

SECOND EDITION

FUNDAMENTALS OF

# AUDIOLOGY

FOR THE SPEECH-LANGUAGE PATHOLOGIST

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13279-3

#### **Production Credits**

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Composition: Cenveo® Publisher Services  
Cover Design: Scott Moden  
Rights & Media Specialist: Merideth Tumasz  
Media Development Editor: Shannon Sheehan  
Cover Image/Design Photo: © Filip Fuxa/Shutterstock  
Printing and Binding: LSC Communications  
Cover Printing: LSC Communications

#### **Library of Congress Cataloging-in-Publication Data**

Names: Welling, Deborah R., author. | Ukstins, Carol A., author.  
Title: Fundamentals of audiology for the speech-language pathologist/  
Deborah Welling and Carol Ukstins.  
Description: Second edition. | Burlington, Massachusetts: Jones & Bartlett Learning, [2019] | Includes bibliographical references.  
Identifiers: LCCN 2017010700 | ISBN 9781284105988  
Subjects: | MESH: Hearing Disorders—therapy | Hearing Disorders—diagnosis | Hearing—physiology | Speech-Language Pathology—methods  
Classification: LCC RF290 | NLM WV 270 | DDC 617.8—dc23  
LC record available at <https://lccn.loc.gov/2017010700>

6048

Printed in the United States of America  
21 20 19 18 17 10 9 8 7 6 5 4 3 2 1

*I dedicate this book to my mother, Regina, and to my sister, Barbara,  
who inspired me to pursue audiology.*

*To my husband, Bill, for the days, months, and years of  
seeing me through this project again.*

*To my friends of faith, especially Harissa and Isabel,  
who not only get me through each day but  
through the bumps in life as well.*

*Thank you for your support.*

*—Deborah R. Welling*

*I dedicate this book to Dr. Susan Rezen, the person who taught me to love audiology,  
and to never say “Oops!” behind an audiometer. To my family: my husband, Jim,  
and my children, Nyasia, John, and Elizabeth, who have afforded me the time  
to be away from them again to complete a Second Edition.*

*To my mother, Joyce, who taught me  
that I could do anything.*

*—Carol A. Ukstins*

*Together, we dedicate this book to Dr. Annette Zaner, mentor and friend,  
who brought us together more than 25 years ago, never imagining  
that we would still be working together 25 years later.*



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# Foreword

As an undergraduate student with aspirations to become a speech-language pathologist, I found my first course in audiology to be interesting but not particularly practical. I knew hearing was important for language and communication, but I thought hearing problems would be managed by the hearing professionals (audiologists) and that I would diagnose and treat the speech disorders. To a young student in the communication disorders professions, the division between audiology and speech-language pathology seemed clear. They (AuDs) did hearing tests and we (SLPs) did therapy. End of story. Except, as I advanced in my studies and began to see the connection between the classroom and the clinic, it became clear that the input (hearing) and output (speech) modes of communication were integrally linked and that any separation of those modes would negatively affect rehabilitation. While I loved learning about speech and language development—how we produce certain sounds, how children put sounds together to make words and then to make sentences—it became clear that I needed to give more than minimal attention to the role of hearing and auditory processing as a foundation for language and speech.

As a clinician, one may focus on ways to improve clients' output; to advance the form of their language and how they use speech, communication, and social skills to effectively interact with the world around them. However, the SLP's role in oversight and management of hearing status may seem unclear. The SLP's responsibility to his or her client may seem limited to performing a hearing screening and creating an action plan of what to do if someone failed a screening. However, understanding one's

role beyond this referral process may be incomplete. The SLP may have the confidence to read an audiogram and identify the degree and severity of a hearing loss but is likely less able to predict the impact of that loss on communication and quality of life. The ability to partner with colleagues in audiology will become a valuable tool and resource resulting in better client outcomes.

In my work as a faculty member, I have been challenged with what to teach my students about teamwork and collaboration for patients with hearing challenges. Changes in health policy are impacting our practices. We are increasingly called upon to collaborate with our colleagues to work together to reduce cost and implement efficiencies that improve our patients' lives. This valuable resource can provide a bridge between the professions of speech-language pathology and audiology and facilitate collegial exchange and collaboration. The publication of the first edition of this book was a welcome addition to the library of both seasoned SLPs and students of the profession. Now with this revised and expanded edition, Deborah Welling and Carol Ukstins have provided even more tools for SLPs to enable them to engage in effective inter-professional practice for individuals with hearing challenges.

As the scope of practice for SLPs has evolved and our research base has expanded, the crucial role the practicing speech and language pathologist plays in oral and written communication is better understood. Our ability to interact with our environment through the auditory sense is essential for the foundation of social interaction, for comprehension, and for language and literacy. In this text, Welling and

Ukstins, both audiologists, display a keen awareness of the role of the SLP in management of auditory issues for individuals with communication disorders. This book serves as an eminently practical guidebook to help SLPs navigate the complex world of hearing and hearing impairment.

In this revised edition, the authors have added key content across a range of subject areas. The importance of screening as a preventive measure for language and learning difficulties is emphasized and the reader is provided with comprehensive guidelines on how to establish and conduct high-quality screening programs. Strategies for measuring the impact of hearing loss on the quality of life of an individual are described, and program planning for populations across the lifespan, from early intervention to adults, is included. A major contribution is new content on language and literacy development

for children with hearing loss. There have been major gains in this area, but the gap in skills remains.

Written with clarity and practicality, this text is an excellent primer for students and new clinicians and a valuable tool for the experienced SLP. We are reminded why hearing is so important and why the SLP role is so much broader than conducting a pure-tone screening test. Readers will understand the key role SLPs play in mitigating the impact of hearing loss on the quality of life for individuals with communication disorders. As is stated several times throughout the book, we will serve our patients well if we think “hearing first.”

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# Preface

## Introduction

*Fundamentals of Audiology for the Speech-Language Pathologist* is a manuscript forged as a true interdisciplinary text designed by a group of professionals with a sincere interest in training the speech-language pathologist in the essential components of audiology practices. For the student, it is our hope that this text provides a solid foundational understanding of the hearing mechanism, audiological equipment and procedures, and the diagnosis and (re)habilitation of hearing loss. For the practicing speech-language pathologist, *Fundamentals of Audiology for the Speech-Language Pathologist* should be viewed as a reference to use when seeking guidance in the management of hearing loss. It is not, however, intended to take the place of consulting one-on-one with colleagues in audiology, but rather to be used as a tool to aid in asking the right questions. In order to maintain a text that is equal in both breadth and depth, much of the technical jargon used throughout the field of audiology has been replaced with easy-to-understand text providing the speech-language pathologist with an adequate understanding of audiometric concepts without getting bogged down in terminology.

When considering the demands of a career as a speech-language pathologist, your role in performing measures of hearing sensitivity or working with individuals with hearing loss may or may not have crossed your mind. However, both fall (within guidelines) under the scope of practice as a speech-language pathologist. Clearly, then, in order to perform screening measures and interpret test data, a certain level of understanding must be

achieved regarding a range of audiologic procedures and concepts. The purpose of this text is not to convert the speech-language pathologist into an audiologist but rather to provide the professional with the necessary information, resource tools, and understanding to competently perform the roles and responsibilities as outlined in the scope of practice.

Through this clear presentation of audiometric measures and practices, it is our goal to provide the clinician with the resources in hand to properly assist in the service provision for patients of all ages with hearing loss so that, through the therapeutic processes, families do not leave your office without a clear understanding of hearing loss; patients with hearing loss achieve the highest possible clinical/therapeutic outcomes; and, not one more child with hearing loss is misdiagnosed.

## New in This Edition

As both practitioners and professors, our mutual goal is for this text to serve as a guide to the speech-language pathologist throughout his or her career. Using the text as a teaching tool ourselves, we feel that the first edition of *Fundamentals of Audiology for the Speech-Language Pathologist* has served our students well, but likewise has also shown us where to expand the text to provide an even more comprehensive guide to the management of hearing loss. New to this edition is a single chapter dedicated to information that you will need in order to perform a comprehensive hearing screening for your clients. Do not overlook the online materials, which include both a printable screening guide and videos to assist you in learning the proper hearing screening

procedures. An expansive chapter dedicated to etiologies of hearing loss will assist in interpreting audiometric test results to better aid in servicing your clients. Being able to link an individual's hearing loss with its cause will assist both you and your client in having a deeper understanding of the underlying nature of their impairment. An exciting addition in the second edition of *Fundamentals of Audiology for the Speech-Language Pathologist* is a full chapter dedicated to teaching reading and writing skills to those with hearing loss. As speech-language pathologists become increasingly involved in teaching literacy skills to their clients, we hope that this chapter becomes a valuable resource for our readers.

*Fundamentals of Audiology for the Speech-Language Pathologist* is your starting point on an exciting journey. Throughout your journey, you will learn the basics of hearing science, the anatomy of the ear, and essential principles of evaluation which will lead you to the habilitation of infants and the rehabilitation of the elderly patient. At journey's end, you will find your reward: making a difference in the lives of individuals with hearing loss.

## About This Textbook

When considering the demands of a career as a speech-language pathologist, your role in performing measures of hearing sensitivity or working with individuals with hearing loss may or may not have crossed your mind. Further, as previously discussed, both fall (within guidelines) under the scope of practice as a speech-language pathologist. Clearly then, in order to perform screening measures and interpret audiometric test data, a certain level of understanding must be achieved regarding a range of audiologic procedures and concepts. The purpose of this text is not to convert the speech-language pathologist into an audiologist, but rather to provide the professional with the necessary information, resource tools, and understanding to competently perform the roles and responsibilities. To that end, this text will address the concepts of hearing evaluation, hearing loss, technology, and

rehabilitation as they pertain specifically to your needs as a communication disorders service provider. The extensive underlying mathematical and neurological processes related to the evaluation of hearing is best left to the practicing audiologist. However, you are always encouraged to research further into a concept should your specific practices necessitate such knowledge.

In order to facilitate a clear understanding of the necessary elements of audiology, the reader will find the following headings throughout much of this text as discussion of testing procedures and practices unfolds. The goal of each section is described as follows:

### What You Need To Know

This section contains a basic overview of the particular procedure, some of the key terminology used, and a more general answer to the question "Why do we do this?" Excessive technological information is not discussed.

### How It Works

This section provides more specific information regarding the procedure and what it is, a discussion of objective versus subjective measures, and the yield of the procedure. In some cases, the materials used are also referenced.

### Technically Speaking

This section provides a more in-depth technical, anatomical, and/or physiological basis for each particular area discussed. Additional depth and detail are added for those with a keen interest in the particular topic.

### Methodologies

Very simply, this section explains the process and/or procedures by which the examiner obtains the data derived, including testing instructions and steps taken for obtaining such data. As appropriate, this section also contains information regarding how the results of the given test or procedure fit in with the larger test battery.

# Acknowledgments

We would like to thank those professionals who assisted in the creation of this text. Without the efforts of the following individuals, we would not have realized our goal to create a text that exemplifies a true collaborative effort. It is with gratitude that we recognize Karen J. Kushla, Donna M. Goione Merchant, Arsen Zartarian, Christina Barris Perigoe, Marietta M. Paterson, Nancy G. Schneider, Cheryl DeConde Johnson, Anthony D. Koutsoftas, Tena L. McNamara, and Annette E. Hurley. We extend our sincere appreciation to our colleagues Vikram Dayalu, Mike Soupious, Corey Howell, Christopher Petruzzi, and Paul Fisher for their

expertise and input throughout this project. We would like to thank Marissa Van Koppen, graduate student, and Mary Migton and Ashleigh Amadeo, graduate assistants, Department of Speech-Language Pathology, Seton Hall University for their contribution to this project. We would also like to thank Kate Reyes for her tireless energy and efforts. May the knowledge you have gained assist you in becoming great professionals. Finally, we would like to recognize Neil Bauman, Curator of The Hearing Aid Museum, not only for his contribution to this text, but for his efforts to keep a portion of audiology history alive for generations to come.





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**Deborah R. Welling, AuD, CCC-A, FAAA**, is an associate professor and director of clinical education in the Department of Speech-Language Pathology at Seton Hall University. Dr. Welling earned her bachelor of arts degree in communication arts and sciences from Hofstra University, her master's degree in audiology from Queens College of the City University of New York, and her doctoral degree in audiology from the University of Florida.

Dr. Welling is a member of the American Speech-Language-Hearing Association (ASHA), a fellow of the American Academy of Audiology (AAA), and a member of the New Jersey Speech-Language-Hearing Association (NJSHA), for whom she has served as Vice-Chair of the Higher Education Committee.

Prior to her role as an associate professor and director of clinical education, Dr. Welling spent many years in direct clinical service provision and supervision, with extensive experience in the behavioral assessment of the very young and difficult-to-test populations. It was during this time period that she met her coauthor, Carol Ukstins.

Dr. Welling has also had extensive involvement with interdisciplinary screening and evaluation processes in the early intervention, preschool, and school-aged populations, with an emphasis on (central) auditory processing assessment.

Since joining the faculty at Seton Hall University, Dr. Welling has been teaching undergraduate and graduate-level courses that cover anatomy and physiology of the auditory system, fundamentals of

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**Carol A. Ukstins, MS, CCC-A, FAAA**, is an educational audiologist who is currently serving as the Auditory Impairments Program Coordinator for The Newark Public Schools, the largest school system in the state of New Jersey. She holds a bachelor's degree in communication sciences and disorders from Worcester State College, a master's degree in audiology from Syracuse University, and advanced certification in assistive technology. She is a member of the American Speech-Language-Hearing (ASHA) Association and a fellow of the American Academy of Audiology (AAA).

With more than 25 years of experience in audiology, Ukstins has worked in hospital and community healthcare centers. Alongside her coauthor, Deborah Welling, she has worked extensively with a wide range of difficult-to-test populations, including the very young and those with multiple disabilities.

She currently works in the public school sector with deaf and hard-of-hearing students, providing support throughout the district to students with both hearing impairment and central auditory processing deficits. As the parent of two children with hearing loss, she speaks with both professional and personal knowledge on the impact of hearing loss.



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