

Compression for Clinicians

A Compass for
Hearing Aid Fittings

THIRD EDITION

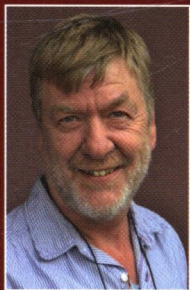
Theodore H. Venema

Compression for Clinicians: A Compass for Hearing Aid Fittings, Third Edition explains many developments that have taken place in the world of hearing aid compression, fitting methods, and real ear measurement. The text aims to make difficult concepts easier to understand and to explain in plain language many topics pertaining to compression. Directional microphones and digital features of noise reduction, feedback reduction, and expansion are also covered. The third edition recognizes two distinct clinical populations of sensorineural hearing loss: mild to moderate, on one hand, and more severe, on the other. These two clinical populations are well served by a corresponding pair of compression types: wide dynamic range compression and output limiting compression. Another double distinction held throughout the text is the two-part task for all hearing aids: providing gain and also increasing the signal-to-noise ratio. Gain is addressed by compression, while listening in noise is addressed by directional microphones and digital noise reduction.

THE THIRD EDITION:

- Includes new chapters on common clinical encounters (Chapter 1), real ear measurement (Chapter 5), and adaptive dynamic range optimization (Chapter 10)
- Distinguishes between “sensory” and “neural” hearing loss and devotes a separate chapter to each of these types of sensorineural hearing loss
- Contains updated coverage of digital hearing aids, directional microphones, and digital noise reduction
- Retains a strong focus on the historical development of compression from yesterday’s analog hearing aids to digital hearing aids of today

Compression for Clinicians is intended for those studying to become hearing health care professionals, including audiologists and hearing instrument practitioners. It is also intended for practicing clinicians who simply want to refresh their knowledge base concerning hearing loss and hearing aids. Clinically relevant and very thorough, it provides a compass in the world of compression hearing aids.



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In 2006, he initiated, developed, and implemented the Hearing Instrument Specialist (HIS) program at Conestoga College in Kitchener, Ontario. He moved to Victoria, British Columbia, in 2013, where he was part owner of a clinical audiology practice with NexGen Hearing. As of September 2015, Dr. Venema has been teaching on a part-time basis with the online HIS program at Ozarks Technical Community College in Springfield, Missouri. Dr. Venema continues to give presentations on various topics of hearing, hearing loss, and hearing aids at many state and provincial hearing aid associations.

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A Compass for Hearing Aid Fittings

THIRD EDITION

Editor-in-Chief for Audiology
Brad A. Stach, PhD

Preface

This book is intended for those studying to become hearing health care professionals, be they audiologists or hearing instrument practitioners; it's intended as well as for practicing clinicians who simply want some refreshment of their knowledge base concerning hearing loss and hearing aids. Readers looking for cutting-edge research will be disappointed. The book mainly summarizes knowledge that is already “out there.” More than that though, it is my take on things, my own way of expressing and explaining developments that have occurred in the world of hearing aid compression, fitting methods, and real ear measurement.

Readers will likely notice in this edition a distinct lack of specific products, models and equipment names. The idea here was to keep the contents of this edition conceptual, and as timeless as possible. The few instances where specific names *are* mentioned, will be found only where historical reference is required.

It was amazing how much these things had changed between the time of the first edition (1998) and the second edition (2006). Now it is 2017. . . It was high time then, and it is high time now that this book is updated.

My own learning process in the world of hearing aids began after leaving academia, while working at Unitron from 1995 until 2001. What I had covered in the the first hearing aids course I ever taught at Auburn University from 1993 to 1995 had only snippets of compression (and those were mostly wrong)! I can truly say Unitron was my alma mater when it comes to hearing aids. The 1990s was a rather exciting time in the world of hearing aids, “Wide dynamic range compression” (WDRC) was developing and emerging as a new compression type. Multi-channel features were being added to programmability. This was all taking place in the world of analog hearing aids, where a hearing aid was either one type of compression or another type. Clinicians *had* to know their compression types. In a way then, the 1990s can be considered as the “golden age” of compression.

The second edition of this book (2006) was intended to be a bridge spanning the transition from analog to digital hearing aids. In it, the reader encountered many historical references. As digital hearing aids became the norm, the complexity of their features and associated fitting software has continued to increase dramatically. The golden age of compression (1990s) however, has long since passed, and the focus shifted elsewhere. The compression types and characteristics seem to be buried beneath the glossy surface of the fitting software. I sometimes tease about the psychosocial questions posited by the software, such as, “Does your client have trouble hearing the preacher from a 45° angle at a distance of 50 feet every second Sunday? If so, push this button.”

This situation does not mean we no longer need to know our compression. All of the compression types utilized in yesterday’s analog hearing aids—and much more—continue to be utilized in today’s digital hearing aids. This then only highlights the fact that we must not lose our grip on the concepts surrounding compression. To truly appreciate and understand compression in today’s digital hearing aids however, one must still consult the old definitions of compression as they were used in yesterday’s analog hearing aids. To that end, this third edition continues to retain an historical perspective on compression.

What’s new in this third edition? To begin with, my own knowledge base has continued to evolve (maybe not improved, but evolved nonetheless). Some things have remained the same; in the preface of the second edition, I urged clinicians to verify software fitting predictions with real ear measurement (REM). I still hold to that position. I knew that if I were ever to write a third edition, a new chapter on REM would be included. It has always been my strong contention that REM is inextricably intertwined with the development and evolution of fitting methods. To that end, the chapter on REM is situated precisely between the chapter that covers linear-based fitting methods and the chapter that covers compression-based fitting methods.

Two chapters from the second edition are gone. In this third edition, the topic of cochlear dead regions as Chapter 2 is now included as part of Chapter 3. As today’s digital hearing aids almost all use multiple channels and programmability, Chapter 6 (Multi-Channel Programmable Hearing Aids) in the second edi-

tion has been folded into a section of the central chapter on compression (7) in this third edition.

Readers will see that there are a couple of themes that run like twin rivers throughout this third edition. One of these is the recognition of two distinct clinical populations of sensorineural hearing loss (SNHL): mild to moderate (“sensory”), and more severe (“neural”). These two clinical populations are well served by a corresponding pair of compression types—namely, WDRC and output limiting compression.

A second theme held throughout this book is the two-part task for all hearing aids—namely, (1) providing gain and (2) increasing the signal-to-noise ratio (SNR). Compression (Chapters 7 and 8) is a gain-related issue. Directional microphones (Chapter 9) and digital noise reduction (Chapters 8 and 9) both address the SNR issue.

The first and last chapters are new additions to this third edition. Chapter 1 covers the topic of Common Clinical Encounters, which has nothing to do with compression per se, but I hope it can make for some interesting reading. Many of these “encounters” do not seem to be deliberately laid out and explained elsewhere, and so the first chapter aims to do just that. The final chapter covers the topic of adaptive dynamic range optimization (ADRO). In the second edition, this topic was covered in the chapter on compression. Since that time, however, I have come to learn more about it. I feel strongly that linear gain *can* be a good thing; accordingly, I thought it might be a good idea to include this topic as a “postscript,” as an “antidote” to the world of “compression as usual.” Besides, many hearing aid manufacturers have been using linear gain as part of their compression schemes as well. I hope the readers unfamiliar with ADRO enjoy looking at things from this “other side of the fence.”

In their song "Woodstock," Crosby, Stills, Nash, and Young sang the line, "And we've got to get ourselves back to the garden." I dedicate this book to my dear Kim Redlin, who has helped me find my own way back to the garden.

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