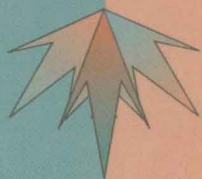


INTRODUCTION TO AUDIOLOGIC REHABILITATION

Third Edition



Ronald L. Schow
Michael A. Nerbonne

Introduction to Audiologic Rehabilitation

Third Edition

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Allyn and Bacon

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**To our colleagues, for their
expertise, new ideas, patience,
and enduring friendship.**

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Preface

Using the feedback from our colleagues and students, we have made extensive updates and revisions to *Introduction to Audiologic Rehabilitation*. Even the title reflects improvement by incorporating the now more preferred term *audiologic*. As a result, we believe this third edition is well-suited for preparing current undergraduate or graduate students in rehabilitative audiology. Included are the same features that have prompted many professors to adopt this book in speech and hearing programs for over 15 years. Seven chapters introduce the fundamentals. Three more chapters cover comprehensive methods and procedures that focus on each age group—children, adults, and elderly adults. We have continued the tradition of thorough documentation and ample illustration. Finally, the text concludes with two case-study chapters and a resource chapter. Included in the updating is a reference to the changing state of audiology wherein a new degree, the Doctor of Audiology, is gradually emerging to revitalize our profession.

We expect that others who teach in this area will find this a readable, current, and practical textbook that will be easily understood by students. Working professionals and students will find a complete listing of resources, with ample appendices containing tests, self-report questionnaires, and other updated materials useful in their clinical rehabilitative work. Recent surveys and position statements by professional organizations are included to make this a valuable compendium of information.

We have included a broad array of case studies to help students understand the variety of audiologic rehabilitation procedures and how they may be applied. Students can learn how today's audiologists are providing complete service—from the use of cochlear implants for deaf youngsters, to the application of the latest programmable hearing aids and assistive devices for adults—in a vast array of commercial, health, and traditional clinical settings.

It goes without saying that the completion of this textbook is the result of efforts made by many contributors who should be commended for their willingness to share

their expertise and time in writing major portions of the book. We also appreciate the flexibility and cooperative spirit they had when we requested revisions and imposed deadlines. All are true professionals in every sense of the word. In the final stages of editing, we were saddened by the sudden death of one of our contributors, Carl Binnie. His case study in Chapter 12 exemplifies the commitment Carl had to providing quality audiologic rehabilitation to his clients and a quality education to his students as well.

Once again, our university colleagues have been both helpful and supportive to us throughout the project. In particular, we would like to single out Diana Hughes, Jerry Church, Linda Seestedt-Standford, Mike Arsenault, Thayne Smedley, Dave Sorensen, Ken Medley, Jeff Brockett, David Mercaldo and Barry Griffing for their suggestions and support, which helped immeasurably as we worked to update the book. We also thank Tracie Radford, Nancy O'Brien and Rob Shaw for the much-appreciated word processing and cheerful assistance they have rendered. Our thanks also to the folks at Allyn and Bacon for their expertise throughout. Users of the second edition, both professors and students, who have offered insightful comments and suggestions to us and thus had a major influence on the content of this third edition are likewise appreciated.

Finally, we want to express love and appreciation once again to our respective families for their continued support and understanding throughout the time we were engaged in writing and editing this edition.

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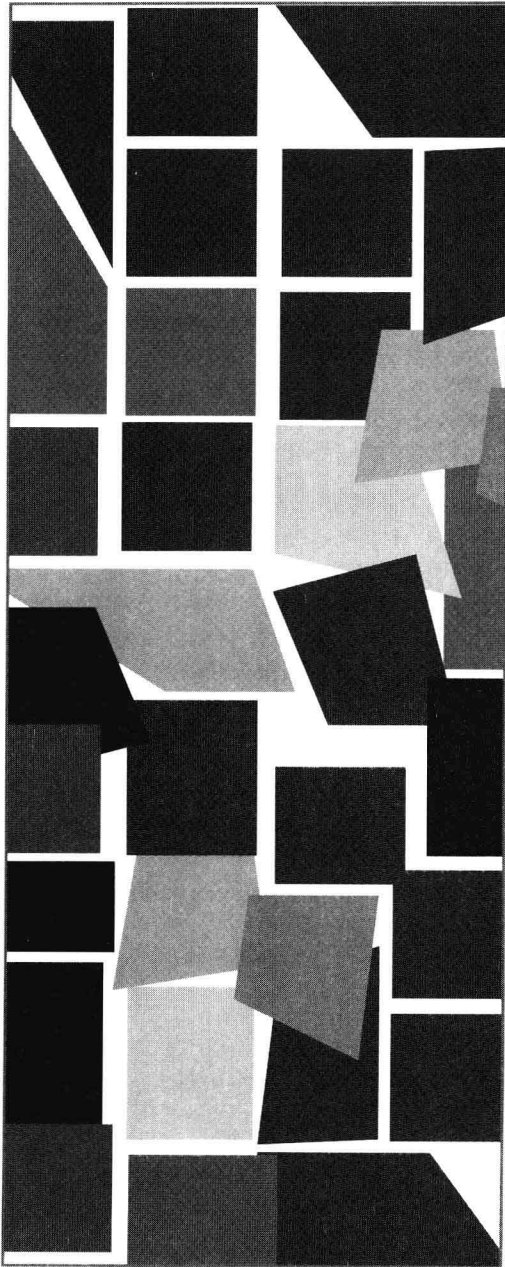
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PART ONE



Fundamentals of Audiologic Rehabilitation

Overview of Audiologic Rehabilitation

RONALD L. SCHOW
MICHAEL A. NERBONNE

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INTRODUCTION

Most of us have had occasion to converse with someone who has a hearing problem. Unless the person had received proper help for the hearing difficulties it probably was a frustrating experience for both parties. When the person with hearing loss is a family member or close friend we become aware that the emotional and social ramifications of this communication barrier can be substantial as well. Providing help to address all of these hearing problems is the focus of this book. Help is possible, but often not utilized. This chapter gives an overview of a process that is crucial for the welfare of persons who suffer from hearing impairment and, in turn, for those who communicate with them.

Definitions—Synonyms

Simply stated, we may define *audiologic habilitation/rehabilitation* as those professional efforts designed to help a person with hearing loss. These include services and procedures for lessening or compensating for a hearing impairment, and specifically involve facilitating adequate receptive and expressive communication (ASHA, 1984; ASHA, 1992). A key consideration in this rehabilitation process involves assisting the person with hearing impairment to attain full potential by using personal resources to overcome difficulties resulting from the hearing loss. Two kinds of important service that are closely related but distinct from the audiologic habilitation/rehabilitation process are *medical intervention* and *teaching academic subjects to the deaf*.

Several terms have been used to describe this helping process. *Audiologic habilitation* refers to remedial efforts with children having a hearing loss at birth, since technically it is not possible to restore (rehabilitate) something that has never existed. *Audiologic rehabilitation*, then, refers to efforts designed to restore a lost state or function. In the interest of simplicity, the terms *habilitation* and *rehabilitation* are used interchangeably in this text, technicalities notwithstanding. Variations of the *audiologic rehabilitation* term include *auditory and aural rehabilitation*, *hearing rehabilitation*, and *rehabilitative audiology*. Terms used to refer to rehabilitative efforts with the very young child include *parent advising/counseling/tutoring* and *pediatric auditory habilitation*. *Educational* (or *school*) *audiology* is sometimes used to refer to auditory rehabilitative efforts performed in the school setting.

Providers of Audiologic Rehabilitation

Audiologic rehabilitation (AR), then, is referred to by different names, and is performed in a number of different settings. All aspects of assisting the client in the audiologic rehabilitation process are not performed by one person. In fact, professionals from several different disciplines are often involved, including educators, psychologists, social workers, and rehabilitation counselors. Nevertheless, the audiologist in particular, and in some circumstances the speech-language pathologist or the educator of those with impaired hearing, will assume a major AR role. These professionals

provide overall coordination of the process or act as advocates for the person with impaired hearing. Audiologic rehabilitation is not something we *do* to a person following a strict “doctor-knows-best” medical model. It is a process designed to counsel and work with persons who are deaf and hard of hearing so they can actualize their own resources in order to meet their unique life situations. This text has been written with the hope of orienting and preparing such “counselors” or “advocates for the hearing-impaired.”

Education Needs of Providers

Recently, much discussion has centered around establishing a professional doctorate in audiology as the minimum educational requirement to practice as an audiologist. The Academy of Rehabilitative Audiology (ARA) recently adopted a position statement which emphasizes the need for future Au.D. students to be well prepared in audiologic rehabilitation. The ARA provides a list of relevant content areas in AR which should be incorporated into any Au.D. program to insure adequate preparation in this all-important area of audiology. This statement and an earlier document along similar lines are available as a resource in this text (see ARA, 1993 and ASHA, 1984, statements on competencies for AR in Chapter 13).

Regardless of academic background, those from the different professions mentioned in the previous section who successfully perform AR must, like competent audiologists, possess an understanding of and familiarity with several areas of knowledge. These include (a) characteristics of hearing impairment, (b) effect of hearing loss on persons, and (c) the previously noted competencies needed for providing audiologic rehabilitation. For purposes of the present treatment, it is assumed that other coursework or study has brought the reader familiarity with the various forms of hearing impairment, as well as procedures used in the measurement of hearing loss. These procedures, referred to as *diagnostic audiology*, serve as a preliminary step towards rehabilitative audiology. The task at hand, then, is to review briefly some characteristics of hearing loss, to explore the major consequences of hearing impairment, and finally to discuss the methods and competencies needed to help with this condition.

HEARING-LOSS CHARACTERISTICS

Important characteristics of hearing loss as they relate to audiologic rehabilitation include (a) degree of impairment, (b) time of onset, (c) type of loss, and (d) auditory speech recognition ability.

Hearing-Impairment Degree

One major aspect of hearing impairment or loss is the person's hearing sensitivity or degree of loss (see Table 1.1). The category of hearing impairment includes both the hard of hearing and the deaf. Persons with limited amounts of hearing loss are

referred to as being *hard of hearing*. Those with an extensive loss of hearing are considered deaf. Generally, when hearing losses, measured by pure tone average (PTA) or speech recognition threshold (SRT), are poorer than 80–90 dB HL, a person is considered to be *audiometrically deaf*. However, deafness can also be described as the inability to use hearing to any meaningful extent for the ordinary purposes of life, especially for verbal communication. This latter way of defining deafness is independent of the findings from audiometric test results.

The prevalence of hearing impairment may be considered for all persons combined and for children and adults separately. In the United States the prevalence of hearing impairment is estimated to be from 14 to 40 million, depending on whether conservative or liberal figures are used (Goldstein, 1984; Ries, 1994; Schow, et al., 1994). These estimates vary depending on the definition of loss; the loss may be self defined or involve different dB fence levels, some as low as 15 dB HL, but most are higher, commonly 20–25 dB HL. Authorities have suggested that a different definition of loss should be applied for children because in a younger person the consequences are greater for the same amount of loss (Roeser, 1988). The prevalence of loss also varies depending on whether the conventional pure-tone average (500, 1000, 2000 Hz) is used or whether some additional upper frequencies (like 3000 and 4000 Hz) are included. In this book we recommend that different pure-tone average fences be used for children and adults at the “slight-to-mild” degree of loss level, although the degree designation is similar at most levels. In addition, we recommend that either 3000 or 4000 Hz be used in evaluating loss, although the usual three-frequency pure-tone average will typically be used in analyzing audiograms. Table 1.1 indicates that a hearing loss is found in children at a lower (better) dB level than in adults; this is consistent with ASHA screening levels for school children that define normal hearing up to and including 20 dB HL (ASHA, 1985). A reasonable estimate from recent prevalence studies would be that at least 10% of the population have permanent, significant impairment of hearing (25 million in the U.S.). Approximately $\frac{1}{3}$ of 1% of the total U.S. population is deaf (about .7 million). Thus, the remaining 24.3 million are in the hard-of-hearing group (Schow, et al., 1994).

Children form a subpopulation of the total group of 25 million individuals with impaired hearing. It is estimated that about 3 million children in the United States are

TABLE 1.1 Degree of Hearing Impairment Descriptions, Based on Pure-Tone Findings^a

Degrees of Hearing Impairment	PTA in dB based on .5, 1, 2, 4 K ^b Hz		
	Children		Adults
Slight to Mild	21–40		26–40
Mild to Moderate	—	41–55	—
Moderate	—	56–70	—
Severe	—	71–90	—
Profound	—	91 plus	—

^aBased on levels advocated by the Committee on Hearing of the American Academy of Ophthalmology and Otolaryngology (adapted from AAOO, 1965).

^bK = 1000.

deaf and hard of hearing, and even more fit in this category if high-frequency and conductive losses are included (Shepherd, Davis, Gorga, & Stelmachowicz, 1981; see Chapter 8). Of this total 3 million, about 50,000 school-age youngsters are classified as deaf (American Annals of the Deaf, 1994; Schein & Delk, 1974). As with children, most adults with impaired hearing are considered to be hard of hearing and only a small minority are deaf (Ries, 1994; Schow, et al., 1994; Davis, 1994).

Degree (sensitivity), however, is only one of several important dimensions of a hearing loss. Even though it is often the first measure available and provides useful evidence of the impact of the loss, there are exceptions to this generalization. Some children with a profound impairment of 90 dB HL outperform—in language and academic areas, average children who have a loss of only 70 dB HL.

Table 1.2 contains a description of deafness and hard-of-hearing categories in terms of typical hearing aspects, use of hearing, use of vision, language development, use of language, speech, and educational needs. Prevalence estimates are also shown.

Time of Onset

Most hard-of-hearing youngsters are thought to have hearing loss beginning early in life, but mild losses may not be detected, so prevalence data on young children are scarce and somewhat uncertain (Lundeen, 1991). With youngsters who are deaf or have more severe impairment, the time when a hearing loss is acquired will determine, in part, the extent to which normal speech and language will be present. Severe hearing loss (deafness) may be divided into three categories (*prelingual*, *postlingual*, *deafened*) depending on the person's age when the loss occurs (Department of Labor, 1971; see Tables 1.2 and 1.3). *Prelingual deafness* refers to impairment present at birth or prior to the development of speech and language. The longer during the crucial language development years (up to age five) a person has normal hearing, the less chance there is that language development will be profoundly affected. *Postlingual deafness* means loss occurs after about age five; its overall effects are therefore usually less serious. However, even though language may be less affected, speech and education will be affected substantially (see Chapters 5 and 7). *Deafened* persons are those who lose hearing after their schooling is completed (i.e., sometime in their late teen years, or thereafter). Normal speech, language, and education can be acquired by these individuals, but difficulty in verbal communication and other social, emotional, and vocational problems may occur (see Table 1.3).

Type of Loss

The type of loss may be *conductive* (damage in the outer or middle ear), *sensorineural* (impairment in the inner ear or nerve of hearing), or *mixed* (a combination of conductive and sensorineural). Generally, conductive losses are amenable to medical intervention whereas sensorineural losses are primarily aided through audiologic rehabilitation. Other less common types of loss are possible as well, such as *functional* (nonorganic) problems and *central auditory processing* (CAP) disorders

TABLE 1.2 Categories and Characteristics of Hearing Impairment

Characteristic	Hard of Hearing (24,333,000) ^a	Category of Deafness		
		Prelingual (75,000) ^a	Postlingual (150,000) ^a	Deafened (442,000) ^a
Hearing impairment	Sensitivity: mild, moderate, or severe; Recognition: fair to good (70%-90%)	Sensitivity: severe or profound degree of loss; Recognition: fair to poor		
Use (level) of hearing	Functional speech understanding (lead sense)	Functional signal-warning/environmental awareness (hearing minimized)		
Use of vision	Increased dependence	Increased dependence		
Language and speech development	Dependent on rehabilitation measures (e.g., amplification)	Dependent on amplification and early intervention	Dependent on amplification and school rehabilitation	Normal
Use of language	May be affected	Almost always affected	May be affected	Usually not affected
Use of speech	May be affected	Always affected	Usually affected	May be affected
Educational needs	Some special education	Considerable special education	Some special education	Education complete

^aUnited States prevalence data for these categories, based on Schow, et al. (1994); Davis (1994); and Goldstein (1984) incidence figures

TABLE 1.3 Definitions of Hearing Impairment

Persons with hearing impairment have been divided into the following groups:

Prelingually Deaf persons were either born without hearing (congenitally deaf) or lost hearing before the development of speech and language: 3–5 years (adventitiously deaf). Both speech and language are affected to varying degrees and—because they usually are acquired formally instead of naturally—may be stilted, mechanical, and difficult to understand. The pre-lingually deaf person communicates primarily through fingerspelling, signs, and writing, but may possess enough speech and speechreading ability for basic social expression.

Postlingually Deaf persons are those who became profoundly deaf after the age of 5–10 years and, although possessing no hearing for practical purposes, had normal hearing long enough to establish fairly well developed speech and language patterns. While speech generally is affected (more for the 5- than for the 10-year-old), communication may be through speech, signs, fingerspelling, and writing. Once the counselor becomes accustomed to their speech, it may be quite understandable. Speechreading, however, may be more haphazard and not always dependable.

Deafened refers to those people who suffer hearing loss after completing their education—generally in their late teens or early twenties and upward. Such people usually have fairly comprehensible, nearly normal speech and language, but they need instruction to acquire useful speechreading. Quite frequently they face problems of adjustment because of the late onset of their hearing loss.

Hard-of-Hearing persons may have been born thus or subsequently experienced a partial loss of hearing. While they have acquired speech normally through hearing and communicate by speaking, speech may be affected to some extent; for example, the voice may be too soft or too loud. They understand others by speechreading, by using a hearing aid, or by asking the speaker to raise his or her voice or enunciate more distinctly.

Source: *Interviewing Guides* (pp. 1–2) by U.S. Dept. of Labor, 1971, Washington DC: Author; as adapted from Moores, 1996 and Vernon and Andrews, 1990.

(which arise from the processing centers in the brainstem or the brain). In the latter type of loss the symptoms may be very subtle. In cases of sensorineural loss, auditory speech recognition or hearing clarity is usually affected. This is also the case in difficult listening situations for those with CAP problems.

Auditory Speech Recognition Ability

Auditory speech recognition or identification ability (clarity of hearing) is another important dimension of hearing loss. The terms *speech recognition*, *speech identification*, *speech discrimination* and *speech intelligibility* will be used interchangeably throughout this text, and all are included under the general category of speech perception or comprehension (see Chapter 3). *Speech discrimination* has been used for many years to describe clarity of hearing as measured in typical word intelligibility tests, but *speech recognition* and *identification* have now replaced *discrimination* since they more precisely describe what is being measured. *Discrimination* technically implies only the ability involved in a same—different judgment, whereas *recognition* and *identification* indicate an ability to repeat or