

HEARING & AGING

TACTICS FOR INTERVENTION

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Hearing and Aging

Hearing and Aging: Tactics for Intervention

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Grune & Stratton, Inc.

A Subsidiary of Harcourt Brace Jovanovich, Publishers

New York London Toronto Sydney San Francisco

Hearing and Aging

Library of Congress Cataloging in Publication Data

Maurer, James F

Hearing and aging.

Includes bibliographies and index.

1. Aged, Deaf. 2. Presbycusis. I. Rupp, Ralph R., joint author. II. Title. [DNLM:

1. Hearing disorders—In old age. 2. Hearing disorders—Rehabilitation. WV270.3 M453h]

RF291.5.A35M38 618.9'77'89 79-5170

ISBN 0-8089-1171-6

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Grune & Stratton, Inc.

111 Fifth Avenue

New York, New York 10003

Distributed in the United Kingdom by

Academic Press, Inc. (London) Ltd.

24/48 Oval Road, London NW 1

Library of Congress Catalog Number 79-5170

International Standard Book Number 0-8089-1171-6

Printed in the United States of America

Preface

The causes and consequences of hearing impairment during the aging years constitute a most complex and often perplexing matter encountered by those who seek knowledge about the subject or who endeavor to assist older persons. The challenge of deafness during the later years of the human life span is indeed awe-inspiring. Those who investigate the aging hearing mechanism or provide services to senior persons handicapped by auditory dysfunctions frequently discover more questions than answers about the causes, contributing conditions, and psycho-social manifestations of this syndrome.

This volume was prompted by an interdisciplinary need for a single source of information about the topic. Its primary objectives are twofold: (1) to provide a broad perspective for understanding hearing impairments that surface or interact with human aging; and (2) to describe behavioral management techniques and procedures for intervention. Although the authors humbly realize much of the iceberg awaits detection, considerable information is still known which merits recognition by audiologists, medical and nursing specialists, hearing aid dispensers, gerontologists, and those simply associated with hearing-handicapped older persons. We appreciate the fact that this first volume—encompassing works from the many fields involved with old age deafness—inevitably runs the risk of exclusion. It is hoped, however, that the book will serve to stimulate interest beyond its scope.

We are indebted to Gwenyth R. Vaughn, Ph.D., and Judith P. Frankmann, Ph.D., for their valuable contribution of a guide to resources and programs for older hearing-impaired adults, which appears in Chapter Seven.

We wish to express gratitude to our wives and families for their support and understanding during some very arduous years. To our graduate students at Portland State University and the University of Michigan, our thanks for their time, energy, and dedication. Finally, we wish to dedicate this book to a very special, hearing-impaired older person whose inspiration has been incalculable.

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What Is Aging?

HISTORIC PERSPECTIVE

The branch of medicine that concerns itself with the prevention and diagnosis of problems associated with aging is called “geriatrics,” a term coined in 1909 by an American physician, Ignaz Leo Vaschers. Accounts of the biophysical and behavioral changes that accompany the process of growing old have been recorded almost since the dawn of history. Hippocrates, in the fourth century, B.C., described the reduced muscular tonicity, skin elasticity, and blood circulation of the elderly. Two centuries later Aristotle wrote that old age was a form of illness, created by a reduction in body heat. This view was opposed by Claudius Galen, who considered aging an alterable physical process rather than an illness. Growing old was explained by Galen in the second century, A.D. as an imbalance between four basic physiologic properties: heat, cold, wetness, and dryness. He observed that cold and dry characteristics tend to predominate during the later years of life, and he prescribed exercise, suitable diet, and massage to counteract this imbalance. Much of the essence of his teachings survives to the present day.

During the Middle Ages, interest in rejuvenation and prolonging life consumed much of the attention of both religious and medical leaders. Elixirs, amulets, and superstitious rituals were espoused to a hopeful but ignorant lay public grasping for ways to reverse the degenerative aspects of increasing age. Precious metals and stones, as well as the internal organs of virile beasts, were used in concoctions that were often administered by “sorcerers” and “magicians.” Potions believed to cure deafness were derived from the brains of lions and the hearts of weasels (Thorndyke, 1923). Modern-day hormone

treatment may have originated from such early attempts to prolong life by developing "medicines" from reproductive organs. Moderation in eating habits and sexual activity, in conjunction with physical exercise, were thought by the Chinese, Indians, and early Christians to ward off old age. The much-touted Fountain of Youth, which led to the accidental discovery of Florida by Spanish explorer Ponce de León, consumed much interest during the fourteenth and fifteenth centuries.

Most traditional philosophies on aging held that growing old is an immutable transformation based solely on biologic changes. Current proponents of biologic aging can be divided into two camps, those who argue that bodily cells are programmed to deteriorate at a certain chronologic age and those who profess that aging is a passive process in which cells simply wear out (Hayflick, 1974). Attempts at investigating and altering the process have been aimed largely at identifying normal aging phenomena and producing changes in maturational biology. Geriatric human behavior has been evaluated merely as a surfacing of normal changes endogenous to the individual. Exogenous or environmental influences on aging have been largely ignored.

The acceleration of knowledge in the social and physical sciences during the twentieth century channeled public attention away from the restoration of youth and toward the retardation of aging. Traces of gullibility continue to persist even today, however. Leonard Hayflick (1974), a microbiologist, summarizes some twentieth century misconceptions:

One need not dwell more upon exploitations of the subject [of life prolongation] by the sensational press and television and by medical quacks than to consider the four major age decelerating hoaxes perpetrated in this century. First, the fermented milk (yogurt) craze of the early 1900's; second, the transplantation of animal gonads to man attempted in the 1920's; third, the cytotoxic serum advocates of the 1940's; and finally, the current fads described as "cell therapy," "cryogenic preservation" and the highly touted but unproven nostrum Gerovital H₃. (p. 40)

The science of gerontology is an interdisciplinary activity. It encompasses all aspects of aging, including the physiologic, sociologic, psychological, religious, and political. The gerontologist is concerned with retarding the consequences of growing old through preventative mental and physical treatment as well as with illuminating those forces that accelerate or reduce the aging process.

SOCIAL THEORIES ON AGING

Theories advanced by gerontologists to explain aging have focused on social behavior and the interaction of environmental parameters. The theory of disengagement (Cumming, 1960; Cumming & Henry, 1961; Cumming,

1964) suggests that growing old is a gradual withdrawal from society, a mutual disinvolvement of the elderly individual and the social forces surrounding him. This reciprocal loss of interest was attributed by Cumming to increasing biologic limitations, the perceived inevitability of death, and the escalating loss of social relationships. Disengagement is a self-perpetuating process in which the search for lost ties with society becomes less rewarding and the need for a new meaning of existence more crucial. Cumming's theory views the first stage of aging as a severance of the bonds established by employment and by family leadership roles. The second stage is represented by terminal dependency, in which the aging individual can no longer maintain behaviors necessary for health, cleanliness, or propriety.

A developmental theory advanced by Kastenbaum (1961; 1964) suggests that old age is the culmination of personal growth. Recognizing the wide latitude of individual differences embodied in the concept that "old age is the end of development," Kastenbaum describes four possible alternatives within his theory. First, development may terminate at a certain point in the aging process, although life may continue. Second, the individual may continue to develop through the later years and never reach "old age." Third, an elderly person may continue to develop even in old age. Fourth, individual growth and change may continue but may or may not reach the plateau commonly characterized as old age and may or may not be considered to be a form of development when old age is reached. How people organize their lives in accordance with their perceptions of their own timetables implies a continual reorganization of values and a reorientation of life experiences. This developmental growth process ceases for some individuals during the later years, and old age sets in because they become incapable of change.

Lindsley's multiple cause-deficit-repair theory of aging (1964) emphasizes the long-term accumulation of deteriorating influences that become increasingly manifest with the fading of youth. A lifetime of physical and emotional abuses culminate in specific behavioral deficiencies that gradually impede performance. Because of the diversity of disabling physiologic and psychological agents acting upon the system during earlier years, multiple deficits comprising both physical and mental problems may be anticipated in old age. Individual differences among elderly persons are explained not only on the basis of variations of accumulated deficits but also by each person's ability to cope with and compensate for his or her unique array of disabilities. Lindsley's conception of aging as a form of behavioral deterioration establishes a foundation for separating and analyzing response deficiencies among older persons.

Some specific applications toward modifying complex aging behaviors have been described by Hoyer (1973), who views the process of growing old as an interaction "between a biologically maturing organism and changing environmental events and consequences" surrounding the organism. Those

responses that comprise "aging" behavior are identified in terms of the environmental reinforcers that maintain them. The elderly person's environment is then altered to shape new, more adaptive responses while extinguishing or reducing maladaptive behaviors. The advantage of this instrumental approach toward rehabilitation of the aging is that it can be accomplished independent of the developmental forces that contributed toward old age.

In this vein, some research has supported the notion that as age progressively increases among the elderly, the frequency of reinforcing activities decreases (Lawinsohn & MacPhillamy, 1974). Apparently this response is not due to the loss of potency of rewarding activities but is associated with a gradual loss of the physical or mental skills that were once used to manage life's pleasures. For example, the effort required to initiate or perform an enjoyable activity ultimately may detract from the pleasure that the activity once held. Even self-esteem may be affected, since the older individual has a less positive image with which to identify (Kuhlen, 1959).

The number of interactions with the environment tend to decrease as a function of chronologic aging and physiologic decline, a relationship that forms the basis of the activity theory of aging (Cavan, Burgess, Havighurst, & Goldhamer, 1949; Havighurst & Albrecht, 1953). This theory proposes that a direct relationship exists between the older person's decreasing level of participation in social activities and personal satisfaction with life. Physical and environmental changes, such as loss of occupation or altered living conditions, force the older person to reduce social participation. As activities with and within the environment lessen, individuals increasingly feel alienated from their environment and their self-images deteriorate correspondingly (Maddox & Eisdorfer, 1962). Conversely, the successful aging person is one who is able to substitute more realistic activities for those that have been relinquished and replace new human associations for those that have been lost (Havighurst, 1963). The activity level, patterns, and value system of middle age, although modified, are preserved during the later years of successful aging.

BIOLOGIC AGING

Whatever the influences of social and physical forces acting upon the individual, the biologic process of aging appears to be the most inevitable and immutable. The human body ages. Its composite systems deteriorate at a rate that according to Goldstein (1971) is less than uniform. In some tissues the number of cells being produced decreases; in others, overproduction occurs. There is an accumulation of foreign substances within neural and muscle cells as well as extracellular deposits that interfere with normal activity and growth.

Physically, there is an outward similarity in aging characteristics within the species.

The consistency of these factors argues strongly in favor of a genetic determinant of aging, a lifespan either programmed to extinction by specific genes coded for such terminal changes or whose information-carrying molecules accumulate errors over time that eventually interrupt cellular function, causing degeneration and death. Considerable evidence is now at hand that supports a number of hypotheses.

The somatic mutation theory of aging postulates that increasing longevity of bodily cells is accompanied by a progressively higher frequency of cell mutations. This increase in the number of unrepaired mutations interferes with the primary function of the cell. Both duration of life-span and rate of aging may be directly related to chromosome damage arising from the mutation process (Curtis, 1965; Curtis & Miller, 1971).

Free radical theory of aging. A free radical is a type of molecule (in this case, produced by reactions within the mitochondria) that possesses a free, unbound electron. Radicals that escape from their systems may react with other molecules, threatening the integrity and function of cellular activity. Free radicals can react with RNA, the messenger agent of DNA, causing errors in protein synthesis and thus in the "script" that the cell is programmed to perform. The degeneration of molecules and changes in body chemistry may account for the loss of tissue elasticity, arteriosclerosis, and calcification commonly observed among the elderly (Harman & Piette, 1966), and longevity may be directly proportional to the rate of metabolic degradation.

Immunologic theory of aging. According to this theory, cellular aging represents a gradual decline in immunity to various disease states. As cells age they undergo immunogenetic diversification and become less resistant to infectious processes to which they were once naturally immune (Wolford, 1969; Peter, 1973).

The Hayflick theory. Microbiologist Hayflick's investigations* of human fetal and adult cell strains have attached considerable credence to the concept that aging is an inherent property of normal cells (1973; 1974). He reasoned that much of the previous research demonstrating cellular immortality, or infinite replication capability, utilized abnormal cell populations studied in vivo. Hayflick's experiments with human fibroblast cells revealed that they possess an inherent biologic "timepiece" that programs them

*Dr. Hayflick's outstanding research on human cells and aging contributed toward his recognition by the Robert W. Kleemeier Award in gerontology in 1972.

for extinction. Arresting cell division by storing them in liquid nitrogen (-195.8°C) for several years and then restoring these cells did not alter the genetic limits of the doubling process, nor did transplanting aging cells into more youthful systems alter their proliferation. The genetic program for growing old, whatever its exact form in human cytology, apparently has a "memory." Regarding the relation between disease states and senescence alluded to earlier, Hayflick (1974) again provides a credible viewpoint:

One is forced to conclude that if all disease-related causes of death were to be resolved, then the aging processes would present some clear physical manifestations well in advance of death itself. The challenge, of course, is to separate disease-related changes from the basic biological changes that are a part of the aging process. Since fundamental aging processes most certainly contribute to or allow for the expression of pathology, then the two concepts may be so closely intertwined as to make any clear distinctions a futile exercise in semantics. (p. 43)

Biologic aging is strongly associated with heredity. Busse (1969) considers those changes that are inborn, inevitable, and unrelated to psychologic stress, physical trauma, or disease processes as examples of primary aging. Secondary aging consists of disabilities that are related to stress, trauma, or disease. Individual senescence is a singular combination of the two. As Jarvik (1975) has suggested, biologic determinants of senescence are often difficult to explain in exclusion of psychological changes, which are also known to signal physiologic aging. Thus while biochemical data within the genetic machinery likely trigger the gradual process of deterioration in the body, individual attitudinal resistance to the concept of "growing old" also is an observable phenomenon in human behavior.

THE CHRONOLOGY OF AGING

The normal human life span is now 70–80 years, which constitutes a 20-year increase in life expectancy over that of 50 years ago, when death, on the average, occurred in one's fifth decade. The 1971 White House Conference on Aging disclosed that the population 65 years or older increased from 3.1 million in 1900 to over 20 million in 1971, and by the year 2000 it will number about 25 million (Martin, 1971) (Table 1-1). U.S. Bureau of Census information (1976) indicates that women comprise about 30 percent more of the population, an imbalance that has been steadily increasing. For both sexes the fastest-increasing segment of the aging population is the older set (75 years and above).

The elderly represent about ten percent of the population in the U.S., one of the largest "minority groups" of Americans. The common retirement age

Table 1-1
Percentage of the Total Population Age 65 Years and Over: 1900–2050

Actual		Projected	
<i>Year</i>	<i>Percent</i>	<i>Year</i>	<i>Percent</i>
1900	4.1	1980	11.0
1910	4.3	1990	11.7
1920	4.6	2000	11.7
1930	5.4	2010	11.9
1940	6.8	2020	14.6
1950	8.1	2030	17.0
1960	9.2	2040	16.1
1970	9.8	2050	16.1
1975	10.5		

U.S. Bureau of Census data compiled by Harris, C. S. *Fact book on aging: A profile of America's older population*. Washington, D.C.: The National Council on Aging, 1978, p. 11.

of 65 tends to be most often associated with earliest inclusion in the category called “elderly,” although social scientists have observed more recently that the term may represent more of a social judgment than a biologic eventuality (Sontag, 1972). Whether or not a person is indeed elderly has more to do with a number of complex, interrelated lifestyle variables than with chronologic age. Variances in the physiologic manifestations of aging are considerable, agreeing to a great extent with individual responses to life stress. An “over-dosage” of such aging factors tends to accelerate the process, producing elderly individuals in their early fifties, while “younger” 70-year-olds continue to live energetic, productive lives. The investigation of these variables embodies the entire field of gerontology and is beyond the scope of this text, although certain areas of significance have surfaced that provide a better understanding of this population.

LIVING SITUATION

Two-thirds of the men but only one-third of the women age 65 years or older in the U.S. are still living with their spouses in these ages still (Church, 1973). The earlier widowhood status for females is associated with the fact that men tend to marry women younger than themselves and that women generally have longer lifespans. Most of the aging population are members of family groups, with only about 20 percent kinless. The majority of elderly