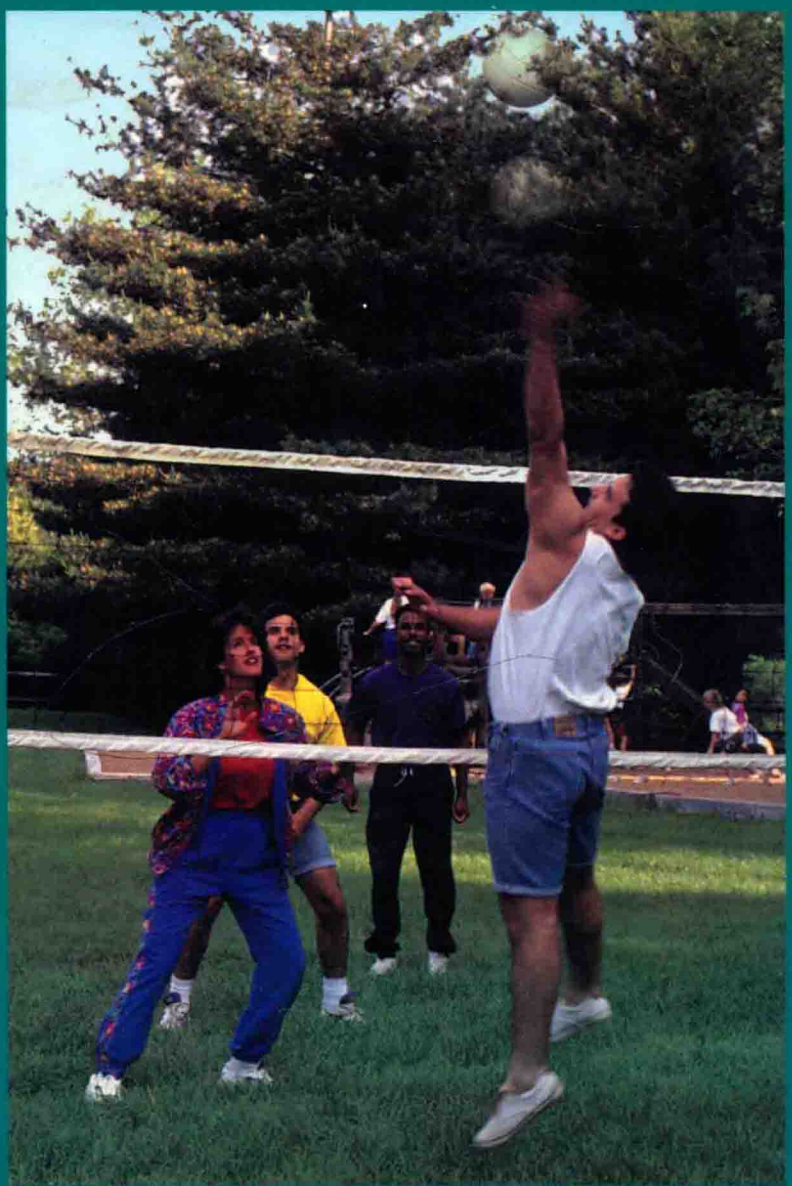
FITNESS

for college and life

Fourth Edition



PRENTICE

FITNESS
for college and life

William Prentice, Ph.D., P.T., A.T., C.

Professor, Coordinator of Sports Medicine Program
Department of Physical Education, Exercise, and Sport Sciences
Clinical Professor, Division of Physical Therapy
Department of Medical Allied Professions
Associate Professor, Department of Orthopedics
School of Medicine
The University of North Carolina
Chapel Hill, North Carolina
Director, Sports Medicine Education and Fellowship Programs
HEALTHSOUTH Rehabilitation Corporation,
Birmingham, Alabama

Fourth Edition

with 255 *illustrations*

Mosby

St. Louis Baltimore Boston Chicago London Madrid Philadelphia Sydney Toronto

Mosby
Dedicated to Publishing Excellence

Editor-in-Chief: James M. Smith
Acquisitions Editor: Vicki Malinee
Developmental Editor: Wendy Schiff
Project Manager: Carol Sullivan Wiseman
Production Editor: Shannon Canty
Designer: Betty Schulz
Cover Photo: Cathy Lander-Goldberg
Cover Design: GW Graphics & Publishing

FOURTH EDITION

Printed in the United States of America
Composition by Graphic World, Inc.
Printing/binding by Wm. C. Brown Publishers

PRINTED WITH SOY INK

Mosby–Year Book, Inc.
11830 Westline Industrial Drive
St. Louis, Missouri 63146

"Recycled"

Library of Congress Cataloging-in-Publication Data
Prentice, William E.
Fitness for college and life/William E. Prentice—4th ed.
p. cm.
Includes bibliographical references and index.
ISBN 0-8016-7854-4
1. Physical fitness. I. Title.
GV481.P77 1994 93-35551
613.7—dc20 CIP

93 94 95 96 97 / 9 8 7 6 5 4 3 2 1

FITNESS
for college and life

Preface

PHYSICAL FITNESS

During the past decade, the words *physical fitness* have taken on a new meaning. In many respects, physical fitness has become an American way of life. People are more aware of the role of fitness in overall health. We eat, sleep, go to school or work, and try to include some form of exercise in our busy schedules. Fitness information comes from many sources. Experts give advice on television or radio, in magazines, books, and newspapers. Even our friends and co-workers are willing to give opinions on the best way to work out or on the latest fitness craze. Furthermore, the image of the attractive, healthy, physically fit person is used to sell everything from foods, nutrient supplements, clothing, sports equipment, and memberships to health and fitness clubs. It is virtually impossible to go through a day without being exposed to something involving physical fitness.

This national preoccupation with fitness has affected every segment of our society. People of all ages and backgrounds have decided to take responsibility for their own physical and emotional well-being by becoming physically active. Communities are recovering vacant lots for park development; large corporations are providing space for fitness classes. Perhaps nowhere is this interest in physical activity more evident than on college or university campuses. On any given day, summer or winter, these communities are crowded with people jogging, walking, or bicycling. Gymnasiums, tennis courts, and playing fields are likely to be even more crowded. In many cases, these college students are establishing patterns of living that may well affect their long-term health and leisure pursuits.

Because of the substantial number of people interested in achieving a higher degree of fitness, self-proclaimed fitness "experts" are determined to try to take advantage of them by disseminating misinformation regarding strength training, cardiorespiratory endurance and flexibility, weight control, nutrition, and injury and stress management. The public's interest in becoming more physically fit has created a multi-million dollar industry that does not always promote items or services that are safe, effective, or necessary. Fitness consumers need a source of reliable information dealing with a wide variety of topics from choosing clothing and equipment to the treatment of shin splints. The college fitness class can provide not only the instruction about proper exercises but also information about how to become a more careful consumer.

The fourth edition of *FITNESS FOR COLLEGE AND LIFE* is designed to provide a comprehensive, readable text for use in general fitness classes that are designed to acquaint college students with the nature and scope of fitness. The text emphasizes the value of establishing lifelong patterns of fitness. It provides individuals with facts and principles that provide the basis for motivating people to incorporate some form of physical activity into their daily lives. The text also identifies the exercises, activities, resources, and assessment instruments that can be used in developing an individualized, well-rounded physical fitness program. Although there are many different approaches that will ultimately lead to physical fitness, following certain principles and guidelines makes the pursuit of physical fitness safer and more effective.

INPUT FROM THE MARKETPLACE

Extensive market research was used before revision of this text. College instructors who are teaching courses in fitness, wellness, and exercise physiology reviewed the third edition of *FITNESS FOR COLLEGE AND LIFE*. Reviewers were asked to determine what health information is necessary for a comprehensive fitness text and which material could be deleted. In addition, experts in the fields of nutrition and stress management provided technical reviews necessary to update chapter content. After careful consideration, these suggestions have been incorporated in the fourth edition of this text. This research provides the assurance that the content is up-to-date, accurate, practical, and relevant to today's college students and adults in general. The following describes the basic features of the text and identifies major areas of revision to this edition.

Physical Fitness as it Relates to Well-Being

In recognizing the importance of today's trend toward wellness, this text concentrates on the importance of the health-related aspects of physical fitness in addition to stressing aspects of performance or motor skill-related fitness. Health-related fitness is concerned with developing the components necessary to

function efficiently and achieve or maintain a healthy lifestyle. Physical fitness is viewed as one very important part of the whole picture of an individual's well-being.

Comprehensive and Systematic Coverage

The text covers all of the important elements of fitness for the college student. An examination of the table of contents provides the user with an appreciation for the comprehensive nature of the text. Diverse and important topics, such as tips for exercising in extreme weather conditions or during pregnancy, are included. In addition, information about purchasing exercise equipment and fitness club memberships is both timely and practical. A discussion about causes and treatments of common fitness injuries is extremely valuable for anyone involved in exercise. In this edition, as in the past, fitness principles blend with practical examples, enabling the student to evaluate their physical condition and apply information.

The various other aspects of healthful living are presented as part of the wellness approach to health and fitness. The first half of the book describes fitness and health-related principles. Facts about the development of cardiorespiratory endurance, muscular strength and endurance, and flexibility are included. Deterrents to fitness, such as substance abuse and sedentary lifestyle, are described. The second half introduces facts about fitness-related topics such as body composition determination, weight management, nutritious food selection, and injury prevention and management. Because the management of stress is an important aspect of any fitness program, this subject is also discussed, along with practical suggestions and techniques for learning how to cope with stress. Furthermore, a series of lifetime fitness activities suitable for personalizing anyone's fitness program is described. General discussions of the various fitness-related topics are followed by lab activities that include assessments, inventories, worksheets, and specific activities to which the principles are applied. The final chapter deals with special considerations for fitness including consumer information, exercise concerns for women, and a discussion of fitness resources available on college campuses.

Basis in Scientific Theory; Emphasis on Application

This text discusses various concepts, principles, and theories that are supported by scientific research to the extent that is reasonable for this audience. Sources of information are from disciplines such as exercise physiology, nutrition, athletic training, biomechanics, and physical therapy. It is important for anyone involved in a physical activity program to have at least a basic understanding of why it is more efficient to make use of a specific technique to maximize results. Therefore this text deals not only with principles but also with specific activities and recommendations for applications.

Timely and Practical Material

This text presents information concerning a wide variety of current fitness topics including recommendations for injury prevention and management, the benefits of water aerobics, and safe rollerblading practices. The latest information regarding the new food pyramid and food labels is described. Also, as healthcare costs rise and ideas for cost containment abound, information is essential to motivate the young adult to seek ways to control costs by making healthier lifestyle choices and becoming a wise fitness consumer.

Easy to Read and Use

FITNESS FOR COLLEGE AND LIFE presents topics in a lively, readable style geared to the general college student's level of understanding and background. Descriptions of anatomical structures, techniques for assessing specific fitness components, and suggestions for specific training are clearly explained so that the student can comprehend and apply what is being discussed. Numerous photographs and diagrams illustrate the correct way to exercise and explain more abstract concepts. The text is perforated so that Lab Activities and related worksheets can be completed and turned in for assignments. Finally, fitness is a fascinating subject, and I have tried to communicate my enthusiasm for it throughout this edition.

NEW TO THIS EDITION

Updated Information Concerning the Health and Wellness Approach to Fitness

Chapter 2 reinforces the wellness approach to healthful living and fitness. *HEALTHY PEOPLE 2000* national goals are highlighted. Also, the chapter has been updated to include the latest information about the relationship of exercise and eating habits to the development of cardiovascular disease and cancer. New information about sexually transmitted diseases, including the latest information about HIV infection and AIDS, is presented. All of these relevant topics have an impact on everyone's level of fitness and wellness.

Body Composition and Nutrition

Because body composition and nutrition play important roles in achieving physical fitness, this subject has been extensively updated and rewritten in Chapters 7 and 8. New information about eating disorders, anorexia nervosa and bulimia, has been added because of its impact on body composition and overall health. Furthermore, some individuals would like to gain weight; their needs are now addressed including a revised chart in which weight gains are recorded.

The Food Pyramid (the latest food guide) and the new labeling format are timely additions to this revision. The appendices on food composition include a new table with information about the nutritional value of foods from the most popular fast food restaurants.

Common Fitness Injuries

Chapter 9 has been rewritten and reorganized to focus on those injuries that may be considered acute traumatic injuries versus those that would be considered chronic overuse injuries. A discussion of various exercises that can be harmful and should be avoided has been added to this chapter.

Management of Stress

Chapter 10 has been rewritten and updated to include a new discussion of the cognitive (psychological) response and the role of personality on stress. Emphasis is now on stress management rather than on the technical aspects of the stress response.

Lifetime Fitness Activities

New trends in fitness have been added to Chapter 11. The section describing various forms of aerobic dance exercise has been significantly expanded to include the latest fads in the aerobics industry. Rollerblading, a current fitness activity, is now included as part of this chapter. Also, a revised discussion of the value of lifetime fitness activities that are skill-related, along with new Lab Activities to assess these fitness components, are included.

Consumer Focus

Chapter 12 relates the increased focus on fitness consumer issues. New guidelines for the consumer of health and fitness products are set forth for those individuals who wish to be more careful of how their resources are spent to get the most from their fitness plan. Included are guidelines for selecting and joining a health club; selecting and purchasing various types of fitness equipment; choosing appropriate clothing and shoes for exercise; and selecting appropriate magazines and books on physical fitness. Also, information about potentially dangerous behaviors, such as the use of tanning beds, has been added.

New, Revised, and More Lab Activities

The number of Lab Activities available for the student has been increased in this fourth edition. There are now 52 Lab Activities, inserted after appropriate chapters in the text. Labs help students assess how they rate in the fitness and wellness activities provided and serve to motivate. Some of the Lab Activities from the third edition have been revised to make them easier to use and to record information. Interesting and new Lab Activities, such as measuring blood pressure and vital capacity, have been added.

Consumer Tips

Information boxes, called *Consumer Tips*, have been added to chapters. We are all consumers, not only of fitness products, but also of fitness information. These boxes highlight and summarize relevant and practical information of particular interest to the consumer in a clear and concise format.

PEDAGOGICAL AIDS

The aids this text uses to facilitate its use by students and instructors include the following:

- Key Terms: Each chapter begins with the most important terms for students to become familiar with while reading the chapter.
- Chapter Objectives: Listed at the beginning of each chapter, these introduce students to the points that will be highlighted. Accomplishing the objectives indicates fulfillment of the chapter's intent.
- Figures, Tables, Photographs: Essential points in each chapter are illustrated with clear visual materials.
- Summary: Each chapter has a summary outlining and reinforcing the major points covered.
- References: Expanded lists of the most up-to-date documentation are provided at the end of each chapter for the student who wishes to read further on the subject being discussed.
- Suggested Readings: Provided with annotations, these present additional resources for further information.
- Lab Activities: Designed to help the student apply the theoretical information presented in the text, the Lab Activities provide individual, practical applications through worksheets, inventories, and exercises. The Lab Activities are perforated for easy removal upon completion of the assignment.
- Appendices: Appendix A is a food composition table that lists useful nutritional information about foods commonly eaten. Appendix B is a new table of the nutritional composition of foods from popular fast food restaurants.
- Glossary: As a convenient reference, a comprehensive glossary has been included at the end of the text. The helpful cross-reference feature provides the page number where each term is first described.

SUPPLEMENTS

Instructor's Manual/Test Bank

An Instructor's Manual containing more than 425 test items is also available. It provides suggestions on how to use the text to its fullest potential. The manual includes chapter overviews, learning objectives, key

terms, and a topical teaching outline. A test bank of true-false, multiple-choice, and discussion questions for each chapter is a useful resource. Extensive lists of additional readings and annotated media and software resources are included. For convenience, directories of addresses and telephone numbers for resources are also provided.

There are 60 transparency masters from lists and illustrations from the text and several summarizing content. Perforated for easy removal, these have been included to help explain more difficult concepts and to facilitate classroom and laboratory instruction.

Valuable resources for the instructor are the two instructional plans outlining suggested activities that can be used in a 10-week (four sessions a week) and a 14-week (three sessions a week) college class pattern. Activities will include such things as lectures, physical activities, testing, and demonstrations. Instructors will be able to use the instructional plans as outlined for their classes, or they can adapt them in a way that will better fit into their own pattern of instruction.

Software

The Fitness Profile Software allows your students to evaluate and apply their knowledge of the health-related components of physical fitness, as well as other factors that impact one's total fitness. It is available to adopters of the text.

ACKNOWLEDGEMENTS

The preparation of a manuscript for a textbook involves a collective, coordinated effort on the part of many individuals. The quality of the text is generally reflective of many special talents, as well as the dedication and commitment to the project of all those involved. My new developmental editor for this text, Wendy Schiff, deserves tremendous credit and sincere gratitude for her invaluable input and considerable expertise in the completion of this revision. Her energy and persistence have been uplifting, and I wish to thank her for that.

In addition my thanks must also be expressed to the following reviewers whose recommendations and suggestions have helped to focus the direction and influence the evolution of this edition.

Daniel Berney
California State University-Dominguez Hills

Jan Boyungs
Central Washington University

Caprice Lynn Dodson
Houston Community College System

David Dzewaltowski
Kansas State University

T. Ellen Eason
Towson State University

Ann V. Fariss
University of Bridgeport

Jim Farmer
University of Southern California

Bridgit Finely
Oklahoma City Community College

John Miller
Western Michigan University

Gail Reiken
William Patterson College

Rachel Robinson
University of Tulsa

Karen Sullivan
Marymount University

Michael L. Teague
University of Iowa

Annette R. Tommerdahl
University of Wyoming

I would also like to thank the numerous reviewers whose expertise contributed to the past three editions.

Particular credit is also due to Ms. Jennifer Lechner and her colleagues at St. Petersburg Junior College for their ongoing contributions to the material included in this text.

Finally, my wife Tena and our two sons, Brian and Zachary, provide inspiration and support in every project I choose to pursue.

William E. Prentice

Contents

CHAPTER

1 The Pursuit of Fitness

OBJECTIVES

After completing this chapter, the student will be able to do the following:

- Describe the nature and scope of fitness as it exists today.
- Define the terms *fitness, physical fitness, health-related fitness,* and *motor skill-related fitness.*
- Explain the role of physical activity in achieving an optimal state of physical fitness.
- List the component parts of physical fitness.
- Describe the relationship between the body systems and fitness.
- Explain why an optimal state of physical fitness is important to college students.

KEY TERMS

fitness
physical fitness
health-related fitness
motor skill-related fitness
cardiorespiratory endurance
flexibility
muscular strength
muscular endurance
body composition
speed
power
agility
reaction time
neuromuscular coordination
balance

EXERCISE TRENDS

Enthusiasm for exercise and fitness in the United States is at an unprecedented level, with millions of people spending countless hours and billions of dollars on sport and exercise. This interest in fitness, initially perceived by some as a fad or a short-lived phenomenon, has grown for over a decade. Surveys indicate that virtually all adults believe that exercise is important to health and fitness and that regular physical activity is essential for themselves and for their children. Still, despite this increased interest in exercise and fitness, the US Department of Health and Human Services reports that only 22% of adults participate in a minimum of 30 minutes of light-to-moderate exercise at least five times per week and only 12% are active seven times per week. Fewer than 10% of the population exercises more than three times per week at exercise intensity levels necessary for improving cardiorespiratory endurance. Approximately 25% of American adults do not engage in any type of leisure-time physical activity, and the prevalence of this sedentary behavior increases with age.

In both 1986 and 1991, *Sports Illustrated* commissioned Lieberman Research, Inc. of New York to do an exhaustive study exploring sport, fitness, and the American lifestyle. The *Sports Illustrated* polls were based on mail questionnaires completed by a nationwide representative sample of 2043 Americans in 1986 and 2320 Americans in 1991, all of whom were 18 years of age and older. The samples included men and women of various ages, income and education levels, and geographic regions, as well as sports fans and nonfans. One part of the study indicated the role that sports and physical activities play in the health and fitness of Americans 18 years of age and older. According to these scientific surveys, in both 1986 and 1991, 73% of the adults who responded participated in sport or fitness activities. But once again the frequency of active participation is not great enough to produce any measurable improvement in levels of fitness. In 1986, people exercised an average of 53.2 times a year, or about once a week. In 1991, exercise frequency had increased to 73.7 times per year, or about 1½ times per week. One of ten persons is involved about four times a week. Such participation in physical activity is engaged in most often by the young, the better educated, and those in the higher income brackets. Those adults who have been educated about fitness and exercise are more likely to participate in regular physical activity during their lifetime.

More women are now choosing to become involved in exercise. Fortunately, many of the long-standing historical prejudices and misconceptions regarding women and fitness are slowly beginning to disappear, although many individuals are still resistant to redefining the "feminine image" for the 1990s. Women are becoming physically active at a much higher rate

than are their male counterparts, participating in both recreational and competitive activities.

Geographically, the study shows that persons who live in the western part of the country are more physically active than those who live in other sections of the nation. The next most active inhabitants are in the Midwest, South, and Northeast, in that order.

Sports and activities with the greatest number of participants are soccer, swimming, bicycling, jogging, calisthenics/aerobics, use of exercise machines, baseball/softball, golf, bowling, hiking/backpacking, pool/billiards, and squash/racquetball. Men engage in a wider range of sports and fitness activities than do women, but women engage more in calisthenics/aerobics than do men. Fifty-eight percent of the Americans surveyed feel they are in "excellent" or "good" physical condition. The rest of the population say they are in "fair" or "poor" physical condition. Again, age and education influence the way Americans rate themselves. Those in the 18- to 34-year age bracket rate themselves higher than do those in the 50-year and older age groups, and of those who did not graduate from high school most feel they are in "fair" or "poor" condition.

One of every two Americans feels he or she is overweight, but only 1 of every 12 feels he or she is underweight. The rest say they are satisfied with what the scales indicate. The results of the study suggest that being overweight is perceived to be a greater problem for women than for men. At the same time, although being overweight is a problem affecting all ages, it is more evident in the 35- to 64-year age range. It is less common in those who live in the West, probably because Westerners have more active lifestyles.

It is interesting to note that most Americans put considerable emphasis on their weight in rating their physical condition. If they feel their weight is right, they are more likely to rate themselves as being in "excellent" physical condition. However, if they are overweight, they are more likely to rate themselves as being in "fair" or "poor" shape.

Certainly, weight is associated with appearance. Many individuals choose to become involved in a physical activity program because of the potential for changing the way others see them as well as the way they see themselves. The images of the thin, "hardbody," picture-perfect people created by the advertising media have contributed to this obsession with weight. Chapter 7 examines issues relating to weight control and maintenance of body composition.

What Has Prompted This Interest in Fitness?

A number of factors have prompted this interest in fitness. Increased leisure time and the desire for youthfulness and self-improvement have prompted some to exercise. The growing realization that exercise and fitness are integral components of a healthy lifestyle has also contributed to the interest in fitness. The positive effects of remaining active throughout one's life have encouraged many to continue their participation in activities or to start regular exercise programs, such as walking, jogging, or swimming. One of the most obvious reasons for becoming physically fit is the benefit derived from a healthy lifestyle that includes proper exercise and nutrition.

The escalating cost of health care has also served as an impetus for individuals and corporations to become increasingly aware of the benefits gained from health promotion efforts. Spiraling health-care costs and the realization of the benefits of participation in health and fitness programs have prompted many individuals to become more involved in fitness activities. Corporations have also found that in an economic sense fitness is good business. It is fairly well documented that health-care costs for organizations that offer prevention and health promotion programs show an approximate 20% savings in the cost of health care per employee per year. Certainly, many corporations are using existing fitness and health programs as recruitment incentives for potential employees. The concept of physical fitness is not new. Primitive humans relied primarily on speed, agility, and strength in the fight for survival. Life was a constant struggle that could be met only through physical prowess. Without knowing the scientific benefits of fitness, primitive humans existed, adapted to a variety of environmental conditions, and lived vigorous lives. In contrast, we now rely largely on our intellect in coping with problems of survival. Whereas cognitive activity is essential for many work-related skills, little physical effort is required in most activities of our modern society. In fact, the modern lifestyle fosters a lack of of physical fitness. Technological advances, such as the automobile, television, elevators, escalators, and moving sidewalks, eliminate the need for physical exertion and contribute to a sedentary lifestyle. Too often our society is so concerned with developing superiority of the intellect that there is a danger of neglecting the development of the whole person. Physical fitness affects the total person: his or her intellect, emotional stability, and physical conditioning.

In addition, our society is characterized by a fast-paced lifestyle, with obligations and stresses that affect our physical and emotional fitness. A common misconception among college students is that daily living incorporates enough exercise to maintain an adequate level of fitness. Walking back and forth to class and participating in an intramural activity or working a part-time job usually provide a limited amount of physical exertion, which in most cases is not adequate to produce physical fitness or eliminate tension.

A physical fitness program should be initiated and followed on a regular basis to overcome inactivity and maintain an optimal level of fitness. Furthermore, such things as an adequate amount of rest, social and emotional outlets, and proper diet are also required for an appropriate level of fitness.

THE MEANING OF PHYSICAL FITNESS

Fitness is a broad term denoting dynamic qualities that allow you to satisfy your needs regarding mental and emotional stability, social consciousness and adaptability, spiritual and moral fiber, and physical health consistent with your hereditary. **Physical fitness** means that the various systems of the body are healthy and function efficiently so as to enable the fit person to engage in activities of daily living, as well as recreational pursuits and leisure activities, without unreasonable fatigue. Beyond physical development, muscular strength, and stamina, physical fitness implies efficient performance in exercise or work and a reasonable measure of motor skill in the performance of selected physical activities. (The terms *exercise* and *physical activities* will be used interchangeably throughout this text.)

The same degree of physical fitness is not essential for everyone. However, everyone needs a minimal amount of fitness to be healthy, and everyone is capable of achieving minimal fitness levels. The level of fitness necessary depends on factors such as the tasks you must perform and your potential for physical effort. Physical fitness varies with the individual and with the demands and requirements of a specific task. The college athlete must constantly work to improve his or her strength, endurance, flexiblity, speed, and cardiorespiratory efficiency, whereas the nonathlete student who cycles to class requires less effort to maintain his or her level of physical fitness. The weekend golfer needs a different level of physical fitness than the mountain climber or wheelchair athlete. A 40-year-old mother requires a different physical fitness level than her daughter. Physical fitness varies according to the circumstances of a person at different times in his or her life. Because no set standard of physical fitness applies to all people, an optimal level of fitness depends on your age, sex, body type, vocation, and physical limitations such as those associated with diabetes or asthma.

Physical fitness is not entirely dependent on exercise. Desirable health practices also play an important role. Physical fitness affects the total person: their intellect, emotional stability, physical conditioning, and stress levels. The road to physical fitness includes proper medical care, the right kinds of food in the right amounts, good oral hygiene, appropriate physical activity that is adapted to individual needs and physical limitations, satisfying work and study, healthy play and recreation, and proper amounts of rest and relaxation.

There are varying degrees of physical fitness. Prac-

TABLE 1-1 Some Activities to Help Develop Components of Physical Fitness

Muscular Strength		
Swimming	Gymnastics	Racquetball
Weight training	Karate	Backpacking
Judo	Cycling	Mountain climbing
Calisthenic exercises (such as push-ups, leg raises, bench step-ups, flutter kicks)		
Muscular Endurance		
Jogging	Cycling	Mountain climbing
Running	Cross-country skiing	Fencing
Swimming	Backpacking	Handball
Weight training	Dancing	Hiking
Rowing	Ice skating	Calisthenics
Cardiorespiratory Endurance		
Aerobic dancing	Swimming	Handball
Skipping rope	Cross-country skiing	Hiking
Running	Cycling	Mountain climbing
Jogging	Backpacking	Rowing
Flexibility		
Calisthenics	Karate	Static stretching
Gymnastics	Swimming	
Judo	Modern dancing	
Body Composition		
Jogging	Swimming	Cross-country skiing
Running	Cycling	Skipping rope
Walking	Aerobic exercise	

tically anyone can improve his or her fitness status, and physical activity is essential to achieving physical fitness. There are no shortcuts. Physical fitness cannot be stored up; it requires daily attention. The person who plays tennis all summer and then gives up all physical activity when autumn starts will not remain physically fit. The sprinter who fails to run after the track season ends will backslide in respect to his or her physical fitness level.

HEALTH-RELATED VERSUS SKILL-RELATED COMPONENTS OF PHYSICAL FITNESS

The American Alliance for Health, Physical Education, Recreation, and Dance (AAHPERD) has classified the components of fitness into two categories: health-related components and motor skill–related components. The **health-related fitness** components concern the development of qualities necessary to function efficiently and maintain a healthy lifestyle. These components include muscular strength, muscular endurance, cardiorespiratory endurance, flexibility, and body composition.

Motor skill–related fitness includes qualities such as strength, power, balance, agility, reaction time, coordination, and speed that are conducive to better performance in sports and other physical activities. The components of health-related and motor skill–related fitness overlap. For example, cardiorespiratory endurance, strength, flexibility, and body composition are essential for healthy living; they are also important in skillful motor performance. However, the degree of development each requires varies according to the type of physical activity. A more extensive development of these components may be required to achieve an appropriate level of motor skill–related fitness, which is often associated with sport. For example, athletes may need to develop their strength to a greater degree than most individuals who are interested solely in improving and maintaining health-related fitness. When designing an individualized physical fitness program, you must first decide what it is you are trying to accomplish and then select those specific components of fitness that ultimately will help you reach your goal. For example, the goals of fitness improvement for a 55-year-old person would probably differ considerably from those of a 20-year-old college student who is preparing to compete in varsity gymnastics. Our 55-year-old person would be more concerned with fitness components such as cardiorespiratory endurance, flexibility, muscular endurance, and body composition. Improvement in these four specific areas would enhance performance in daily tasks without undue fatigue, as stated in our definition of physical fitness.

On the other hand, the 20-year-old gymnast must be concerned not only with the components that have been mentioned, but also with components such as strength, speed, power, balance, and agility. If he or she does not include activities in the training regimen that specifically address these various skill-related fitness components, chances are that he or she will be unsuccessful in a competitive situation.

Table 1-1 recommends several activities that may help you develop each of the health-related components of fitness. As you will notice, there are several activities that are recommended under more than one fitness component; thus the benefits of those activities will accrue to several components of fitness simultaneously.

A number of different factors collectively contribute to an individual's physical fitness. Although a complete consensus on the components of physical fitness does not exist, most authorities agree that the following are basic elements.

HEALTH-RELATED COMPONENTS OF FITNESS

Cardiorespiratory Endurance

Cardiorespiratory endurance is the ability to persist in a physical activity requiring oxygen for physical exertion without experiencing undue fatigue (Figure 1-1). The student who runs 2 miles or swims 2000 yards is displaying cardiorespiratory endurance. The functioning of the heart, lungs, and blood vessels is essential for distribution of oxygen and nutrients and removal of wastes from the body. For performance of vigorous activities, efficient functioning of the heart and lungs is necessary. The more efficiently they function, the easier is will be to walk, run, study, and concentrate for longer periods of time. A more efficient student will be able to maintain effort for a longer time.

Cardiorespiratory endurance is characterized by moderate contractions of large muscle groups for a relatively long time, during which adjustments of the cardiorespiratory system to the activity are necessary, as in distance running or swimming. Exercise of this nature involves the heart, the vessels supplying blood to all parts of the body, and the oxygen-carrying capacity of the blood. Cardiorespiratory endurance can be assessed by various technical measurements, including blood pressure, heart rate, stroke volume of the heart, and oxygen consumption. These tests are often taken during a resting state and then again after exercise.

Flexibility

Flexibility is the ability to move freely throughout a full, nonrestricted, pain-free range of motion about a joint or series of joints (Figure 1-2). It may be improved by engaging in consistent stretching. Flexibility is important for performance in most active sports; it is also important for maintaining good posture. Furthermore, it is essential in carrying on many daily activities and can help to prevent muscle strain and orthopedic problems, such as backaches.

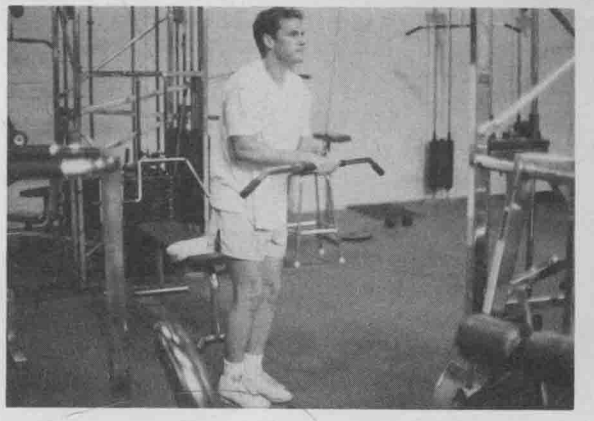
Muscular Strength

Muscular strength is the ability or capacity of a muscle or muscle group to exert force against resis-

FIGURE 1-1 Cardiorespiratory Endurance. Perhaps the most essential fitness component for both good health and skill-related performance.

FIGURE 1-2 Flexibility. The ability to move freely through a full range of motion.

FIGURE 1-3 Muscular Strength. The ability to generate force against resistance.



tance (Figure 1-3). It refers to the muscle's ability to exert maximal force in a single effort. Strength is needed in all kinds of work and physical activity. Strong muscles provide better protection of body joints, resulting in fewer sprains, strains, and muscular difficulties. Furthermore, muscle strength helps in maintaining proper posture and provides greater endurance, power, and resistance to fatigue. The lack of strength of abdominal muscles is a primary cause of low back problems. Weak abdominal muscles and inflexible posterior thigh muscles allow the pelvis to tip forward, thereby causing an abnormal arch in the lower back that results in low back pain. Strength is also an important element of athletic activity. Conversely, by overemphasizing a particular muscle group, postural abnormalities may also develop. The best athletes pay particular attention to developing strength in various muscle groups.

Muscular Endurance

Muscular endurance is the ability of muscles to perform or sustain a muscle contraction repeatedly over a period of time (Figure 1-4). Muscular endurance is closely related to muscular strength. An individual who is strong will be less resistant to fatigue because relatively less effort will be required to produce repeated muscular contraction.

Body Composition

Body composition relates to the makeup of the body in terms of muscle, bone, fat, and other elements (Figure 1-5). With respect to physical fitness, the term particularly refers to the percentage of fat in the body relative to the fat-free content. An excess of fat in the body is unhealthy because it requires more energy for movement and may reflect a diet high in saturated fat. The demand on the cardiorespiratory system is greater when the percentage of body fat is high. Furthermore, it is believed that obesity contributes to degenerative diseases such as high blood pressure

and atherosclerosis. Obesity can also result in psychological maladjusgments and may shorten life. A balance between caloric intake and caloric expenditure is necessary to maintain proper body fat content. Adequate exercise, therefore, is effective in controlling body fat.

FIGURE 1-4 Muscular Endurance. The ability to perform muscular contractions repeatedly over a period of time.

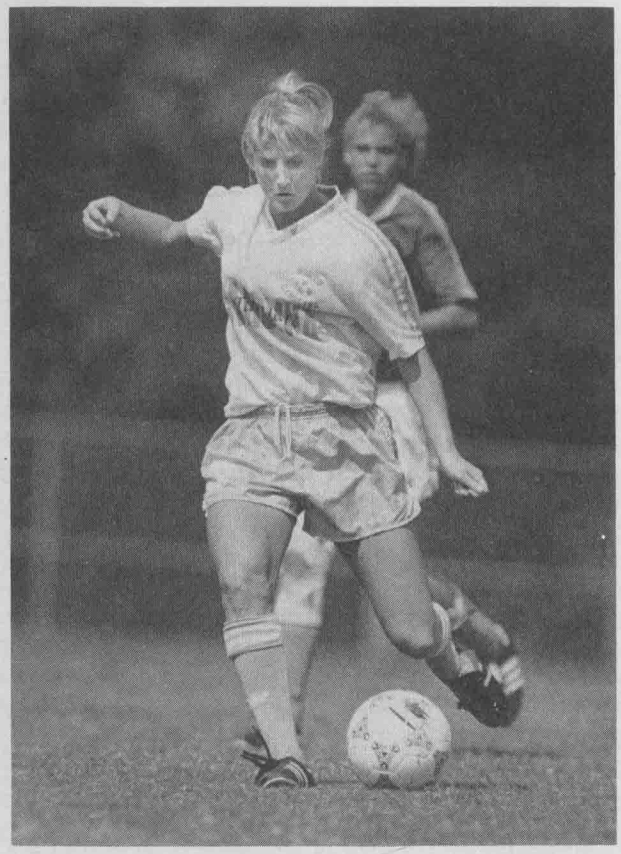
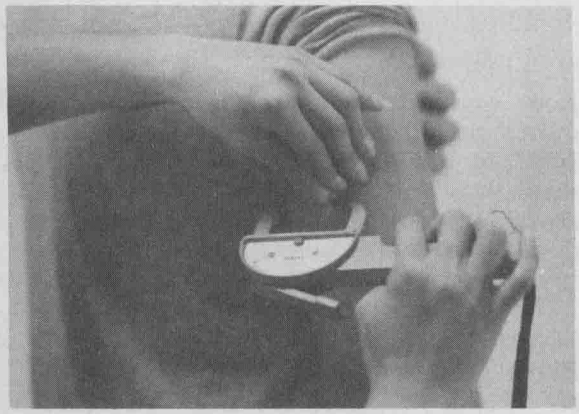


FIGURE 1-5 Altering Body Composition. Exercise reduces the percentage of total body weight that is fat tissue.



MOTOR SKILL–RELATED COMPONENTS OF FITNESS

Speed

Speed is the ability to perform a particular movement very rapidly (Figure 1-6). It is a function of distance/time. It is an important component for successful performance in many competitive athletic situations.

Power

Power is the ability to generate great amounts of force against a certain resistance in a short period of time (Figure 1-7). Power is a function of both strength and speed. The ability to drive a golf ball, hit a softball, or kick a ball a long distance requires some element of power.

Agility

Agility is the ability to change or alter, quickly and accurately, the direction of body movement during activity (Figure 1-8). Agility is to a large extent dependent on neuromuscular coordination and reaction time. Agility may be improved with increased flexibility and muscular strength.

Neuromuscular Coordination

Neuromuscular coordination is the ability to integrate the senses—visual, auditory, and proprioceptive (knowing the position of your body in space)—with motor function to produce smooth, accurate, and skilled movement (Figure 1-9).

FIGURE 1-6 Speed. An important component in many competitive athletic situations.

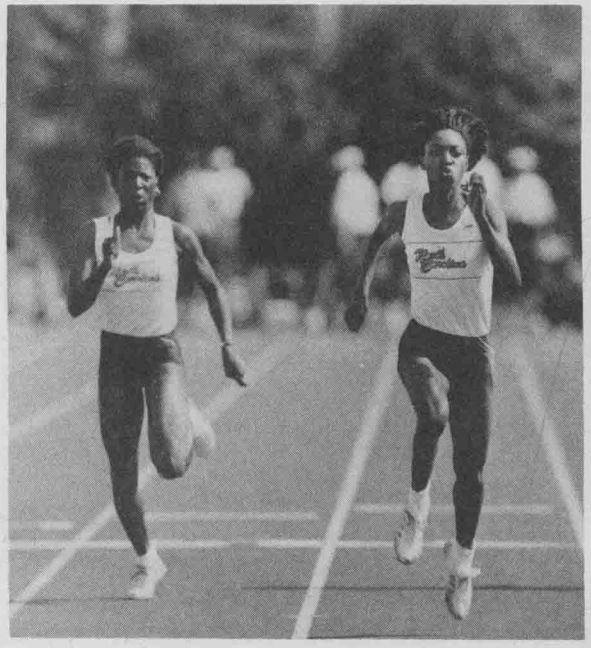


FIGURE 1-7 **Power.** The ability to generate large amounts of force rapidly.

FIGURE 1-8 **Agility.** The ability to change direction of movement quickly and accurately.

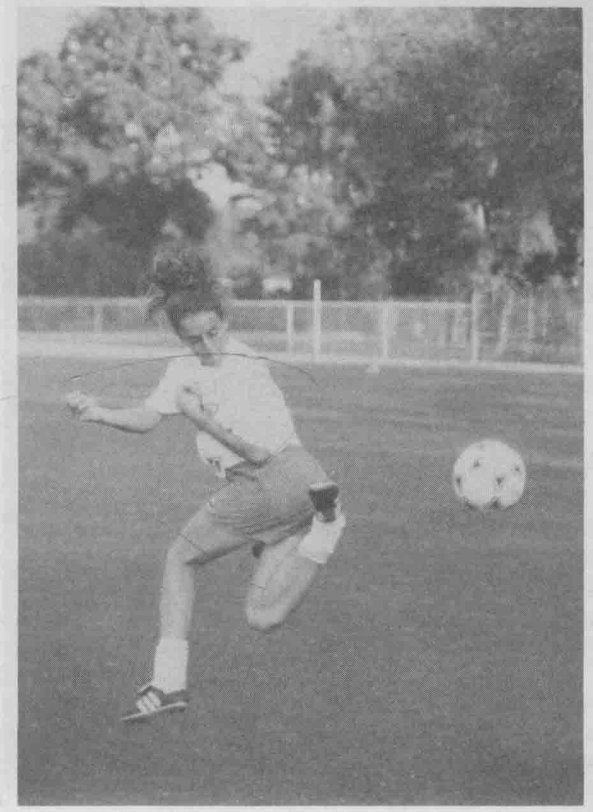


FIGURE 1-9 **Neuromuscular Coordination.** The ability to integrate the senses with motor function to produce coordinated movement.