

Ninth Edition

CONCEPTS OF
Physical Fitness

WITH LABORATORIES

Charles B. Corbin ■ Ruth Lindsey



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C O N C E P T S O F

Physical Fitness

WITH LABORATORIES

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- PREFACE -

Looking Forward

Never in history have we had so much scientific information to support the value of healthy lifestyles in the promotion of physical fitness. The recent publication of *The Surgeon General's Report of Physical Activity and Health* provides definitive evidence that physical activity is one of the most important lifestyles that a person can adopt if lifetime fitness is an important goal. This report follows previous documents from the Surgeon General's office including reports on tobacco and nutrition which have had major impacts on our society. *Healthy People 2000* (a statement of national health goals) has focused public attention on healthy lifestyles such as regular physical activity, proper nutrition, controlling use of alcohol and tobacco, and stress reduction to achieve mental health. These reports, and the evidence on which they are based, show that healthy living can increase length of life and improve the quality of life for our extended years. A recent Mid-Decade Update of *Healthy People 2000* goals has shown that national efforts to improve lifestyles are producing results.

As we near the new century we are excited to be a part of the educational effort to promote physical fitness, health, and wellness. The wealth of evidence now available to us far exceeds what was available when we wrote our early editions. This reassures us that what we have presented in the previous eight editions of this text over the past three decades was sound and what we present in this ninth edition of *Concepts of Physical Fitness* will give you the best information available. We are pleased that we can continue our long tradition of providing our readers with information based on the most recent science.

Organization

This text is intended for an introductory college-level course dedicated to promoting healthy lifestyles that result in optimal physical fitness. *Concepts of Physical Fitness* is for teachers and students who want an up-to-date book focusing on physical activity and physical fitness. Section I: Physical Activity, Fitness, and Wellness includes introductory information, concepts on the health benefits of physical activity, preparing for activity, information about how much physical activity and physical fitness are needed to enhance performance and to produce health benefits, plus anatomy and physiology charts to help you identify the major parts of the muscle, skeletal, and circulatory/respiratory systems. **NEW** to this edition is a Physi-

cal Activity Pyramid which aids you in identifying the appropriate types of activities for gaining optimal health benefits.

Section II: Health Related Physical Fitness, presents up-to-date information on each of the five health related parts of fitness. The concepts provide the facts about each fitness component, as well as pictures and descriptions of the best exercises and activities for attaining each part of fitness. An attractive light blue color with a dark blue band is used on all pages containing illustrations of exercises. This **NEW** feature will allow you to easily locate exercise illustrations and descriptions. Also **NEW** are a 1 RM strength assessment and charts for determining desirable weight from skinfold measures. (The concept on Questionable Exercises in this section is a classic. Requests for use of this material in books and magazines has been unprecedented. You get the chance to get this information in its most up-to-date form, from its original source.)

Section III: Special Considerations for Physical Activity includes concepts on sports and skill-related fitness, information on care of the back and posture, and planning for lifetime activity.

Section IV: Healthy Lifestyles, includes a wellness overview, and concepts on nutrition, stress management and relaxation, and recognizing quackery. **NEW** to this edition is a discussion of self-management skills for aiding you in developing lifetime behaviors such as regular physical activity. The Surgeon General's recent report has an entire chapter devoted to the factors which help you to adhere to physical activity. We agree with the need for such a discussion and in this edition we emphasize the factors that aid you in adhering to lifetime activity. The section concludes with a concept on planning for healthy lifestyles.

Features

Over the years we have listened to teachers and students who use our books. Suggestions from you help us add to the features of the book that have proved to be so successful over time. Some of the key features that we think you will appreciate include:

- **Full-color Format.** The use of full color is intended not only to make the book attractive but to make the materials educationally sound. Full color allows us to highlight muscles used in each exercise, to present figures and pictures in a way that is easy to understand, and to help you locate materials (color tabs connecting concepts to labs, color pages for exercise illustrations, color bands for figures and tables).

- **Concepts.** We use concepts statements to introduce each major topic of the book. The concept statement and the evidence to support the statement are referred to as a concept rather than a chapter.
- **Health Goals.** Each concept includes health goals based on *Healthy People 2000*. **NEW** to this edition are updates of progress toward the nation's health goals.
- **Glossary.** A glossary of terms is listed at the beginning of each concept, then each term appears in boldface when it occurs in the text for the first time. This gives the reader an opportunity to refer back to the definitions if necessary.
- **Fact Statement Format.** Each major topic within each concept is made as a fact statement. This fact statement is followed by an explanation, discussion, and practical applications. Presenting information in this way allows us to present more information in less space and cuts through verbiage often found in texts of this type. This feature has been highly rated by users over the years.
- **Suggested Readings and References.** Suggested readings are listed at the end of each concept to aid those who are interested in learning more about a topic. In addition, an extended list of references is included so that you can know the source of materials presented in the text. We have gone to great lengths to get the most recent scientific information. It is for this reason that this book is widely used as a reference book as well as a text.
- **Laboratory Experiences and Questionnaires.** Most concepts are accompanied by laboratory exercises. Lab sheets provide spaces for recording personal data. Some labs require you to perform activities while others are questionnaires which help you learn more about yourself. Two planning labs are especially important (planning for active living and planning for healthy lifestyles). Color tabs (same color and location on the page) help you easily locate corresponding concepts and labs.
- **Lab Resource Materials.** At the end of each concept, lab resource materials are presented. These are materials that you will need to perform the lab experiences and complete the lab sheets at the end of the book. This allows you to easily locate the materials and to read about the various activities at the same time as you read each concept. These materials are available for future reference when the lab sheets have been used.
- **Appendices.** Metric conversion charts and charts of nutrient values are included for your use.
- **Inclusive Personalized Coverage.** No matter who you are, becoming physically active on a regular basis and adopting other healthy lifestyles will pay dividends. In this book we have been very careful to show how we are all *included* among those who can benefit. We are each individuals and for this reason we must be careful to personalize our lifestyles to suit individual needs. To help you personalize the

information, we have provided fitness standards for different age groups and for men and women. We have noted instances when age, gender, and/or ethnic differences might affect disease risks of various kinds. Our intent is to point out our similarities while at the same time providing information that will be inclusive and personalized.

- **Criterion Referenced Fitness Standards.** For nearly thirty years we have provided criterion-referenced standards for use in rating your health-related fitness. We have based fitness ratings on levels of fitness deemed to be associated with improved health and wellness. Only recently have others come to recognize the wisdom of this system. Criterion-referenced standards allow you to decide how much fitness you need for your own good health and wellness. Your success is judged by self-comparisons and comparisons to health standards rather than the fitness of another person. Consult concept 4 for more information.

Concepts of Physical Fitness is intended to help you make important decisions about a wide variety of fitness issues. We feel that this book will empower you to take responsibility for personal fitness and wellness by adopting and maintaining healthy lifestyles, particularly regular physical activity designed to promote health-related physical fitness. We hope that you will find the book interesting and useful, and that you will want to share its message with your family and friends.

A Note to Instructors

Over the years, *Concepts of Physical Fitness* has changed to make it easier to use for both students and instructors. With each edition we have made changes recommended by users. The larger trim size introduced with the 5th edition, and the full color introduced in the 7th edition, were especially well received. Users continue to appreciate the outline format and tearout labs, and these are retained in the 9th edition.

We hope you agree that we continue to “lead the way” by including the most up-to-date facts that are documented by current references. You will note that the references are located at the end of the book. This allows us to reduce duplication so that we can avoid lengthening the book, which in turn keeps the price down. Many of you have expressed your thanks for our efforts to keep the price of the book low while still providing essential factual information.

Concepts of Physical Fitness is more than just a text; it is a full educational package. Many ancillary materials are available as part of the total educational package. The components of this package are:

- **Instructor's Manual (IM).** This revised manual includes: course objectives, suggestions for organization and scheduling lectures and labs, attention to using our electronic Lecture Presentation CD, grading

suggestions, lecture outlines (complete with visual aids), chapter objectives, key points, discussion questions, ideas for outside activities, audiovisual resources, sources of equipment, blackline masters for use in making overhead transparencies, and an expanded test item file.

- **MicroTest III.** *MicroTest III* allows you to prepare custom exams using our prepared test bank along with your own test items. To improve the quality of our test items, we retained the services of a leading test expert, Dr. Weimo Zhu, to review and assist in writing the very best test items possible. MicroTest is available in IBM DOS, Windows, and Macintosh versions.
- **Color Transparencies.** Two sets of transparencies are now available (on request). The first set of 50 color images includes anatomical, physiological, fitness, and wellness images specifically for use with *Concepts of Physical Fitness*. A second set of general fitness and wellness transparencies supplements the *Concepts* set.
- **Videos.** Videos continue to be available to instructors. The first tape focuses on physical fitness. This newly released video presents the fitness philosophy, an overview of the administration of fitness tests found within the text, and describes the concept approach. The second video focuses on wellness. It includes basic wellness definitions as well as a general wellness philosophy. Both tapes are perfect classroom tools for use in motivating students at an early stage in the course. They can be used in class prior to the presentation of those tests, or can serve as resource material for the instructor.
- **Computer Programs.** In addition to Testpak, several computer programs continue to be available in both IBM and Macintosh formats. The computer assessment programs evaluate students in the areas of physical activity, target heart rate, heart disease risk, nutrition, and stress. Students enter information and receive instant feedback on their current status as well as ways to maintain or improve their levels of fitness.
- **Teacher's Resource Notebook (Binder).** A special notebook (binder) will be given free to each adopter of the text. This handy binder comes complete with tabbed dividers to contain such items as the Instructor's Manual, Transparencies, etc.

Acknowledgments

In the years since the first *Concepts* book was published, many people have helped to make it successful. There is great risk in attempting to identify all of those who have helped us through the years because there is the very real possibility that we will forget to name someone who has made an important contribution to the book's success. Nevertheless, we want to extend a thanks to the many people who have helped. To those of you who we no doubt missed (including all of the

users who have written us with suggestions over the years), we apologize. We do want to make these acknowledgments because without the help of those named, the *Concepts* books would not have experienced the success that they have.

First, we would like to acknowledge a few people who have made special contributions over the years. **Linus Dowell, Carl Landiss, and Homer Tolson**, all of Texas A&M University, were involved in the development of the first *Concepts* book and their contributions were also important as we helped start the fitness movement back in the 1960s. Other pioneers were **Jimmy Jones** of Henderson State University who started one of the first *Concepts* classes in 1970 and has led the way in teaching fitness in the years that followed; **Charles Erickson**, who started a quality program at Missouri Western; and **Al Leister**, a leader in the east at Mercer County Community College in New Jersey. **David Laurie** and **Barbara Gench** (now at Texas Women's University) at Kansas State University, as well as others on that faculty, were instrumental in developing a prototype *Concepts* program which research has shown to be successful. A special thanks is extended to **Greg Welk** who has contributed so much to the development of the most recent editions of the book, including his coauthorship of the Instructor's Manual, CD-ROM presentation disk, and other ancillary materials. **Mark Ahn, Keri Chesney, Chris MacCrate, Guy Mullin, Stephen Hustedde, Greg Nigh, and Doreen Mauro**, along with other employees of the Consortium for Instructional Innovation and the Micro Computer Resource Facility at Arizona State University, and **Betty Craft** and **Ken Rudich** and other employees of the Distance Learning Technology Program at Arizona State University deserve special recognition. All of the above-named people were instrumental in the development of the *Concepts* books over the years.

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The challenge of Healthy People 2000 is to use the combined strength of scientific knowledge, professional skill, individual commitment, community support, and political will to enable people to achieve their potential to live full, active lives. It means preventing premature death and preventing disability, preserving a physical environment that supports human life, cultivating family and community support, enhancing each individual's inherent abilities to respond and to act, and assuring that all Americans achieve and maintain a maximum level of functioning.

*Public Health Service
Healthy People 2000*




The Healthy People 2000 goals . . . emphasize the quality of life—not just its quantity—as measured through use of quality-adjusted life expectancy (years of healthy life).

*J. Michael McGinnis
Public Health Service
Healthy People 2000 at Mid Decade*



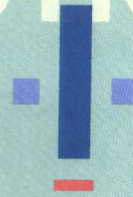
We must get serious about improving the health of the nation by affirming our commitment to healthy physical activity on all levels: personal, family, community, organizational, and national. Because physical activity is so directly related to preventing disease and premature death and to maintaining a high quality life, we must accord it the same level of attention that we give other important public health practices that affect the entire nation. Physical activity thus joins the front ranks of essential health objectives, such as sound nutrition, the use of seat belts, and the prevention of adverse health effects of tobacco.

*Audrey F. Manley
Surgeon General (Acting)*





SECTION

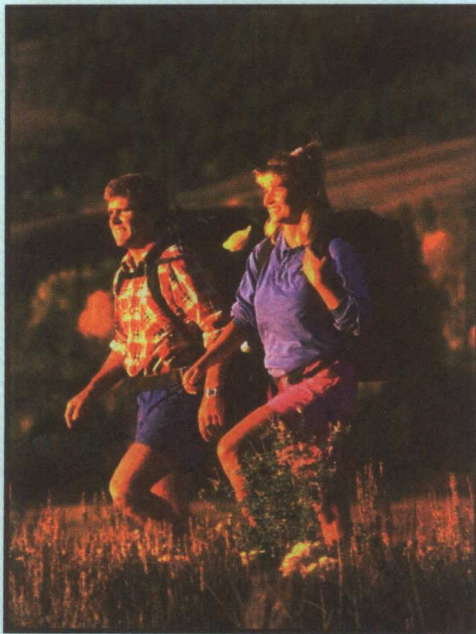


Physical Activity, Fitness, and Wellness



CONCEPT 1

Introduction to Physical Activity, Fitness, and Wellness



Concept 1

Good physical fitness, regular exercise, and optimal wellness are important for all people.

A Statement About National Health Goals

At the beginning of each concept in this book is a section containing abbreviated statements of national health goals from the document *Healthy People 2000: National Health Promotion and Disease Prevention Objectives*. These statements, established by expert groups representing more than 300 national organizations, are intended as realistic national health goals to be achieved by the year 2000. In 1995 a mid-decade review was conducted and it was determined that progress was being made in more than half of the priority goal areas. Throughout the book we have indicated areas in which improvements have been made and areas in which progress has been lacking. Although the goals are intended to improve the health of those in the United States, they seem important for all people in North America and in other cultures throughout the world. This book is written with the achievement of these important health goals in mind.

Introduction

The recently published *Surgeon General's Report on Physical Activity and Health* (1996) traces the link between physical activity and good health to the 5th century B.C. The exercise to health relationship was traced through Greek cultures to modern times. The early notion that activity is beneficial to health is now well-documented. Evidence is available to support the idea that lack of regular physical activity results in poor physical fitness. Those who are not physically fit and who are sedentary often suffer from hypokinetic diseases and other conditions discussed in this book.

As western civilization becomes more automated, physical exertion becomes less necessary as a part of the normal work of many adults. However, the need for regular exercise has not decreased; if anything, it has increased. Regular physical activity is, however, only one of many lifestyle patterns that can enhance health and wellness. Recent scientific evidence, as summarized in the Surgeon General's report and other recent documents, suggests that a healthy lifestyle, more than any other single factor, is responsible for optimal wellness. The implication is that each of us can learn to alter our lifestyles to foster lifetime fitness, health, and wellness.

Health Goals for the Year 2000

- Increase the span of healthy life. (↑)
- Increase the proportion of people who do regular physical activity for cardiovascular fitness. (↑)
- Increase the proportion of people who do regular physical activity for strength, muscular endurance, and flexibility. (<=>)
- Decrease the proportion of people who do no leisure-time physical activity. (↓)

- Reduce the prevalence of overfatness and increase physical activity among those who have excess body fatness. (↓)

Note: (↑) indicates progress toward goal, (↓) indicates regression from goal, and (<=>) indicates either no change or lack of new data since 1990.

General Terms

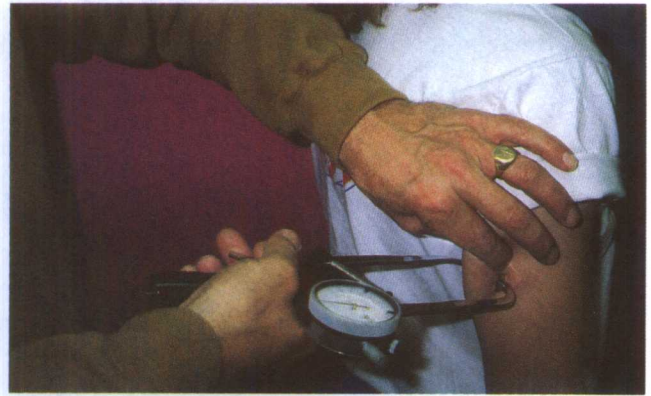
Throughout the book, key terms are in bold type the first time they appear in the text. You may wish to check the definition of each term as you read.

- **Bone Integrity** Soundness of the bones associated with high density and absence of symptoms of deterioration.
- **Exercise** Formally exercise is defined as physical activity done for the purpose of getting physically fit. Physical activity is generally considered to be a broader term used to describe all forms of large muscle movements including sports, dance, games, work, lifestyle activities, and exercise for fitness. In this book, exercise and physical activity will often be used interchangeably to make reading less repetitive and more interesting.
- **Health** Health is optimal well-being that contributes to quality of life. It is more than freedom from disease and illness, though freedom from disease is important to good health. Optimal health includes high-level mental, social, emotional, spiritual, and physical fitness within the limits of one's heredity and personal disabilities.
- **Hypokinetic Diseases or Conditions** Hypo means under or too little, and kinetic means movement or activity. Thus, hypokinetic means "too little activity." A hypokinetic disease or condition is one associated with lack of physical activity or too little regular exercise. Examples of such conditions include heart disease, low back pain, adult-onset diabetes, and obesity.
- **Illness** Illness is the ill feeling and/or symptoms associated with a disease or circumstances that upset homeostasis.
- **Lifestyles** Lifestyles are patterns of behavior or ways an individual typically lives.
- **Physical Fitness** Physical fitness is the body's ability to function efficiently and effectively. It consists of health-related physical fitness and skill-related physical fitness, which have at least eleven different components, each of which contributes to total quality of life. Physical fitness is associated with a person's ability to work effectively, to enjoy leisure time, to be healthy, to resist hypokinetic diseases, and to meet emergency situations. It is related to but different from health, wellness, and the psychological, sociological, emotional, and spiritual components of fitness. Although the development of physical fitness is the result of many things, optimal physical fitness is not possible without regular exercise.

- **Wellness** Wellness is the integration of all parts of health and fitness (mental, social, emotional, spiritual, and physical) that expands one's potential to live and work effectively and to make a significant contribution to society. Wellness reflects how one feels (a sense of well-being) about life as well as one's ability to function effectively. Wellness, as opposed to illness (a negative), is sometimes described as the positive component of good health.

Health-Related Fitness Terms

- **Body Composition** The relative percentage of muscle, fat, bone, and other tissues of which the body is composed. A fit person has a relatively low, but not too low, percentage of body fat (body fatness).



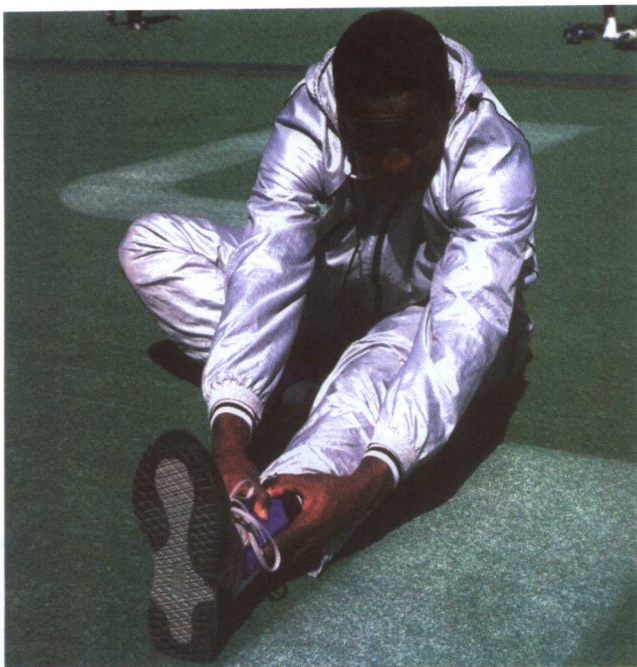
Body composition (fatness)

- **Cardiovascular Fitness** The ability of the heart, blood vessels, blood, and respiratory system to supply fuel, especially oxygen, to the muscles and the ability of the muscles to utilize fuel to allow sustained exercise. A fit person can persist in physical activity for relatively long periods without undue stress.



Cardiovascular fitness

— **Flexibility** The range of motion available in a joint. It is affected by muscle length, joint structure, and other factors. A fit person can move the body joints through a full range of motion in work and in play.



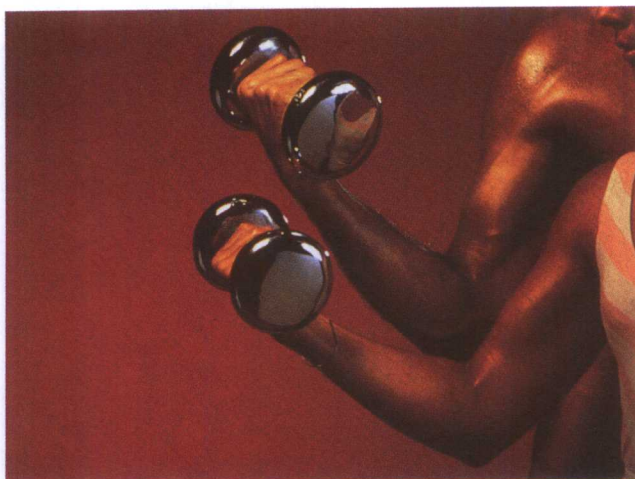
Flexibility

— **Muscular Endurance** The ability of the muscles to repeatedly exert themselves. A fit person can repeat movements for a long period without undue fatigue.



Muscular endurance

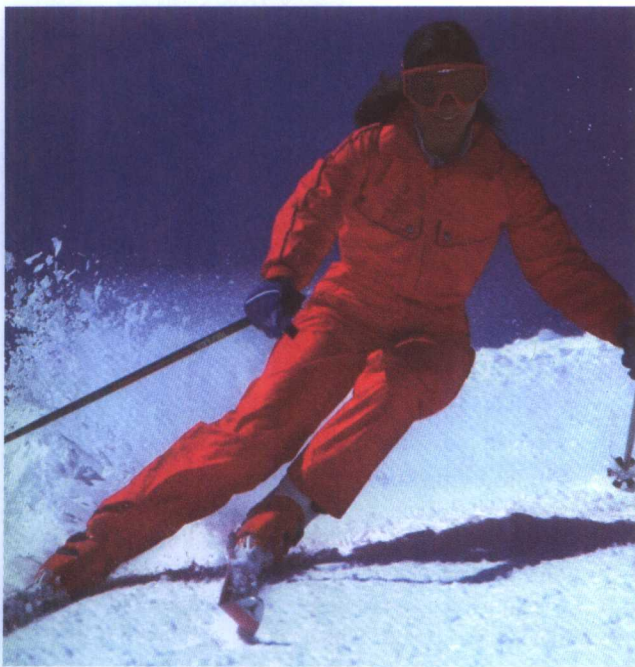
— **Strength** The ability to exert an external force or to lift a heavy weight. A fit person can do work or play that involves exerting force, such as lifting or controlling one's own body weight.



Strength

Skill-Related Fitness Terms

— **Agility** The ability to rapidly and accurately change the direction of the movement of the entire body in space. Skiing and wrestling are examples of activities that require exceptional agility.



Agility

Balance The maintenance of equilibrium while stationary or while moving. Water skiing, performing on the balance beam, or working as a riveter on a high-rise building are activities that require exceptional balance.



Balance

Coordination The ability to use the senses with the body parts to perform motor tasks smoothly and accurately. Juggling, hitting a golf ball, batting a baseball, or kicking a ball are examples of activities requiring good coordination.



Coordination

Power The ability to transfer energy into force at a fast rate. Throwing the discus and putting the shot are activities that require considerable power.



Power

Reaction Time The time elapsed between stimulation and the beginning of reaction to that stimulation. Driving a racing car and starting a sprint race require good reaction time.



Reaction time

Speed The ability to perform a movement in a short period of time. A runner on a track team or a wide receiver on a football team needs good foot and leg speed.



Speed

The Facts

Good **health** is of primary importance to adults in our society.

When polled about important social values, 99 percent of adults in the U.S. identified “being in good health” as one of their major concerns. The three concerns expressed most often were good health, good family life, and good self-image. The one percent who did not identify good health as an important concern had no opinion on any social issues. Among those polled, none felt that good health was unimportant.

Optimal health is more than freedom from disease.

During this century the life expectancy for the average person has increased by 60 percent. A child born in 1900 could expect to live only 47 years. A child born today can expect to live to the age of 75.8. Much of the increase in life span can be attributed to modern medical science. Many diseases that killed thousands in earlier times can now be easily treated. Pneumonia, which can be treated with antibiotics, is a good example.

As treatment for killer diseases became available, the emphasis shifted to disease prevention. Curing disease was still of concern, but the development of vaccines and other preventions for disease became central to the efforts of public health and medical experts. Many lives have been saved and much pain and suffering has been avoided as a result of the development of vaccines for diseases such as smallpox and polio.

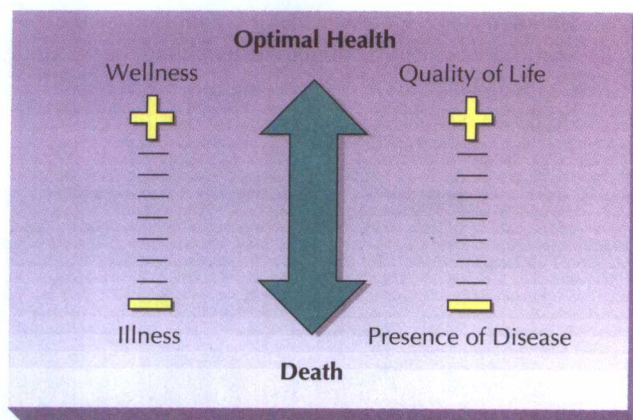


Figure 1.1

Wellness is an important part of optimal health.

As a result of the advances in illness treatment and prevention, an effort can now be made to focus on **wellness**. Wellness, or a sense of well-being, includes one's ability to live and work effectively and to make a significant contribution to society. It reflects how one feels about life as well as one's ability to function effectively. Wellness represents a quality of living component that is essential for optimal health.

As illustrated in figure 1.1, good health is partly associated with freedom from illness and disease. Disease treatment and prevention efforts are important to good health. However, as noted previously, a sense of well-being or wellness as reflected in quality living is critical to optimal health. Health promotion programs often go beyond disease treatment and prevention in that they contribute to optimal **physical fitness** and spiritual and emotional health, as well as other components that enhance the quality of life.

Increasing the span of healthy life is a principal health goal.

Consistent with the notion that optimal health includes a wellness dimension that is more than freedom from disease, the Public Health Service has adopted as its principal goal the increase in *healthy* span of life. In this regard we have been effective in meeting national health goals as the life expectancy for the average person has increased from 73.7 to 75.8 years since the national health goals were developed. Unfortunately, the average person can expect to have only about 64 years of healthy life (see figure 1.2). The remaining 11.8 years are characterized as dysfunctional or lacking in the wellness component. For these people quality of life is diminished.

Lack of wellness is not, however, a problem exclusive to older people. Many young people fail to achieve