American standards for his age group by USA Track and Field (USATF). In 2015, he finished third in the one mile run at the USATF Masters Indoor Track and Field National Championships, and third and fourth respectively in the 800- and 1,500-meters at the Outdoor National Senior Games.

Sharon A. Hoeger is Vice-President of Fitness & Wellness, Inc. of Boise, Idaho. Sharon received her degree in computer science from Brigham Young University. She is extensively involved in the research process used in



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retrieving the most current scientific information that goes into the revision of each textbook. She is also the author of the software written specifically for the fitness and wellness textbooks. Her innovations in this area since the publication of the first edition of *Lifetime Physical Fitness & Wellness* set the standard for fitness and wellness computer software used in this market today.

Sharon is a co-author in five of the seven fitness and wellness titles. She also served as Chef de Mission (Chief of Delegation) for the Venezuelan Olympic Team at the 2006 Olympic Winter Games in Turin, Italy. Husband and wife have been jogging and strength training together for more than 39 years. They are the proud parents of five children, all of whom are involved in sports and lifetime fitness activities. Their motto: “Families that exercise together, stay together.”

Amber L. Fawson and Cherie I. Hoeger received their degrees in English with an emphasis in editing for publication. For the past 15 years Amber has enjoyed working in the publication industry and has held positions as an Editorial Coordinator for *BYU Studies*, Assistant Editor for Cengage Learning, and freelance writer and editor for tertiary education textbooks and workbooks. During the last decade, Cherie has been working as a freelance writer and editor;

writing research and marketing copy for client magazines, newsletters, and websites; and contracting as a textbook copy editor for Cengage Learning (previously under Thomson Learning and the Brooks/Cole brand).

Amber and Cherie have been working for Fitness & Wellness, Inc. for several years and have now taken on a more significant role with the research, updates, and writing of the new editions. There is now a four-person team to sort through and summarize the extensive literature available in the health, fitness, wellness, and sports medicine fields. Their work has greatly enhanced the excellent quality of these textbooks. They are firm believers in living a healthy lifestyle, they regularly attend professional meetings in the field, and they are active members of the American College of Sports Medicine.



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Introduction to Physical Fitness and Wellness

Daily physical activity is the miracle medication that people are looking for. It makes you look and feel younger, boosts energy, provides lifetime weight management, improves self-confidence and self-esteem, and enhances independent living, health, and quality of life. It further allows you to enjoy a longer life by decreasing the risk of many chronic conditions, including heart disease, high blood pressure, stroke, diabetes, some cancers, and osteoporosis.

Objectives

- > Understand the importance of lifetime fitness and wellness.
- > Learn the recommended guidelines for weekly physical activity.
- > Define physical fitness and list components of health-related and skill-related fitness.
- > Understand the benefits of a comprehensive fitness and wellness program.
- > Learn motivational and behavior modification techniques to enhance compliance with a healthy lifestyle program.
- > Learn to write SMART goals to aid with the process of change.
- > Determine whether medical clearance is required for safe participation in exercise.

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REAL LIFE STORY | Jordan's Experience

Last year as a freshman in college I was advised to enroll in a general ed fitness and wellness course. I played high school sports and thought I knew all there was to know about being fit and in shape. As the course started, I realized I didn't really know how important it was to exercise regularly and take good care of myself. It quickly became my favorite class, and I couldn't wait to try what I was learning.

I started cardio and strength workouts according to an exercise prescription I wrote myself. I didn't even know there was such a thing as an "exercise prescription." I even stretched once in a while and started to eat better. As I became more fit, I started to feel better about



myself, I lost weight, I toned up, I had so much more energy, and I actually started to enjoy exercise. It is fun to work out! I now know that how well I will live the rest of my life has a lot to do with wellness choices I make.

My goal is to never stop exercising and take good care of myself.

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Most people believe school will teach them how to make a better living. A fitness and wellness course will teach you how to live better—how to truly live your life to its fullest potential. Real success is about more than money: Making a good living will not help you unless you live a wellness lifestyle that will allow you to enjoy what you have. Your lifestyle is the most important factor affecting your personal well-being, but most people don't know how to make the right choices to live their best life.

The benefits of an active and healthy lifestyle have been clearly substantiated by scientific evidence linking increased physical activity and positive habits to better fitness, health, and improved quality of life. Even though a few individuals live long because of favorable genetic factors, for most people, the quality of life during middle age and the "golden years" is more often related to

wise choices initiated during youth and continued throughout life.

Unfortunately, the current way of life in most developed nations does not provide the human body with sufficient physical activity to maintain adequate health. Furthermore, many lifestyle patterns are such a serious threat to health that they actually speed up deterioration of the human body. In a few short years, lack of wellness leads to loss of vitality and gusto for life, as well as premature morbidity and mortality.

Even though most people in the United States believe a positive lifestyle has a great impact on health and longevity, most do not know how to implement a fitness and wellness program that will yield the desired results. Patty Neavill is an example of someone who frequently tried to change her life but was unable to do so because she did not know how to implement a sound exercise and weight



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Physical activity and exercise lead to less disease, a longer life, and enhanced quality of life.

control program. At age 24, Patty, a college sophomore, was discouraged with her weight, level of fitness, self-image, and quality of life in general.

She had struggled with weight most of her life. Like thousands of other people, she had made many unsuccessful attempts to lose weight. Patty put aside her fears and decided to enroll in a fitness course. As part of the course requirement, she took a battery of fitness tests at the beginning of the semester. Patty's cardiorespiratory fitness and strength ratings were poor, her flexibility classification was average, she weighed more than 200 pounds, and she was 41 percent body fat.

Following the initial fitness assessment, Patty met with her course instructor, who prescribed an exercise and nutrition program such as the one presented in this book. Patty fully committed to carry out the prescription. She walked or jogged five times a week, worked out with weights twice a week, and played volleyball or basketball two to four times each week. Her daily caloric intake was set in the range of 1,500 to 1,700 calories. She took care to meet the minimum required amounts from the basic food groups each day, which contributed about 1,200 calories to her diet. The remainder of the calories came primarily from complex carbohydrates. By the end of the 16-week semester, Patty's cardiorespiratory fitness, strength, and flexibility ratings all had improved to the "good" category, she had lost 50 pounds, and her percent body fat had dropped to 22.5!

A thank-you note from Patty to the course instructor at the end of the semester read:

Thank you for making me a new person. I truly appreciate the time you spent with me. Without your kindness and motivation, I would have never made it. It's great to be fit and trim. I've never had this feeling before and I wish everyone could feel like this once in their life.

Thank you, your trim Patty!

Patty never had been taught the principles governing a sound weight loss program. She needed this knowledge, and, like most Americans who have never experienced the process of becoming physically fit, she needed to be in a structured exercise setting to truly feel the joy of fitness.

Of even greater significance, Patty maintained her aerobic and strength-training programs. A year after ending her calorie-restricted diet, her weight actually increased by 10 pounds—but her body fat decreased from 22.5 percent to 21.2 percent. As discussed in Chapter 6, the weight increase was related mostly to changes in lean tissue lost during the weight-reduction phase. Despite only a slight drop in weight during the second year following the calorie-restricted diet, Patty's

2-year follow-up revealed a further decrease in body fat, to 19.5 percent. Patty understands the new quality of life reaped through a sound fitness program.

1.1 Lifestyle, Health, and Quality of Life

Research findings have shown that physical inactivity and negative lifestyle habits pose a serious threat to health. Movement and physical activity are basic functions for which the human organism was created. Advances in modern technology, however, have all but eliminated the need for physical activity in daily life. Physical activity no longer is a natural part of our existence. This epidemic of physical inactivity is the second greatest threat to U.S. public health and is often referenced in new concerns about "Sitting Disease" and "**Sedentary Death Syndrome**," or **SeDS**. (The number-one threat is tobacco use—the largest cause of preventable deaths.)

Today we live in an automated society. Most of the activities that used to require strenuous physical exertion can be accomplished by machines with the simple pull of a handle or push of a button. If people go to a store that is only a couple of blocks away, most drive their automobiles and then spend a couple of minutes driving around the parking lot to find a spot 10 yards closer to the store's entrance. During a visit to a multilevel shopping mall, nearly everyone chooses to ride the escalators instead of taking the stairs.

Automobiles, elevators, escalators, cell phones, remote controls, electric garage door openers—all are modern-day commodities that minimize the amount of movement and effort required of the human body.

With the developments in technology, three additional factors have changed our lives significantly and have had a negative effect on human health: nutrition, stress, and environment. Fatty foods, sweets, alcohol, tobacco, excessive stress, and environmental hazards (such as wastes, noise, and air pollution) have detrimental effects on people's health.

One of the most significant detrimental effects of modern-day technology has been an increase in **chronic diseases** related to a lack of physical activity. These include hypertension (high blood pressure), heart disease, diabetes, chronic low back pain, and obesity, among

GLOSSARY

Sedentary Death

Syndrome (SeDS) Deaths that are attributed to a lack of regular physical activity.

Chronic diseases

Illnesses that develop and last over a long time.



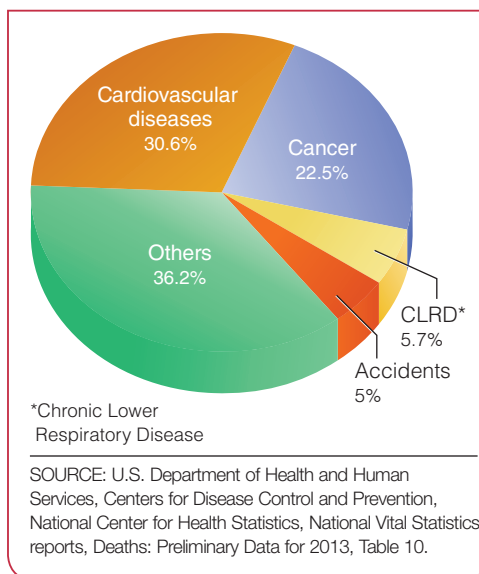
The epitome of physical inactivity is to drive around a parking lot for several minutes in search of a parking spot 10 to 20 yards closer to the store's entrance.

others. They sometimes are referred to as **hypokinetic diseases**. (“Hypo” means low or little, and “kinetic” implies motion.) Lack of adequate physical activity is a fact of modern life that most people can avoid no longer. Worldwide, obesity now claims triple the number of victims as malnutrition. Over the last two decades the world has transitioned from a concern about how populations did not have enough to eat (though many still don't) to one about how an abundance of unhealthy food and physical inactivity are causing obesity, chronic diseases, and premature death. According to the World Health Organization (WHO), chronic diseases account for 60 percent of all deaths worldwide.¹ If we want to enjoy contemporary commodities and still expect to live life to its fullest, a personalized lifetime exercise program must become a part of our daily lives.

The leading causes of death in the United States today (see Figure 1.1) are lifestyle-related. About 53 percent of all deaths in the United States are caused by cardiovascular disease and cancer.² Almost 80 percent of these deaths could be prevented by adhering to a healthy lifestyle. The third leading cause of death—chronic lower respiratory (lung) disease—is related largely to tobacco use. Accidents are the fourth leading cause of death. Even though not all accidents are preventable, many are. Fatal accidents often are related to abusing drugs and not wearing seat belts.

Estimates indicate that more than half of disease is lifestyle-related, a fifth is attributed to environmental factors, and a tenth is influenced by the health care the individual receives. Only 16 percent is related to genetic factors. Thus, the individual controls as much as 84 percent of disease and quality of life. The data also indicate that most of the deaths that occur before age 65

Figure 1.1 Leading causes of death in the United States: 2013.



are preventable. In essence, most people in the United States are threatened by the very lives they lead today.

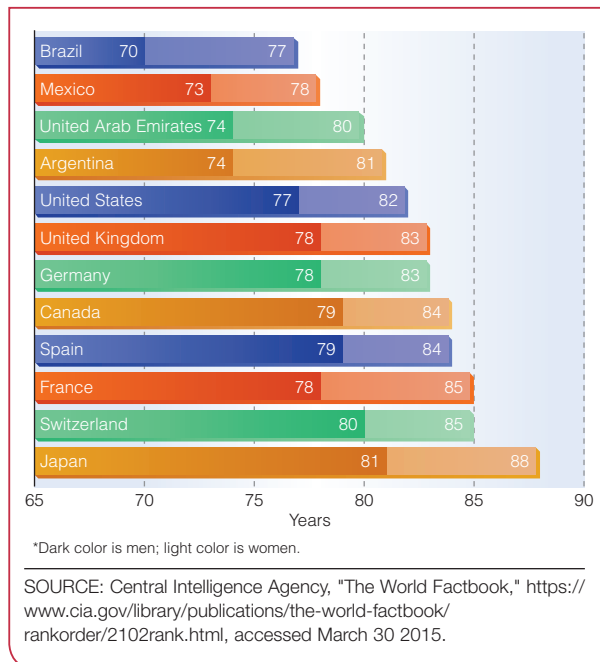
1.2 Life Expectancy

Currently, the average **life expectancy** in the United States is 79.6 years (77.1 years for men and 81.9 years for women). In the past decade alone, life expectancy has increased by one year—the news, however, is not all good. The data show that people now spend an extra 1.2 years with a serious illness and an extra two years of disability.

Based on the WHO data, the United States ranks 33rd in the world for life expectancy (see Figure 1.2). Japan ranks first in the world with an overall life expectancy of 84.46 years. While the United States was once a world leader in life expectancy, over recent years, the increase in life expectancy in the United States has not kept pace with that of other developed countries.

Several factors may account for the current U.S. life expectancy ranking, including the extremely poor health of some groups (such as Native Americans, rural African Americans, and the inner-city poor) and fairly high levels of violence (notably homicides). The current trend is a widening disparity between those in the United States with the highest and lowest life expectancy. For example, males in Fairfax County, Virginia can expect to live as long as males in Japan, while those in Bolivar County, Mississippi have the same life expectancy as males in countries with much lower life expectancies, like Pakistan. Physical activity trends by United States county, in most cases, are aligned with life expectancy trends.³

Figure 1.2 Life expectancy at birth for selected countries as of December 2012.



While not a single country has managed to lower its obesity rate in more than 30 years, some countries have seen slower rises in obesity than the United States. A report by the Organisation for Economic Cooperation and Development (OECD) found that while the United States far outspent every other country in health care cost per capita, it also easily had the highest rates of obesity of all 36 OECD countries.⁴

Although life expectancy in the United States gradually increased by 30 years over the past century, scientists from the National Institute of Aging believe that in the coming decades the average life-span may decrease by as much as 5 years. This decrease in life expectancy will be related primarily to the growing epidemic of obesity. About 35 percent of the adult population in the United States is obese. The latest statistical update from the American Heart Association reported that the incidence of diabetes has been climbing dramatically each year in parallel step with the increased incidence of obesity.⁵ Currently, one of ten adults has type 2 diabetes. If we are unable to change the current trend, by 2050 the number of adults suffering from diabetes could be one in three. This will be one in three of our current elementary to college-age youth. Diabetes is the third most expensive chronic disease to treat, preceded only by angina (heart disease) and hypertension, respectively. All three of these chronic conditions are linked with obesity.⁶ Additional information on the obesity epidemic and its detrimental health consequences is given in Chapter 5.

1.3 Importance of Increased Physical Activity

The U.S. Surgeon General along with various other national and global health organizations has announced that poor health as a result of lack of physical activity is a serious public health problem that must be met head-on at once. Regular moderate physical activity provides substantial benefits in health and well-being for the vast majority of people who are not physically active. For those who are already moderately active, even greater health benefits can be achieved by increasing the level of physical activity.

Among the benefits of regular physical activity and exercise are a significant reduction in premature mortality and decreased risks for developing heart disease, stroke, metabolic syndrome, type 2 diabetes, obesity, osteoporosis, colon and breast cancers, high blood pressure, depression, and even dementia and Alzheimer's.⁷ Regular physical activity also is important for the health of muscles, bones, and joints, and has been shown in clinical studies to improve mood, cognitive function, creativity, and short-term memory and enhance one's ability to perform daily tasks throughout life. It also can have a major impact on health care costs and helps maintain a high quality of life into old age.

Based on the abundance of scientific research on physical activity and exercise, a distinction has been established between physical activity and exercise. **Exercise** is considered a type of physical activity that requires planned, structured, and repetitive bodily movement to improve or maintain one or more components of physical fitness. A regular weekly program of walking, jogging, cycling, aerobics, swimming, strength training, and stretching exercises is an example of various types of exercise.

Physical activity is defined as bodily movement produced by skeletal muscles that requires the expenditure of energy and produces progressive health benefits. Examples of simple daily physical activity are walking to and from work and the store, taking the stairs instead of elevators and escalators, gardening, doing household chores, dancing, and washing

GLOSSARY

Hypokinetic diseases

Diseases related to a lack of physical activity.

Life expectancy Number of years a person is expected to live based on the person's birth year.

Exercise A type of physical activity that requires planned, structured, and

repetitive bodily movement done to improve or maintain one or more components of physical fitness.

Physical activity Bodily movement produced by skeletal muscles that requires energy expenditure and produces progressive health benefits.

the car by hand. Physical inactivity, by contrast, implies a predominantly sedentary lifestyle, characterized by excessive sitting throughout most days and a level of activity that is lower than that required to maintain good health.

Physical activity can be of light intensity or moderate to vigorous intensity. Extremely light expenditures of energy throughout the day needed to pick up children, set and clear the table, stand at a counter, take the stairs, or carry the groceries are of far greater significance in our overall health than we once realized. To better understand the impact of all intensities of physical activity, scientists created a new category of movement called **nonexercise activity thermogenesis (NEAT)**. Any energy expenditure that does not come from basic ongoing body functions (such as digesting food) or planned exercise is categorized as NEAT.⁸ A person on an average day may expend 1300 calories simply maintaining vital body functions (the basal metabolic rate) and 200 calories digesting food (thermic effect of food). Any additional energy expended during the day is expended either through exercise or NEAT. Though it may not increase cardiorespiratory fitness as moderate or vigorous exercise will, NEAT can easily use more calories in a day than the planned exercise session itself. As a result, NEAT is extremely critical to keep daily energy balance in check. For example, people who spend most of the day working on their feet, such as a medical assistant or a stay-at-home parent, will expend an average of 700 daily calories more than a person who has a desk job that does not offer the option to stand, take walking breaks, or move about.

Moderate physical activity has been defined as any activity that requires an energy expenditure of 150 calories per day, or 1,000 calories per week. The general health recommendation is that people strive to accumulate at least 30 minutes of physical activity a minimum of 5 days per week. Whereas 30 minutes of continuous activity is preferred, on days when time is limited, 3 activity sessions of at least 10 minutes each provide about half the aerobic benefits. Examples of moderate physical activity are walking, cycling, playing basketball or volleyball, recreational swimming, dancing fast, pushing a stroller, raking leaves, shoveling snow, washing or waxing a car, washing windows or floors, and gardening.

1.4 Federal Guidelines for Physical Activity

Because of the importance of physical activity to our health, in October 2008 the U.S. Department of Health and Human Services issued Federal Physical Activity Guidelines for Americans for the first time. These guidelines complement international recommendations issued

by the World Health Organization (WHO) and further substantiate previous recommendations issued by the American College of Sports Medicine (ACSM) and the American Heart Association (AHA) in 2007⁹ and the U.S. Surgeon General in 1996.¹⁰

The federal guidelines provide science-based guidance on the importance of being physically active and eating a healthy diet to promote health and reduce the risk of chronic diseases. The federal guidelines include the following recommendations:¹¹

Adults Between 18 and 64 Years of Age

- Adults should do 150 minutes a week of **moderate-intensity aerobic (cardio-respiratory) physical activity**, 75 minutes a week of **vigorous-intensity aerobic physical activity**, or an equivalent combination of moderate- and vigorous-intensity aerobic physical activity (also see Chapter 3). When combining moderate- and vigorous-intensity activities, a person could participate in moderate-intensity activity twice a week for 30 minutes and high-intensity activity for 20 minutes on another two days. Aerobic activity should be performed in episodes of at least 10 minutes long each, preferably spread throughout the week.
- *Additional health benefits* are provided by increasing to 5 hours (300 minutes) a week of moderate-intensity aerobic physical activity, 2 hours and 30 minutes a week of vigorous-intensity physical activity, or an equivalent combination of both.
- Adults should also do muscle-strengthening activities that involve all major muscle groups, performed on two or more days per week.

Older Adults (Ages 65 and Older)

- Older adults should follow the adult guidelines. If this is not possible due to limiting chronic conditions, older adults should be as physically active as their abilities allow. They should avoid inactivity. Older adults should do exercises that maintain or improve balance if they are at risk of falling.

Children 6 Years of Age and Older and Adolescents

- Children and adolescents should do 1 hour (60 minutes) or more of physical activity every day.
- Most of the 1 hour or more a day should be either moderate- or vigorous-intensity aerobic physical activity.
- As part of their daily physical activity, children and adolescents should do vigorous-intensity activity on at least three days per week. They also should do muscle-strengthening and bone-strengthening activities on at least three days per week.

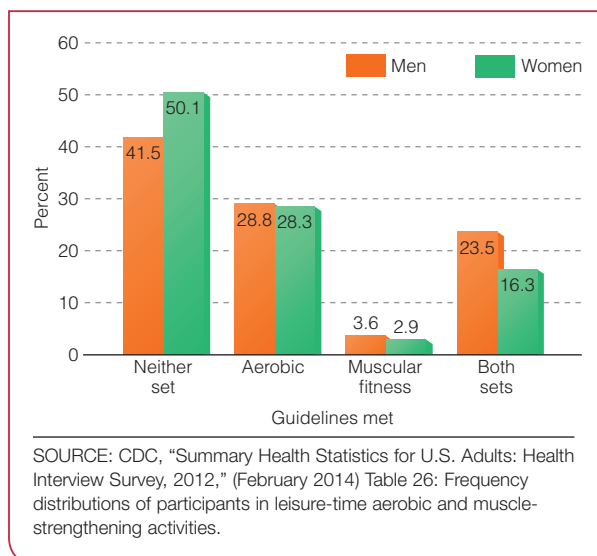
Pregnant and Postpartum Women

- Healthy women who are not already doing vigorous-intensity physical activity should get at least 2 hours and 30 minutes (150 minutes) of moderate-intensity aerobic activity a week. Preferably, this activity should be spread throughout the week. Women who regularly engage in vigorous-intensity aerobic activity or high amounts of activity can continue their activity provided that their condition remains unchanged and they talk to their health care provider about their activity level throughout their pregnancy.

The guidelines state that some adults should be able to achieve calorie balance with 150 minutes of moderate physical activity in a week, while others will find they need more than 300 minutes per week.¹² This recommendation is based on evidence indicating that people who maintain healthy weight typically accumulate 1 hour of daily physical activity.¹³ Between 60 and 90 minutes of moderate-intensity physical activity daily is recommended to sustain weight loss for previously overweight people.¹⁴ And 60 to 90 minutes of activity per day provides additional health benefits.

The most recent data released in 2012 by the Centers for Disease Control and Prevention (CDC) indicate that only 19.8 percent of U.S. adults ages 18 and older meet the federal physical activity guidelines for both aerobic and muscular fitness (strength and endurance) activities, whereas 28.6 percent meet the guidelines for aerobic fitness. Another 46 percent of Americans are completely inactive during their leisure time (Figure 1.3).

Figure 1.3 Percentage of adults who did not meet and who met the 2008 federal guidelines for physical activity by gender.



Critical Thinking

Do you consciously incorporate physical activity into your daily lifestyle? • Can you provide examples? • Do you think you get sufficient daily physical activity to maintain good health?

1.5 Benefits of Physical Fitness

The benefits to be enjoyed from participating in a regular fitness program are many. In addition to a longer life (see Figure 1.4 and Figure 1.5), the greatest benefit of all is that physically fit people who lead a positive lifestyle have a healthier and better quality of life. These people live life to its fullest and have fewer health problems than inactive individuals who also indulge in negative lifestyle habits. Compiling an all-inclusive list of the benefits to be reaped through participation in a fitness program is a challenge, but the list provided in Table 1.1 summarizes many of these benefits.

In addition to the benefits listed in Table 1.1, **epidemiological** research studies linking physical activity habits and mortality rates have shown lower premature mortality rates in physically active people. Pioneer work in this area demonstrated that, as the amount of weekly physical activity increased, the risk of cardiovascular deaths decreased.¹⁵ In this study, conducted among 16,936 Harvard alumni, the greatest decrease in cardiovascular deaths was observed in alumni who burned more than 2,000 calories per week through physical activity.

A landmark study subsequently upheld the findings of the Harvard alumni study.¹⁶ Based on data from 13,344 individuals who were followed over an average of 8 years, the results confirmed that the level of cardiorespiratory fitness is related to mortality from all causes. These findings showed a graded and consistent inverse relationship between physical fitness and mortality, regardless of age and other risk factors.

GLOSSARY

Nonexercise activity thermogenesis (NEAT)

Energy expended doing everyday activities other than exercise.

Moderate physical activity

Any activity that requires an energy expenditure of 150 calories per day, or 1,000 calories per week.

Moderate-intensity aerobic physical activity

Defined as the equivalent of

a brisk walk that noticeably increases the heart rate.

Vigorous-intensity aerobic physical activity

Defined as an activity similar to jogging that causes rapid breathing and a substantial increase in heart rate.

Epidemiological Of the study of epidemic diseases.

Figure 1.4 Death rates by physical fitness levels.

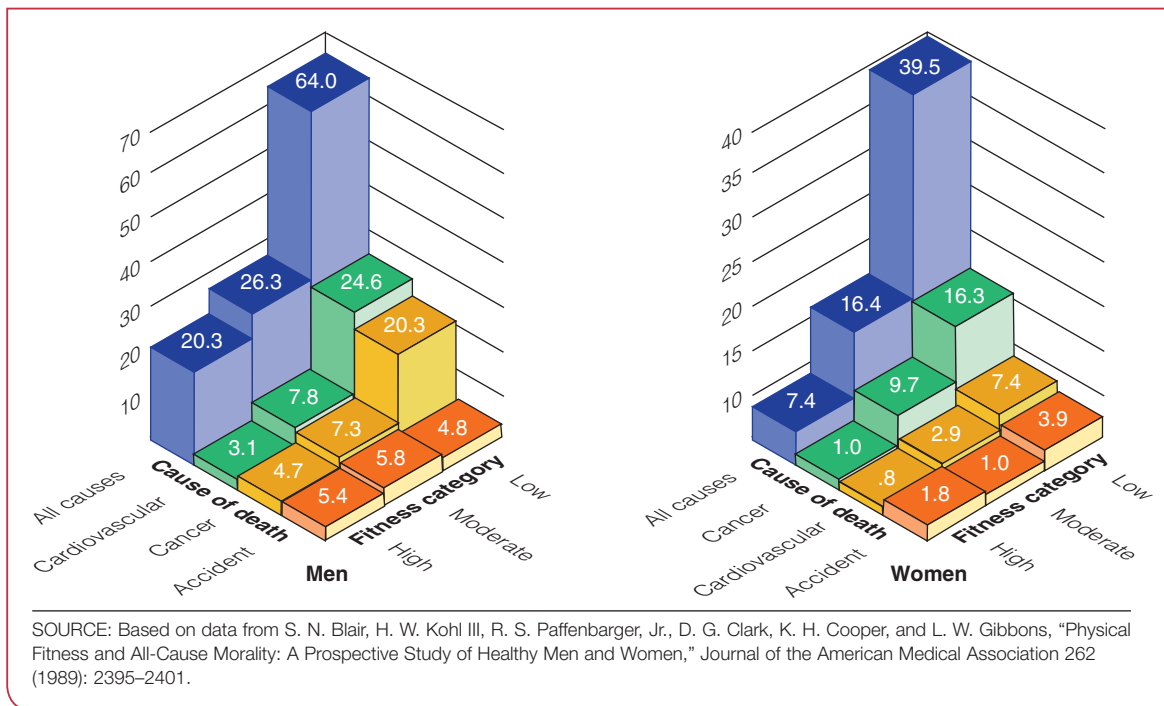
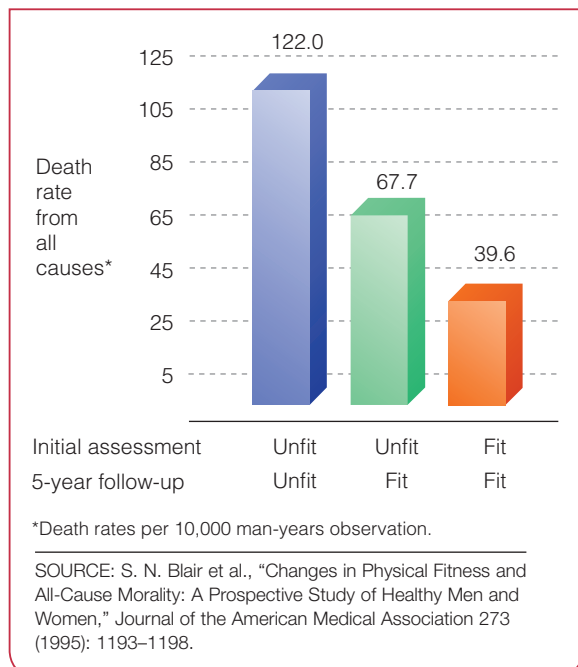


Figure 1.5 Effects of fitness changes on mortality rates.



In essence, the higher the level of cardiorespiratory fitness, the longer the life (see Figure 1.4). The death rate from all causes for the low-fit men was 3.4 times higher than for the high-fit men. For the low-fit women, the death

rate was 4.6 times higher than for the high-fit women. The study also reported a greatly reduced rate of premature deaths, even at moderate fitness levels, which most adults can achieve easily. People gain further protection when they combine higher fitness levels with reduction in other risk factors such as hypertension, elevated cholesterol, cigarette smoking, and excessive body fat.

Additional research that looked at changes in fitness and mortality found a substantial (44 percent) reduction in mortality risk when the study participants abandoned a sedentary lifestyle and became moderately fit (see Figure 1.5).¹⁷ The lowest death rate was found in people who were fit and remained fit, and the highest rate was found in men who remained unfit.

A 2013 study looked to specifically compare the efficacy of commonly prescribed drugs against the impact of regular exercise. The data is based on more than 14,000 patients recovering from stroke, being treated for heart failure, or looking to prevent Type 2 diabetes or a second episode of coronary heart disease. The study looked at the effectiveness of exercise versus drugs on health outcomes. The results were revealing: Exercise programs were more effective than medical treatment in stroke patients and equally effective as medical treatments in patients of diabetes and coronary heart disease. Only in the prevention of heart failure were diuretic drugs more effective in preventing mortality than exercise.¹⁸

Table 1.1 Long-Term (Chronic) Benefits of Exercise

Regular participation in exercise

- improves and strengthens the cardiorespiratory system.
- maintains better muscle tone, muscular strength, and endurance.
- improves muscular flexibility.
- enhances athletic performance.
- helps maintain recommended body weight.
- helps preserve lean body tissue.
- increases resting metabolic rate.
- improves the body's ability to use fat during physical activity.
- improves posture and physical appearance.
- improves functioning of the immune system.
- lowers the risk for chronic diseases and illness (including heart disease, stroke, and certain cancers).
- decreases the mortality rate from chronic diseases.
- thins the blood so it doesn't clot as readily (thereby decreasing the risk for coronary heart disease and strokes).
- helps the body manage cholesterol levels more effectively.
- prevents or delays the development of high blood pressure and lowers blood pressure in people with hypertension.
- helps prevent and control type 2 diabetes.
- helps achieve peak bone mass in young adults and maintain bone mass later in life, thereby decreasing the risk for osteoporosis.
- helps people sleep better.
- helps prevent chronic back pain.
- relieves tension and helps in coping with life stresses.
- raises levels of energy and job productivity.
- extends longevity and slows the aging process.
- improves and helps maintain cognitive function, decreasing the risk for dementia and Alzheimer's disease.
- promotes psychological well-being, including higher morale, self-image, and self-esteem.
- reduces feelings of depression and anxiety.
- encourages positive lifestyle changes (improving nutrition, quitting smoking, controlling alcohol and drug use).
- speeds recovery time following physical exertion.
- speeds recovery following injury or disease.
- regulates and improves overall body functions.
- improves physical stamina and counteracts chronic fatigue.
- reduces disability and helps to maintain independent living, especially in older adults.
- enhances quality of life: People feel better and live a healthier and happier life.

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Additional studies in this area have substantiated early findings and also indicated that primarily vigorous activities are associated with greater longevity.¹⁹ Vigorous activity was defined as activity that requires a MET level equal to or greater than 6 METs (see Chapter 4, Table 4.1, page 116). This level represents exercising at an energy level of 6 times the resting energy requirement. Examples of vigorous activities used in the previous study include brisk walking, jogging, swimming laps, squash, racquetball, tennis, and shoveling snow. Results also indicated that vigorous exercise is as important as maintaining recommended weight and not smoking.

While it is clear that moderate-intensity exercise does provide substantial health benefits, the research data shows a dose-response relationship between physical activity and health. That is, greater health and fitness

benefits occur at higher duration and/or intensity of physical activity.

Vigorous activities are preferable, to the extent of one's capabilities, because they are most clearly associated with better health and longer life. Compared to prolonged moderate-intensity activity, vigorous-intensity activity has been shown to provide the best improvements in

GLOSSARY

MET Short for metabolic equivalent; represents the rate of energy expenditure while sitting quietly at rest. This energy expenditure is approximately 3.5 milliliters of oxygen per kilogram of body

weight per minute (mL/kg/min) or 1.2 calories per minute for a 70-kilogram person. A 3-MET activity requires three times the energy expenditure of sitting quietly at rest.