

PERSONALIZATION

PRESENTED BY: LAURA KEARNS AU.D



SPEAKER DISCLOSURE

Relevant Financial Relationships:

Laura Kearns is an employee of Widex USA and receives financial compensation.

Relevant Nonfinancial Relationships:

There are no nonfinancial relationships.



YOUR WIDEX TEAM



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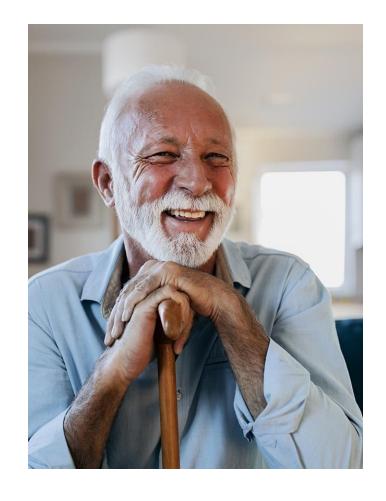


AGENDA

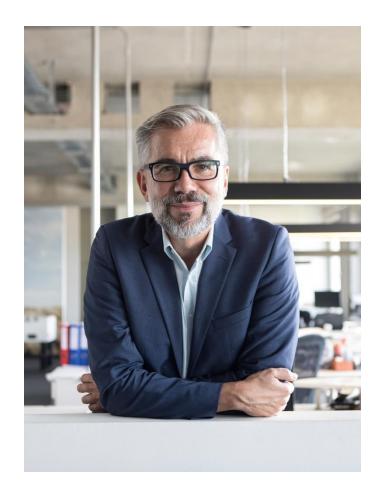
- The modern patient and the barriers to reaching them
- Physics of signal processing delay and why it matters to today's patients
- Well-being and the use of music and mixed sound therapy for relaxation
- The use of AI in patient empowerment



WHO IS THE MODERN PATIENT?

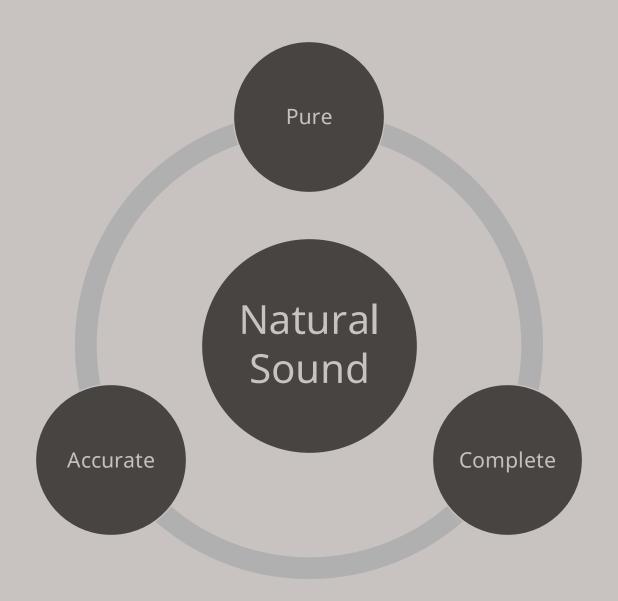








WHAT DO PATIENTS WANT IN A HEARING AID?





TREAT THE WHOLE PERSON









PERSONALIZE

Creating something to meet someone's individual requirements

INDIVIDUALIZE

To adapt to the needs or special circumstances of an individual

CUSTOMIZE

When a user manually makes changes to achieve their preferred experience



PERSONALIZE

Creating something to meet someone's individual requirements

INDIVIDUALIZE

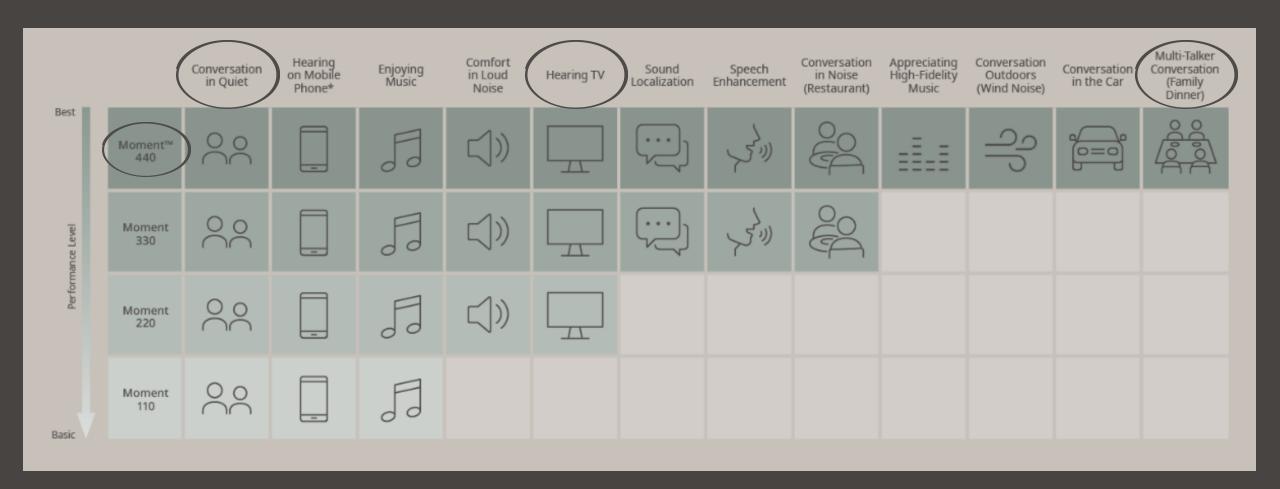
To adapt to the needs or special circumstances of an individual

CUSTOMIZE

When a user manually makes changes to achieve their preferred experience



FOCUS ON THEIR PRIORITIES





WHY WIDEX





® 95%





® 80%

The faster an amplified sound gets to your ear, the more accurately It Is presented to the brain. Widex delivers sound

fastest, by far1

Why does ____ that matter?

of wearers agree the sound is natural and clear with greater satisfaction participating in daily life2

How can that help?

as many wearers are very satisfied in noisy backgrounds using PureSound™ with ZeroDelay™ compared to other hearing aids3

What else can Widex offer?

of wearers with tinnitus experienced a reduction of tinnitus severity using Widex SoundRelax™4

WHAT ARE YOUR PRIORITIES

		Conversation in Quiet	Hearing on Mobile Phone*	Enjoying Music	Comfort in Loud Noise	Hearing TV	Sound Localization	Speech Enhancement in Noise	Conversation in Noise (Restaurant)	Appreciating High-Fidelity Music	Conversation Outdoors (Wind Noise)	Conversation in the Car	Multi-Talker Conversation (Family Dinner)
Best	Moment™ 440	000		J	⟨⟩)			((*ئى	69		20		
Performance Level	Moment 330	20		J	⟨⟩⟩)			((نځې					
Good	Moment 220	000		J	□								



SOUND LIKE NO OTHER



WHICH WIDEX MOMENT FITS YOU BEST

Moment 440 • 15 Channels • 11 Sound Classes Improved Localization Moment 330 Real Time Speech Performance Enhancer and • 12 Channels · Dedicated Speech-Personalization In-Noise Program 7 Sound Classes Moment 220 Improved High Frequency Boost Localization 10 Channels SmartWind" Standard Speech Manager Enhancer 4 Sound Classes Direct Streaming' Direct Streaming' Direct Streaming' Connectivity · Moment App with · Moment App with · Moment App with and Control MySound™ Al' MySound Al' MySound Al' · Tonelink App Tonelink App Tonelink App · Industry-leading Industry-leading Industry-leading ZeroDelay™ ZeroDelay ZeroDelay Technology¹ Technology¹ Technology¹ Sound Quality and Tinnitus Natural Sound · Natural Sound Natural Sound Management Audibility Extender · Audibility Extender Audibility Extender Widex SoundRelax** Widex SoundRelax Widex SoundRelax and Zen and Zen and Zen Professional recommendation:

Slugocki C, Kuk F, Korhonen P, Ruperto N. Neural encoding of the stimulus envelope facilitated by Widex ZeroDelay technology.

- Bailing LW, Townend O, Heimink D. Sound quality in real life-Not just for experts. Hearing Review. 2021;28:27-30.
- Balling LW, Townent O, Heimink D. Sound quality for all: The benefits of ultra-fast signal processing in hearing aids. Hearing Review. 2021:28(9):32-35.
- Balling LW, Caporali S, Parker D, Jeppersen AM, Heimink D. Expanding options for effective tinnitus management. Hearing Review.

RIC AND BTE MODELS



Sheer sRIC R D

Via Widex

Sound Assist*











ITE MODEL	S

CIC

.









XP .

CUSTOMIZE YOUR COLORS

RIC/BTE

(119)

Autumn Beige

(123)

(077)



Golden Brown

(120)

Sporty Red

(076)

DEX Compatible

Telecoll

Rechargeable

2.4 GHz Apple* &

DEX** Compatible

Telecoll

Android" Connectivity



Honey Blonde

(114)

(078)

Mediterranean Turquoise Shocking Pink









Pearl White

(830)



.



Deep Blue

(136)





ITE





"Must have 2.4 GHz enabled hearing aid paired to Apple" (IOS) or Android" (ASHA) phone. 'Available in RIC and BTE models.



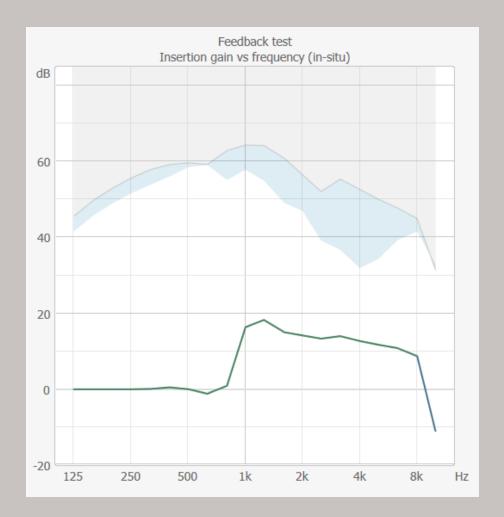
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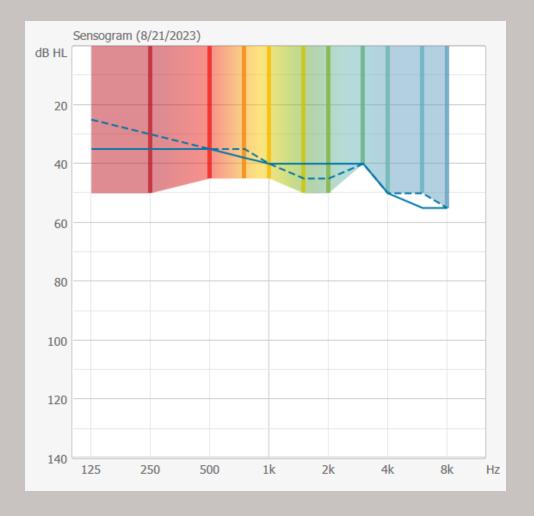






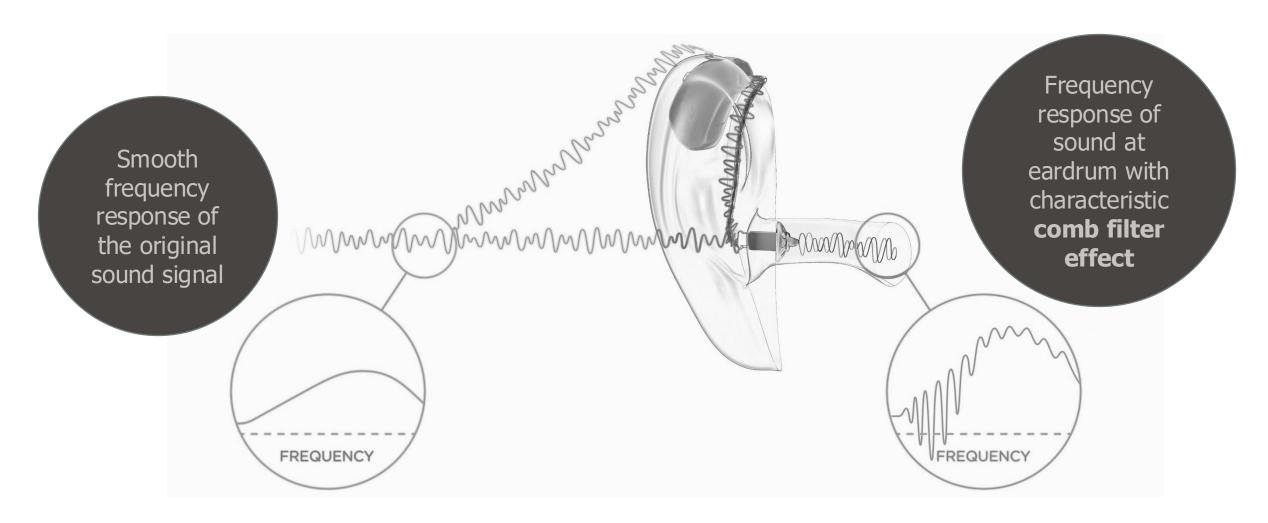








THE PHYSICS OF DELAY AND WHY IT MATTERS

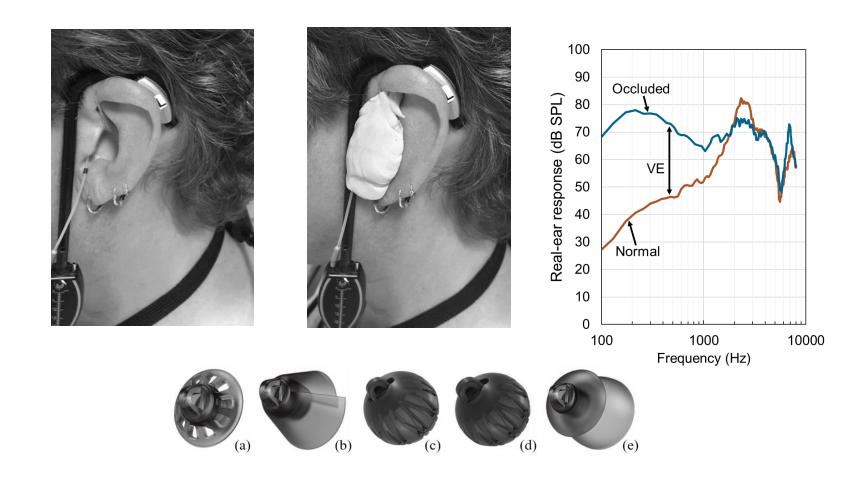








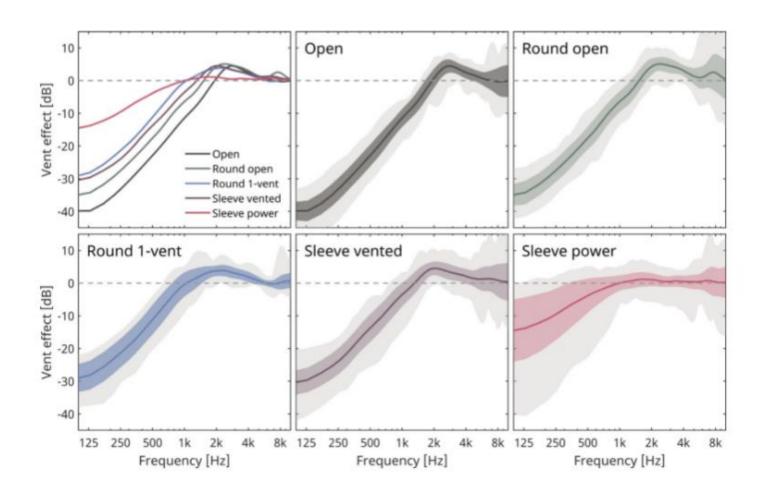
ARE YOU FITTING OPEN?



Balling, L. W., Jensen, N. S., Caporali, S., Cubick, J., & Switalski, W. (2019). Challenges of Instant-Fit Ear Tips: What Happens at the Eardrum? Hearing Review, 26(12), 12–15.

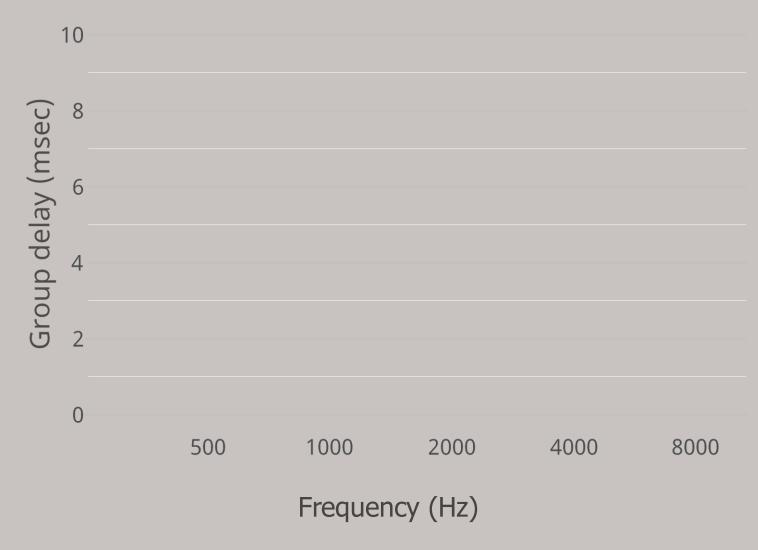


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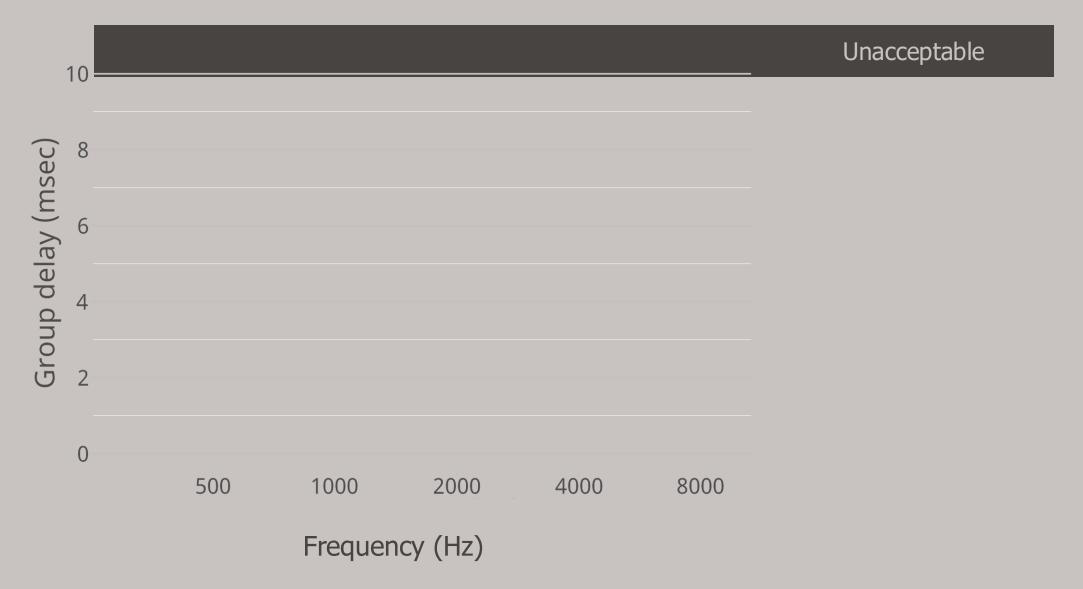


Balling, L., Caporali, S., Cubick, J. (2023) Sound Quality and Comfort with Instant Ear-tips: From the Lab to Real Life. WidexPress, 49.





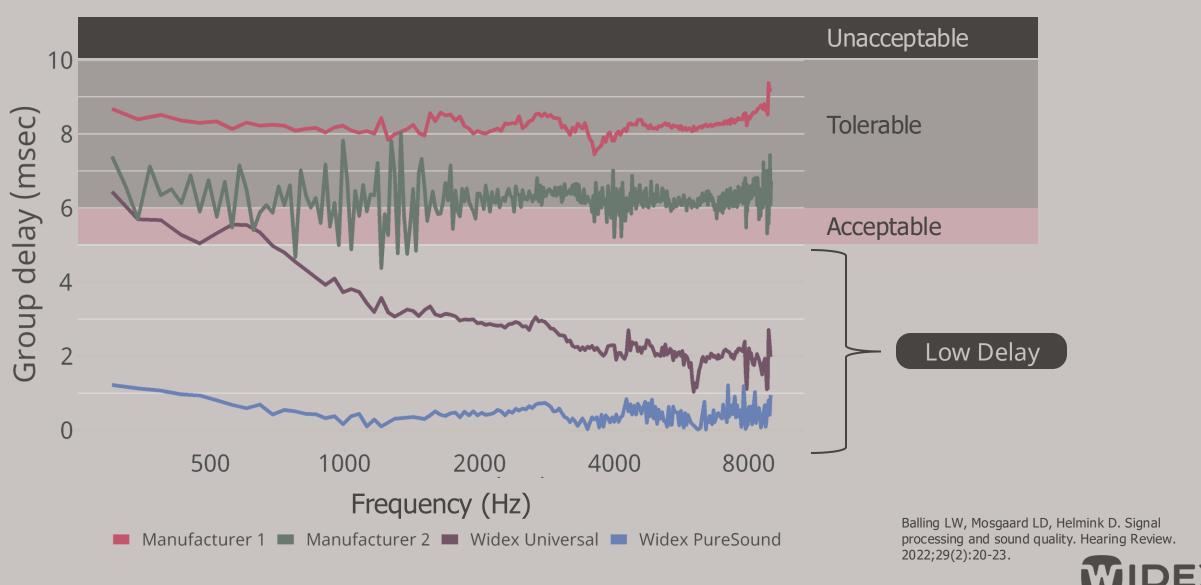








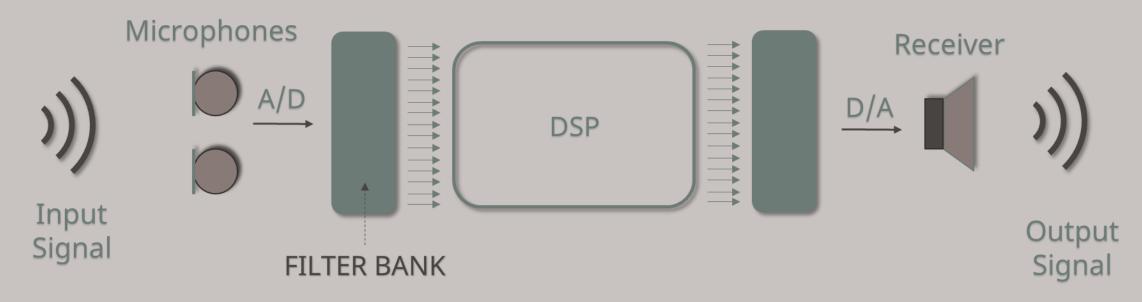




WHY DON'T ALL HEARING AIDS DELIVER LOW DELAY?

One answer is filter bank design...

A filter bank is an array of filters that separate the input signal into multiple components for digital signal processing.



Choices made in filter bank design greatly influence the resulting signal quality.



WHY DOES THE FILTER BANK DESIGN MATTER?

Frequency-Domain Filter Banks



- All bands must be the same size
- The narrow bands result in long delay and low sampling rate



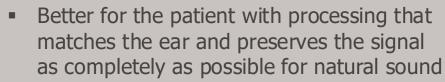
- Easier for the manufacturer with less burden for complex computations and easier power management
- Potentially poorer for the patient as it introduces the risk of comb filter distortion and limitation on sound quality



Time-Domain Filter Banks



- Flexibility to set different bandwidths
- Supports matching critical hearing bands and allows low delay processing



 Makes signal processing design harder for the manufacturer, but is better for natural sound

Balling, L.W., Mosgaard, L.D., & Helmink, D. (2022). Signal Processing and Sound Quality. Hearing Review, 29 (2), 20-23.

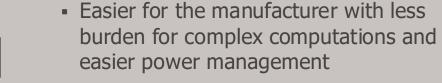


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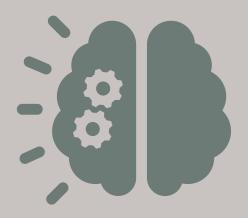
- Better for the patient with processing that matches the ear and preserves the signal as completely as possible for natural sound
- Makes signal processing design harder for the manufacturer, but is better for natural sound

Balling, L.W., Mosgaard, L.D., & Helmink, D. (2022). Signal Processing and Sound Quality. Hearing Review, 29 (2), 20-23.



PATIENT OUTCOMES WITH LOW DELAY

Objective Measures



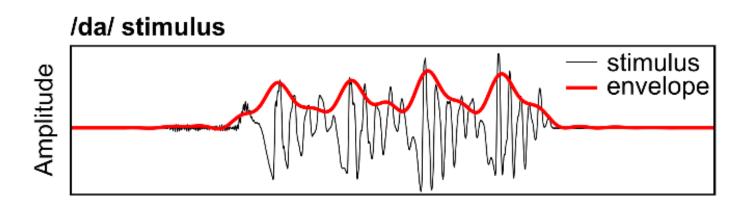
Subjective Preference





NEURAL ENCODING OF SPEECH

Electroencephalography (EEG) measures the electrical signals from the brain



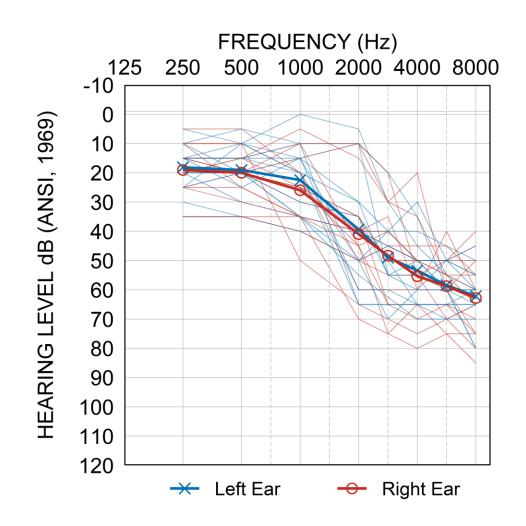
Slugocki C., Kuk F., Korhonen P., & Ruperto, N. (2020). Neural encoding of the stimulus envelope facilitated by Widex ZeroDelayTM technology. Hearing Review, 27(8), 28-31.



NEURAL ENCODING OF SPEECH

- Using EEG to measure neural response to speech
- 16 participants with mild-to-moderate hearing losses
- PureSound[™] with 0.5 ms group delay and two other manufacturers' premium products with 6 ms & 8 ms group delay
- Fit to NAL-NL2 using each manufacturer's defaults settings for open eartips

Slugocki C., Kuk F., Korhonen P., & Ruperto, N. (2020). Neural encoding of the stimulus envelope facilitated by Widex ZeroDelay[™] technology. Hearing Review, 27(8), 28–31.





NEURAL ENCODING OF SPEECH WHAT DO YOU THINK THIS MEANS FOR YOUR PATIENTS?

AT THE BRAIN

The black line shows the fundamental frequency of the speech signal, an important speech cue**. The other three lines represent the envelope-following response (EFR) for three different hearing aids and reflect the neural representation of this important speech cue. PureSound in blue shows a more accurate and stronger EFR, indicating better representation of the speech cues at the brain.

Better neural representation may contribute to more natural sound experience.



Amplitude (µV) 60 40 Latency (ms) Widex Manufacturer 1 Manufacturer 2

^{*} Balling, et al., Hearing Review 2020. ** Kuk, F. (2020)

^{**}Slugocki C., Kuk F., Korhonen P., & Ruperto, N. (2020). Neural encoding of the stimulus envelope facilitated by Widex ZeroDelay[™] technology. Hearing Review, 27(8), 28–31.

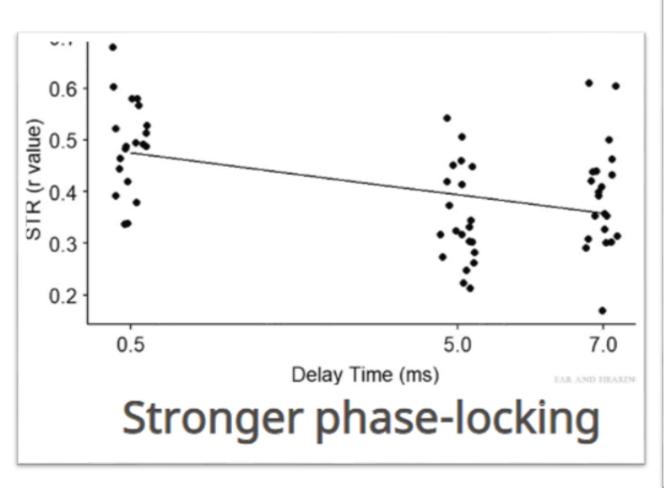


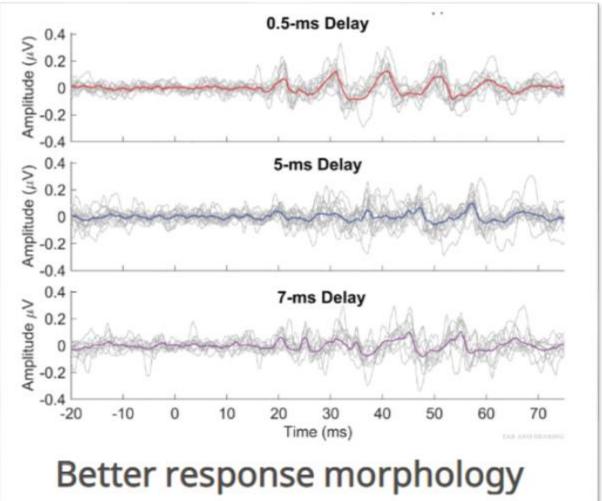
➤ **Objective:** To determine the effects of hearing aid delay on the neural representation of the temporal envelope.

> Conclusions:

- ➤ Hearing aid processing delays disrupt phase locking due to the mixing of processed and unprocessed sound when using open domes
- Better phase locking correlates with better speech in noise performance



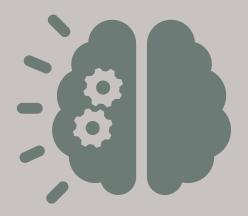






PATIENT OUTCOMES WITH REDUCED DELAY

Objective Measures



Subjective Preference

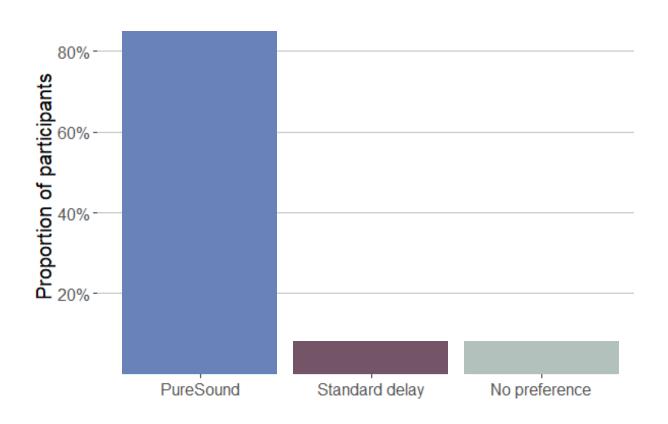




ZERO DELAY USER PREFERENCES

- 1.85% of participants with mild-to-moderate hearing loss prefer zero delay
- 2. 100% of participants with normal hearing prefer zero delay
- 3. Across situations, there were significantly more preferences for **zero delay**

Overall sound quality preference



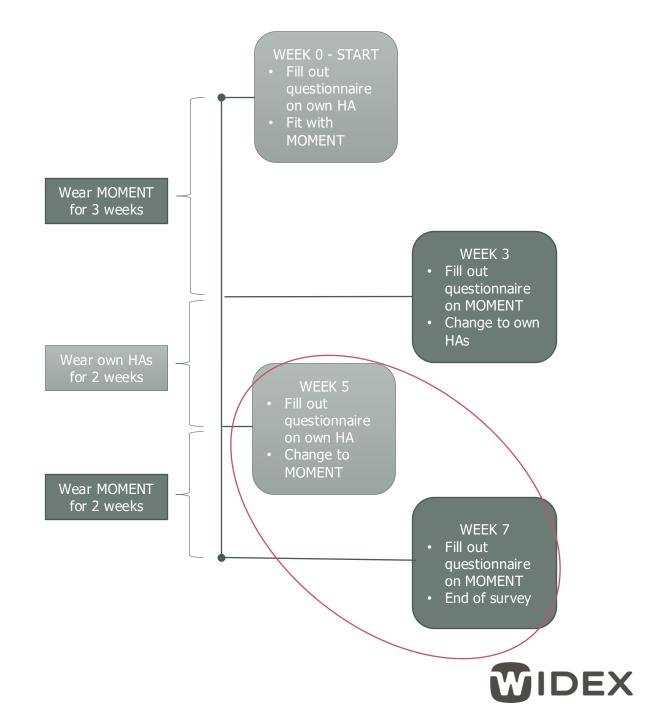
Balling, L.W., Townend, O., Steifenhofer, G., Switalksi, W. (April 2020) Reducing Hearing Aid Delay for Optimal Sound Quality: A New Paradigm in Processing. Hearing Review, Vol. 27, No. 4: 20-26.



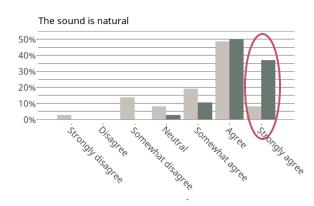
ZERO DELAY IN REAL LIFE

- Survey of 39 experienced hearing aid users with hearing losses in the PureSound fitting range
- Aged between 20 and 88 years (mean 66), 17 females and 22 males
- Cross-over design over seven weeks in real life

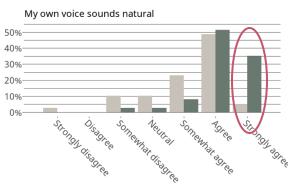
Balling LW, Townend O, Helmink D. Sound quality for all: The benefits of ultrafast signal processing in hearing aids. Hearing Review. 2021;28(9):32-35.



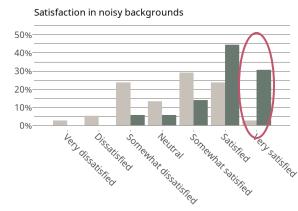
THERE IS A CLEAR PREFERENCE FOR LOWER DELAY



More than <u>FOUR</u> times as many respondents strongly agree that the sound is **NATURAL** for PureSound compared to their own hearing aids



More than <u>SIX</u> times as many respondents strongly agree that their **OWN VOICE** sounds natural with PureSound compared to their own hearing aids

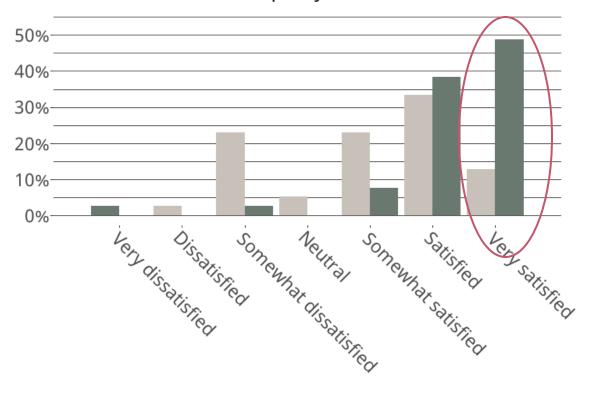


More than <u>TEN</u> times as many respondents are very satisfied is **NOISY BACKGROUNDS** with PureSound compared to their own hearing aids



IT ALL COMES TOGETHER IN SOUND QUALITY RATINGS

Satisfaction with sound quality



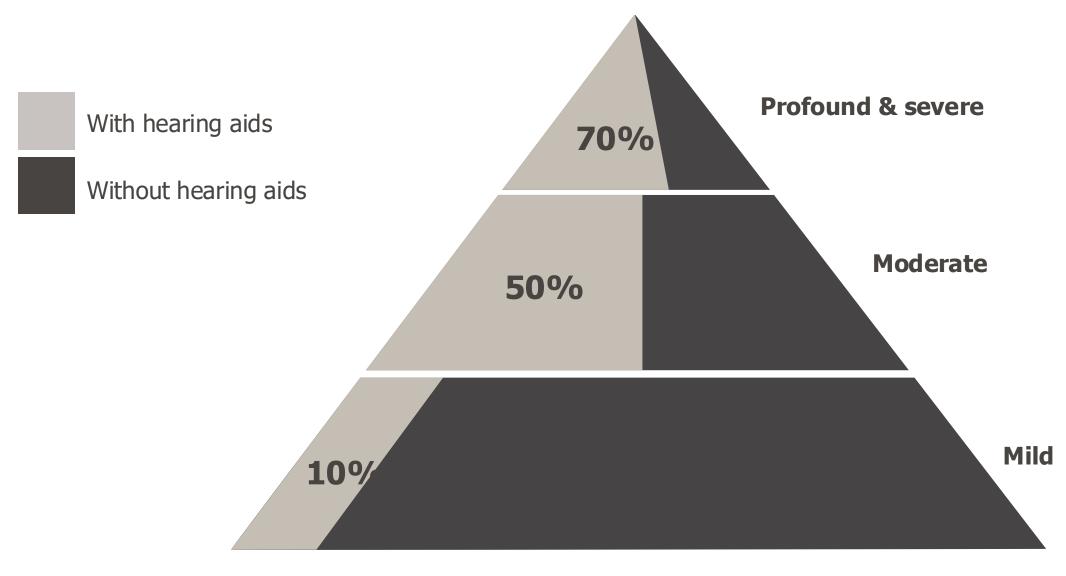
More than <u>THREE</u> times as many respondents are very satisfied with the SOUND QUALITY of PureSound compared to their own hearing aids

Own hearing aids PureSound

Balling LW, Townend O, Helmink D. Sound quality for all: The benefits of ultra-fast signal processing in hearing aids. Hearing Review. 2021;28(9):32-35.

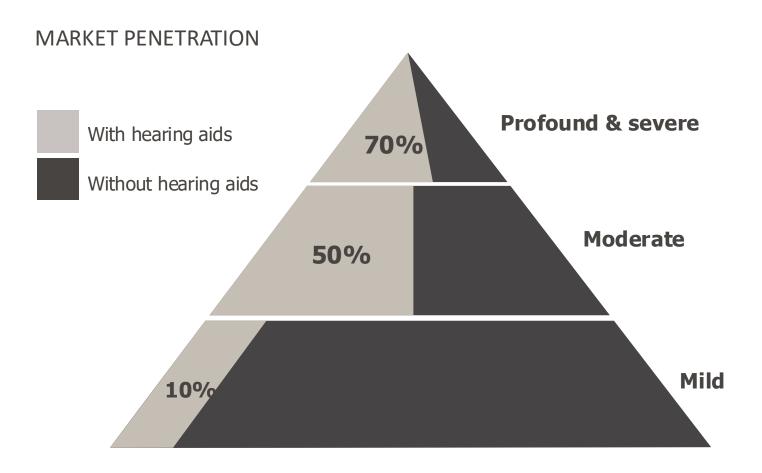


MARKET PENETRATION





We are playing in a massively underserved market



Awareness

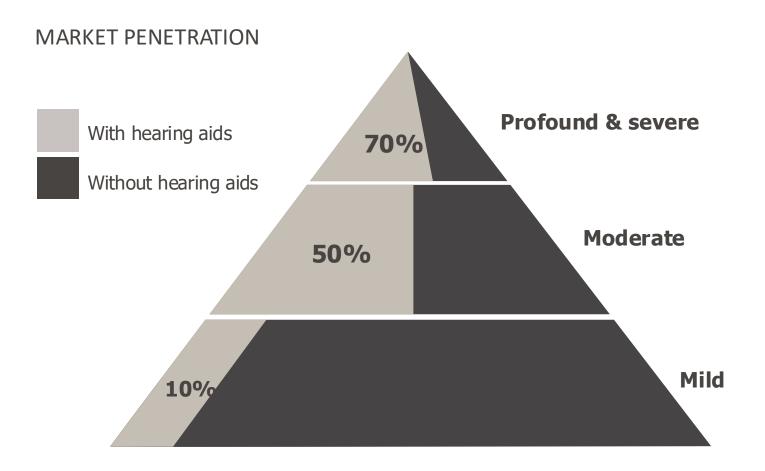
Access

Stigma

Affordability



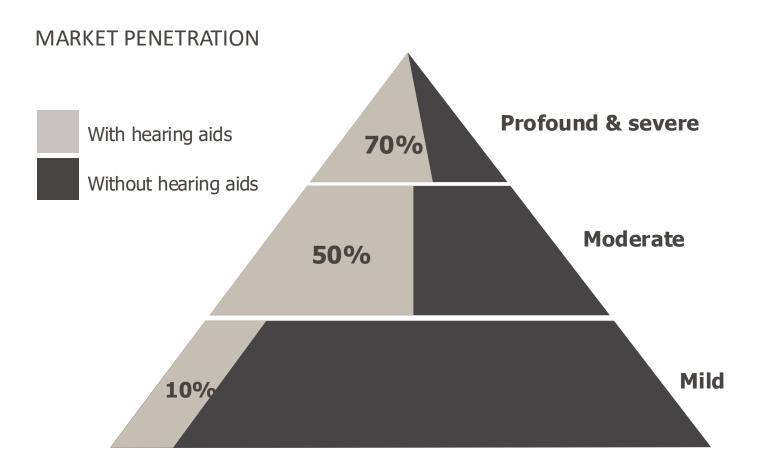
We are playing in a massively underserved market







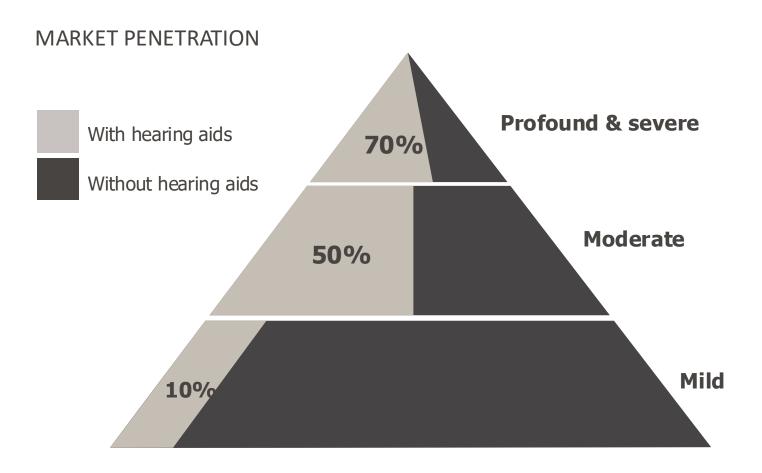
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Awareness

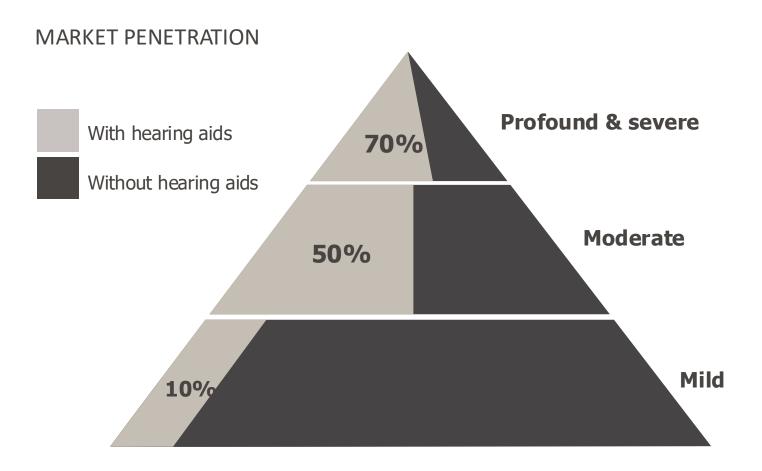
Access

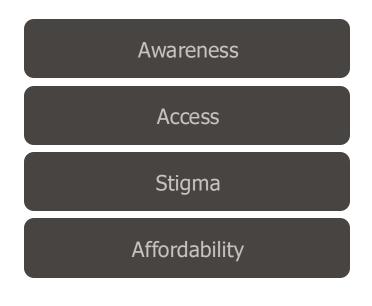
Stigma

Affordability



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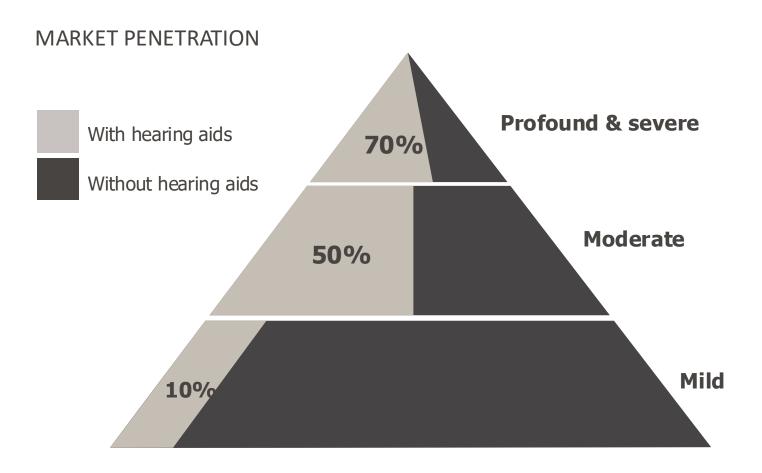


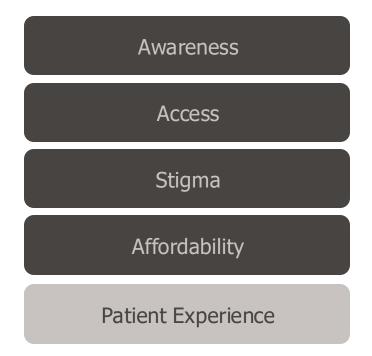


WHAT DO YOU THINK?



We are playing in a massively underserved market







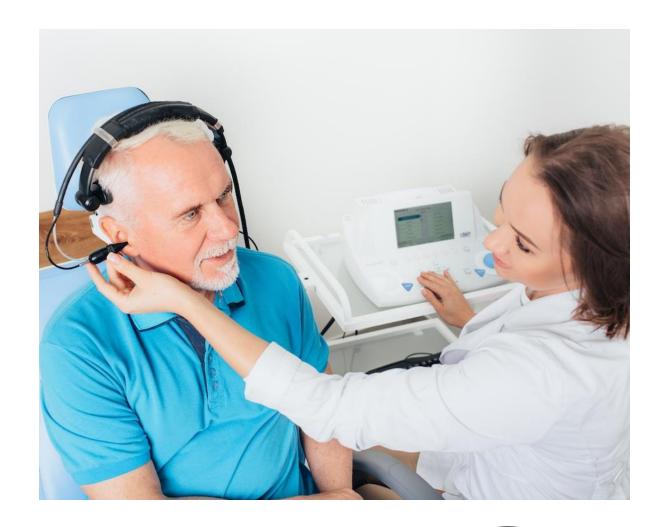
THE MODERN PATIENT AND PATIENT-CENTRIC CARE

Putting the patient first in an open and sustained engagement of the patient to respectfully and compassionately achieve the best experience and outcome for that person and their family

Themes of importance:

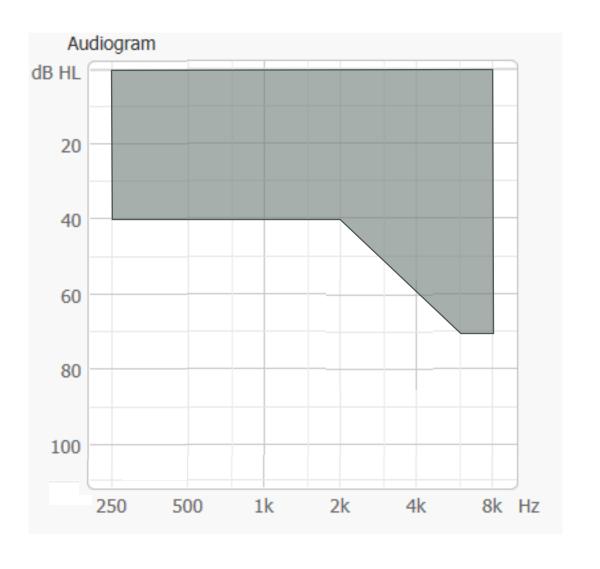
- Inclusiveness
- Sharing goals that are patient and family-centred
- Empowering patients to take control of their own health
- Working in a way that shows respect, compassion and openness
- Working in partnership

Yeoman G, Furlong P, Seres M, et al. Defining patient centricity with patients for patients and caregivers: a collaborative endeavour. BMJ Innovations 2017;3:76-83.

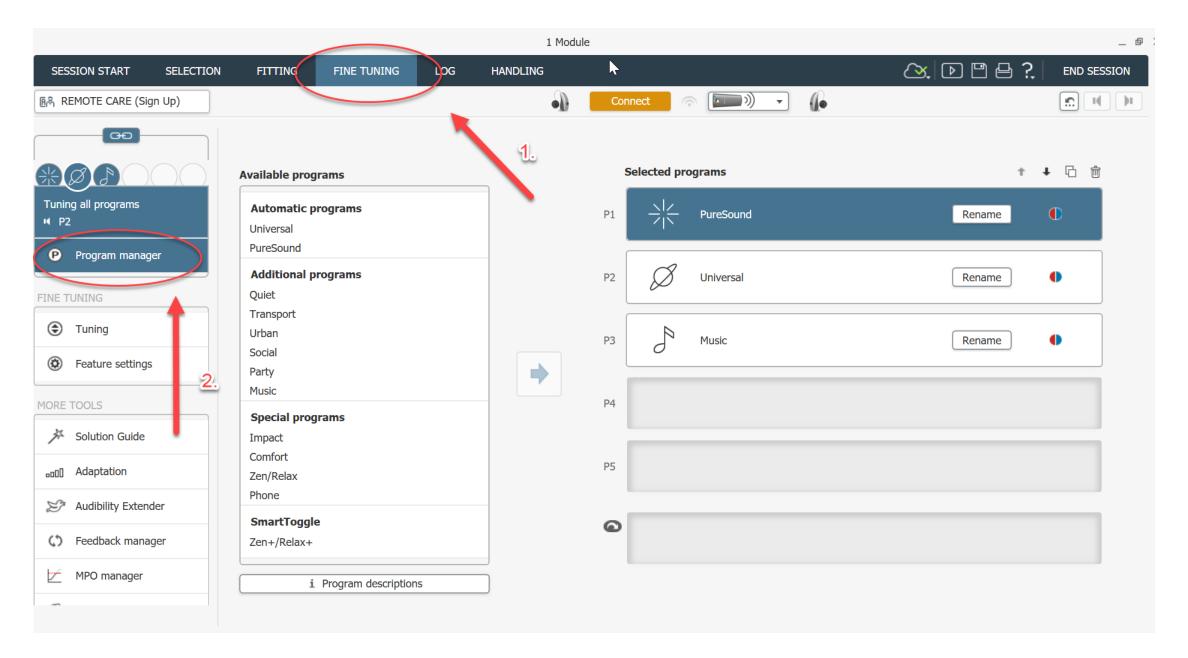




FITTING PURESOUND™









PERSONALIZE

Creating something to meet someone's individual requirements

INDIVIDUALIZE

To adapt to the needs or special circumstances of an individual

CUSTOMIZE

When a user manually makes changes to achieve their preferred experience



WELL-BEING



HOW IS WELL-BEING DEFINED?



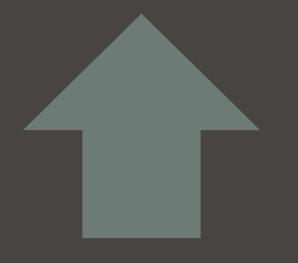
JUDGING LIFE POSITIVELY



FEELING GOOD



ACHIEVING WELL-BEING





Presence of positive emotions:

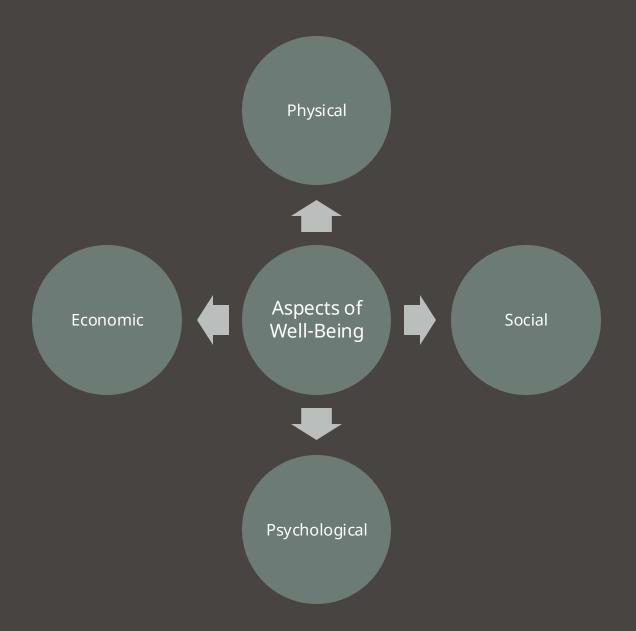
- Contentment
- Happiness
- Connectedness
- Autonomy/control

Absence of negative emotions:

- Anxiety
- Stress
- Isolation
- Helplessness



ASPECTS OF WELL-BEING





SIGNIFICANCE OF STRESS

Heart Disease

Asthma

Obesity

Diabetes

Depression & Anxiety

Gastrointestinal Problems Alzheimer's Disease



MUSIC REDUCES STRESS AND HELPS RELAX

Studies show that:

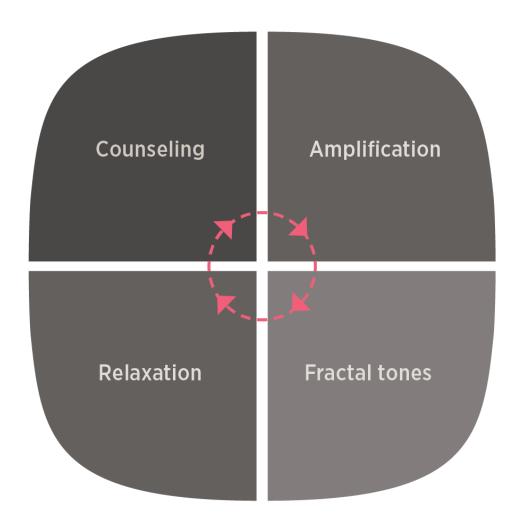
Listening to music can help older people to reduce depression level.

- Valuable effect of music therapy on anxiety and depression in patients with mild to moderate Alzheimer's disease.
- Profound effects were found when 'relaxation' was stated as the reason for music listening:
 - Decreases in subjective stress levels
 - Lower cortisol concentrations





FRACTAL SOUND THERAPY IN TINNITUS MANAGEMENT







SOUNDSCAPES FOR WELL-BEING

FRACTAL TONES

COMBINATIONS

WAVE SOUNDS



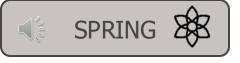
















ARE HEARING AIDS THE ANSWER TO REDUCING STRESS AND IMPROVING WELL-BEING?

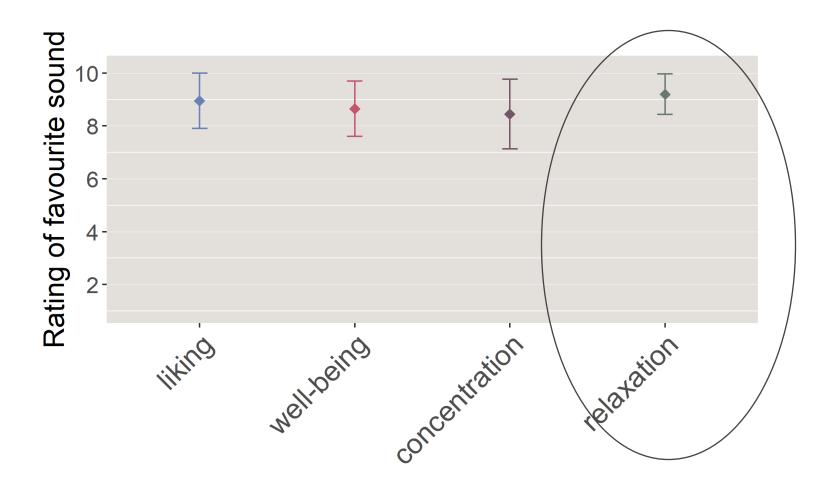
Widex SoundRelax is a new palette of fractal sounds to support well-being.

Balling LW, Caporali S, Parker D, Jeppesen AM, Helmink D. Are hearing aids the answer to reducing stress and improving well-being? Hearing Review. 2022;29(8):24-27.





KEY FINDINGS



Asked: "How relaxing is the sound to listen to?"

90% of participants rate the relaxing effect of their favorite sounds at either 9 or 10 where 10 is "extremely relaxing"

Balling LW, Caporali S, Parker D, Jeppesen AM, Helmink D. Are hearing aids the answer to reducing stress and improving well-being? Hearing Review. 2022;29(8):24-27.



WELL-BEING

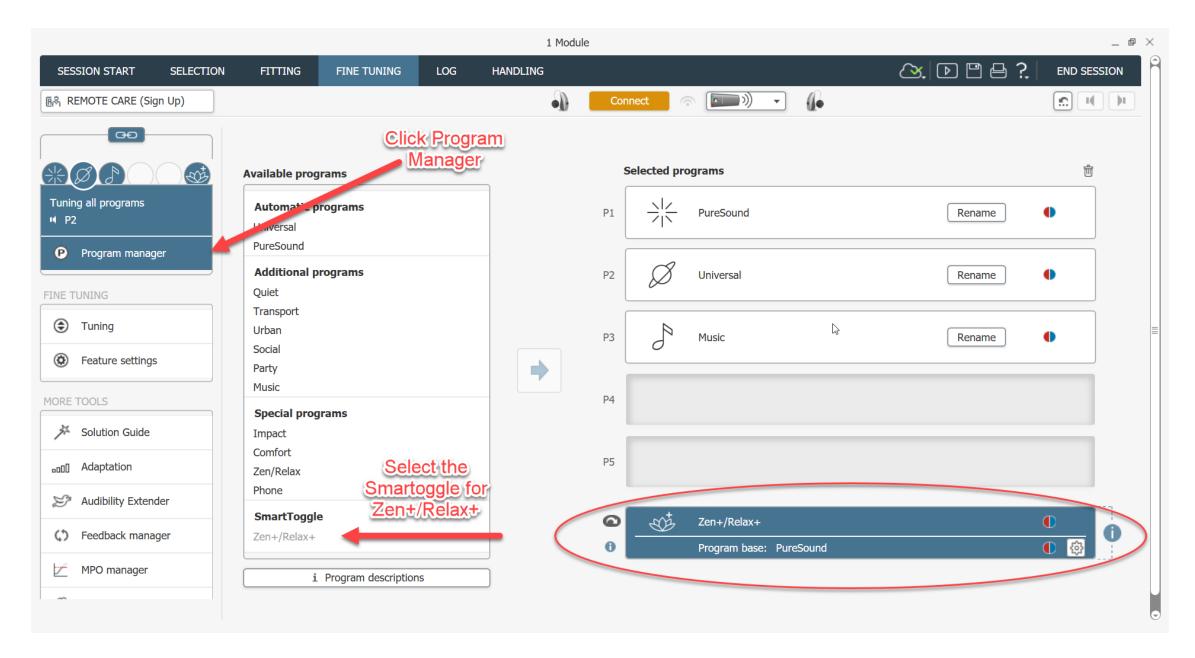
Helps relax and focus

Tinnitus / no tinnitus

Evidence-based









ADVANCED TECHNOLOGY FOR INDIVIDUALIZED AND CUSTOMIZED EXPERIENCES

Artificial Intelligence

"Artificial intelligence leverages computers and machines to mimic the problem-solving and decisionmaking capabilities of the human mind."

-Source: IBM cloud education 6.3.2020

Machine Learning

"Machine learning is a branch of artificial intelligence (AI) and computer science which focuses on the use of data and algorithms to imitate the way that humans learn, gradually improving its accuracy."

-Source: IBM cloud education 7.15.2020





LEVERAGE AI TECHNOLOGY TO ENHANCE PATIENT EXPERIENCES

AUTOMATICS

Trained in the real world to address infinite soundscapes

Hearing Aid (AI)

REAL-TIME INTENT

When automatics
are not enough
to anticipate
YOUR intent in a given
listening situation

Hearing Aid AI Apps





AI AUTOMATICS: IN THE HEARING AID







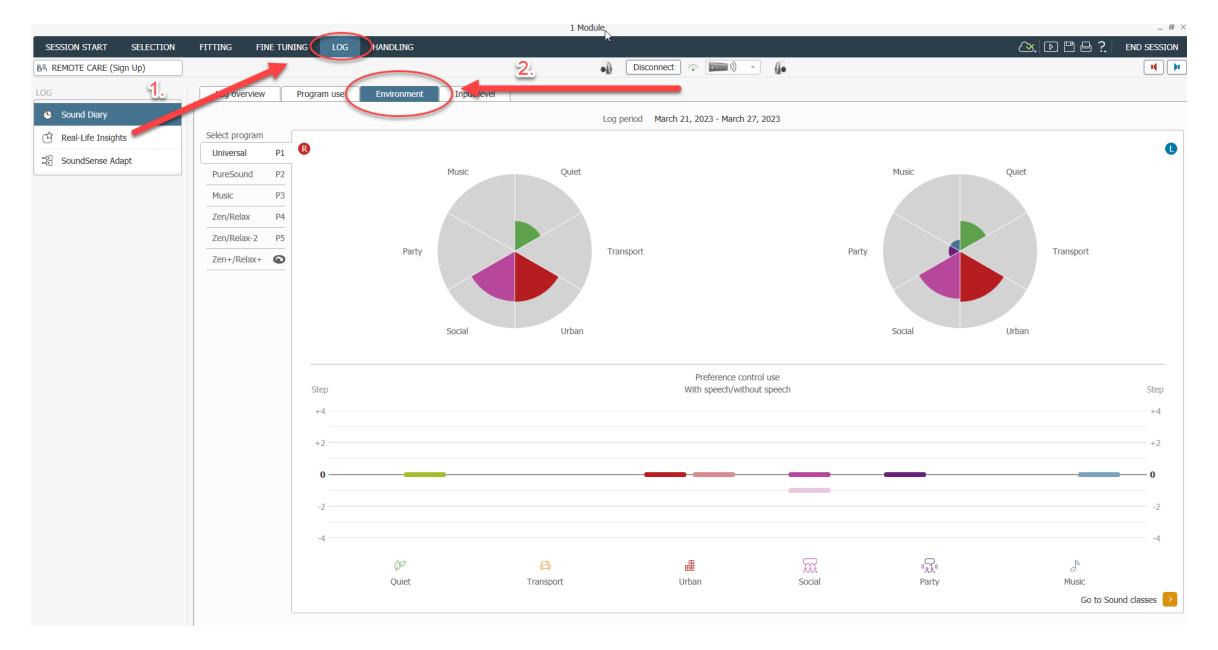




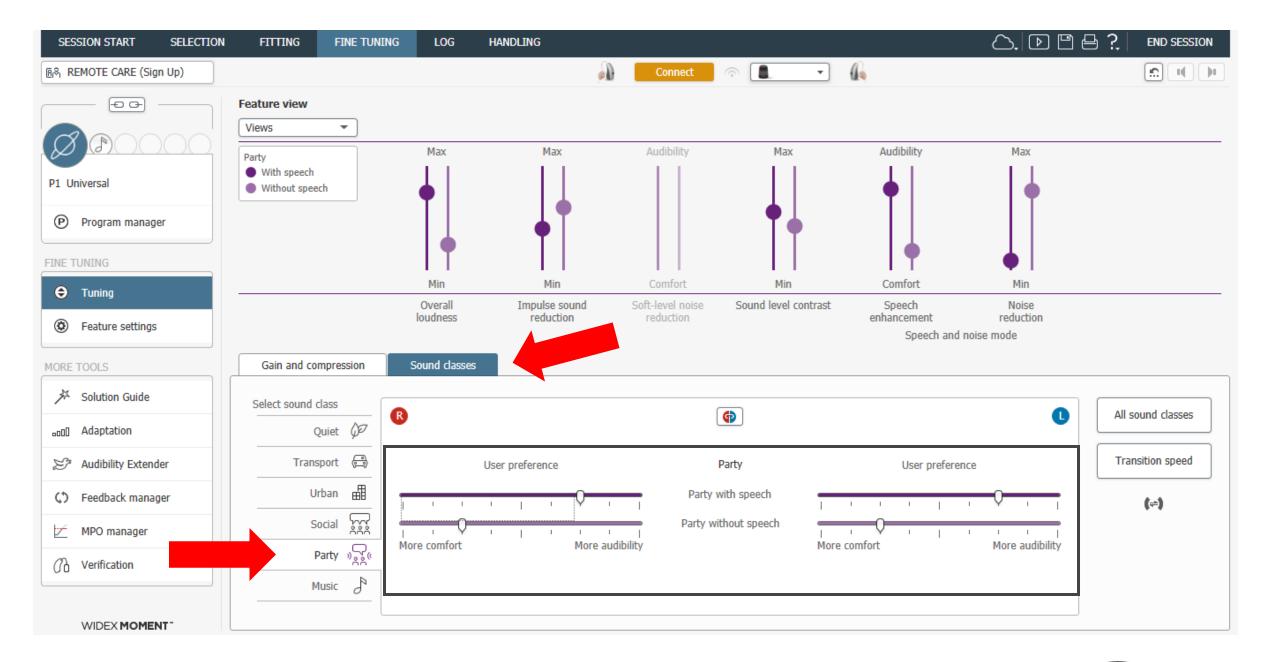


PERFORMANCE LEVEL/BENEFIT	SOCIAL	MUSIC CONTEMPORARY	MUSIC CLASSICAL	QUIET	QUIET W/SPEECH	PARTY	PARTY W/SPEECH	TRANSPORT	TRANSPORT W/SPEECH	URBAN	URBAN W/SPEECH
WIDEX MOMENT 440 11 Available Sound Classes	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\) <u>, , , ((</u>)), ; ((
WIDEX MOMENT 330 7 Available Sound Classes)) <u>o</u> o (());;(()				
WIDEX MOMENT 220 4 Available Sound Classes)) <u>o</u> o o ((











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WHY ARE WE STILL TRYING TO SOLVE WEEKEND FRUSTRATIONS ON MONDAY MORNING?





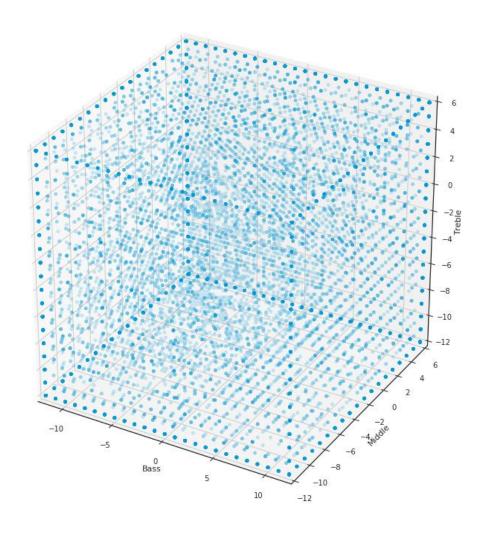


MEETING PATIENTS WHERE THEY ARE





ARTIFICIAL INTELLIGENCE MEETS HUMAN INTELLIGENCE

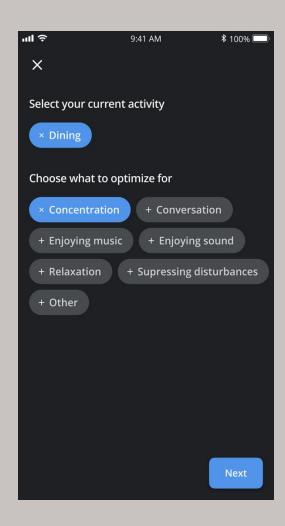


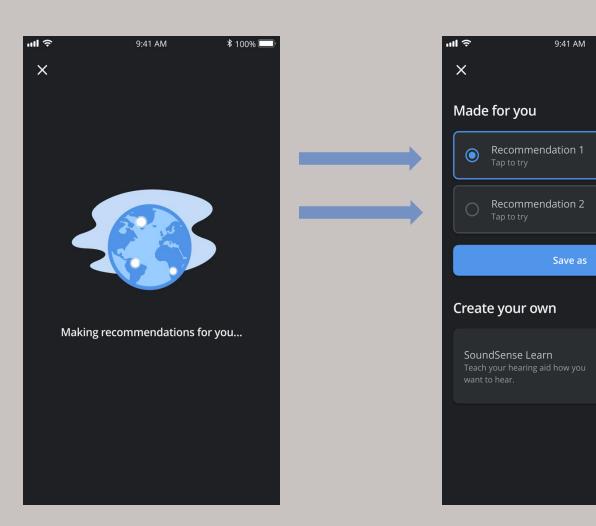
Address individual preferences





RECOMMENDATIONS MADE FOR YOU



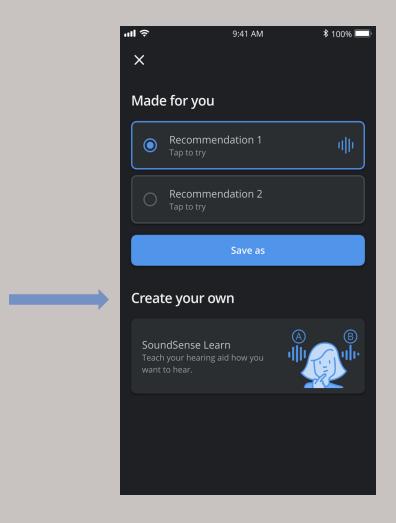




≯ 100% □

垂

CREATE YOUR OWN PERSONAL CUSTOMIZATION MADE BY YOU







SAME PERSON – SAME SETTING – DIFFERENT INTENT

Adjust emphasis Person-specific & situation specific



Focus on nearer/louder inputs

Open to softer/farther inputs

Balling LW, Jeppesen AM, Nielsen JBB, Helmink D. Empowering patients with personalized compression. Hearing Review. 2022;29(11):16-18.





...AI can address this...
supporting the patient and audiologist



DO WE KEEP TRYING TO SOLVE LAST WEEK'S PROBLEMS IN YOUR OFFICE? OR LET THE PATIENT BE IN THE DRIVER'S SEAT



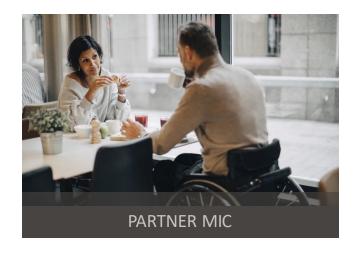








AN ASSIST FOR ANY SITUATION

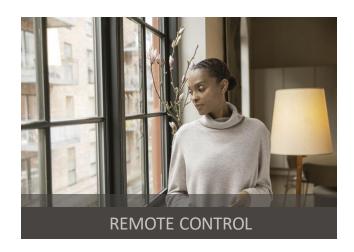














SOUND ASSIST STATS

Full charge in

3

hours



Up to*

10

Hours of use



Pair with

1

Set of HAs

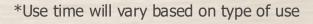


Pair with

8

Bluetooth devices

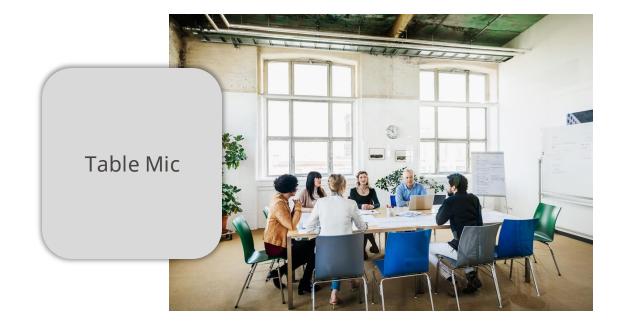






REMOTE MICROPHONE MODE

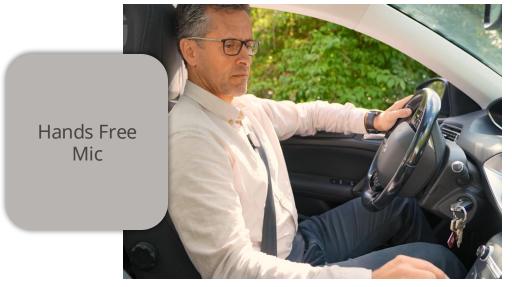






BLUETOOTH MODE





Remote Control

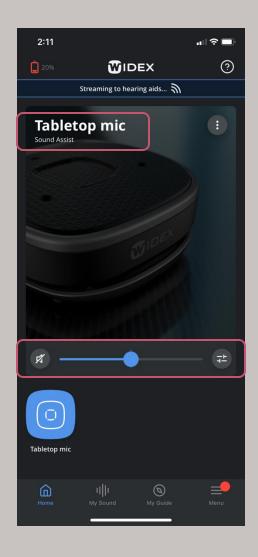


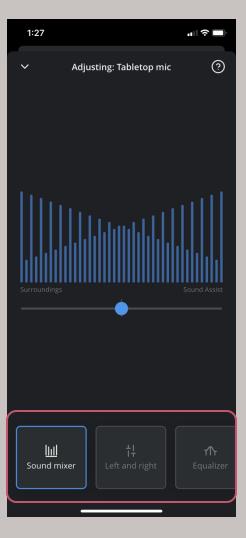
TELECOIL MODE





MOMENT[™] APP V1.6







TREAT THE WHOLE PERSON









BE DIFFERENT – MAKE A DIFFERENCE





THANK YOU FOR YOUR TIME!

Laura Kearns, AuD

Clinical Educational Specialist Laura.Kearns@widexsound.com





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