

ASSESSMENT AND MANAGEMENT OF FUNCTIONAL HEARING LOSS IN ADULTS

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NIAGARA FALLS, ONTARIO

OCTOBER 13, 2022



WHO ARE THESE PATIENTS...A PATIENT WALKS INTO AN AUDIOLOGY OFFICE

- I can't hear in background noise
- I've had hearing tests before and "they" always tell me my hearing is "perfect"
- I avoid situations—social (e.g. bars, restaurants, etc.), work related
- I am anxious about hearing/listening/communicating

FRAMING THE PRESENTATION: WHO ARE THE PATIENTS WE ARE TALKING ABOUT?

- FOCUS FOR THIS PRESENTATION IS ADULTS BUT WE NEED TO THINK ABOUT CHILDREN, TOO
- WILL LABEL THIS AS “FUNCTIONAL” HEARING LOSS
- THESE ARE PEOPLE WHO ARE SEEKING OUR HELP, WHO WANT WHAT WE HAVE TO OFFER
- SOME OF THIS INFORMATION MAY BE “CONTENTIOUS”:
SETTING A STAGE FOR WORKING WITH THIS POPULATION
 - Evidence: History with auditory neuropathy
 - Evidence: Pharmaceutical treatment of depression

Not the historical or “old school” definition of functional hearing loss

- Pseudohypacusis, malingering, “faking”, psychogenic, non-organic hearing loss (NOHL)
 - This is NOT the patient population that is the focus of this presentation
 - However, the focus of the presentation is related to those who are thought to be malingerers
 - “Your hearing is just fine”
 - “This is all in your head”
 - The “happy talk” (Beck & Danhauer, 2018)

Not the historical or “old school” definition of functional hearing loss

- Research suggests:
 - Prevalence estimated as low as 1.35% to as high as 9.5% (Qui, et al, 1998; Hussain and Hohman, 2022, Mathai, 2021)
 - May demonstrate “intent” (monetary gain or compensation claim) based on the Austen-Lynch model (Austen & Lynch, 2004)
 - May demonstrate conscious response (malevolent, malingering) or unconscious (conversion disorder, dissociative disorder) (Fatih Topuz, Erdem Ozel, & Onen, 2021)

AS WITH EVERYTHING ELSE WE DO:

- Listening carefully to the patient
 - Industrial, vocational, or motivation
- Careful case history: Is there an “organic” explanation
 - Not as easy as in the past
 - Concepts like hidden hearing loss, subclinical hearing loss were not recognized in the past
- Listening carefully to your “gut” and intuition
 - Suspicion of malingering
- Using tools beyond the audiogram
 - Authentic assessment (questionnaires, etc.)
 - Speech in noise testing

- Functional hearing loss, in the context of this presentation, may also be referred to as:
 - HD (hearing difficulty), Suprathreshold auditory disorders (SAD), subclinical hearing loss, hidden hearing loss, Obscure auditory dysfunction (OAD), King-Kopetsky syndrome (some of these introduced in the 1980s and 1990s)
- The definitions of hearing loss are changing
 - World Health Organization challenges us to see hearing as “functional” communication
- The role of audiology: hearing is much broader than the “audiogram”, the “graph of hearing”
 - It is **an** important measure, it is NOT **the** important measure

WHAT IS “FUNCTIONAL” HEARING LOSS

- Hewitt (2018)
- The pure tone audiometer was developed in 1879
- Pure tone audiometer considered today to be the “gold standard”
- Although pure tone results will likely be a “gold standard” it will not be THE “gold standard” in the future
- Need to look at binaural/dichotic listening issues
 - How do the two ears work together as a team?

CURRENT RESEARCH

- Sanchez et al (2016)
 - Cochlear synaptic loss that can lead to neural changes in the auditory pathway
 - May have a normal audiogram; can actually have about 50% of outer hair cells die and still have "normal hearing" on an audiogram
 - Back to the example: People with sensorineural hearing loss have difficulty listening in background noise but it is not restricted to those individuals (and they may have "loss" that doesn't show up on the audiogram)
 - May also have tinnitus (ringing in the ear) or sound tolerance issues and these may be an early indicators of vulnerability to hidden synaptic injury
 - Learning more about this as a science and profession

A FEW THOUGHTS ABOUT “FUNCTIONAL” HEARING LOSS

- Broadening considerations on an audiogram
 - Reconsidering grades of hearing loss based on the Global Expert Group on Hearing Loss (Olusanya, Davis, & Hoffman, 2019): 20 dB or better is normal
 - Historically, people with hearing between 15-25 dB HL reported difficulty listening in noise
 - Normal hearing at 25 dB or less is an arbitrary measure; the definition of “normal” hearing and recommendations for hearing aid candidacy are not evidence-based (Golub, et al, 2020)

A FEW THOUGHTS ABOUT “FUNCTIONAL” HEARING LOSS

- Broadening considerations on an audiogram
 - Golub and colleagues (2020) introduced the term of “subclinical hearing loss” (15-25 dB HL)
 - Higher incidence of cognitive issues and depressive symptoms reported in this population then for those who demonstrated “normal” hearing
 - Also cited that Over the Counter hearing aids may greatly improve accessibility of hearing loss treatment?
 - This is the topic for today—what is our role with this population?

SUPRATHRESHOLD COMPLAINTS

- People with “normal” hearing on an audiogram and standard audiologic testing performed in quiet but report considerable difficulty listening in less than optimal listening environments
- Estimated to be 26 million Americans (Beck and Danhauer, 2019).
- Report experiencing more difficulty than would be anticipated based on standard audiometric results
 - Suggested to be between 15-30% of younger adults (e.g. less than 40 years of age) (Pang et al, 2019)

WHAT MIGHT WE LEARN FROM PSYCHOACOUSTIC APPROACHES

- Bardi, Siegel, & Wright (2011)
 - Impaired frequency resolution is a factor in this population
 - How precise listening is in those “bins” or “channels”
 - Impacted by sensorineural hearing loss—the “bins” become wider and let in more “noise”
 - In this study, subjects with normal audiograms who had no difficulty listening in noise were compared to subjects with normal audiograms who reported difficulty in noise on frequency resolution skills
 - The “impaired” group had significantly wider filters when compared to those with normal hearing and no hearing complaints, specifically in the higher frequencies; no distinguishable differences in absolute thresholds
 - Authors suggest that this population have hearing deficits that are not identified by “standard” audiometry
 - May support the use of hearing technology, for the same reasons that we aid those with sensorineural hearing loss (it’s more than a loss of volume)

IS THIS AN AUDITORY PROCESSING DISORDER (APD)?

DOES A ROSE BY ANY OTHER NAME
SMELL AS SWEET?

HOW DO WE, AS AUDIOLOGISTS,
PRACTICE AT THE TOP OF OUR
SCOPE?

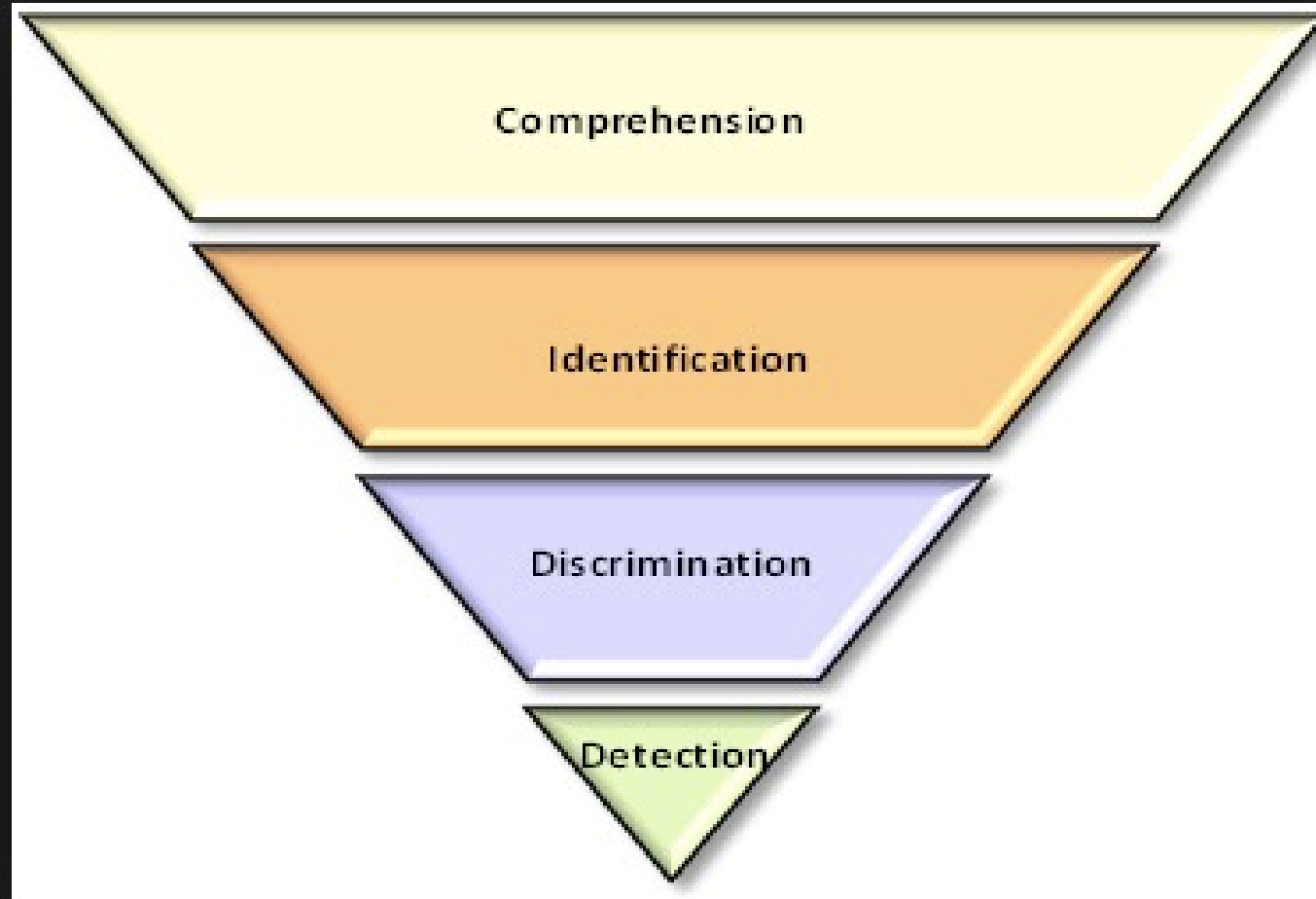
WHY DO WE CONTINUE TO
PERPETUATE THAT THIS IS
“CONTROVERSIAL?”

SO MANY CONTROVERSIES, SO
LITTLE TIME: ANSD,
AUTISM, BALANCE,
TINNITUS, COCHLEAR
IMPLANTS—EVEN OUR
BELOVED HEARING AIDS

AS A PROFESSION, WE MUST CHALLENGE SOME LONG HELD MYTHS AND BELIEFS

- APD/Functional hearing loss doesn't exist
 - The “happy talk” described by Beck and Danhauer doesn't stop patients from continuing to seek answers
- Teaching only about the audiogram in clinical education programs: must educate future audiologists to be critical thinkers/problem solvers
- The vast majority of patients don't malingering
- Using a “shared decision making model” of patient care
 - Must move away from a paternalistic/maternalistic model
- Our ethical responsibilities: The beneficence of our profession

ERBER'S HIERARCHY (1992. 1996)



“UNPACKING” ERBER’S HIERARCHY

- **Detection** is the ability to respond to the presence or absence of sound. It is the essential first step listening and represents pure tone audiometry
- **Discrimination** is the ability to perceive similarities and differences between two or more speech stimuli
- **Identification** is the ability to label by repeating, pointing to or writing the speech stimulus heard
 - Identification involves the suprasegmental & segmental of speech
- **Comprehension** is the ability to understand the meaning of speech by answering questions, following directions, paraphrasing, or participating in a conversation.

Comprehension is demonstrated by the listener when his/her response is qualitatively different than the stimuli presented.

PATIENTS THAT ARE THE FOCUS OF THIS PRESENTATION

- Speech in noise as the “low hanging fruit”
 - Crandell and colleagues (1991) pointed out that pure tone audiometry was unable to reliably predict the issue that many patients present with—difficulty hearing in typical environments where competition is present
 - Wilson (2011) recommended speech in noise testing in every diagnostic evaluation
 - Speech in noise testing should be a standard of care (however only 15 % of audiologists do this routinely) (Clark, Huff, & Earl, 2017)

CASE HISTORY

- Careful case history
 - Many patients may have had lifelong issues
 - The importance of addressing functional hearing loss in children
 - Some may have new symptoms with a possible known etiology (mild traumatic brain injury)
 - Some may have new symptoms with unknown etiology (Neuro-audiology, our contribution to understanding the case, practicing at the top of our scope)

AUTHENTIC ASSESSMENT

- Questionnaires
 - Adult Auditory Processing Scale (AAPS) (Roup)
 - Auditory Processing Questionnaire (APQ)
 - Vanderbilt Fatigue Questionnaire (<https://www.vumc.org/vfs/scales-and-user-guide>)
 - Hearing Handicap Inventory for Adults (HHIA) (cut off of 34 suggested by Roup, Post, & Lewis, 2018)
 - Speech, Spatial, and Qualities of Hearing Scale (SSQ)
 - Personal Assessment of Communication Ability (PACA)
 - Beck Anxiety or Beck Depression Inventory (looking at the “whole” person—analogous to cognitive screening)

A TEST BATTERY APPROACH

- Comprehensive audio (OAEs, ARTs)
- Speech in noise testing
- APD battery
 - The key is to tax the auditory system, not to get caught up in a test battery approach; how do we simulate “walking into a bar?”
 - What do you feel comfortable with? There isn’t a “gold standard” at this time and not likely to be one in the foreseeable future
 - Behavioral options
 - SCAN-3 A
 - GIN
 - Buffalo model
 - Refer to clinical practice guidelines from AAA, ASHA, BSA, European Association
 - Note that additional testing (e.g. electrophysiology, etc.) may be needed as one learns more about the patient

SPEECH IN NOISE TESTING

- Tax the auditory system
- These tests are the minimal that should be considered with this population (and the argument may be made that they should be part of every diagnostic audiometric battery)
- Options
 - HINT
 - WIN
 - QSIN
 - RSPIN
 - Others
- Select what you have, what you like, just do it!

THE FUTURE OF ASSESSMENT

- Some places to keep an eye on!
 - Walter Reed National Medical Center
 - National Center for Rehabilitative Auditory Research (NCRAR) (Erick Gallum and his colleagues)
 - Speech Recognition and Aging Lab at The Ohio State University (Christina Roup)
 - Have not even focused on aging in this presentation; aging issues go beyond a loss of volume

IDENTIFICATION/DIAGNOSIS IS THE FIRST STEP

- Partnership with healthcare providers: Hearing care is healthcare
 - Educating otolaryngologists and otologists: The payoff
 - Is there a medically treatable aspect of impaired hearing

FITTING OF AMPLIFICATION

- The concept of “mild gain” hearing aids
 - Drop the term “mild gain”: Focus on appropriately fit with verification and validation
- Historically, remote mic/FM system
 - DM System
 - Greatest improvement in SNR
 - Convenience of use in everyday life
 - Most adults discontinue use despite reporting significant benefit
- Not a new concept
 - Winchester (1975) raised this idea in the Maico Audiological Library Series
 - However, the technology today has opened this door

FITTING OF AMPLIFICATION

- Current technology: Sophisticated
 - Directional technology
 - Beam-forming directionality
 - Multi-speaker-access-technology (MSAT)
 - Beck and Danhauer (2019)
 - Mild Gain Hearing Aids (Roup, Whitelaw, & Baxter, 2018)
 - Enhance soft consonants of speech
 - Improve SNR with use of multiband directional microphones
 - Background noise algorithms may improve comfort and reduce distractions

FITTING OF AMPLIFICATION

- Evidence from studies in this population
 - Reduced listening effort (Ohlenforst et al, 2018)
 - Improvement of speech in noise and signal to noise ratio (average of 6 dB) (Beck & LeGoff, 2018)
 - Improvement of listening in quiet and noise for the majority of subjects fit (Roup, Post, & Lewis, 2018)
 - Better word recall in noise, reduced fatigue/listening effort, and improved SNR (Beck, Ng, & Jensen, 2019)
 - Perception of soft sounds
 - Restoring some frequency selectivity? (Bardi et al, 2011)

FITTING RECOMMENDATIONS (ROUP, WHITELOW, & BAXTER, 2022)

- Open as possible
- 5-15 dB gain for soft and conversational speech
- Little to no gain for loud sounds
- MPO not to exceed patient's LDL
- Verification using real ear unaided and aided responses for soft and moderate sounds and MPO
- Use of directional microphones and noise reduction technology
- Advanced signal processing: level of technology?

PRACTICAL CONSIDERATIONS

- Obtain medical clearance (educate, help with accessing funding, “shared decision making”)
- Trial period contributes to success
 - Demo hearing aids on loan for a month
- Verification and validation
- Ability to provide telehealth adjustments if needed
- Technology
 - Remote mic
 - Bluetooth to devices
 - Program such as “live listen”
 - Digitally modulated (DM) system
- Payor options

AUDITORY TRAINING

- BUFFALO MODEL AUDITORY TRAINING (BMAT)
- AUDITORY VERBAL TRAINING
- AMPTIFY (<https://amptify.com/>)
- LISTENING AND COMMUNICATION ENHANCEMENT (LACE) (<https://laceauditorytraining.com/>)
- WORD SUCCESS (<https://apps.apple.com/us/app/wordsuccess/id1497217347>)
- ANGEL SOUND (http://angelsound.tigerspeech.com/angelsound_download.html)

CASES



The background features a vertical gradient from deep blue at the bottom to dark purple at the top, overlaid with a field of small, light-colored dots resembling a starry sky. Faint, white geometric diagrams are scattered across the frame: a circular gauge with a scale from 0 to 210 in the top right; a circular arrow diagram in the bottom right; a dashed circular arrow diagram in the bottom left; and a partial circular gauge in the top left.

JIM

- 33 year old Firefighter
- Reported speech in noise issues that are lifelong
- Recent exacerbations of hearing and listening difficulties
- Noise exposure? Normal hearing thru 12.5Hz bilaterally, normal DPOAEs bilaterally
- Significant deficits in speech in noise performance, abnormal “auditory processing” skills
- Chemical exposures impacting hearing/listening skills (we are looking at this in a study at OSU at the moment)
- Hearing aids and aural habilitation

RACHEL

- 32 year old woman
- Long term history of auditory symptoms
- Speech in noise issues among others (auditory processing disorder)
- Fit with advanced hearing aid technology
- “Life changing”
- Quality of her life
- Insurance paid for her hearing aids

ASHLEY

- 34 year old attorney
- TBI from a serious car accident
- Speech in noise issues/fatigue/listening anxiety
- Sound tolerance issues (music in grocery stores, etc.)
- Hearing aids recommended
 - Slow go at first
 - Two months of trial: Remarkable
 - Can go into group situations, converse more easily without fatigue, hear and listen to her toddler son's voice
- Aural rehabilitation using Amptify app (<https://amptify.com/>)

ANDI

- 37 year old woman
- Drives 8 hours to come to our clinic
- Lifelong listening issues
- Fit with hearing aids 5 years ago
 - Changed her family dynamics and her family
 - Her husband and her batteries
- Lost her hearing aids at the beginning of summer, 2022
- What motivated her to get new hearing aids?
 - Fit new technology in July

CONCLUSIONS

- Quality of Life issues in this patient population
- Our role can be significant
- Waiting until we have all the answers is a mistake
- addressed by use of amplification
- Patients who are
 - Interested in options (they don't stop looking when they are told they have "normal hearing")
 - Willing to use amplification and prioritize obtaining hearing aids
 - Willing to pursue other treatment options

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