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Fitness & Wellness

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

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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. The current American lifestyle, however, does not provide the human body with sufficient physical activity to enhance or maintain adequate health. As a result, a sound fitness and wellness program is of utmost importance to lead a long and healthy life, reach one's potential, and maintain 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 U.S. 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 the United States is so harmful to health that it actually increases the deterioration rate of the human body and leads to premature aging, illness, and death.

Based on the updated *Physical Activity Guidelines for Americans* released in 2018 (2nd edition), 80 percent of U.S. adults are not meeting the key guidelines for both aerobic and muscular-strengthening activity. Only about one-half meet the recommended amount of weekly aerobic physical activity, whereas less than a fourth meet the guidelines for muscular-strengthening activity. Among those who meet the guidelines, many do not reap the full benefits because they simply do not know how to implement and stick 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. The myriad benefits of exercise include enhanced functional capacity; increased energy; weight loss; improved mood, self-esteem, and physical appearance; decreased risk for many chronic ailments, including obesity, cardiovascular disease, cancer, and diabetes; and a much lower risk for premature mortality. 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 course 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 course 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 Course Covers

As you study this material and complete the respective activities, you will learn to do the following:

- 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.
- Implement behavior modification techniques to help you adhere to a lifetime fitness and wellness program.
- Assess the health-related components of fitness (cardiorespiratory endurance, muscular fitness [strength and endurance], muscular flexibility, and body composition).
- Create exercise prescriptions for cardiorespiratory endurance, muscular fitness, 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.

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- 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 14th Edition

This 14th edition of *Fitness & Wellness* provides a modern and visually stimulating layout throughout the text, and the authors have developed and sourced many new informational boxes and photos in each chapter. Throughout the text, the authors have made substantial changes with the focus of finding new ways to help students understand and achieve a wellness way of life. Many chapters have been rethought and reorganized with new headings and enhanced introductory text.

Fitness & Wellness now has 10 chapters, as the behavior modification information from Chapter 1 has been placed into a chapter all its own (Chapter 2). All 10 chapters have been revised and updated according to advances published in the scientific literature and information reported at professional health, fitness, wellness, and sports medicine conferences. Note that the numbered reference notes for each chapter now appear in the end matter of the text, and Appendix E: Selective Nutrient Content of Common Foods is available online in MindTap for this edition. You can visit cengage.com/login to access MindTap. The following are the most significant chapter updates:

Chapter 1, Introduction to Physical Fitness and Wellness

- All figures and statistics have been updated to reflect the latest data, including the 2018 *Physical Activity Guidelines for Americans*. New Figure 1.2 helps students understand the greatest mortality risk at each age.
- The chapter has been shortened and refocused to help students better grasp the importance of physical activity and wellness. New Figure 1.7 presents the long-term and short-term benefits of exercise.

Chapter 2, Behavior Modification

- The behavior modification content from Chapter 1 has been separated and reorganized as Chapter 2.
- Up-to-the-minute research and realistic/personalized advice helps students set achievable and motivating goals.
- Added content helps students consider their unique individuality when setting goals.

Chapter 3, Assessment of Physical Fitness

- The content on "Fitness Conditioning: Responders versus Nonresponders" has been moved to this chapter.
- The explanation of oxygen uptake has been edited to make it an easier concept to understand.
- The American College of Sports Medicine (ACSM) guidelines as to who should seek medical clearance prior to undergoing exercise testing are given in the chapter.
- Information on body shape and health risks, including android and gynoid obesity, is new to the chapter.

Chapter 4, Exercise Prescription

- Updated data are provided on the number of Americans who currently meet the federal physical activity guidelines.
- Information on activity trackers and the recommended number of steps to accumulate each day is now found in this chapter.
- All exercise prescription recommendations conform to the ACSM Guidelines for Exercise Testing and Prescription.

Chapter 5, Personal Fitness Programming

- Chapter 5, now titled "Personal Fitness Programming," has been updated to help students choose realistic exercise options that will greatly enhance their success rate based on their current personal lifestyle.
- A new Activity 5.1 guides students through a reflection process about the aspects of an exercise regimen that they will personally enjoy.
- New fitness activities, including rucking and distance training, are discussed.
- A new feature offers guidelines for success when trying a new sport.

Chapter 6, Nutrition for Wellness

- Key nutrient contents have been revised throughout the chapter to conform with current nutrient data available to the consumer.
- Overall chapter contents have been edited to simplify statistical nutrient data presented in the chapter.

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- The new food label approved by the Food and Drug Administration (FDA), required for all packaged food by 2021, is presented in the chapter.
- An update is provided on the FDA ban on the use of trans fats in foods sold in American restaurants and at all grocery stores.

Chapter 7, Weight Management

- The most recent data on the incidence of overweight and obesity in the United States published by the Centers for Disease Control and Prevention (CDC) are presented.
- The content on fad dieting has been revised.
- Some of the most popular diets on the market today are described.
- The factors that determine the daily energy (caloric) requirement are discussed.
- The discussion on the benefits of additional light activity throughout the day has been expanded.
- Greater emphasis is placed on consuming most of one's daily calories during daytime hours and not during the evening meal.
- A new approach to estimate caloric expenditure of physical activity based on intensity of exercise during the activity is introduced.

Chapter 8, Stress Management

- The sympathetic nervous system and its role in activating the fight-or-flight response are introduced.
- The discussion of the importance of good sleep practices for college-age adults has been expanded.
- The organization of the stress management strategies section has been improved.

Chapter 9, A Healthy Lifestyle Approach

- A stronger emphasis is placed on light-intensity physical activity throughout the day to reduce the risk of premature cardiovascular mortality.
- The discussion of the importance of proper nutrition on blood lipids management has been expanded.
- New information about cancer prevention guidelines will help students make positive/immediate lifestyle changes. Additions include a feature about safe sun exposure and a figure explaining the relative risk of cancer-causing agents according to the International Agency for Research on Cancer (IARC).

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- Current information on the prevalence of nonmedical use of prescription drugs has been added based on the newest data available from the CDC.

Chapter 10, Fitness and Wellness FAQ

- Several of the questions in this chapter have been edited and updated to conform with advances in the fitness and wellness field.

Additional Course Resources

- **Health MindTap for Fitness & Wellness.** MindTap is an outcomes-driven application that propels students from memorization to mastery. MindTap is the platform that gives you complete control of your course—to craft unique learning experiences that challenge students,

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- **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 you complete 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.
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- **Cengage Testing Powered by Cognero.** Cengage Testing Powered by Cognero is a flexible, online system that allows you to do the following:
  - Author, edit, and manage test bank content tailored for this course.
  - Create multiple test versions in an instant.
  - Deliver tests from your LMS, your classroom, or wherever you want.

Acknowledgments

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Brief Author Biographies

Werner W. K. Hoeger is a professor emeritus of the Department of Kinesiology at Boise State University, where he taught between 1986 and 2009. He had previously taught at the University of the Andes in Venezuela (1978–1982); served as Technical Director of the Fitness Monitoring Preventive Medicine Clinic in Rolling Meadows, Illinois (1982–1983); taught at the University of Texas of the Permian Basin in Odessa, Texas (1983–1986); and briefly taught for one semester in 2012, 2013, and 2016 as an adjunct faculty at Brigham Young University–Hawaii in Laie, Hawaii. He remains active in in the areas of exercise physiology, physical fitness, health, and wellness.

Dr. Hoeger completed his undergraduate and master's degrees in physical education and received his doctorate degree with an emphasis in exercise physiology. He is a *Fellow* of the *American College of Sports Medicine* and also of the


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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 is 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.

Using his knowledge and personal experiences, Dr. Hoeger writes 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 65 editions of his nine fitness and wellness-related titles. Among the textbooks written for Wadsworth/Cengage are *Principles and Labs for Fitness and Wellness,* 15th edition; *Lifetime Physical Fitness & Wellness: A Personalized Program,* 15th edition; *Fitness & Wellness,* 14th edition; *Principles and Labs for Physical Fitness,* 10th edition; *Wellness: Guidelines for a Healthy Lifestyle,* 4th edition; and *Water Aerobics for Fitness & Wellness,* 4th edition.

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 in the field immediately followed his lead.

As an innovator in the field, Dr. Hoeger has developed many fitness and wellness assessment tools, including fitness

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tests such as the Modified Sit-and-Reach, Total Body Rotation, Shoulder Rotation, Muscular Endurance, 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, and so far only 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 Turin, Italy. At different times and in different distances (800 m, 1,500 m, and the mile) in 2012, 2014, 2015, 2016, 2018, and 2019 Dr. Hoeger 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-meter events at the Outdoor National Senior Games. In 2016, he advanced to the finals in both the 800 m and the 1,500 m at the World Masters Track and Field Championships held in Perth, Australia. He finished seventh (out of 12 finalists) in the 800 m and eighth (out of 16 finalists) in the 1,500 m. Most recently, in 2019, he finished second in the 800 m at the USATF Masters Outdoor Track and Field Championships and won the gold medal in the 800 m and 5K, and the silver medal in the 1,500 m and 3,000 m at the Huntsman World Senior Games in St. George, Utah.

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 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

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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 company's 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 41 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."

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Amber L. Fawson and Cherie I. Hoeger received their degrees in English with an emphasis in editing for publication. For the past 19 years Amber has enjoyed working in the publication industry and has held positions as an Editorial Coordinator for *BYU Studies,* Assistant Editor for Cengage, and freelance writer and editor for tertiary education textbooks and workbooks. During the last 15 years, 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 (previously under Thomson Learning and the Brooks/Cole brand).

Amber and Cherie have been working for Fitness & Wellness, Inc. for several years and have coauthored eight editions of the Hoeger *Fitness & Wellness* textbooks. They have taken on a significant role with the research, updates, writing, and illustrations in 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. Both Amber and Cherie 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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1

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.

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Introduction to Physical Fitness and Wellness

OBJECTIVES

1.1 **Understand** the importance of lifetime fitness and wellness.

1.2 **Learn** the recommended guidelines for weekly physical activity.

1.3 **Define** physical fitness and list components of health-related and performance-related fitness.

1.4 **Understand** the benefits of a comprehensive fitness and wellness program.

1.5 **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.

Do you ever stop to think about factors that influence your actions on a typical day? As you consider typical moments from this past week, which actions were positive and healthy and which were negative or harmful? Did you go for a walk or have a conversation with a friend? Did you buy and eat food that you felt good about? Did you pursue a task that held purpose and meaning for you? Conversely, did you battle ongoing stress and anxiety or allow yourself irregular sleep? Did you settle for highly processed food? Did you struggle with relationship problems? Did you regress to previous, unhealthy behaviors?

Take a moment to consider whether the choices from the past week repeated over years would accumulate to promote wellness or to cause disease. 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 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 management 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

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

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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 7 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.

Kate Ferguson

Kameron Kincade

In developed countries we have automated many of the daily physical activities that are still common in emerging countries.

1.1 Lifestyle, Health, and Quality of Life

Advances in technology have almost completely eliminated the necessity for physical exertion in daily life. Most nations, both emerging and developed, are experiencing an epidemic of physical inactivity.

Today in developed countries we live in an automated society. We no longer carry water back from a well, gather firewood, or hand-wash clothes. We grow up in communities that lack sidewalks, bike lanes, or amenities that are near enough to walk to. We go about life being driven walkable distances to save time, to avoid unpleasant weather, or to keep clothes and appearance pristine. We may not own weather-protective clothes because we go from home to car to school or work. Young people are part of this epidemic of inactivity. Sadly, 19-year-olds in the United States currently average the same level of physical activity as 60-year-olds.[1]

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 others. They sometimes are referred to as **hypokinetic diseases**. (*Hypo* means low or little, and *kinetic* implies motion.) In the United States, physical inactivity is the second greatest threat to public health (after tobacco use) and is often referenced in concerns about *sitting disease* and **sedentary death syndrome (SeDS)**. According to the World Health Organization (WHO), chronic diseases account for 60 percent of all deaths worldwide.[2]

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Public bikes make it easier for individuals to adopt a physically active lifestyle and also act as a cue that bikecommuting is an accepted and supported behavior in a community.

GLOSSARY

Chronic diseases Illnesses that develop and last over a long time period.

Hypokinetic diseases Diseases related to a lack of physical activity.

Sedentary death syndrome (SeDS) Deaths that are attributed to a lack of regular physical activity.

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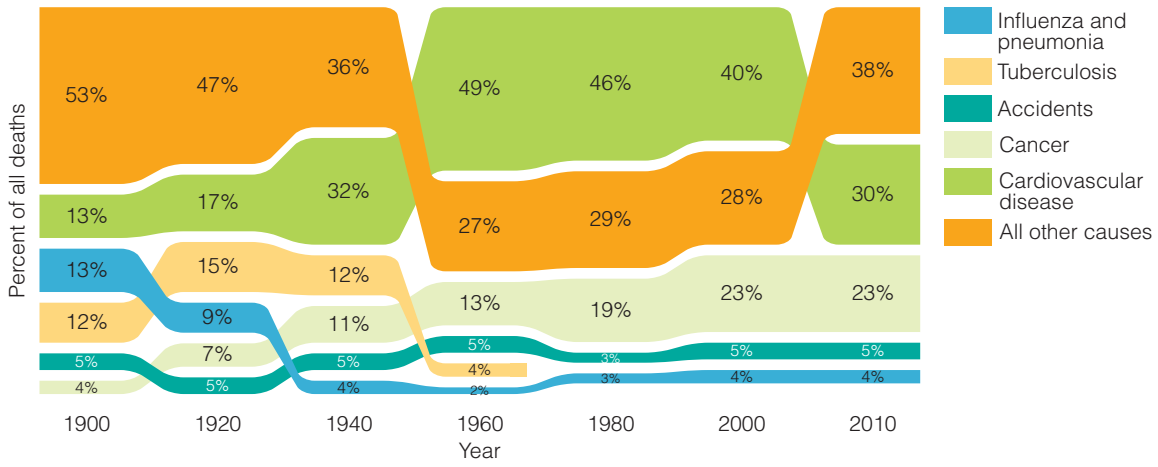
Figure 1.1 Causes of deaths in the United States for selected years.

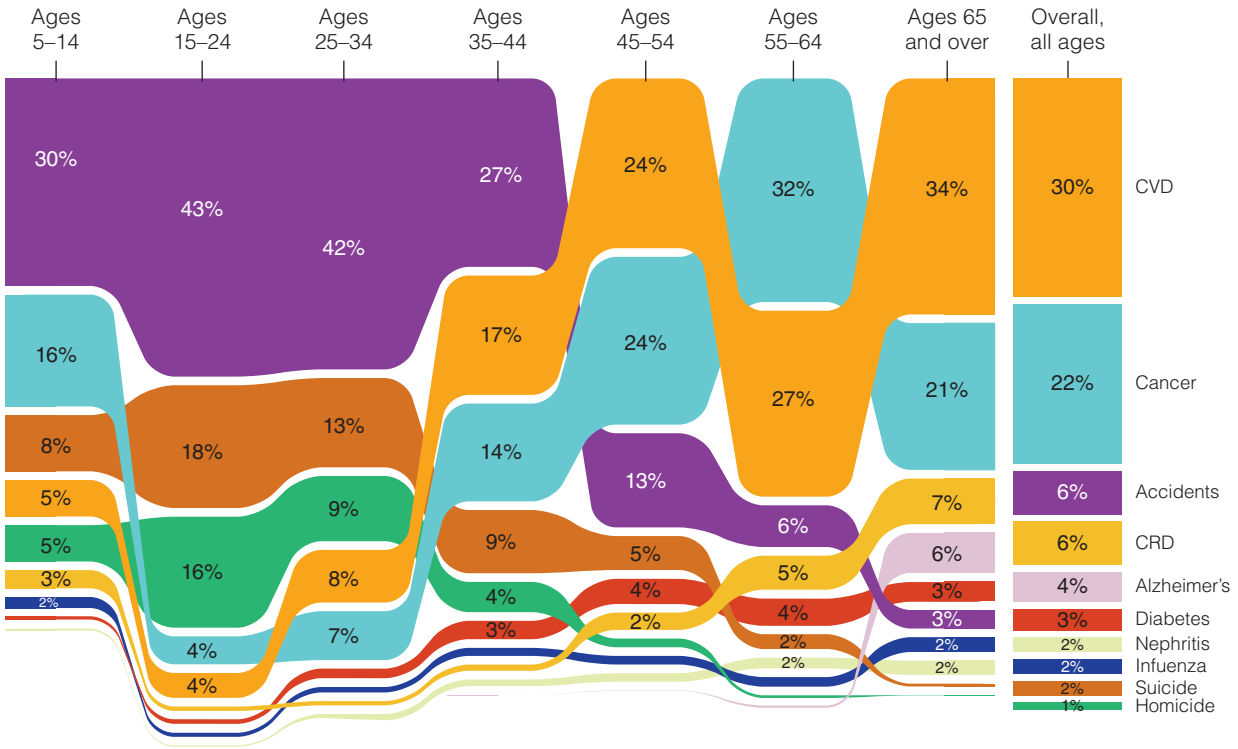


SOURCE: National Center for Health Statistics, Division of Vital Statistics.

Another downside of our chosen lifestyle is chronic stress. Suicide rates and drug abuse are climbing due to conventions we have normalized in our lifetimes. If we want to enjoy contemporary commodities yet still expect to live life to its fullest, we must take action. We must prioritize activities that relieve stress and promote wellness. And we must embrace a personalized lifetime exercise program as part of our daily lives.

The leading causes of death in the United States today are lifestyle-related (see Figure 1.1). More than half of all deaths in the United States are caused by cardiovascular disease and cancer.[3] Almost 80 percent of these deaths could be prevented by adhering to a healthy lifestyle. The third and fourth leading causes of death across all age groups are accidents and chronic lower respiratory disease, respectively. From the age of 1 to 44, accidents are the leading cause of death (see Figure 1.2). Specifically, automobile

Figure 1.2 Leading causes of death in the United States by age.



SOURCE: National Vital Statistics Reports, "Deaths: Final Data for 2016, Table 6. Number of deaths from selected causes, by age." Volume 67, Number 5, July 26, 2018.

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accidents are the leading cause of death for teens, and drug overdose is the leading cause for people in their 20s and 30s. Suicide follows as the second leading cause of death for ages 10 to 34.[4]

Hoeger Key to Wellness

Scientists believe that a healthy lifestyle program has the power to prevent almost 80 percent of deaths from cardiovascular disease and cancer.

Even though not all accidents are preventable, many are. Consider automobile accidents. Across the United States, fewer than 15 percent of people taking trips in automobiles choose not to wear seatbelts, yet these people account for half of all automobile deaths. As for the cause of automobile accidents themselves, fatal accidents are often related to failure to stay in the correct lane or yield the right of way due to driver distraction or alcohol use.[5] Pedestrian deaths are another example of preventable accidents. Almost half of these deaths occur because either the driver or pedestrian is above the legal blood-alcohol level.[6]

Based on estimates, more than half of disease is lifestyle related, a fifth is attributed to the environment, 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 80 percent of his or her vulnerability to disease—and consequently quality of life. In essence, most people in the United States are threatened by the very lives they lead today.

1.2 Life Expectancy

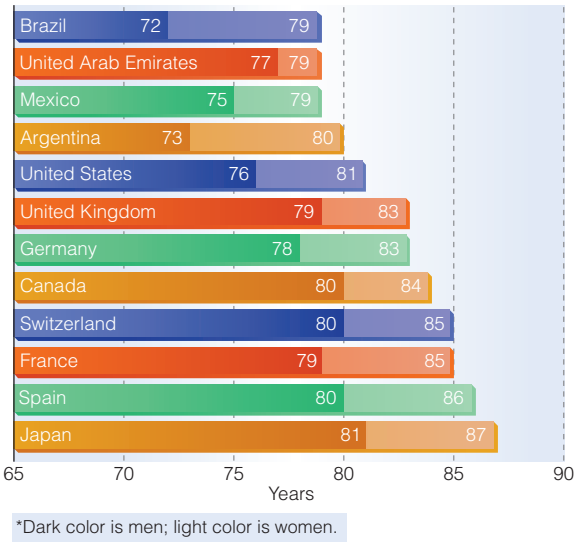
Currently, the average life expectancy in the United States is 78.6 years (76.1 years for men and 81.1 years for women).[7] After several years of ever-slowing improvement, in 2015 the life expectancy in the United States began an alarming decline. This decline has lasted longer than any other since the decline that occurred during the years 1915 to 1918, the years of World War I and the infamous flu epidemic. Today's decline is a result of a spike in deaths due to opioid addiction and suicide among people in their 20s and 30s, even as people aged 44 and up continue to fall victim to preventable chronic disease. Another alarming trend is evidence that people now spend an extra 1.2 years with a serious illness and an extra 2 years with a disability. A healthy lifestyle, on average, adds 5 to 6 years of disability-free life.[8]

The United States was once a world leader in life expectancy. Based on data from the World Health Organization (WHO), the United States now ranks 43rd in the world for life expectancy (see Figure 1.3), and a recent study suggests that the United States will plunge to a rank of 64th by the year 2040.[9]

The Need to Prevent Disease, Not Only Cure It

The United States has not invested the same resources in preventing disease as it has in treating disease after onset. Ninety-five percent of our health care dollars are spent on

Figure 1.3 Life expectancy at birth for selected countries: 2005–2015 projections.*



*Dark color is men; light color is women.

SOURCE: World Bank, "Life Expectancy at Birth (Male), 2016" and "Life Expectancy at Birth (Female), 2016," http://data.worldbank.org /indicator/SP.DYN.LE00.FE.IN.

treatment strategies, and less than 5 percent are spent on prevention. The latest data indicate that one in four adults in the United States has at least two chronic conditions.[10] This trend has health officials alarmed, as the burden on a patient with multiple conditions is greater than the sum of the individual diseases.

A report by the Organisation for Economic Co-operation and Development (OECD) found that while the United States far outspent every other country in health care costs per capita, it also easily had the highest rates of obesity of all 36 OECD countries.[11] As a nation, we are seeing the consequences of these numbers unfold. The incidence of diabetes climbed dramatically in parallel step with the incidence of obesity. Today, nearly half of the people in the United States have diabetes or prediabetes.[12]

In terms of yearly health care costs per person, the United States ranks in the top three among OECD countries. Per capita U.S. health care costs are about 2.5 times the OECD average. An estimated 5 percent of the people account for 50 percent of health care costs.[13]

1.3 Physical Activity Affects Health and Quality of Life

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.[14] Regular physical activity also is important for the health of muscles, bones, and joints, and has been shown

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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.

Physical Activity and Exercise Defined

Abundant scientific research over the past three decades has established a distinction between physical activity and exercise. **Exercise** is a type of activity that requires planned, structured, and repetitive bodily movement to improve or maintain one or more components of physical fitness. Examples of exercise are walking, running, cycling, doing aerobics, swimming, and strength training. Exercise is usually viewed as an activity that requires a vigorous-intensity effort.

Physical activity is bodily movement produced by skeletal muscles. It requires energy expenditure and produces progressive health benefits. Physical activity can be of light intensity or moderate to vigorous intensity. Examples of daily **light physical activity** include walking to and from work, taking the stairs instead of elevators and escalators, grocery shopping, and doing household chores. Physical inactivity, by contrast, implies a level of activity that is lower than that required to maintain good health.

Extremely light expenditures of energy throughout the day used to walk casually, perform self-care, or do other light work like emptying a dishwasher are of far greater significance in our overall health than we once realized. We now understand the impact of accumulating constant/small movements. Every movement conducted throughout the day matters.

To better understand the impact of all intensities of physical activity, scientists created a new category of movement called **nonexercise activity thermogenesis (NEAT).**[15] Any energy expenditure that does not come from basic ongoing body functions (such as digesting food) or planned exercise is categorized as NEAT. 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. For an active person, NEAT accounts for a major portion of energy expended each day. Though it may not increase cardiorespiratory fitness as moderate or vigorous exercise will, NEAT can easily use more calories in a day than a planned exercise session. As a result, NEAT is extremely critical for keeping daily energy balance in check. Especially when beginning or intensifying an exercise program, some individuals tend to adjust other activities of daily living, so they sit more and move less during the remainder of the day. This self-defeating behavior can lead to frustration that exercise is not providing the weight management benefits it should. It is important to keep daily NEAT levels up regardless of exercise levels.

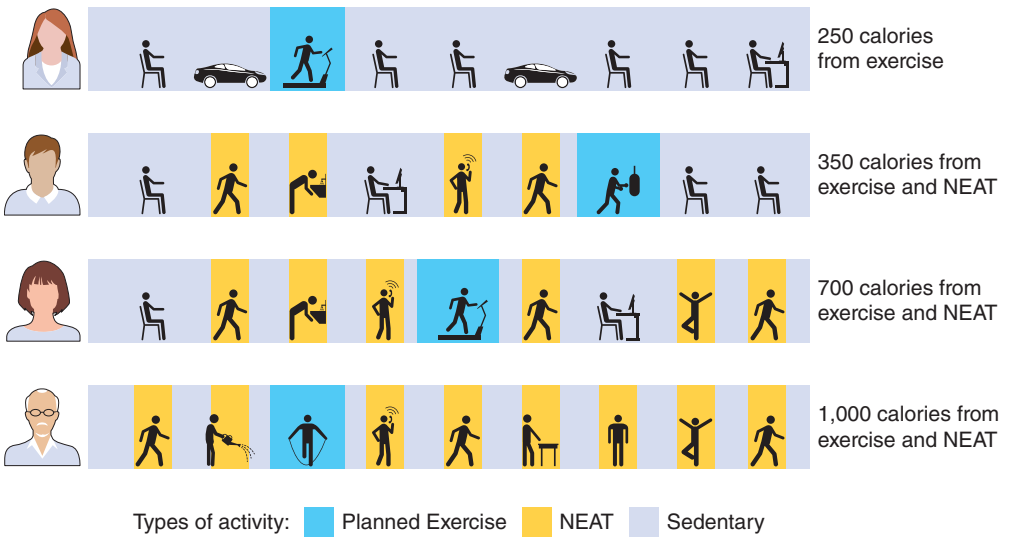
Hoeger Key to Wellness

A growing number of studies are showing that the body is much better able to maintain its energy balance—and, therefore, keep body weight at a healthy level—when the overall daily activity level is increased.

A growing number of studies are showing that the body is much better able to maintain its energy balance—and, therefore, keep body weight at a healthy level—when the overall daily activity level is high. An active person can vary calories from day to day with fewer swings in body weight, while a sedentary person who changes caloric intake will see those changes amplified, as observed by greater swings in body weight.

A person with a desk job who has the option to stand and move about throughout the day will expend 300 more calories a day than a person who sits at the desk most of the day (see Figure 1.4). People who spend most of the day working on their feet, such as medical assistants or stay-at-home parents, expend 700 daily calories more than a person with a sedentary desk job. People with physically demanding jobs, such as construction workers, can easily burn 1,600 daily calories more than a sedentary worker.[16] Variations in NEAT add up over

Figure 1.4 The importance of nonexercise activity thermogenesis (NEAT) and exercise.



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days, months, and years and provide substantial benefits for weight management and health.

Beyond the workday are several hours of leisure time that can also be spent quite differently on a vast variety of physical activities, from light physical activities to sports and exercise that are **vigorous physical activity**. Regular **moderate physical activity** provides substantial benefits in health and well-being. For those who are already moderately active, even greater health benefits can be achieved by increasing the level of physical activity. Examples of moderate physical activity are brisk walking or cycling, playing basketball or volleyball, recreational swimming, dancing fast, pushing a stroller, raking leaves, shoveling snow, and gardening.

Light physical activity (along with moderate physical activities lasting less than 10 minutes in duration) is not included as part of the moderate physical activity recommendation, though it is included as part of one's NEAT for a given day.

1.4 Federal Guidelines for Physical Activity

Because of the importance of physical activity to our health, the U.S. Department of Health and Human Services issued *Physical Activity Guidelines for Americans.*[17] A second edition of these guidelines was issued in 2018.

Adults Between 18 and 64 Years of Age

- All adults should move more frequently and sit less throughout the day. Any amount of physical activity provides some health benefits.
- Adults should do 150 minutes (2 ½ hours) to 300 minutes (5 hours) a week of moderate-intensity aerobic (cardiorespiratory) physical activity or 75 minutes (1 hour and 15 minutes) to 150 minutes (2 ½ hours) 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 and vigorous-intensity activity on another 2 days. Preferably, aerobic activity should be performed throughout the week.
- *Additional health benefits* are provided by increasing physical activity beyond the equivalent 300 minutes (5 hours) of moderate-intensity activity per week.
- Adults should also do muscle-strengthening activities that involve all major muscle groups, performed on 2 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 moderate- to vigorous-intensity physical activity every day.
- As part of their daily physical activity, children and adolescents should do vigorous-intensity activity on at least 3 days per week.
- Children and adolescents should also do muscle-strengthening and bone-strengthening activities on at least 3 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 during pregnancy and the postpartum period. Preferably, this activity should be spread throughout the week. Women who regularly engage in vigorous-intensity aerobic activity prior to pregnancy can continue their activity throughout pregnancy and the postpartum period, provided that their condition remains unchanged and they talk to their health care provider about their activity level throughout this time.

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.[18] This recommendation is based on evidence indicating that people who maintain healthy weight typically accumulate 1 hour of daily physical activity.[19] Between 60 and 90 minutes of moderate-intensity physical activity daily is recommended to sustain weight loss for previously overweight people.[20] And 60 to 90 minutes of activity per day provides additional health benefits.

GLOSSARY

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.

Light physical activity Any activity that uses less than 150 calories of energy per day, such as casual walking and light household chores.

Nonexercise activity thermogenesis (NEAT) Energy expended doing everyday physical activities not related to exercise.

Vigorous physical activity An activity similar to jogging that causes rapid breathing and a substantial increase in heart rate.

Moderate physical activity Activity that uses 150 calories of energy per day, or 1,000 calories per week.

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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 Figures 1.5 and 1.6), 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 Figure 1.7 summarizes many of these benefits.

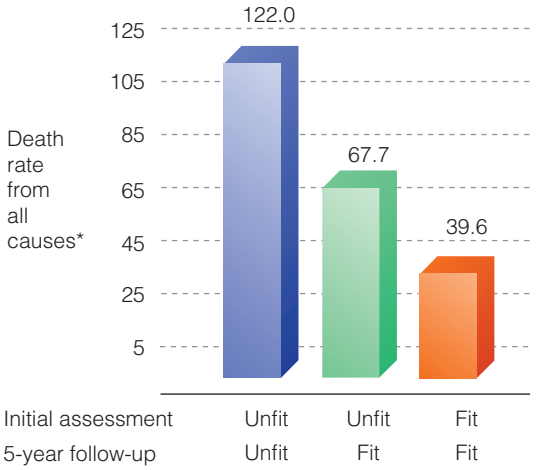
In addition to the benefits listed in Figure 1.7, **epidemiological** research studies linking physical activity habits and mortality rates have shown lower premature mortality rates in physically active people. Pioneering work in this area demonstrated that as the amount of weekly physical activity increased, the risk of cardiovascular death decreased.[21] 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.[22] 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.

In essence, the higher the level of cardiorespiratory fitness, the longer the life (see Figure 1.5). 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 a 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 1.6).[23] The lowest death

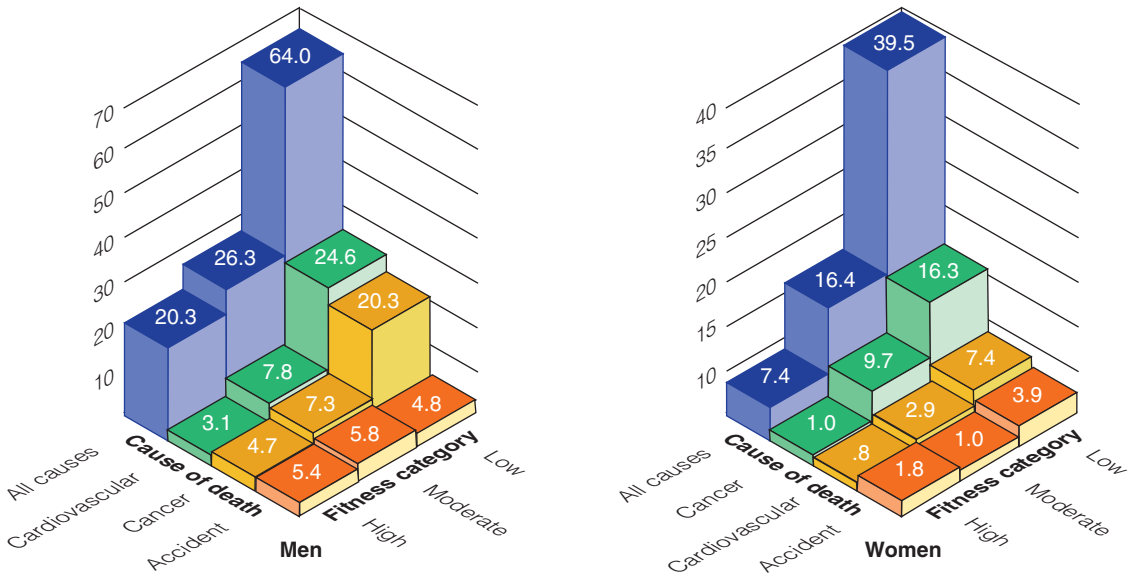
Figure 1.6 Effects of fitness changes on mortality rates.



*Death rates per 10,000 man-years observation.

SOURCE: S. N. Blair et al., "Changes in Physical Fitness and All-Cause Morality: A Prospective Study of Healthy Men and Women," *Journal of the American Medical Association* 273 (1995): 1193–1198.

Figure 1.5 Death rates by physical fitness levels.



SOURCE: Based on data from S. N. Blair, H. W. Kohl III, R. S. Paffenbarger, Jr., D. G. Clark, K. H. Cooper, and L. W. Gibbons, "Physical Fitness and All-Cause Morality: A Prospective Study of Healthy Men and Women," *Journal of the American Medical Association* 262 (1989): 2395–2401.

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Figure 1.7 Long- and short-term benefits of exercise.

Long-term 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 achieve peak bone mass in young adults and maintain bone mass later in life, thereby decreasing the risk for osteoporosis.
- helps prevent chronic back pain.
- speeds recovery time following physical exertion.
- speeds recovery following injury or disease.
- improves posture and physical appearance.

- helps maintain recommended body weight.
- increases resting metabolic rate.
- helps preserve lean body tissue.
- improves the body's ability to use fat during physical activity.

- regulates and improves overall body functions.
- retards creeping frailty, reduces disability, and helps to maintain independent living in older adults.
- improves functioning of the immune system.
- lowers the risk for chronic diseases and illnesses (including heart disease, stroke, and certain cancers).
- decreases the mortality rate from chronic diseases.
- thins the blood so that it doesn't clot as readily, thereby decreasing the risk for coronary heart disease and stroke.
- helps the body manage blood lipid (cholesterol and triglyceride) 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.
- extends longevity and slows the aging process.

- improves and helps maintain cognitive function, decreasing the risk for dementia and Alzheimer's disease.

- helps people sleep better.
- relieves tension and helps in coping with life stresses.
- raises levels of energy and job productivity.
- 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).
- improves physical stamina and counteracts chronic fatigue.
- enhances quality of life: People feel better and live a healthier and happier life.

Short-term (immediate/acute) Benefits of Exercise
(Expect a number of benefits as a result of a single exercise session. Some of these benefits last as long as 72 hours following your workout.)

- increases heart rate, stroke volume, cardiac output, pulmonary ventilation, and oxygen uptake.
- begins to strengthen the heart, lungs, and muscles.
- enhances metabolic rate or energy production (burning calories for fuel) during exercise and recovery. (For every 100 calories you burn during exercise, you can expect to burn another 15 during recovery.)
- improves joint flexibility.
- decreases arthritic pain.

- increases fat storage in muscle which can then be burned for energy.

- uses blood glucose and muscle glycogen.
- improves insulin sensitivity (decreasing the risk of type 2 diabetes).
- immediately enhances the body's ability to burn fat.
- lowers blood lipids.
- reduces low-grade (hidden) inflammation.
- improves endothelial function. (Endothelial cells line the entire vascular system, which provides a barrier between the vessel lumen and surrounding tissue—endothelial dysfunction contributes to several disease processes, including tissue inflammation and subsequent atherosclerosis.)
- decreases blood pressure the first few hours following exercise.
- improves digestion.
- improves resistance to infections.

- improves brain function.

- increases endorphins (hormones), which are naturally occurring opioids that are responsible for exercise-induced euphoria.
- enhances mood and self-worth.
- provides a sense of achievement and satisfaction.
- leads to muscle relaxation.
- decreases stress.
- promotes better sleep (unless strenuous exercise is performed too close to bedtime).
- boosts energy levels.

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