Physical Activity and Public Health Practice

Edited by

Barbara E. Ainsworth and Caroline A. Macera

CRC Press
Taylor & Francis Group

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CRC Press
Taylor & Francis Group
Boca Raton London New York

CRC Press is an imprint of the
Taylor & Francis Group, an **informa** business

CRC Press
Taylor & Francis Group
6000 Broken Sound Parkway NW, Suite 300
Boca Raton, FL 33487-2742

Printed in the United States of America on acid-free paper
Version Date: 20120123

International Standard Book Number: 978-1-4398-4951-4 (Hardback)

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http://www.taylorandfrancis.com

and the CRC Press Web site at
http://www.crcpress.com

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Preface

PHYSICAL INACTIVITY AS A PUBLIC HEALTH PROBLEM: CHALLENGES AND OPPORTUNITIES

Introduction

Physical inactivity is an emerging public health concern worldwide. Many adults and children are not active at health-enhancing levels. This situation provides a great opportunity to improve population health by increasing levels of physical activity. Health is a dynamic state influenced by multiple influences including personal, social, cultural, institutional, and environmental factors. Although this poses a challenge in understanding how these factors influence physical activity in ways that constrain individuals' choices to become and remain active, the opportunities of an active society are seen in reduced morbidity and mortality due to physical inactivity.

The World Health Organization (WHO) defines health as "a state of complete physical, mental, and social well-being, not merely the absence of disease or infirmity" (World Health Organization 2011). As the world's leading public health agency, WHO sets the agenda for activities to prevent diseases, prolong life, and promote health and efficiency through organized community action. As such, public health has the charge to address threats to health among people in developing countries and in developed countries. The scope of public health is broad; it aims to modify the social conditions resulting in disease and injury and promote activities to assure community conditions that are conducive to well-being. Many of the conveniences taken for granted in developed countries, such as clean water, sanitation services, and control of communicable diseases, can be attributed to organized public health efforts. Public health practice focuses on two levels to assure the community's health. Activities that require no action are termed "passive protection" and include water treatment, legislative smoking bans, and preservation of food quality. Activities designed to ensure health that require action by an individual are termed "active protection." These include laws requiring motorcyclists and bicyclists to wear helmets and people in cars to wear seat belts. Engaging in regular physical activity is a form of active protection in that it requires effort by an individual to ensure health benefits.

PHYSICAL ACTIVITY AND PUBLIC HEALTH

Over the past century, many advances in public health have been documented, and during the last half of the twentieth century, physical activity became recognized as a major health-enhancing behavior. Surveillance to identify physical activity levels in populations began in the 1970s and 1980s and continue to the present day. During this time, physical inactivity was identified as a major risk factor for coronary heart disease with equal strength as previously recognized risk factors of cigarette

smoking, hypertension, and hypercholesterolemia (Fletcher et al. 1992). In 1995, the U.S. Centers for Disease Control and Prevention and the American College of Sports Medicine issued a consensus statement on the value of regular, moderate intensity physical activity as a health-enhancing behavior for the prevention of many chronic diseases (Pate et al. 1995), which led to the first U.S. Surgeon General's Report on Physical Activity and Health, released in 1996 (U.S. Department of Health and Human Services 1996). In 2008, the U.S. government updated the physical activity guidelines for children, adults, and older adults (U.S. Department of Health and Human Services 2011). Since the turn of the twenty-first century, recognition of the health promoting benefits of physical activity has occurred globally.

PHYSICAL INACTIVITY AS A PUBLIC HEALTH PROBLEM

Criteria have been used to identify the breadth of physical inactivity as a public health problem instead of merely a social or popular cultural issue. Four criteria will be discussed to answer the question: "Is physical inactivity a public health problem?"

1. Physical inactivity crosses geographic, political, and other boundaries. Differences in physical activity by race and ethnicity, cultural traditions, economic and educational strata, and geographic boundaries suggest a widespread condition not limited to a single population group or geographic location. Data are consistent that physical inactivity is higher in women than men, graded by educational attainment and social class, and influenced by cultures and traditions.
2. Physical inactivity affects the health, function, and well-being of a large number of people. Physical inactivity is causally associated with many types of chronic diseases, including coronary heart disease, type 2 diabetes, colon cancer, breast cancer, and potentially disabling conditions of overweight and obesity, depression, osteoporosis, and frailty among older adults (U.S. Department of Health and Human Services 2011). Globally, 1.9 million deaths are attributed to physical inactivity, a number which could be eliminated if all persons received at least 150 minutes per week of moderate and vigorous intensity physical activity (Lopez et al. 2006).
3. The causal mechanisms of physical inactivity, which involves a large number of people, are unknown. While a great deal is known about the causal mechanisms for the effects of physical activity on health and disease conditions, little is known about the many possible factors that contribute to sedentary lifestyles. How do age, sex, body mass, and self-efficacy influence decisions to be active or sedentary? Can social support, cultural traditions, and family dynamics help people to be more active? Or do they inhibit physical activity for selected individuals? Are worksite policies and access to recreational areas effective in promoting decisions to be physically active? And how do the urban form, transportation choices, and legislative mandates affect how people make choices to live active or sedentary lives? These are difficult questions, but it is essential to know the answers for effective promotion of physical activity at the community level.

4. Physical inactivity will get worse if it is not addressed as a community responsibility. A hallmark of the public health approach to preventing disease and ensuring good health is that a public health problem must be addressed at the community level and as a community responsibility. Community efforts reflect the sum of individuals, groups, institutions, organizations, and governments within cities, towns, and villages to act in coordination for optimal results. Physical activity surveillance in England shows a steady increase in the proportion of adults who meet their physical activity recommendations, increasing from 20% to 25% in women and 33% to 40% in men from 1997 to 2006 (Craig and Mindell 2008). This reflects a tremendous effort from government and volunteer groups to intentionally increase opportunities for physical activity. While a 5% increase in the prevalence of physically activity may not seem very large, every 1% decrease in sedentary behaviors can translate into thousands of lives saved from a chronic disease diagnosis or early mortality.

COMMUNITY PHYSICAL ACTIVITY PROGRAMS

Public health problems are best solved with coordinated, community approaches. An example of a community physical activity promotion project that has had a global influence on the promotion of physical activity is called Agita São Paulo (Agita São Paulo 2011). Led by Dr. Victor Matsudo, Agita São Paulo was launched in 1996 to encourage physical activity as a way of life in Brazil. At the start of the program, nearly 70% to 80% of residents in São Paulo, a city of 34.7 million people, did not meet the state's recommendation for 30 minutes per day and 5 days per week of moderate intensity physical activity. The program was so successful that it was exported to other states in Brazil, other countries in South America, and ultimately adopted by WHO as a network. The Agita Mundo Network (Move for Health for All) includes 59 countries and 263 member institutions.

From research performed in the past 50 years, we have learned a great deal about the health benefits of regular physical activity and of enhanced physical fitness (U.S. Department of Health and Human Services 2011). Almost all disease risks can be reduced by living a lifestyle with regular periods of moderate and/or vigorous physical activity. However, we remain challenged with identifying the best approaches to encouraging people to initiate and maintain active lifestyles on a regular basis.

SUMMARY

The philosophy of public health is that preventable death and disability ought to be minimized; that activities are conducted as an ethical enterprise as an agent for social change; and that change is made in the face of superstition, ignorance, public apathy, political interference, and with inadequate resources. We act as public health professionals to increase physical activity for community citizens because it is the right thing to do, not because it is the popular thing to do. As such, it is a goal of all physical activity health promotion advocates to increase the opportunity for citizens of any city and state to live active, healthy lives.

This book is a summary of the latest scientific research in the area of physical activity and health and is designed to guide public health practitioners and public health researchers. The 18 chapters in this book provide a comprehensive review of the field of physical activity starting with a historical approach and the latest information on physiological adaptation to physical activity and the unique contribution of sedentary behavior to overall health. This book also includes chapters describing the role of physical activity in the prevention and treatment of chronic disease as well as its role in relation to growth and development, among healthy adults and older adults, and in relation to obesity. Also covered are practical aspects such as measurement, national recommendations, and surveillance. The final chapters focus on promoting physical activity among hard to reach populations, worksites, and schools, as well as the contribution of the built environment and policy decisions in promoting physical activity.

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1 History of Physical Activity Contributions to Public Health

Amanda E. Paluch, Jack W. Berryman, Kenneth E. Powell, Ilkka Vuori, Charles M. Tipton, and Steven N. Blair

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INTRODUCTION

Surveys show that a large majority of adults believe that regular physical activity is good for health, although this does not necessarily translate into them getting sufficient activity. This concept of the importance of regular activity has a long history. In this chapter, we review some of the early comments on this topic, and trace the development of this theme throughout the twentieth century and up to the present. Space limitations prevent an exhaustive review of information on physical activity and health, and our comments are based on our own experience, a selective review, and recent events.

HEALTH, EXERCISE, AND EXERCISE PRESCRIPTION DURING ANTIQUITY

The importance of physical activity for good health and, in some instances, to cure disease, dates back to India and the river civilization in the Indus River Valley. Here, in about 1500 BC, were the 1,028 sacred hymns of the Rgveda (Rig-Veda) written in Sanskrit that included requests for benevolence and blessings from gods and goddesses and divine remedies for diseases. When health was mentioned, it was not related to disease or recovery from disease; it was viewed as a condition of the pleasure or displeasure of the gods. One hymn makes reference to the existence of three humors that influence health. Another sacred text, the Atharaveda (Atharva-Veda), also contains detailed information about medicine, health, and disease. Many of these Vedic texts were foundational elements in the development of what would later become Ayurvedic medicine (i.e., the science of life).

Between 1500 and 800 BC, the tridosa doctrine (also known as the trihautu doctrine and considered to be the Indian humoral theory) was developed. It was introduced to help explain the meaning of life, death, health, and disease while describing how the elements of water, fire, air, earth, and ether contributed to the formation of the human body. Interacting within the body were nutrient particles derived from the wind, sun, and moon that later became transformed into air, bile, and phlegm. These were regarded by the physician Susruta (ca. 600 BC) as *dosas* (humors) and were identified as *vayu*, *pitta*, and *kapha*, respectively. He added a fourth humor, blood, since he believed it was capable of influencing interactions between the other humors.

According to the tridosa doctrine, the humors controlled and regulated all functions of the body. When they were in equilibrium, health was present. But if one or more humors were displaced or out of balance with the others, health was impaired and illness or death could occur. In addition to disease, conditions that could alter the equilibrium between the humors were climate, food, fatigue, psychic changes, poisons, sedentary living, and exercise (Tipton 2008a).

Susruta's views on the importance of physical activity are contained in *The Sushruta Samhita*. He defined exercise as a "sense of weariness from bodily labor and it should be taken every day." It included walking, running, jumping, swimming, diving, riding, archery, wrestling, and javelin throwing. As a physician, Susruta prescribed exercise because it increased the growth of limbs; improved muscle mass, strength, endurance, and tone; reduced corpulence; increased resistance against fatigue; enhanced mental alertness, retentive memory, and keen intelligence; and improved appearance and complexion. In general, he believed that regular moderate exercise provided resistance to disease and "against physical decay" and stated, "Diseases fly from the presence of a person, habituated to regular physical exercise. . . ." Susruta was convinced that a sedentary lifestyle that included lack of physical activity, sleeping through the day, and excessive food or fluids, would sufficiently elevate the kapha humor to a level that would disrupt humoral equilibrium resulting in a disease state and potential death. Obesity was the likely result for which Susruta prescribed exercise (Tipton 2008b). Many of the themes in Susruta's works would be echoed centuries later in the Yoga-Sûtra of Pâtanjali. The Yoga-Sûtra, a Sanskrit

manual of nearly 200 aphorisms, emphasizes that the path to enlightenment necessitated physical activity. This text forms the basis of modern Hatha Yoga.

Just as the early religious and philosophical writings of Hinduism (i.e., the Vedic texts) laid the foundation for Ayurvedic medicine, early Taoist philosophy and thought strongly influenced the development of traditional Chinese medicine. Taoism, usually translated as "the Way" or "the Path," reflected the simplicity of nature and imbued ancient Chinese culture with a reverence for the relationship between life and death, as well as man's eternal struggle with nature. The gradual accumulation of Taoist and folk knowledge during antiquity further developed during the Warring States period (475–221 BC). The *Huangdi Neijing* (*The Yellow Emperor's Inner Canon*) was the culmination of centuries of observation and medical experience. This book is rich in the philosophy of physical activity. To remain healthy and avoid disease, one must first understand the body. Dietary modifications according to the alterations of yin and yang were emphasized along with paying attention to the duration of physical postures and activity (e.g., sitting, lying, standing, and walking). In another text, the *Annals of Mr. Lü*, a historical miscellany from the point of view of the Qin Kingdom (about 239 BC), the politician Buwei Lü referred to longevity as maintaining health that includes "conforming to natural laws of life," "abstinence," "removal of harmful factors," and "movement." "Movement" refers to exercise. This book uses simple truths from the daily life of ordinary people and highlights the influence of exercise on the human body. In the third century, the Chinese physician and surgeon Hua Tuo prescribed moderate exercise as a method to increase "yang" (i.e., masculine energy) and overcome disease.

Exercise also played a central role in ancient Greek and Roman culture from the 400s BC and the time of the Greek physician Hippocrates (460–370 BC) to the death of the Roman physician Galen (129–210 AD). They both emphasized that medicine consisted of two fundamental parts—hygiene (named after the goddess Hygieia) and therapeutics, or the treatment of disease. Accordingly, the physician was involved with patients on a regular basis to advise them on how to stay healthy and how to avoid sickness, along with restoring health if they became ill. In the era of Hippocrates, this involved an understanding of the four bodily fluids, or humors (blood, phlegm, yellow bile, and black bile), because the patient's health was believed to be dependent on their balance and harmony. The humors then had to be understood as they related to the four elements (earth, air, fire, and water) and the four primary qualities (hot, cold, wet, and dry) (Berryman 2010).

For his part, Hippocrates—based on observation and analysis of a patient's physiological information—would provide advice and a prescription of regimen. The main ingredients of his regimen were food and exercise since he believed that they—independently or in combination—had the greatest potential to alter the body's humoral makeup. To this end, Hippocrates wrote at least three separate books on regimen: *Regimen in Health*, *Regimen*, and *Regimen in Acute Diseases*. In *Regimen in Health*, he noted that "eating alone will not keep a man well; he must also take exercise. For food and exercise, while possessing opposite qualities, yet work together to produce health" (Berryman 2003).

The most prominent figure in medicine, anatomy, and physiology after Hippocrates was Galen. His theories and writings dominated medicine and went unchallenged