

1. This document is created for accessibility and is intended to be a supplemental resource. If you would like to print a hard copy of this document, please follow the general instructions below to print multiple slides on a single page or in black and white.
2. This handout is for reference only. Non-essential images have been removed for your convenience. Any links included in the handout are current at the time of the live webinar, but are subject to change and may not be current at a later date.
3. Copyright: Images used in this course are used in compliance with copyright laws and where required, permission has been secured to use the images in this course. All use of these images outside of this course may be in violation of copyright laws and is strictly prohibited.
4. Social Workers: For additional information regarding standards and indicators for cultural competence, please review the NASW resource: Standards and Indicators for Cultural Competence in Social Work Practice
5. Need Help? Select the “Help” option in the member dashboard to access FAQs or contact us.

How to print Handouts

On a Mac

- Open PDF in Preview
- Click File
- Click Print
- Click dropdown menu on the right “preview”
- Click layout
- Choose # of pages per sheet from dropdown menu
- Checkmark Black & White if wanted.

On a PC

- Open PDF
- Click Print
- Choose # of pages per sheet from dropdown menu
- Choose Black and White from “Color” dropdown

No part of the materials available through the continued.com site may be copied, photocopied, reproduced, translated or reduced to any electronic medium or machine-readable form, in whole or in part, without prior written consent of continued.com, LLC. Any other reproduction in any form without such written permission is prohibited. All materials contained on this site are protected by United States copyright law and may not be reproduced, distributed, transmitted, displayed, published or broadcast without the prior written permission of continued.com, LLC. Users must not access or use for any commercial purposes any part of the site or any services or materials available through the site.



Hearing Aids and Music: Addressing the Needs of the Casual Listener

Brian Taylor, AuD and
Navid Taghvaei, AuD

Webinar FAQs

- **How to ask a question:**
 - Click Q&A, type your question and Send.
- **Where to get the handout:**
 - Resources in the classroom and under Pending Courses in your account
- **How to view captions:**
 - Click Live Transcript CC button
 - Click Show Subtitle
- **How to earn CEUs:**
 - After the webinar, go to your Pending Courses and pass the multiple-choice exam.
- **For assistance or tech support:**
 - Call 800-753-2160
 - customerservice@audiologyonline.com
 - Use the Q&A window

Hearing Aids and Music: Addressing the Needs of the Casual Listener

Brian Taylor, AuD

Navid Taghvaei, MA, AuD

Risks/Benefits

- The applicability and accuracy of the course content may vary by the clinical, geographical, and cultural context; you should evaluate the course accordingly.
- As healthcare is rapidly evolving, new findings may change the validity of the information presented in this course. Providers should always consult the latest research and guidelines from professional associations.
- The interventions discussed in this course may be limited in generalizability, requiring practitioners to consider specific individual and population factors.
- The course may not cover all possible risk factors, diagnostic methods, or treatment options, and complex cases may require additional considerations.
- Healthcare providers should apply cultural competence and sensitivity to ensure effective and respectful care based on their patients' diverse needs.
- Providers should always evaluate the limitations of diagnostic and screening tools, considering their potential for false results as well as any ethical implications.
- It is the responsibility of course participants to critically evaluate the evidence from multiple sources to guide professional practice.



Learning Outcomes

After this course:

- 1) Participants will be able to define the casual music listener and how they differ from audiophiles
- 2) After this course, participants will be able to describe the features of hearing aids needed to optimize sound quality of music.
- 3) After this course, participants will be able to describe differences in streaming music through hearing aids compared to listening to music via loudspeakers with hearing aids and how these differences can be addressed during fitting and fine-tuning.



Disclosures

- Both presenters are employed by WS Audiology and receive a salary



Agenda

- Who is the casual music listener? How are they different than an audiophile or “serious” music listener?
- Why is it important to optimize a music solution with hearing aids?
- Review the essential elements needed to process music effectively with minimal distortion and if/when these elements can/should be adjusted to improve performance
- Review the quality and accuracy of automated music programs in current hearing aids
- A plan for verifying quality of both streamed and “loudspeaker” music for hearing aids

Who is the casual music listener?

~0.1 to 0.2% of population is a self-reported audiophile (obsessed with sound quality, technical details)

- AudioGen Discussion Group (2023)

~15% of population are “discerning” music listeners (prioritize new music, emotional connections)

- Music Business Worldwide (2023)

	Casual Listener	“Discerning” & Audiophile
Attention to musical detail	Low to medium	High to extremely high
Prioritizes sound quality	Secondary	High (maybe highest) priority
Listening environment	Anywhere, based largely on convenience	Quiet, acoustically treated, often a dedicated space
Equipment	Earbuds, portable speakers	Hi-fi system
Preferred music formats	Streaming platform (e.g., Spotify, Apple Music)	High resolution (e.g., 200-gram vinyl)
Function of music in daily life	Casual enjoyment, relaxation, “background sound”	Emotional, artistic, a strong sense of connection with a certain genre

Why this short course? (1)

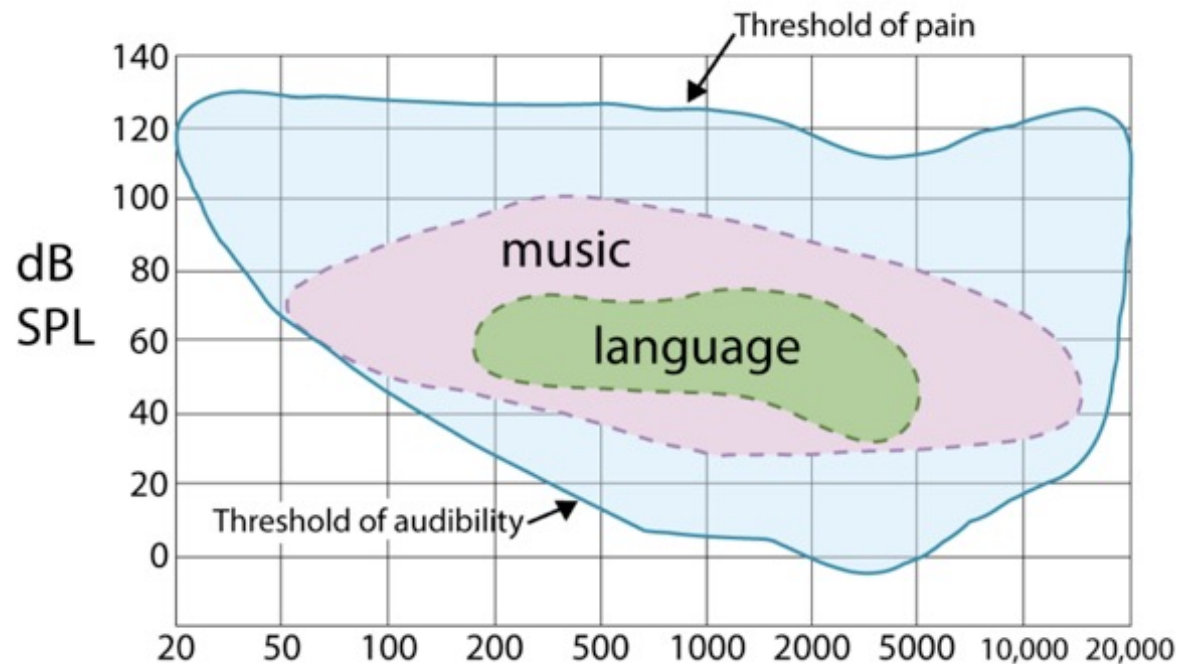
- ~ 90% of American internet users stream music (Cyber News, 2024)
- Smartphone integration among hearing aid wearers has reached critical mass.
- ~70% of current hearing aid wearers report they use connect their hearing aids to their smartphone
- Hearing aid wearers spend, on average, 36.5 minutes per day streaming. Listening to music is one of the three activities (podcasts and phone call are the other two) (Pruess & Bulut, 2025)

Why this short course? (2)

“She couldn’t walk, she couldn’t talk, music therapy helped Joni Mitchell recover from a stroke– could it ward off depression and dementia too?”-The Guardian, January 25, 2025

- Enjoyment
- Relaxation
- Healing
- Restorative Effects

Why this short course (3)



Music = Broader bandwidth and larger dynamic range

Musical Enjoyment and Hearing Loss

- Chern et al (2023) explored how hearing loss (HL) affects active music enjoyment among hearing aid wearers and whether hearing aids improved this experience
- Surveyed 100 hearing aid wearers (avg age ~65, mean PTA 50.4 dB mean WRS 84.5%) and 20 normal hearing adults.
- Participants listened to musical excerpts with and without their HAs and rated the music on three dimensions using visual analog scales (VAS): pleasantness, musicality, and naturalness

Musical Enjoyment and Hearing Loss

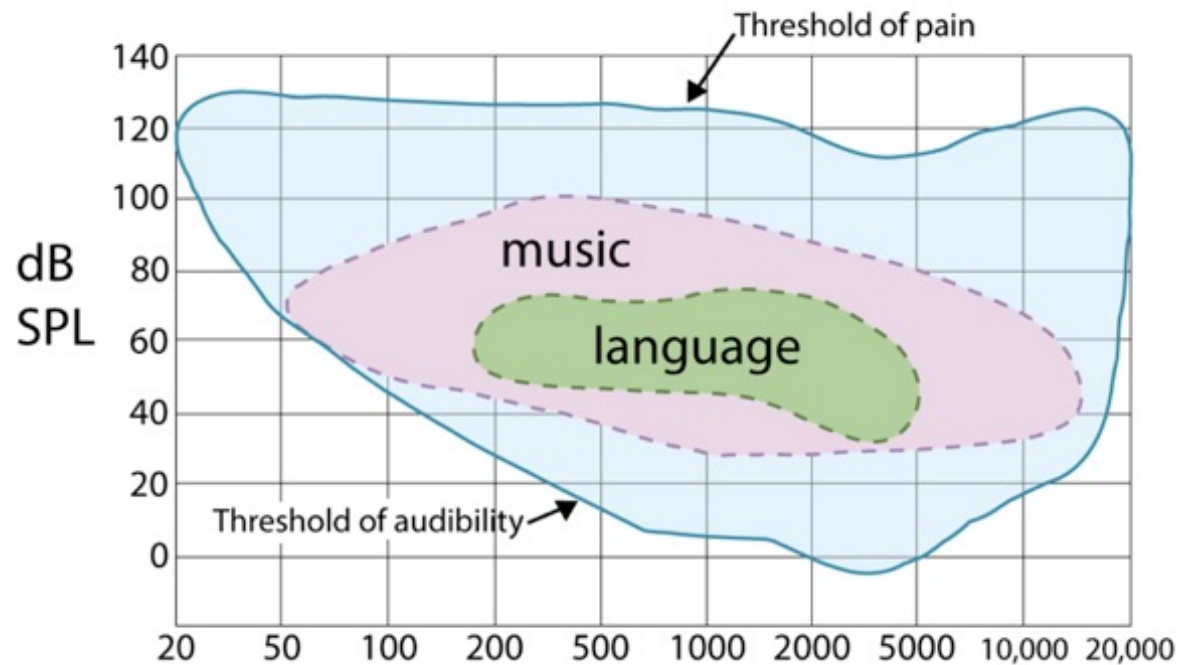
- Results:

1. Music enjoyment scores of NH controls were significantly higher across all three measures than those of HA wearers, regardless of HA use
2. Those with greater HL (higher PTA) had lower ratings of pleasantness, musicality, and naturalness—both with and without hearing aids ($p < .05$)
3. Use of HAs significantly increased music enjoyment, particularly in the dimension of musicality, among wearers with moderate to severe HL.

Musical Enjoyment and Hearing Loss

- HA wearers report increased music enjoyment with HAs compared to without wearing their hearing aids (Chern et al 2022).
- Looi et al (2019) observed that severe HL led to notably lower music appreciation, and some HA wearers found music less melodic, highlighting that music enjoyment remains challenging for many, especially with severe-profound loss
- A review by Bleckly et al (2024) report a consistent pattern: HL and hearing devices tend to negatively impact perception and appreciation of music. Many adults with hearing loss experience diminished enjoyment or participation in musical activities.

Acoustics of music vs. speech

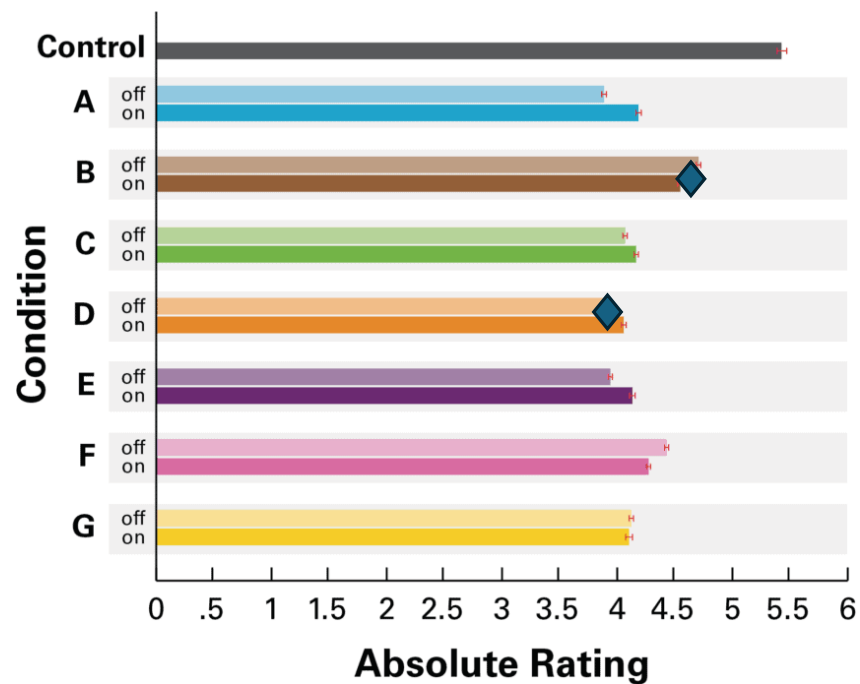


Key Features for Optimal Music Performance

Feature	Why It Matters	Best Setting
High Input Level Capacity	Prevents distortion in loud music	≥ 110 dB SPL
Extended Frequency Response	Preserves harmonics	8,000+ Hz bandwidth
Slow-Acting Compression or No Compression	Maintains dynamics	Slow acting compression and linear gain
Minimal Noise Reduction	Prevents loss of musical details	Noise reduction deactivated
Omnidirectional Microphones	Captures full spatial sound	Omnidirectional
Reduced Feedback Suppression	Prevents loss of high-pitched musical sounds	Feedback canceller deactivated
Low Latency Processing	Prevents timing issues for musicians	<10 ms delay

See *Music and Hearing Aids: A Clinical Approach*, by Marshall Chasin, Plural Publishing 2022

Automatic Music Programs



Sandgren & Alexander (2023)

- 7 premium brands
- 70 participants, aged 18-24 with normal hearing judged quality of music on 1 to 7 scale
- Off = speech program matched to gain target
- On = default music program
- Differences in music quality ratings were larger between brands than between music and speech program

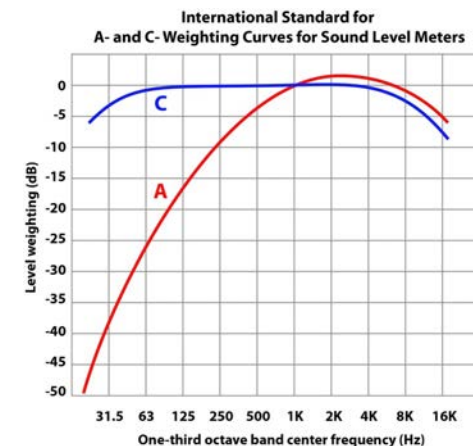
Streamed vs. Loudspeaker Music Listening

Streamed Music Variables

- Coupling
 - Occluded vs. mold
- Bluetooth connection
 - MFi
 - BT Classic
 - LE Audio
 - ASHA Protocol
- Wireless communication between hearing aids
 - NFMI
 - Bluetooth Classic

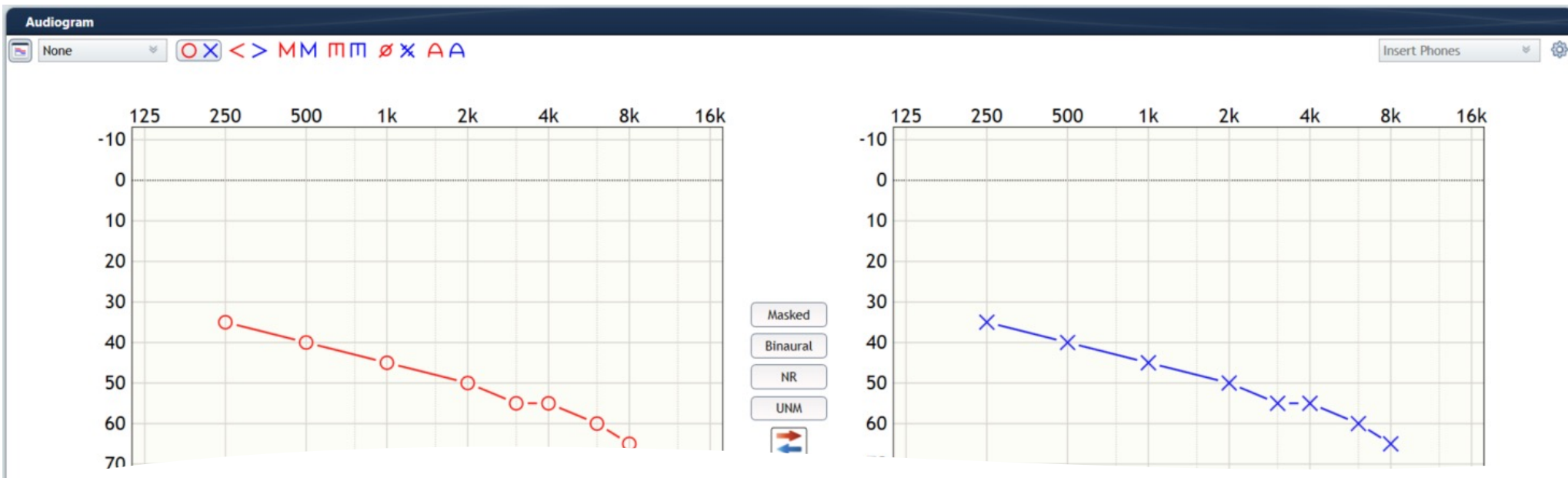
Loudspeaker Music Variables

- Coupling
 - Occluded vs. mold
- Automatic program
 - Universal (for speech)
 - Music
 - Other



Considerations

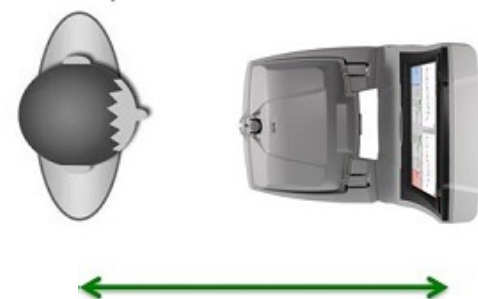
- Several studies indicate that wearers prefer different acoustic parameters for music compared to speech (e.g., Vaisberg et al 2017; Vaisberg et al 2019)
 - More low frequency gain
 - Less compression (more linear)
 - Broader-band frequency response with less treble (flatter)
- Automatic music programs fall short. At default settings, they are judged to be no better than “speech” programs
- Given the rising popularity of streaming music, you need to optimize both loudspeaker/live music and streamed music



- How we evaluated programs:
 - Signia Pure Charge & Go 7 IX T
 - Allure RIC RD 440
 - Mild to moderate hearing loss
 - Power sleeves (occluded)
 - Custom ear mold
 - John Coltrane, Impressions (Take 1), 80 dB
 - REM set up
 - Ears 1~ meter from speaker

Aided ear with
probe tube positioned

Verifit in On-ear
speechmap mode



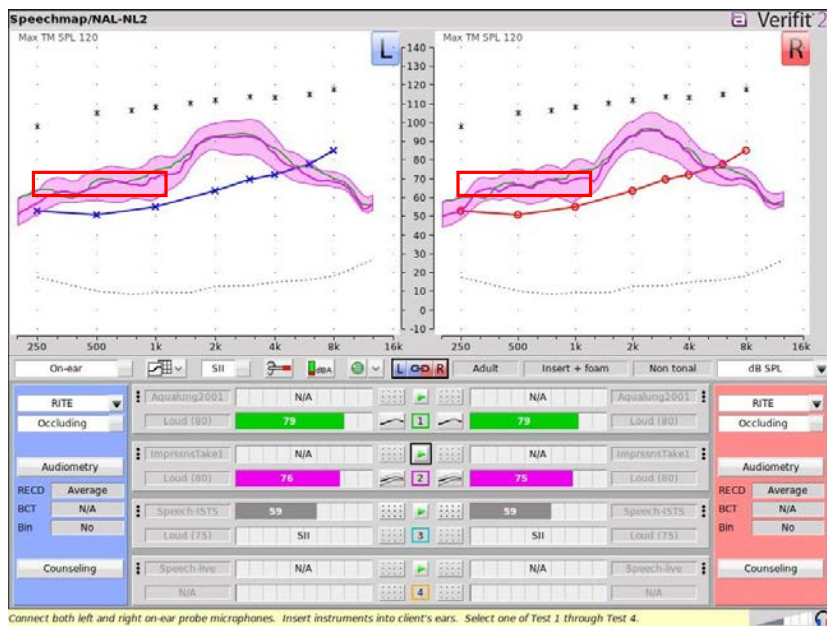


Loudspeaker and Streaming Output Measurement Protocol

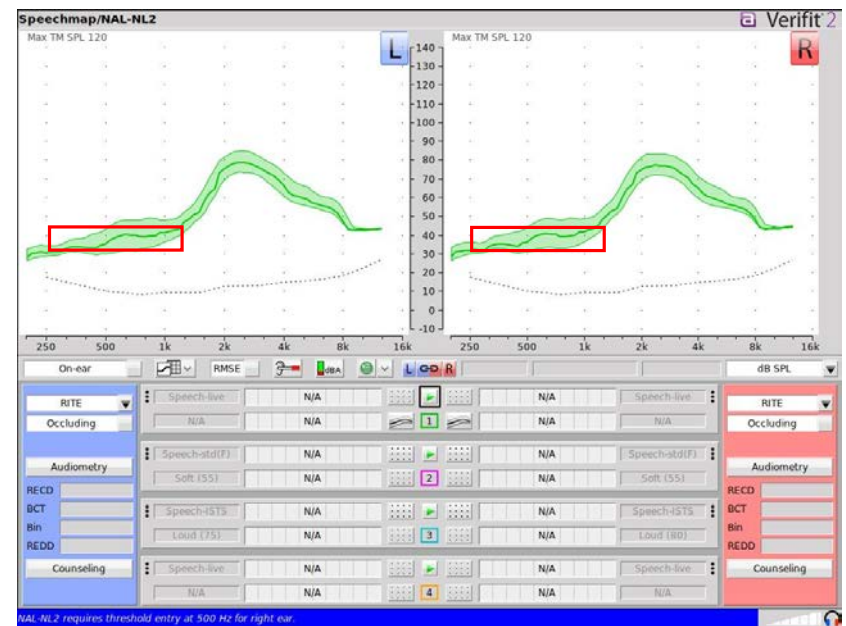
1. For the streaming tests' setup, the "Live Speech" Speechmap On Ear test was selected.
 - The music signal was streamed through the smartphone as a .wav audio file.
 - Test was run as the music was streamed/recorded for a 20 seconds duration.
 - The phone's volume was adjusted to an ~80 dB SPL limit at the probe mic.
2. For the Loudspeaker test setup, the "Speechmap" On Ear test was selected.
 - The music signal was played through Verifit 2 as a .wav audio file.
 - Test was run as the music was played for a duration of 20 seconds.
 - The level was selected at 80 dB SPL

Loudspeaker vs Streamed (IX)

- Frequency response
- Shape
- Level



Loudspeaker Response

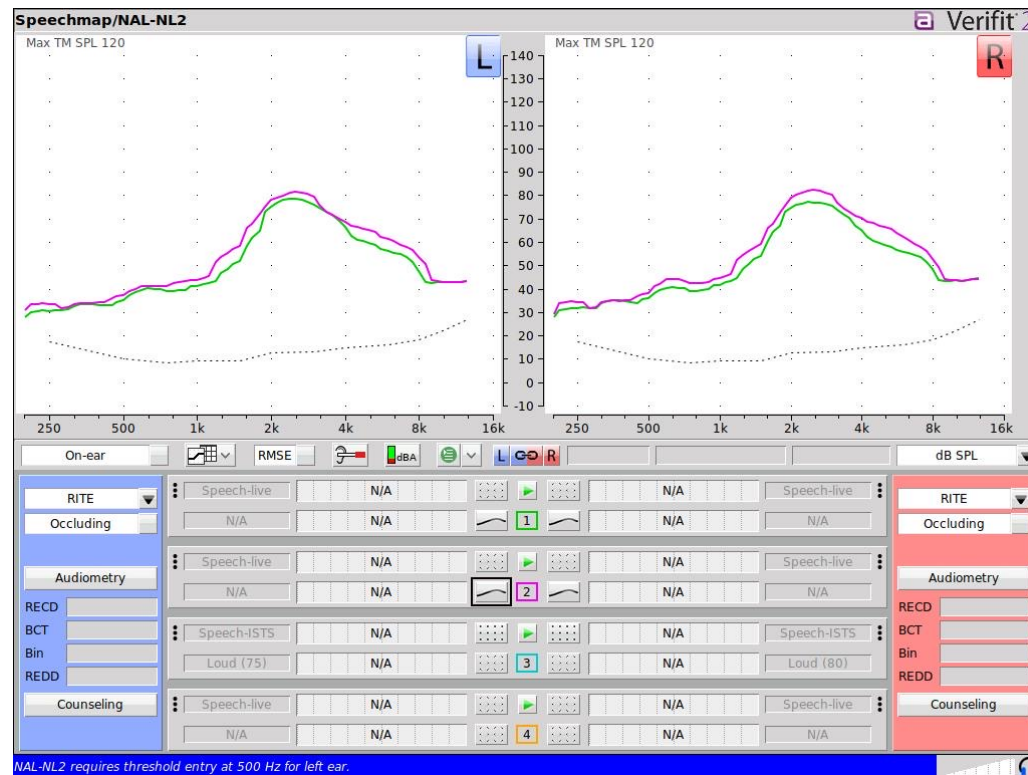


MFi Streamed Response

Jazz – OCCLUDED- MFi vs. CBT STREAMING (IX)

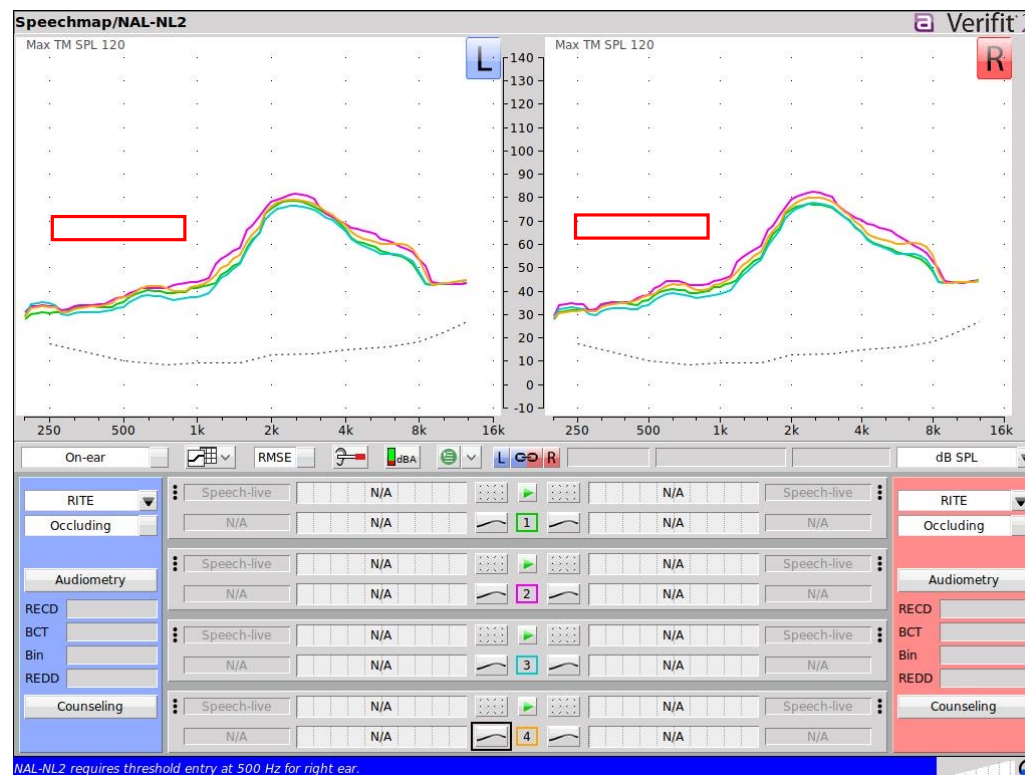
Speechmapping

- MFi – Green
- CBT- Purple



Jazz – OCCLUDED- MFi/CBT/ASHA/LE Audio STREAMING (IX) Speechmapping

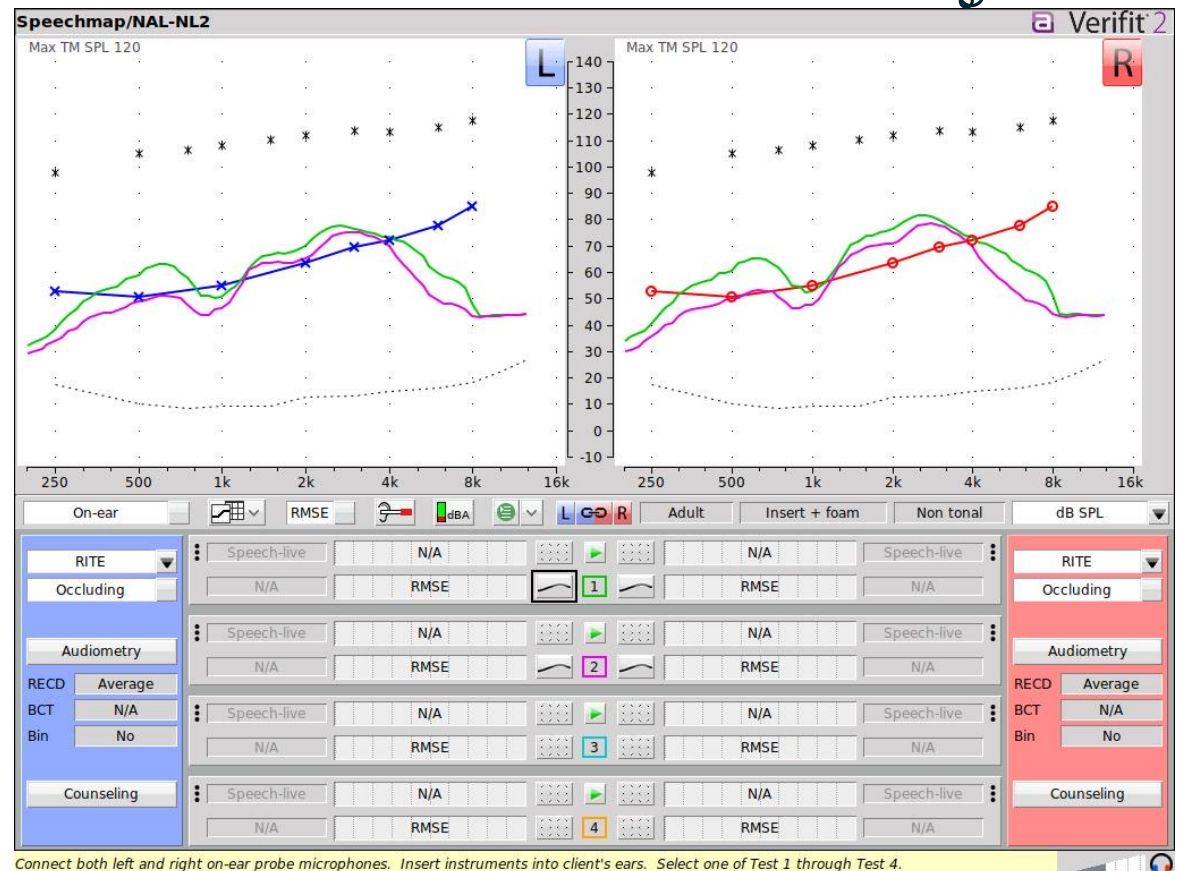
- MFi – Green
- CBT- Purple
- ASHA-Teal
- LE Audio-Orange



Jazz – MOLD - MFi vs. CBT STREAMING (IX) Speechmapping

- MFi – Green
- CBT- Purple

Note: “Headphone Safety Limits do NOT treat CBT and MFi streaming the same

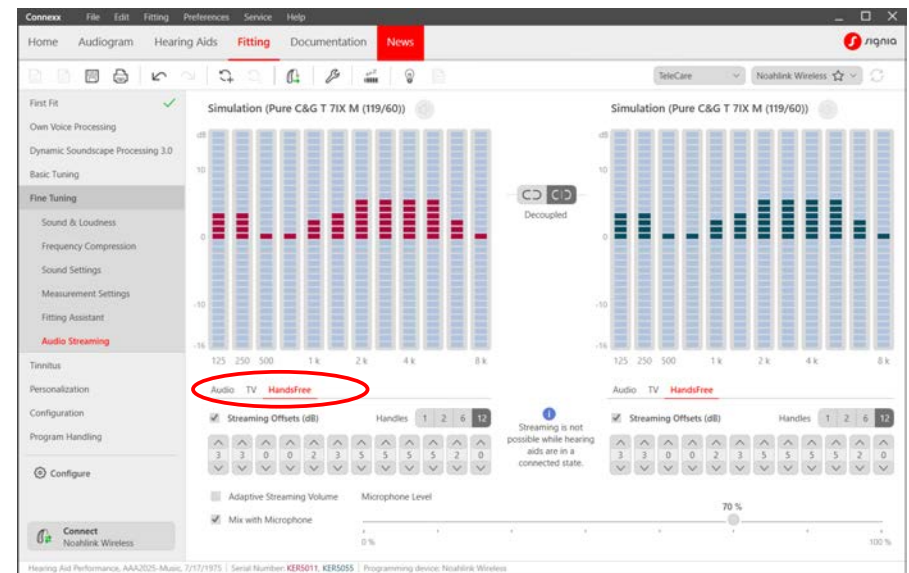
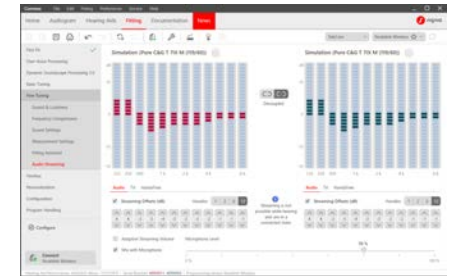
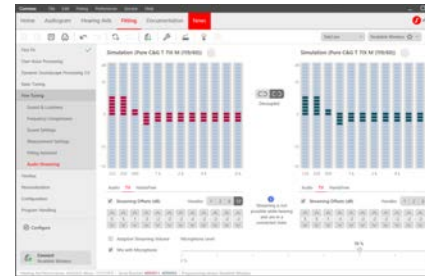


MFi vs LE Audio vs Bluetooth Classic

Feature	MFi	LE Audio	Bluetooth Classic
Owner	Apple	Bluetooth SIG	Bluetooth SIG
Main Use Case	Certified accessories for Apple devices	Low-power, high-quality audio over BLE	Traditional Bluetooth audio (e.g., A2DP)
Audio Codec	Apple proprietary (for hearing aids)	LC3	SBC, AAC, aptX, etc.
Power Efficiency	Depends on implementation	Very high (optimized for low power)	Lower (more power-hungry)
Audio Quality	Good (Apple-optimized)	High (even at low bitrates)	Varies (decent at higher bitrates)
Streaming Type	Direct streaming to MFi hearing aids	Multi-stream, broadcast (Auracast)	Point-to-point
Platform Support	Apple-only	Cross-platform (new devices)	Cross-platform
Latency	Low for MFi use cases	Very low (especially for hearing aids)	Medium to high
Cert Required?	Yes, for accessory makers	No (just implement the spec)	No (just implement the spec)
Backward Compatible	N/A	No (requires new BLE hardware)	Yes (widely supported)

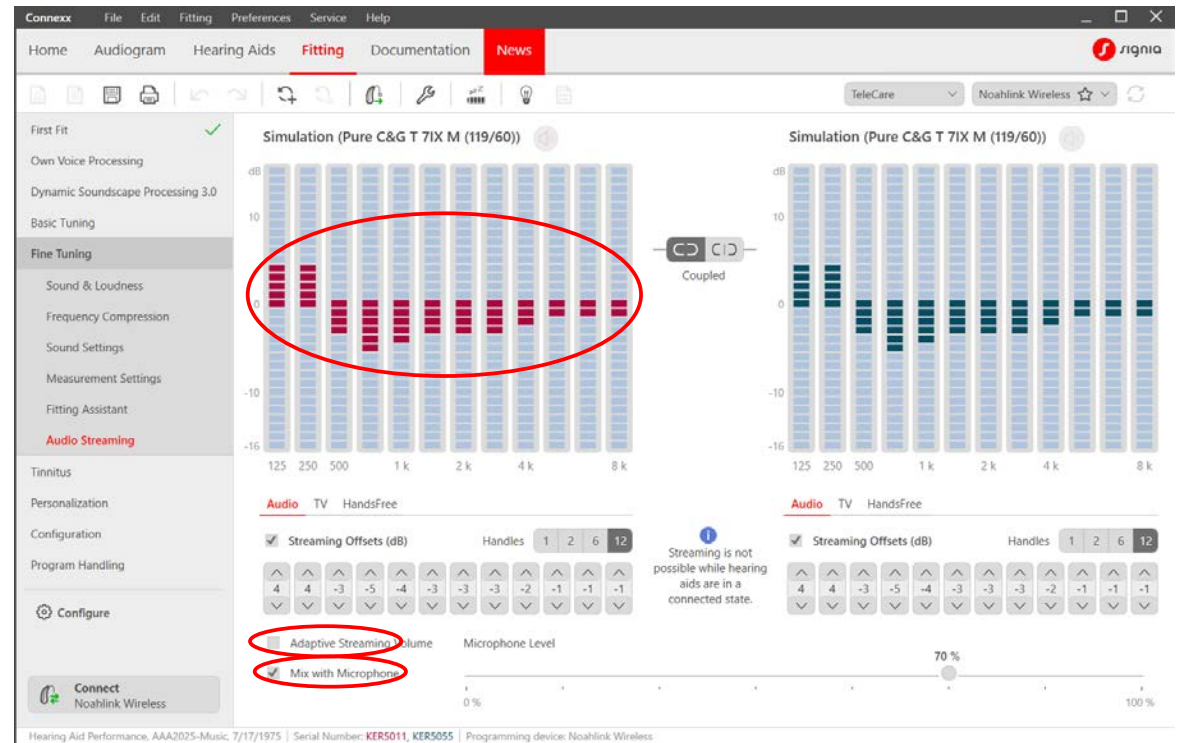
Audio Streaming (IX)

- Type of signal
- Streaming offsets
- Additional processing



Streamed Signal Processing

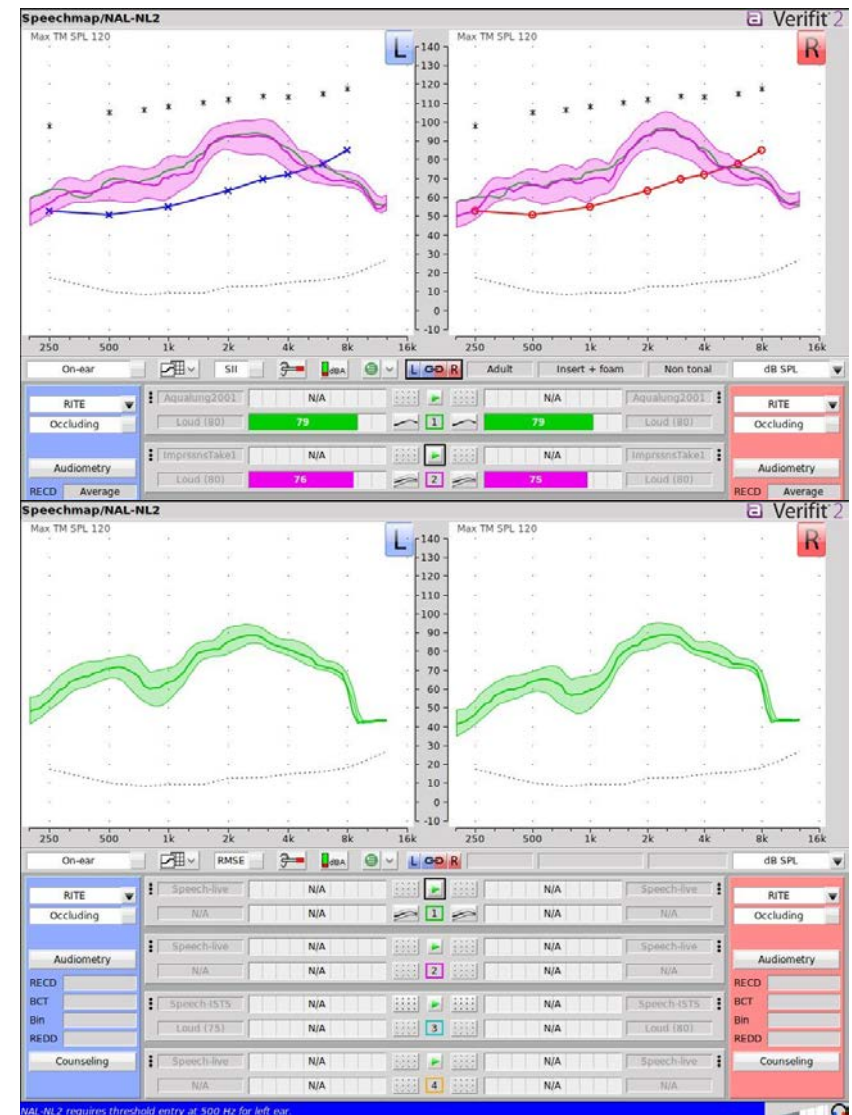
- Streaming Offsets
- Mix with Microphone
- Adaptive Streaming Volume



Loudspeaker Custom vs. Occluded dome (IX)

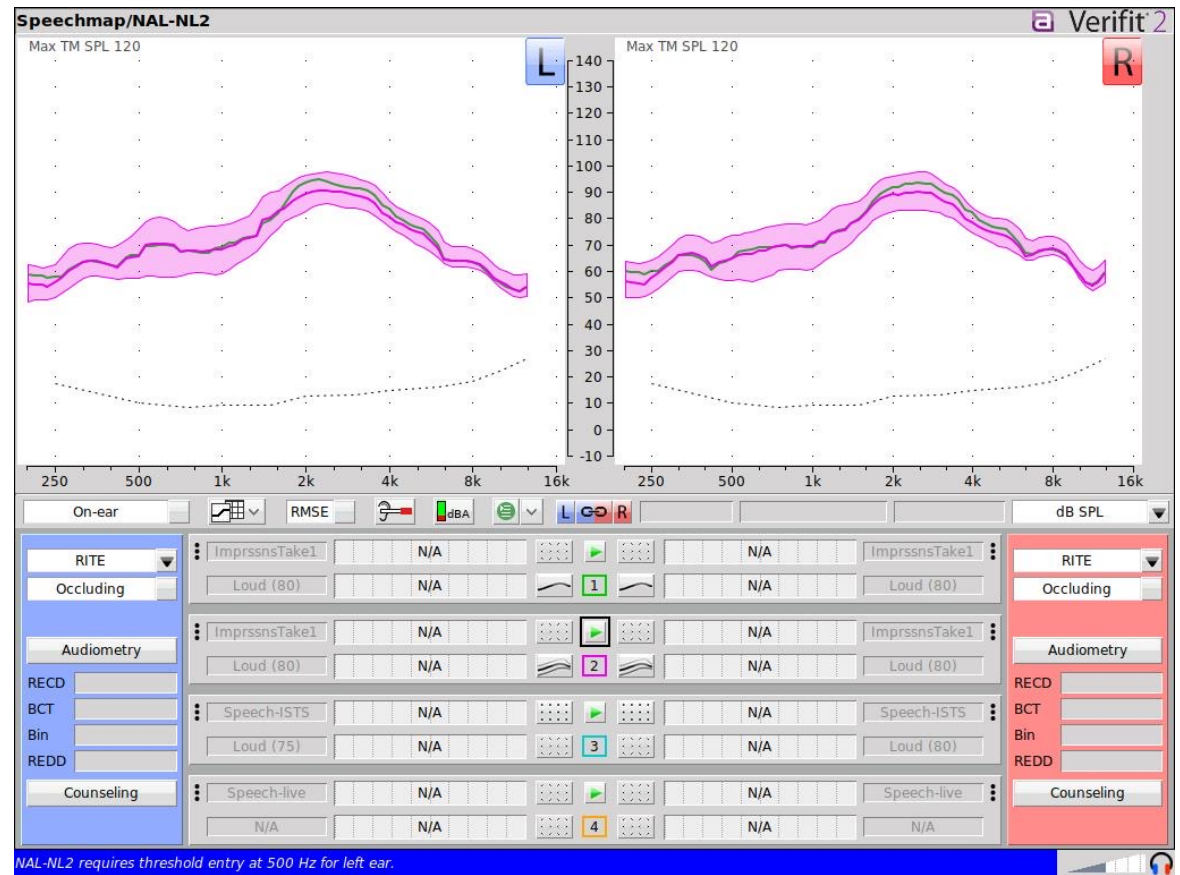
- Frequency response
- Shape
- Level

- Custom – Purple
- Occluded – Green (dome)



Loudspeaker Universal vs. Music (IX)

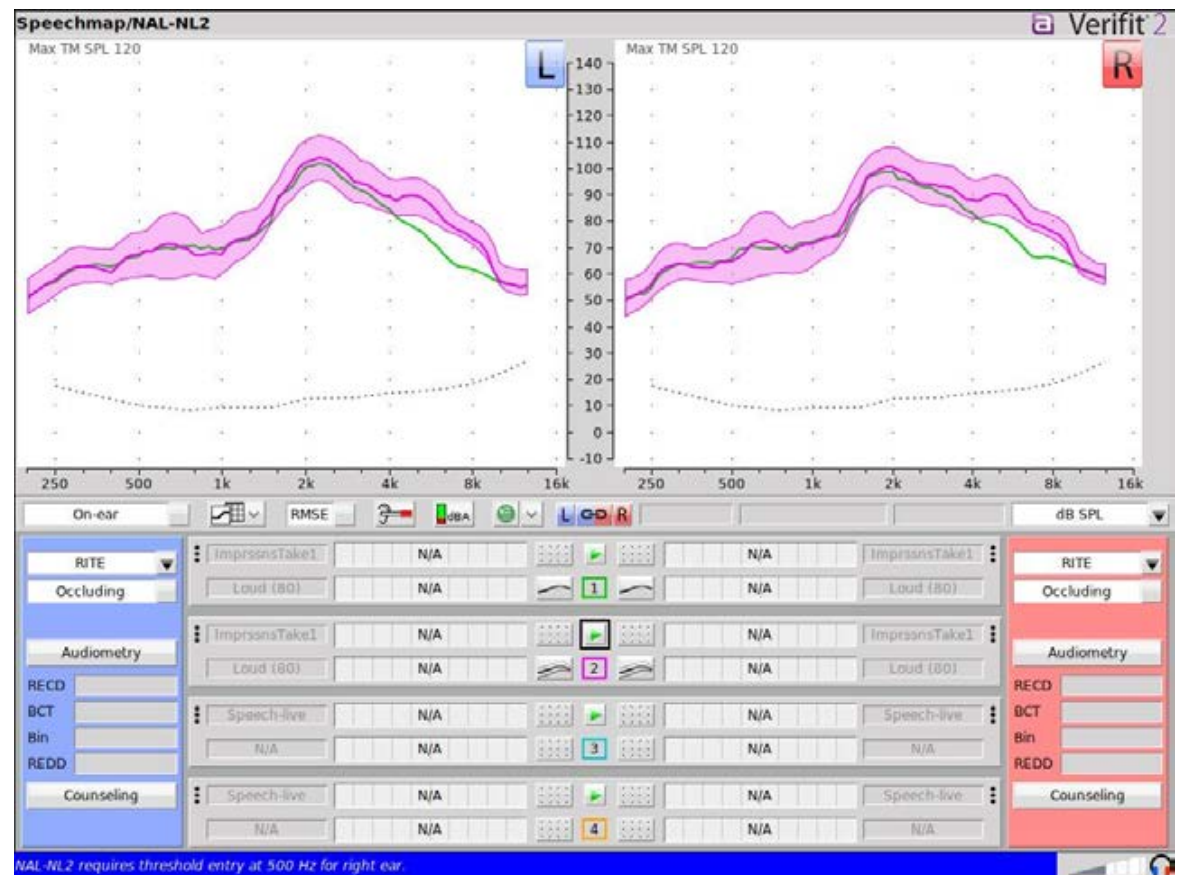
- Frequency response
- Shape
- Level



Loudspeaker Universal vs. Music (Allure)

- Frequency response
- Shape
- Level

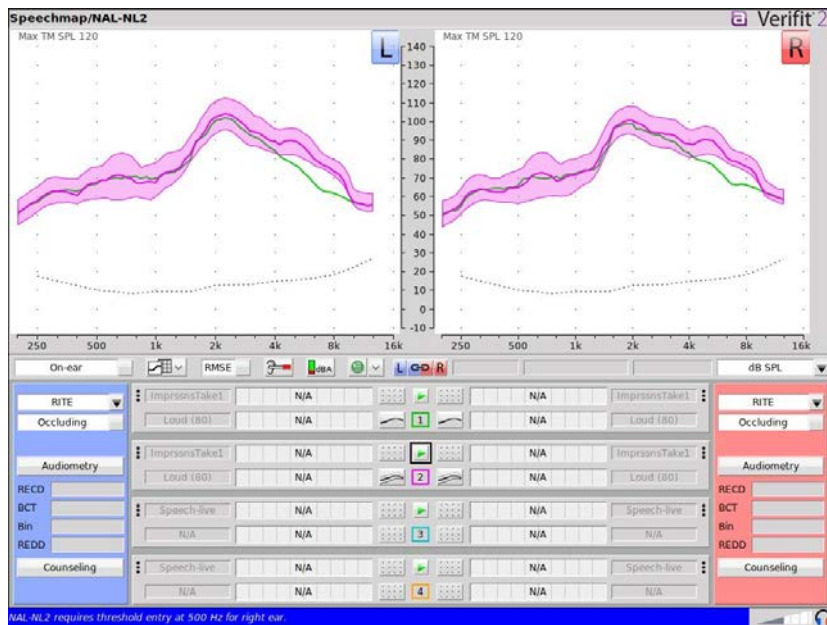
- Music – Purple
- Universal – Green



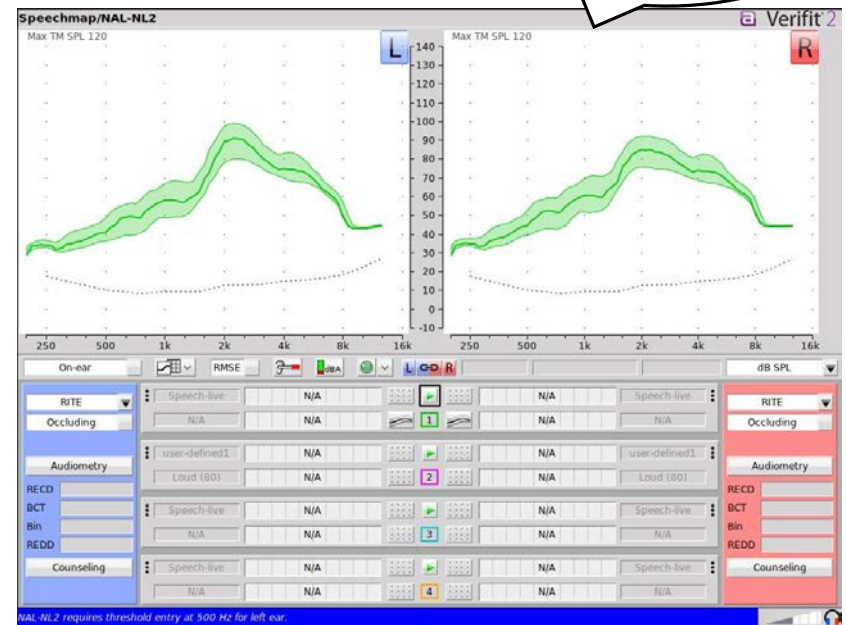
Loudspeaker vs Streamed (Allure)

- Frequency response
- Shape
- Level

~90 dB SPL
(avg.)



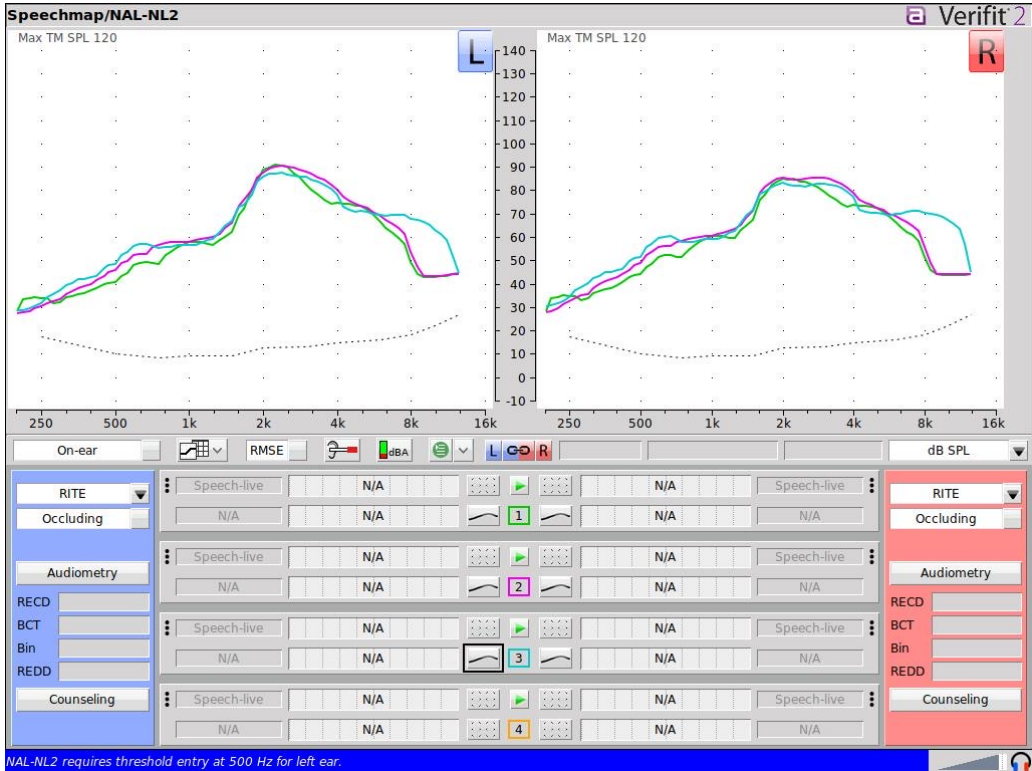
Uni. and Music Response



MFi Streamed Response

Speechmapping

- **MFi – Green**
- **ASHA- Purple**
- **LE Audio-Teal**



Programming Strategies for Music in Hearing Aids

Input Dynamic Range & Compression

- Widen input dynamic range to handle music's loud dynamics
- Use slower compression speeds (attack/release)
- Reduce number of compression channels
- Preserve natural musical dynamics

Noise Reduction & Feedback Management

- Disable or minimize noise reduction (may distort harmonics)
- Loosen/disable aggressive feedback cancellation
- Ensure good earmold fit to reduce whistling
- Prevent suppression of sustained notes/instruments

Frequency Response

- Maintain wide bandwidth for clarity and overtones
- Allow more low-frequency amplification for richness
- Use less prescriptive gain shaping
- Aim for natural, fuller sound quality

Output & Loudness

- Increase maximum power output (MPO) carefully
- Prevent distortion on louder passages
- Avoid discomfort from sudden loudness
- Ensure microphones can handle higher input levels

Specialized Music Program & Co-Listening

- Create (but also fine-tune) a dedicated Music program (separate from speech)
 - Streaming will likely look very different than acoustic
- Let patients test with their own recordings/instruments
- Encourage co-listening during adjustments
- Document preferred settings for future use

Conclusions (1)

- If music is a Top-5 listening priority:
- Custom earmolds with small-ish parallel vents
- In the Music program, you may need to:
 - Add more lows to flatten the frequency response
 - Turn up the MPO settings (more headroom)
 - Create a more linear response (smaller compression ratio)
 - Deactivate noise reduction features

- Use REM to verify music parameters
 - Loudspeaker music
 - Streamed music

- Frequency response
- Shape
- Level



Conclusion (3)

Use co-listening during
REM to verify sound quality



References

- Bleckly, F., Lo, C. Y., Rapport, F., & Clay-Williams, R. (2024). Music Perception, Appreciation, and Participation in Postlingually Deafened Adults and Cochlear Implant Users: A Systematic Literature Review. *Trends in hearing*, 28, 23312165241287391.
- Chern, A., Denham, M. W., Leiderman, A. S., Sharma, R. K., Su, I. W., Ucci, A. J., Jones, J. M., Mancuso, D., Cellum, I. P., Galatioto, J. A., & Lalwani, A. K. (2022). Hearing Aids Enhance Music Enjoyment in Individuals With Hearing Loss. *Otology & neurotology : official publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology*, 43(8), 874–881.
- Chern A, Denham MW, Leiderman AS, et al. The Association of Hearing Loss With Active Music Enjoyment in Hearing Aid Users. *Otolaryngol Head Neck Surg*. 2023;169(6):1590-1596.
- Hribar, J. F., Jr., & Wright, N. (2020). Verification of direct streaming to hearing aids: A how-to guide to the digital listening environment. *Canadian Audiologist*, 7(2). Retrieved from <https://canadianaudiologist.ca/direct-streaming-to-hearing-aids-how-to-feature/>
- Looi, V., Rutledge, K., & Prvan, T. (2019). Music Appreciation of Adult Hearing Aid Users and the Impact of Different Levels of Hearing Loss. *Ear and hearing*, 40(3), 529–544.
- Madsen SM, Moore BC. (2014) Music and hearing aids. *Trends Hear* 18:1–29.
- Preuss, M., & Bulut, K. (2025). Clinical trends for mild to moderate hearing losses. *Phonak Field Study News*. <https://www.phonak.com/evidence>
- Sandgren & Alexander (2023) Music quality in hearing aids. *Audiology Today*. 35, 4.
- Scollie, S. (2023). 20Q: next-level hearing aid verification *AudiologyOnline*, Article 28775. Available at www.audiologyonline.com
- Vaisberg, J.M., Folkeard, P., Parsa, V., Froehlich, M., Littmann, V., Macpherson, E.A., & Scollie, S. (2017, August). Comparison of music sound quality between hearing aids and music programs. *AudiologyOnline*, Article 20872. Retrieved from www.audiologyonline.com
- Vaisberg JM, Martindale AT, Folkeard P, Benedict C. (2019) A qualitative study of the effects of hearing loss and hearing aid use on music perception in performing musicians. *J Am Acad Audiol* 30(10):856–870.