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Current Topics in Audiology Treatment

A presentation in partnership with Thieme publishers

Jason A. Galster, PhD, CCC-A, FAAA

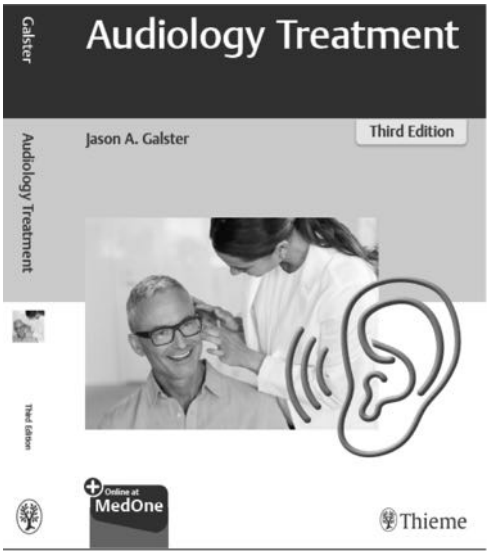
Disclaimer

Learning Outcomes

After this course, participants will be able to

- Describe current treatment options with hearing aids.
- Describe current treatment options with cochlear implants.
- Describe current treatment options with bone conduction hearing devices.

Introducing
Volume 3, 2018



An esteemed collection of authors and subject-matter experts

- Harvey Abrams, Ph.D.
- Samuel Atcherson, Ph.D.
- James Curran, M.S.
- Brian Fligor, Sc.D.
- William Hodgetts, Ph.D.
- Jason Galster, Ph.D.
- Andrew Johnson, MSEE
- Ryan McCreery, Ph.D.
- Erin Picou, Au.D., Ph.D.
- David Preves, Ph.D.
- John Pumford, Au.D.
- Ayasakanta Rout, Ph.D.
- David Smriga, M.A.
- Christopher Spankovich, Au.D., Ph.D.
- Sarah Sydlowski, Au.D., Ph.D.
- Dennis Van Vliet, Au.D.

Chapters

1. Introduction: On the treatment of hearing loss
2. Fundamentals of hearing aid acoustics and hardware
3. Standards for assessing hearing aid performance
4. Hearing aid coupling: Theory and Application
5. Hearing aid coupling: Techniques and technologies
6. Audio signal processing for hearing aids
7. Fundamentals of real-ear measurement
8. Real-ear measurement techniques
9. Hearing aid prescriptive fitting methods
10. Outcome measures in the prescription of hearing aids for adults
11. Hearing aid selection and prescription for children
12. Bone conduction hearing solutions
13. Hearing assistive and related technology
14. Hearing protection devices
15. Tinnitus and sound sensitivity

Content arc for this presentation

- On the treatment of hearing loss
- Hearing aids
- Prescription of hearing aids
- Implantable hearing solutions
- Hearing assistive and protective technology

On the treatment of hearing loss

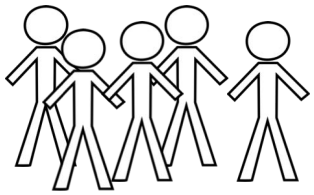
Jason Galster, Ph.D.

Christopher Spankovich, Au.D., Ph.D.

Referenced Chapters:

- On the treatment of hearing loss
- Tinnitus and sound sensitivity

360 million people have disabling hearing loss
5% of the Global Population



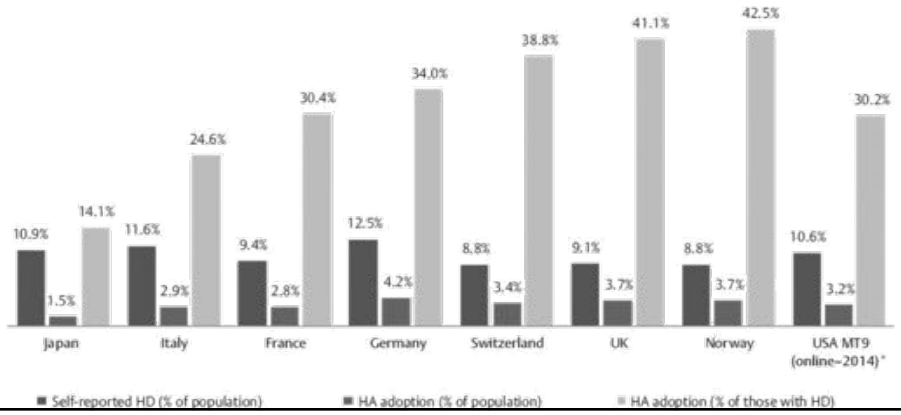
- In a 2017 report, the WHO presented a compelling case for the treatment of hearing loss
  - The cost of unaddressed hearing loss is estimated at $750 to $790 billion USD, annually.
  - Unemployment and premature retirement, resulting from untreated hearing loss, cost $105 billion USD annually.
  - The annual cost of childhood hearing loss is estimated between 24 and 47 billion USD, with a dependency on a country's GDP and the inclusion of cochlear implantation.
  - The prevalence of regular tinnitus may exceed 10% of the population

Data from EuroTrak and MarkeTrak 9

Blue bars show estimated proportion of the population that self-reports hearing difficulty.

Red bars show estimated proportion of the population that reports hearing aid ownership.

Yellow bars show estimated proportion of the population with hearing difficulty who have pursued hearing aids.



Five essential elements to best practice in the treatment of hearing loss

Hearing Aids

Andrew Johnson, MSEE

David Preves, Ph.D.

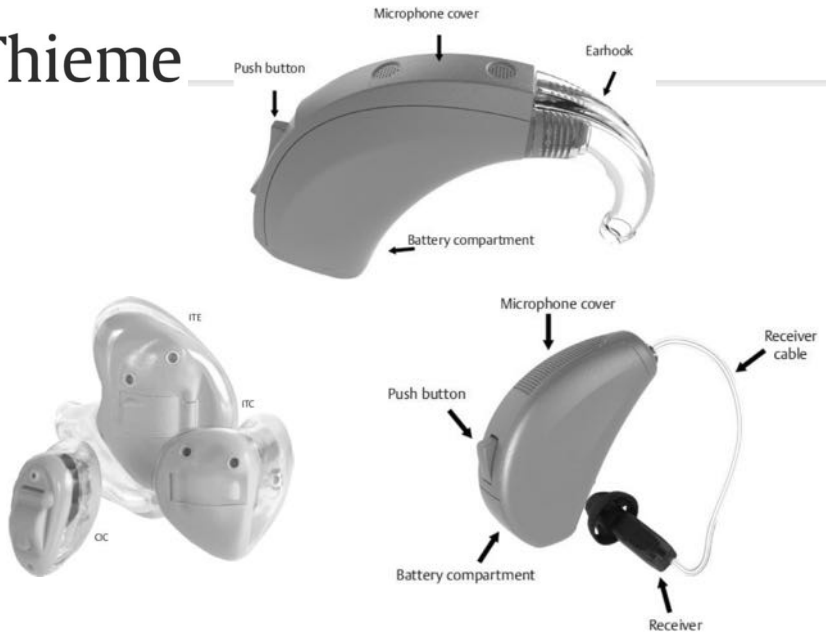
Ayasakanta Rout, Ph.D.

Dennis Van Vliet, Au.D.

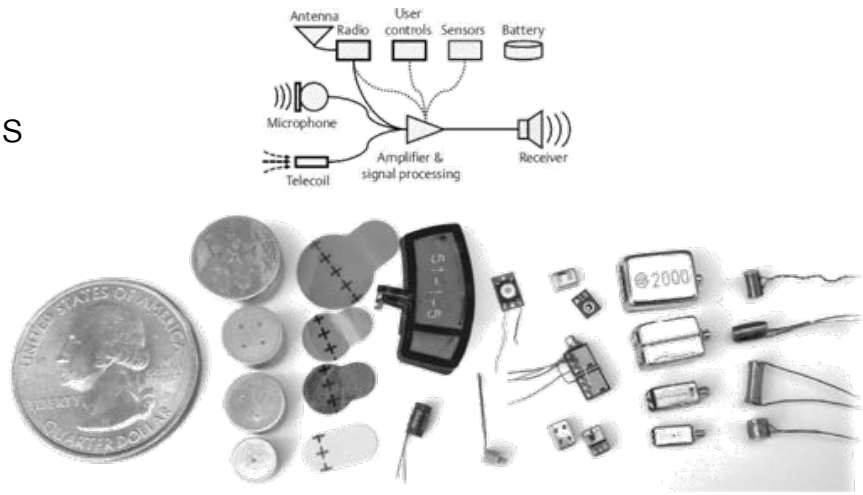
Referenced Chapters:

- Fundamentals of hearing aid acoustics and hardware
- Standards for assessing hearing aid performance
- Hearing aid coupling: Theory and Application
- Hearing aid coupling: Techniques and technologies
- Audio signal processing for hearing aids

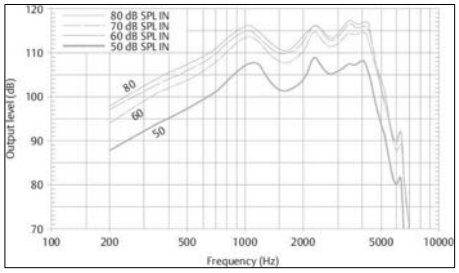
Hearing aids are the most common audiologic treatment for hearing loss



Modern hearing aids are miniature low-power computers

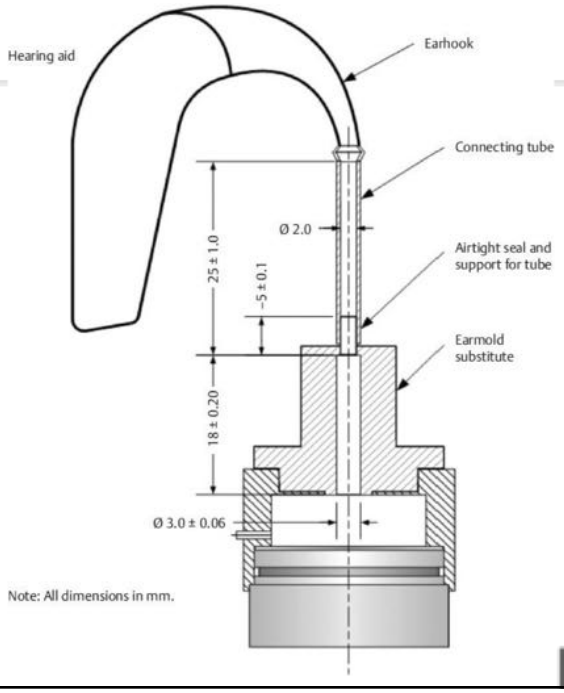


Federal law requires that hearing aid manufacturers must report the parameters specified in S3.22 using the measurement methods of S3.22 for specification sheets

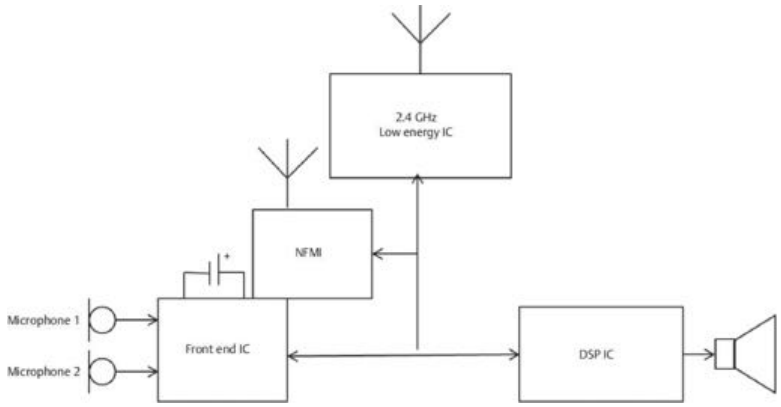


- ANSI S3.22 (Specification of Hearing Aid Characteristics) was first created in 1976 at the request of the Food and Drug Administration (FDA), and last revised in 2014.
- Hearing aid performance data of interest includes, but is not limited to, measurements of amount of amplification, maximum output sound pressure level, frequency response, frequency range, distortion, internal circuit noise, battery current drain, telecoil sensitivity, directionality, and automatic gain control (compression).

Hearing aids are manufactured to rigorous and standardized specifications



Modern wireless hearing aids may use multiple systems to communicate between ears, while also connecting to Bluetooth devices



The Prescription of Hearing Aids

Harvey Abrams, Ph.D.

Ryan McCreery, Ph.D.

Erin Picou, Au.D., Ph.D.

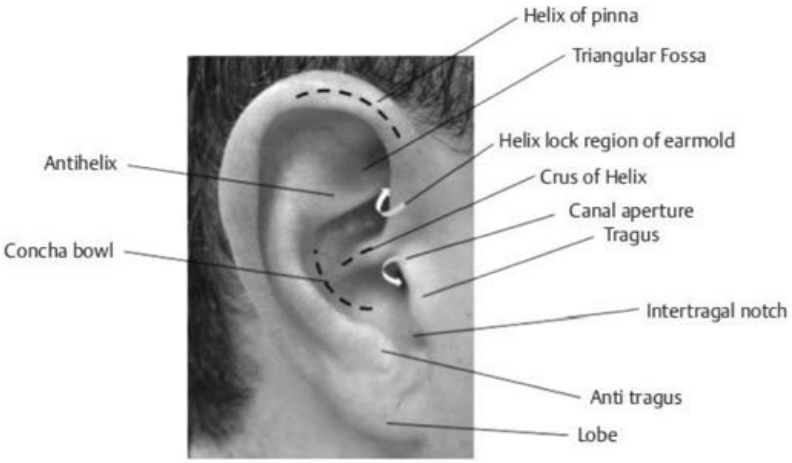
John Pumford, Au.D.

David Smriga, M.A.

Referenced Chapters:

- Fundamentals of real-ear measurement
- Real-ear measurement techniques
- Hearing aid prescriptive fitting methods
- Outcome measures in the prescription of hearing aids for adults
- Hearing aid selection and prescription for children

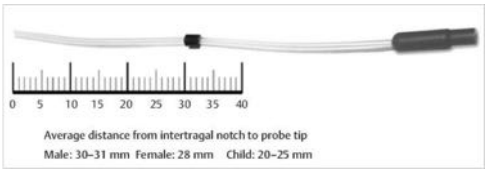
The prescription of hearing aids requires detailed understanding of the ear and insitu acoustics

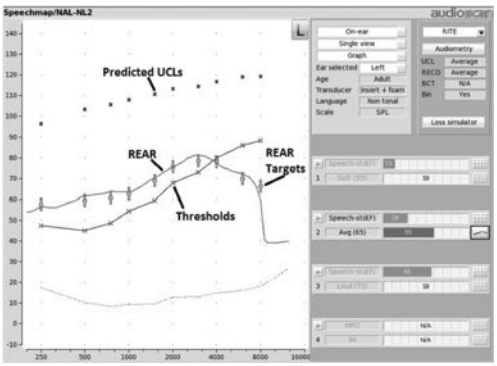


Key anatomical nomenclature for ear impressions

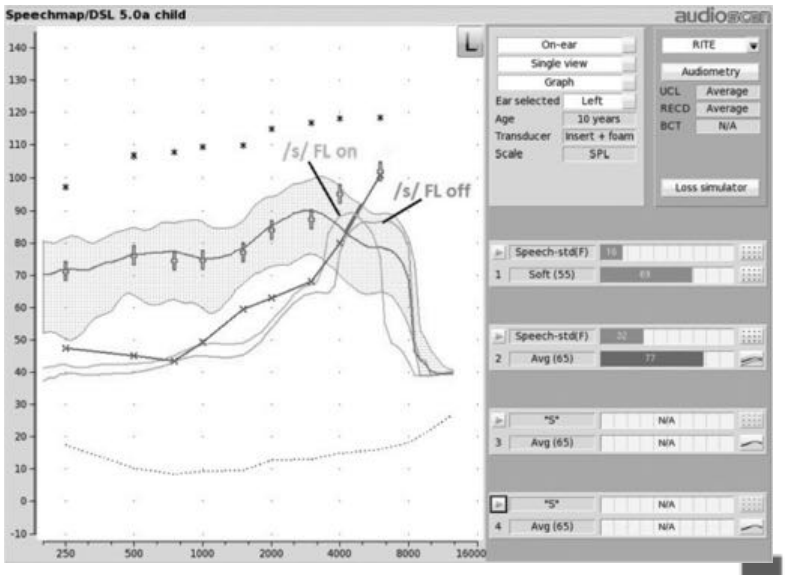
Real-ear measurement is the standard of care when prescribing hearing aids

Use of a probe microphone measurement allows comparison of hearing aid output to prescription targets and the audiogram





Advanced signal processing (e.g. frequency lowering) can be measured and more accurately prescribed



A variety of hearing aid prescriptions are available from independent parties and hearing aid developers

Parameter	NAL-NL2	DSL v 5.0
Experience	Level-specific adjustments for previous hearing aid experience; experienced users are prescribed 10dB more gain for hearing thresholds greater than 65dB HL; differences are smaller for milder losses	No adjustment
Gender	1dB increase in gain for males; 1dB decrease in gain for females	No adjustment
Bilateral correction	Level-specific adjustments for bilateral fittings; 2dB for input levels up to 40dB SPL sloping to 6dB adjustment for levels greater than 85dB SPL	3dB reduction in targets for bilateral fitting (adults only)
Noise	No adjustment	3 to 5 dB reduction of less important speech frequencies for listening in noise
Conductive component	75% of conductive component is added to the prescription for the sensorineural component	25% of the conductive component is added to the upper limit of comfort, resulting in small gain corrections
Loudness discomfort measures	No adjustment	Adjusts prescription based on patient-specific loudness discomfort levels
Adult–child differences	5dB more gain for children at moderate inputs; higher compression ratio for children than adults	More gain for children; higher compression ratio for children than adults

Self-reported outcome measures are often used to document the effectiveness of a treatment

Instrument/authors	Purpose	Domain	Number of items	Scoring and interpretation
Abbreviated Profile of Hearing Aid Benefit (APHAB)	Quantify hearing loss disability and reduction of disability after using a hearing aid	Activity	24	Four subscale scores provided: ease of communication (EC); background noise (BN); reverberation (RV); aversiveness (AV). EC, BN, and RV combine to provide global score
Client Oriented Scale of Improvement (COSI)	Subjective identification of situations of listening difficulty and benefit from hearing aid intervention	Activity Participation	1–5	Patient judges degree of change attributable to intervention and final ability as a result of intervention.

Implantable Hearing Solutions

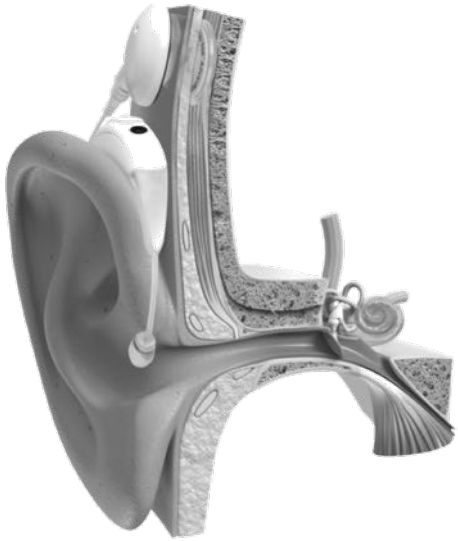
Sarah Sydlowski, Au.D., Ph.D.

William Hodgetts, Ph.D.

Referenced Chapters:

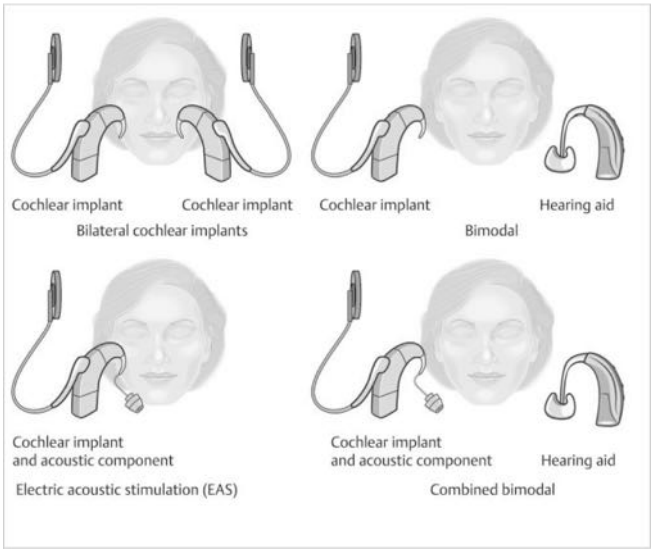
- Cochlear implants in adults
- Cochlear implants in children
- Bone conduction hearing solutions

Cochlear implants are the only implantable device that successfully restores a major sense



The internal component (electrode) of a cochlear implant is surgically placed and carefully inserted in the cochlea

Cochlear implants are worn in a variety of configurations that may depend on hearing ability between ears



Bone conduction hearing aids are a common treatment for conductive hearing loss

Hearing Assistive and Protective Technology

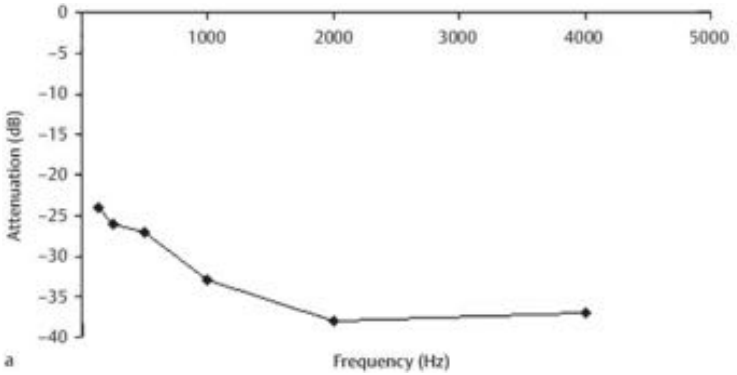
Samuel Atcherson, Ph.D.

Brian Fligor, Sc.D.

- Referenced Chapters:
- Hearing assistive and related technology
- Hearing protection devices

Assistive technologies take many forms: from amplified telephones to systems that wireless transmit audio from microphones or a television

Hearing protection is an important consideration in preventative audiologic care. There are many types of hearing protection, ranging from non-custom foam earplugs to custom fitted earmolds.



Treatment of hearing loss is a fundamental responsibility of audiologists that has lasting benefits, including improved quality of life and healthier aging

Thank You!

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