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STRATEGIES FOR CRAFTING A MORE NATURAL HEARING EXPERIENCE

PRESENTED BY: AMANDA ALBERTSEN, AUD

LEARNING OUTCOMES

After this course, participants will be able to:

1

Define what it means to “respect all sounds” and describe the impact that has on sound quality

2

Explain how the Widex fitting algorithm tailors the fit uniquely to each individual end-user and what the benefits of that are

3

Describe two features that allow wearers to focus on what matters most, even in noisy situations

SPEAKER DISCLOSURE

- Relevant Financial Relationships:
 - Presenters are employees of Widex USA and receive financial compensation.
- Relevant Nonfinancial Relationships:
 - There are no nonfinancial relationships.

A photograph of a paved road that splits into two paths, leading into a dense green forest. A bright light source, possibly the sun, is positioned at the top center of the frame, creating a strong lens flare and illuminating the road and the surrounding foliage. The text "HEARING LOSS IS A JOURNEY" is overlaid on the left side of the image.

HEARING LOSS IS A JOURNEY



NATURAL
SOUND

NATURAL HEARING

NOTHING UNNECESSARY ADDED
NOTHING IMPORTANT TAKEN AWAY



WIDEX
OUR SMART
TECHNOLOGICAL
DECISIONS



WIDEX SOUND PHILOSOPHY

Our Widex Sound Philosophy is based on three fundamental principles:

RESPECT
ALL
SOUNDS

TAILOR
TO THE
USER

FOCUS ON
WHAT
MATTERS



WIDEX SOUND PHILOSOPHY

RESPECT
ALL
SOUNDS



WIDEX SOUND PHILOSOPHY

TAILOR
TO THE
USER



WIDEX SOUND PHILOSOPHY

FOCUS ON
WHAT
MATTERS



BENEFITS OF THE WIDEX SOUND PHILOSOPHY

RESPECT
ALL
SOUNDS

Authentically
natural sound
that mimics the
way the auditory
system works and
delivers the
**cleanest signal to
the brain**

TAILOR
TO THE
USER

A truly
**individualized
experience** from
first fit through
the entire hearing
care journey

FOCUS ON
WHAT
MATTERS

Optimal **clarity
and comfort** in
every
environment,
automatically
and without
compromise

TECHNOLOGY DELIVERING THE WIDEX SOUND

RESPECT
ALL
SOUNDS

Time-domain
filter bank

Sampling
rate

TruInput
technology

TAILOR
TO THE
USER

TruAcoustics™

Sensogram

MySound

FOCUS ON
WHAT
MATTERS

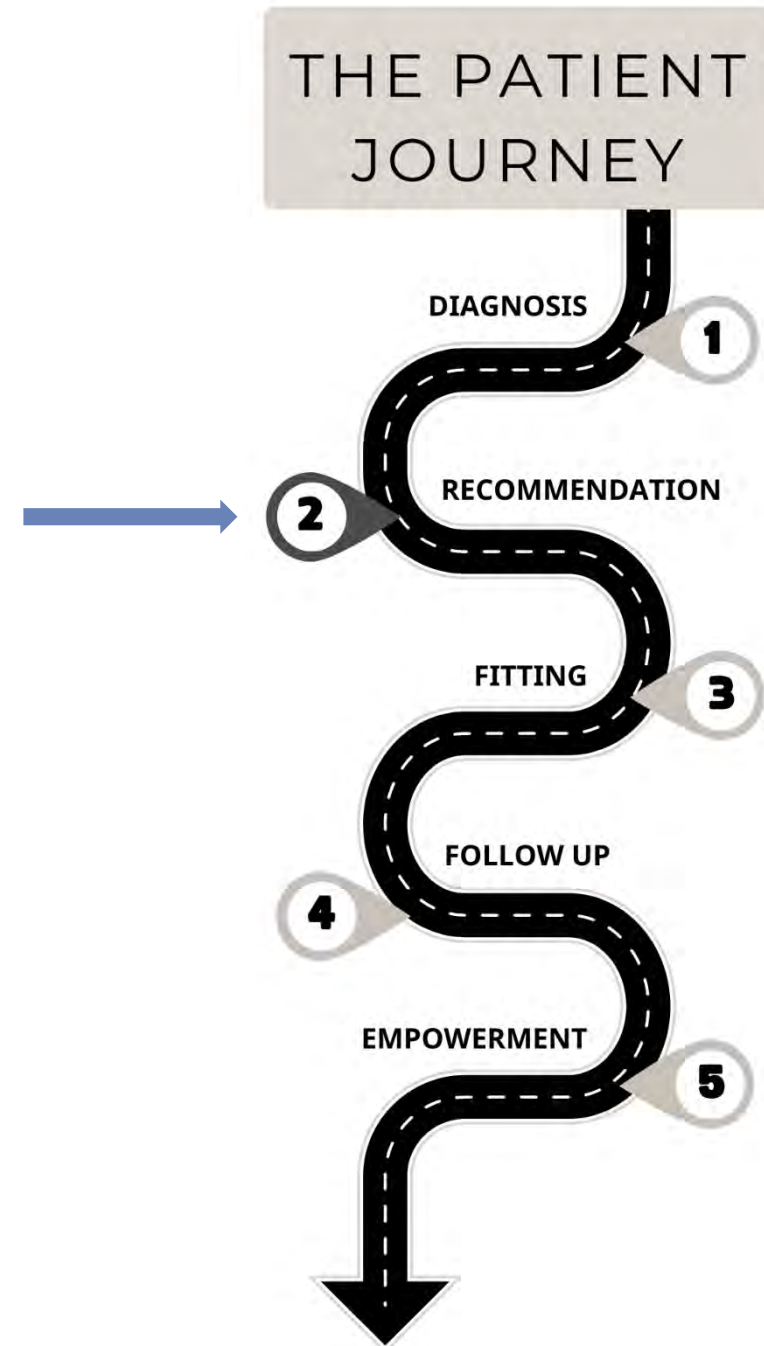
Sound Class
Technology

Speech
Enhancer

SmartWind™
Manager

RECOMMENDATION

- You have diagnosed the patient with hearing loss, now what?
- Best sound quality
- Proven performance in noise
- Don't all hearing aids claim that?
- Follow the facts and evidence

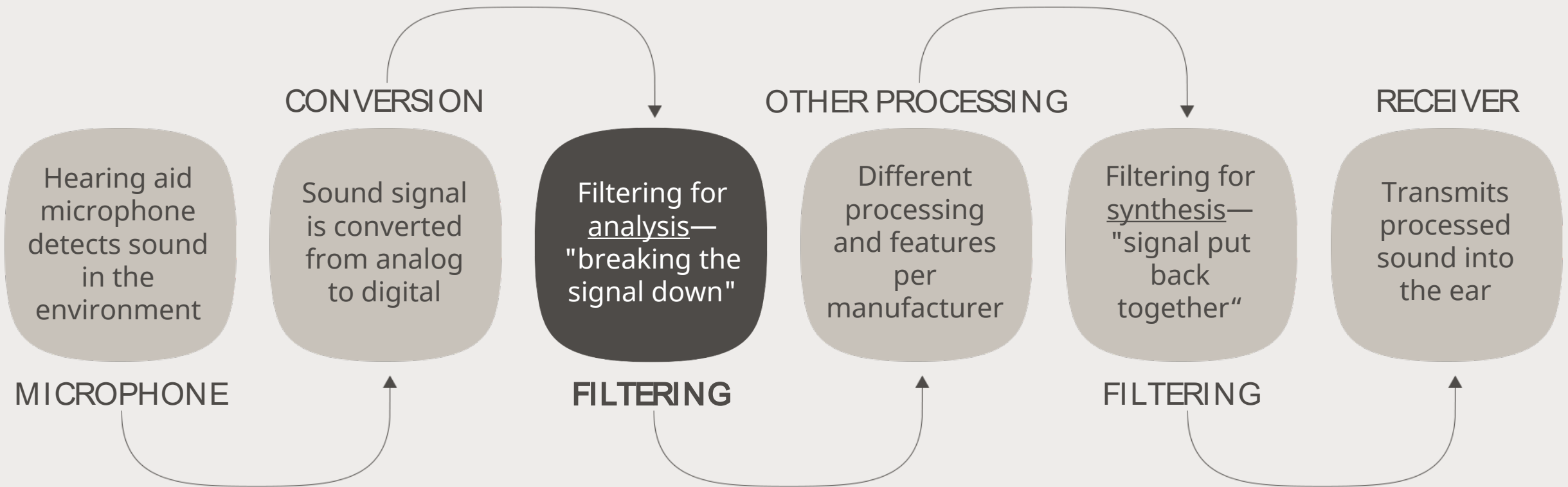


TIME-DOMAIN FILTER BANK

THE SMART APPROACH TO SOUND FILTERING

TIME-DOMAIN FILTER BANK

RESPECT
ALL
SOUNDS

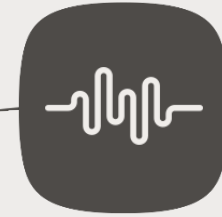


Two main types of filter bank



Time-domain filter bank:

- Focuses on time resolution
- Applies a more flexible approach
- Frequency bandwidths vary



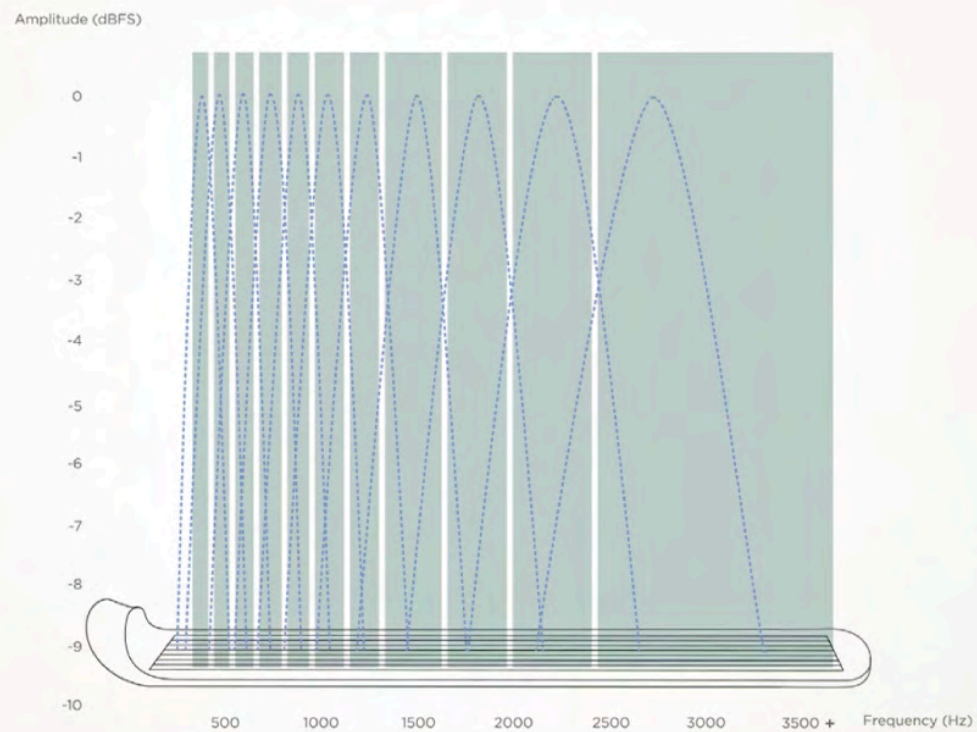
Frequency-domain filter bank:

- Focuses on frequency resolution
- Follows a uniform approach
- Treats all frequencies in the same way

TIME-DOMAIN FILTER BANK

RESPECT
ALL
SOUNDS

TIME-DOMAIN
Varying widths
|
Fewer bands needed

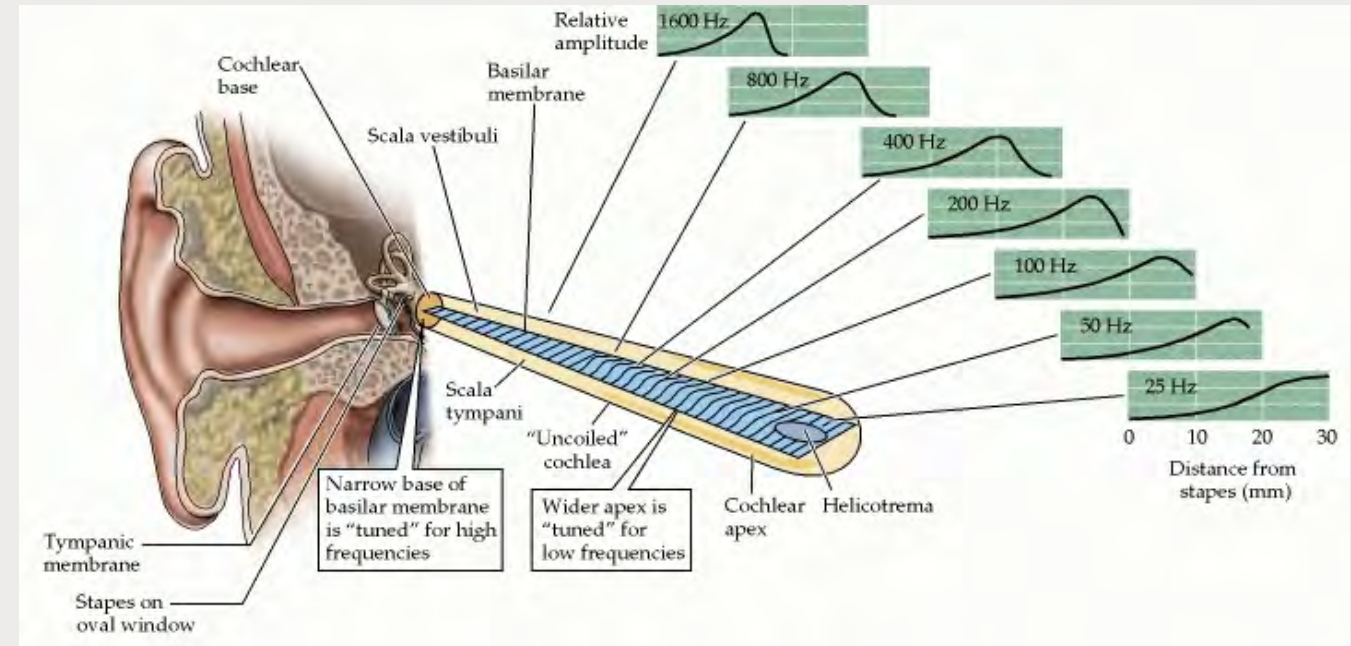


TIME-DOMAIN FILTER BANK: MORE BANDS $\neq$ BETTER

RESPECT
ALL
SOUNDS

Different frequency resolutions (sensitivity) on the basilar membrane:

- Low frequencies are more sensitive and require more detailed analysis
- High frequencies are less sensitive and require less detail



TIME-DOMAIN FILTER BANK: MORE BANDS $\neq$ BETTER

RESPECT
ALL
SOUNDS



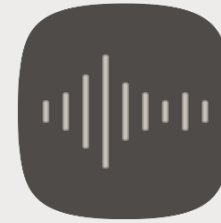
Narrow bands in
the low frequencies



Broader bands in the
high frequencies



Mimics the way that
the cochlea naturally
filters and analyzes
sound



Covers the full
frequency range with
fewer frequency
bands

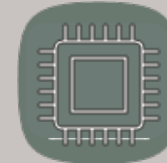
More frequency bands = longer processing time | Longer processing time = poorer sound quality

WHY WOULDN'T EVERYONE USE TIME-DOMAIN FILTER BANKS THEN?

Other Brands Frequency-Domain Filter Banks



Easier for the manufacturer - with less burden for complex computations and easier power management



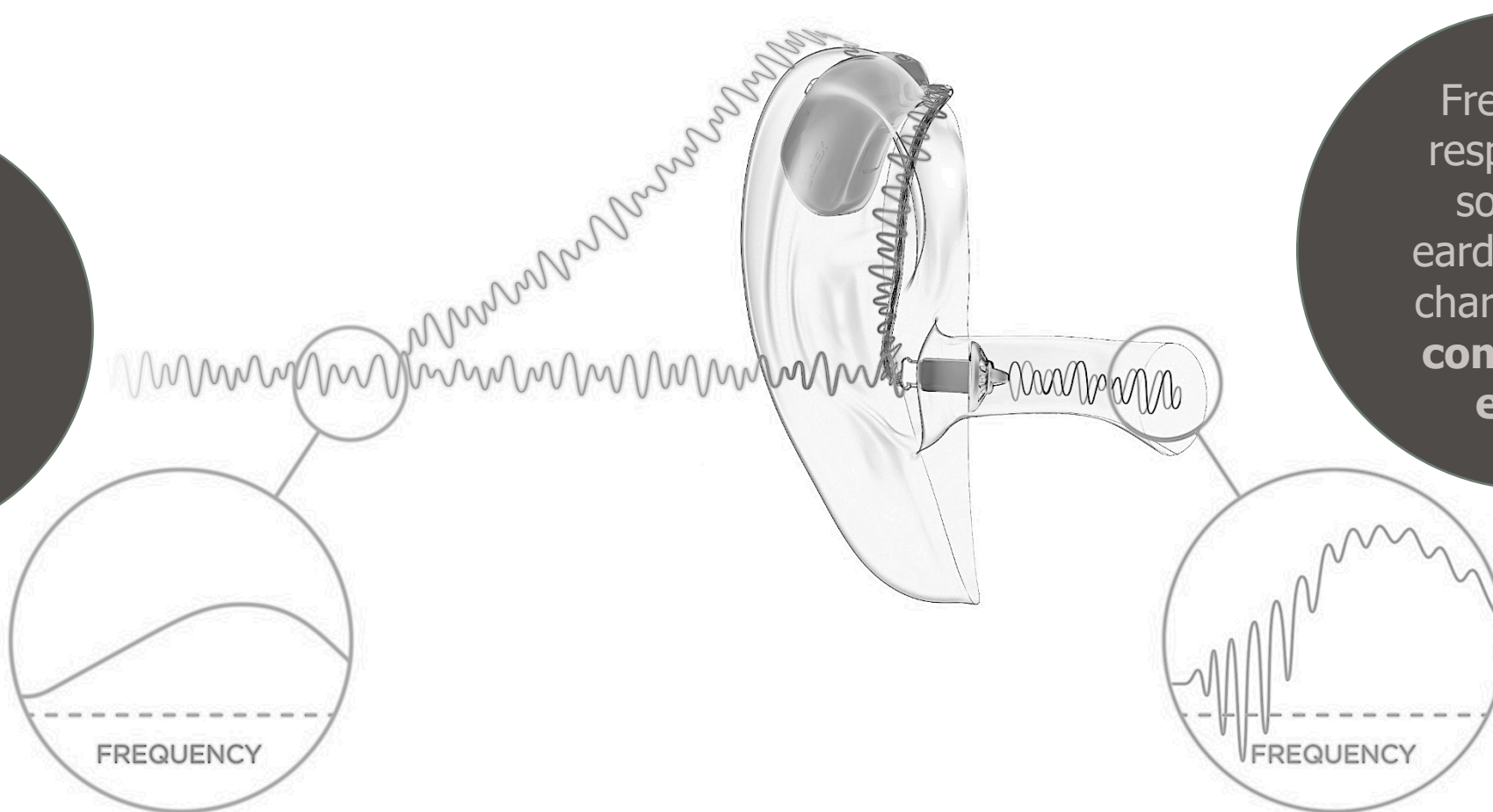
More challenging for the manufacturer – must work very hard to employ complex computations for improved sound quality without impacting battery life

Widex Time-Domain Filter Banks

LONGER DELAY = COMB FILTER DISTORTION

RESPECT
ALL
SOUNDS

Smooth
frequency
response of
the original
sound signal



Artificial

Hollow

Echo

**Like a
Microphone**

Funny

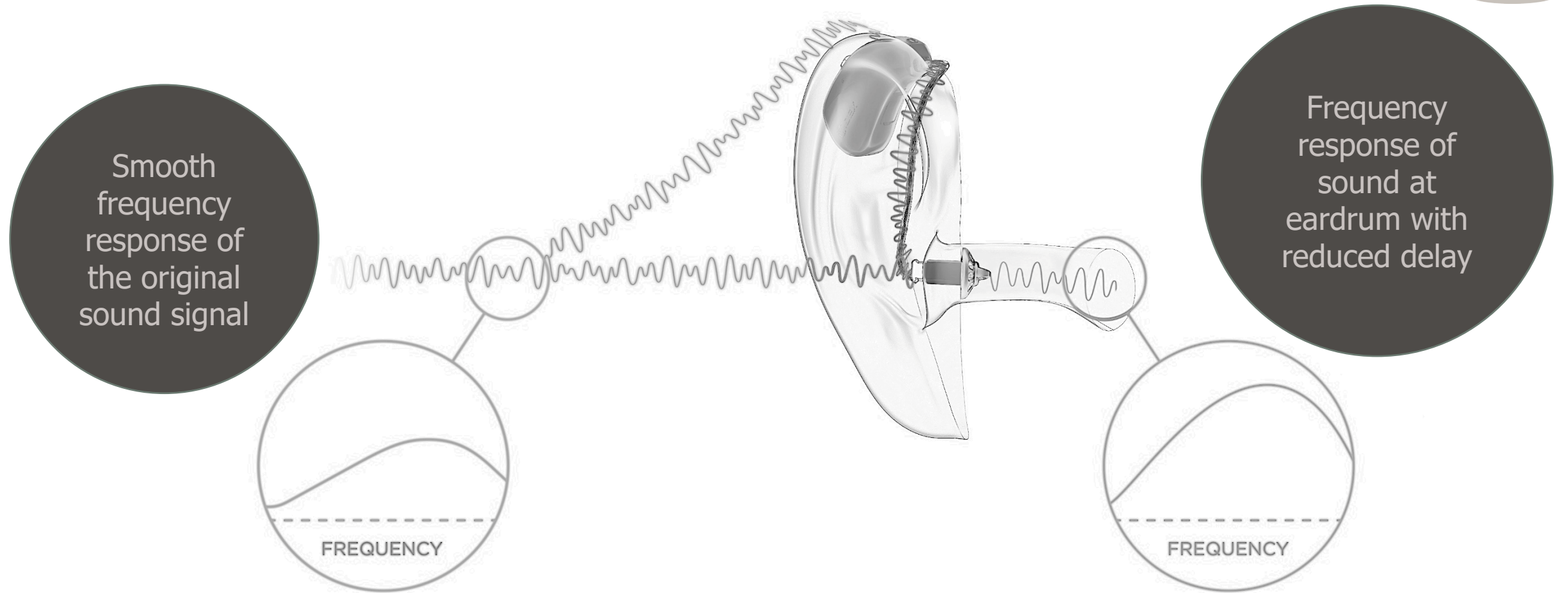
Boomy

Tinny

Weird

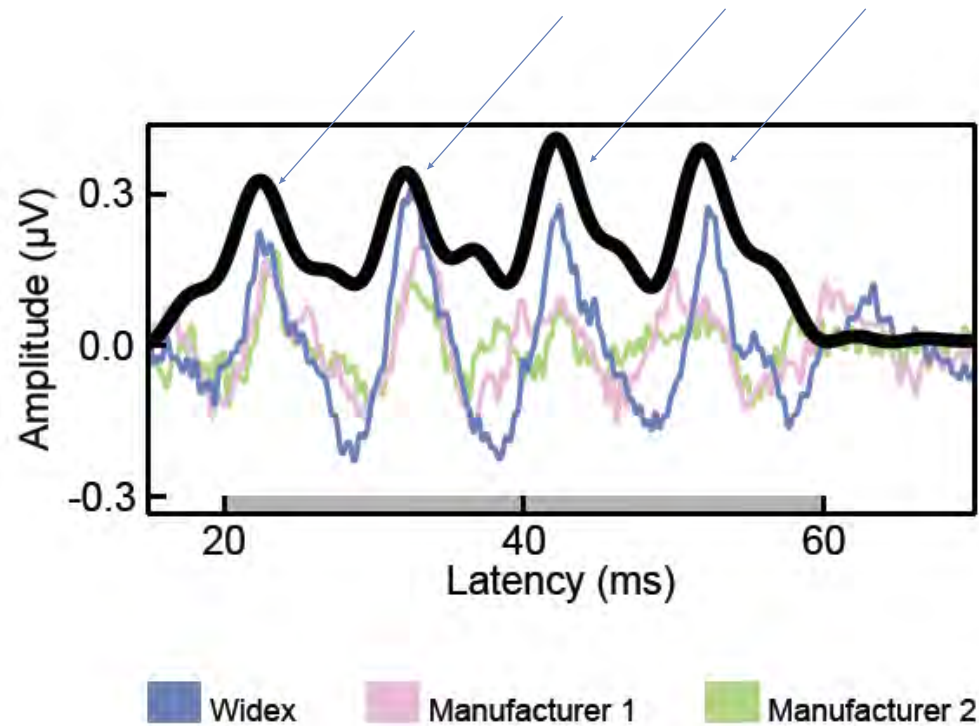
ELIMINATE DELAY = ELIMINATE DISTORTION

RESPECT
ALL
SOUNDS



A DIFFERENCE MEASURED AT THE BRAIN

RESPECT
ALL
SOUNDS



Widex shows a more accurate and stronger envelope-following response (EFR), indicating better representation of important speech cues at the brain.

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.

A DIFFERENCE MEASURED AT THE BRAIN

RESPECT
ALL
SOUNDS

Neural phase locking can be measured to see the brain's response to speech



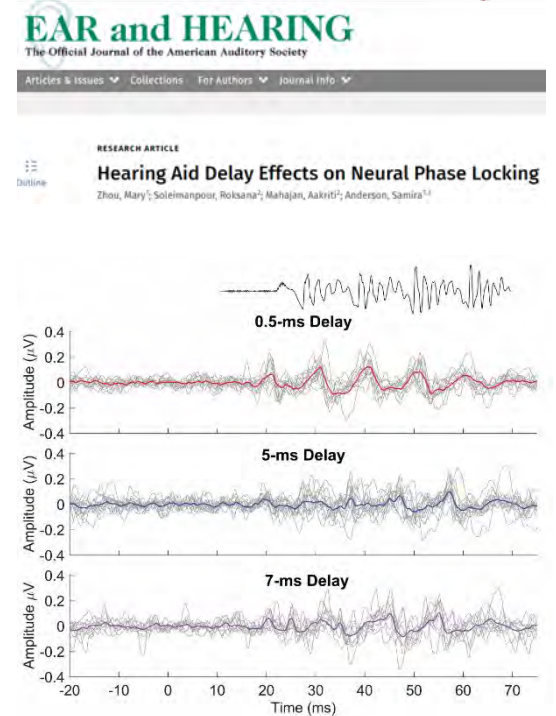
Better neural phase locking is associated with better in speech-in-noise performance



Hearing aid processing delays disrupt neural phase locking



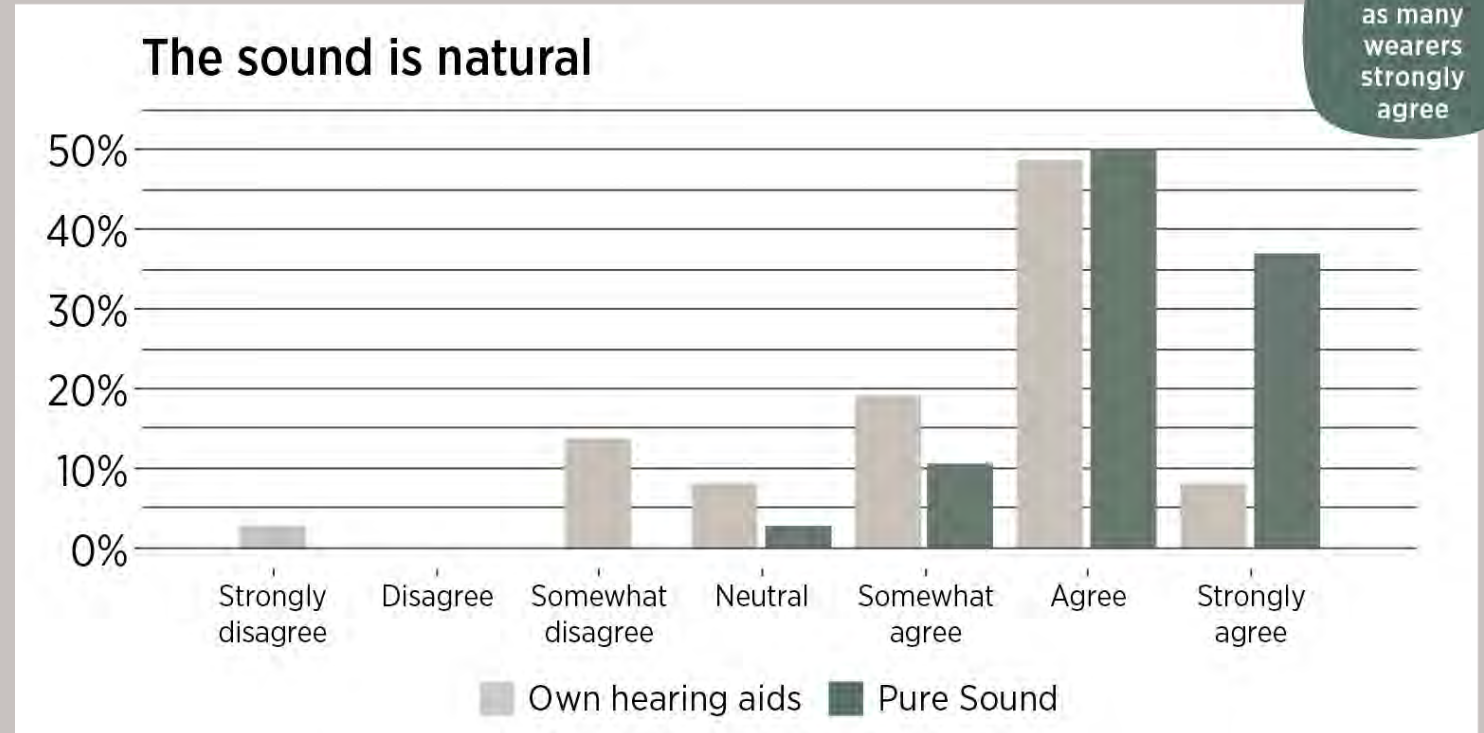
Widex demonstrates a significantly better neural phase locking



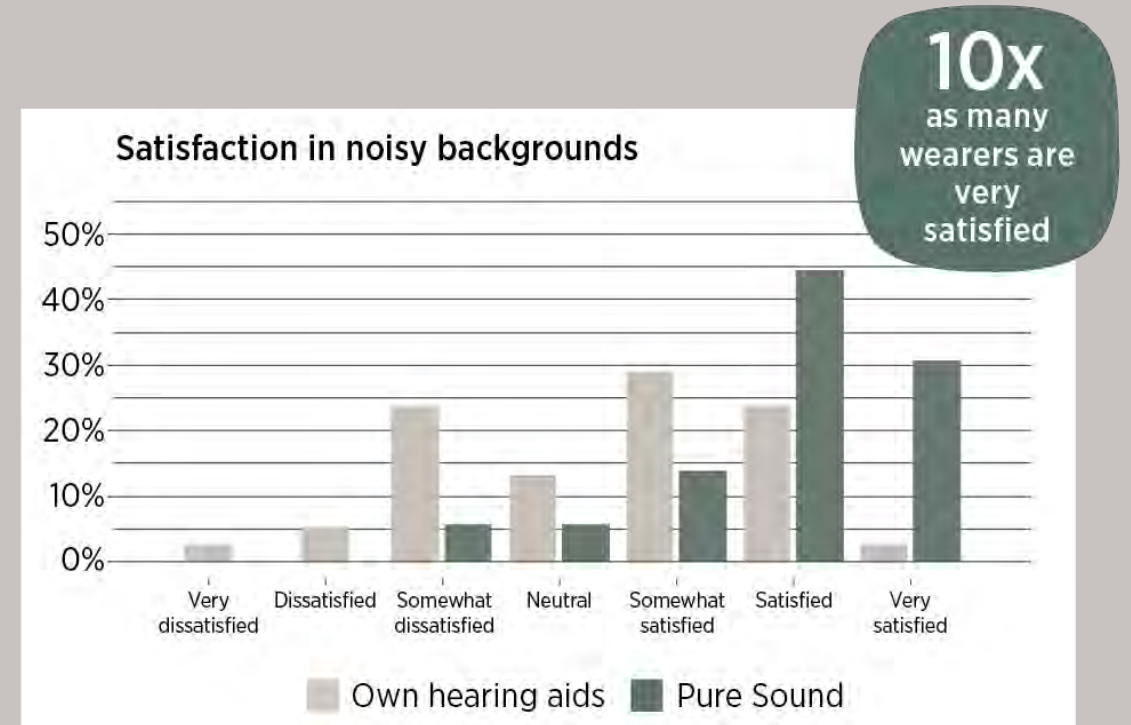
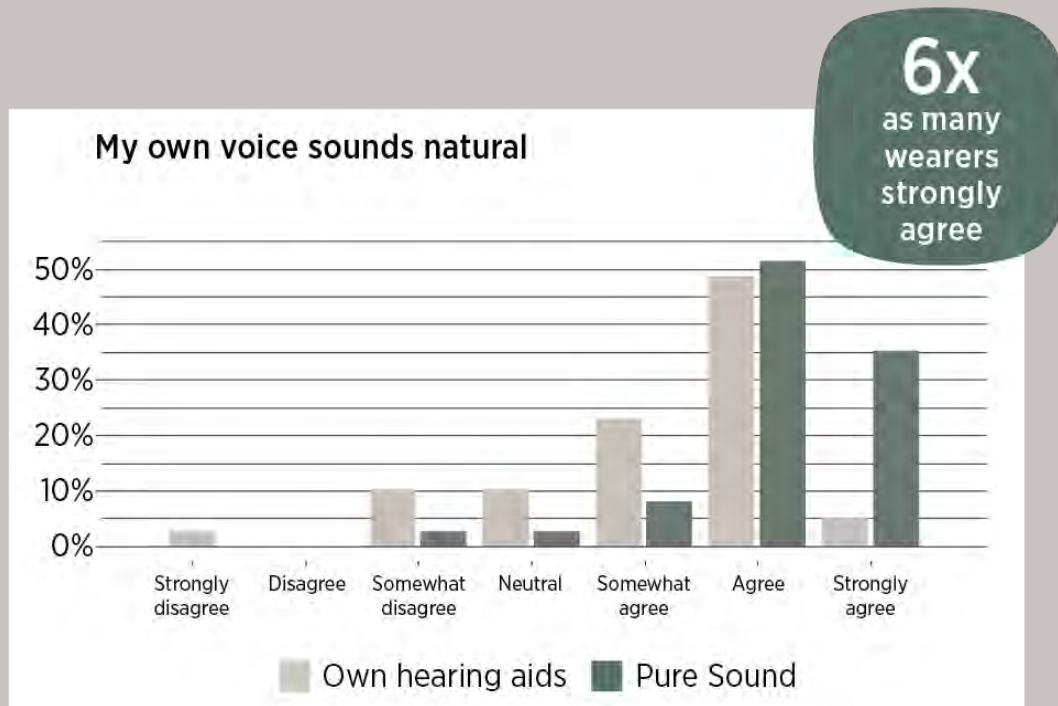
Zhou, M, Soleimanpour, R., Mahajan, A, & Anderson, S. (2023). Hearing Aid Delay Effects on Neural Phase Locking. *Ear & Hearing*.

A DIFFERENCE YOUR PATIENTS CAN HEAR

The ultra-fast signal processing is designed to overcome long-standing barriers to patient satisfaction

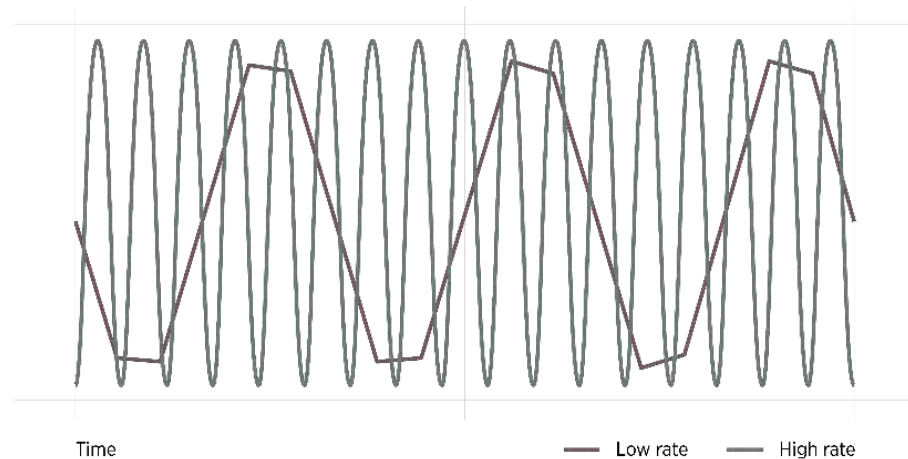


A DIFFERENCE YOUR PATIENTS CAN HEAR



BUT WAIT – THERE’S MORE!

Industry-leading sampling frequency
 $33.1 \text{ kHz} = 16,000 \text{ Hz}$ internal bandwidth



Industry-leading linear input dynamic range
 $5 \text{ dB} - 113 \text{ dB} = 108 \text{ dB}$





Our priority:

- Respectful handling of sound
- Produce a hearing aid that sounds natural and as close to the original sound as possible in a hearing aid

Our decisions:

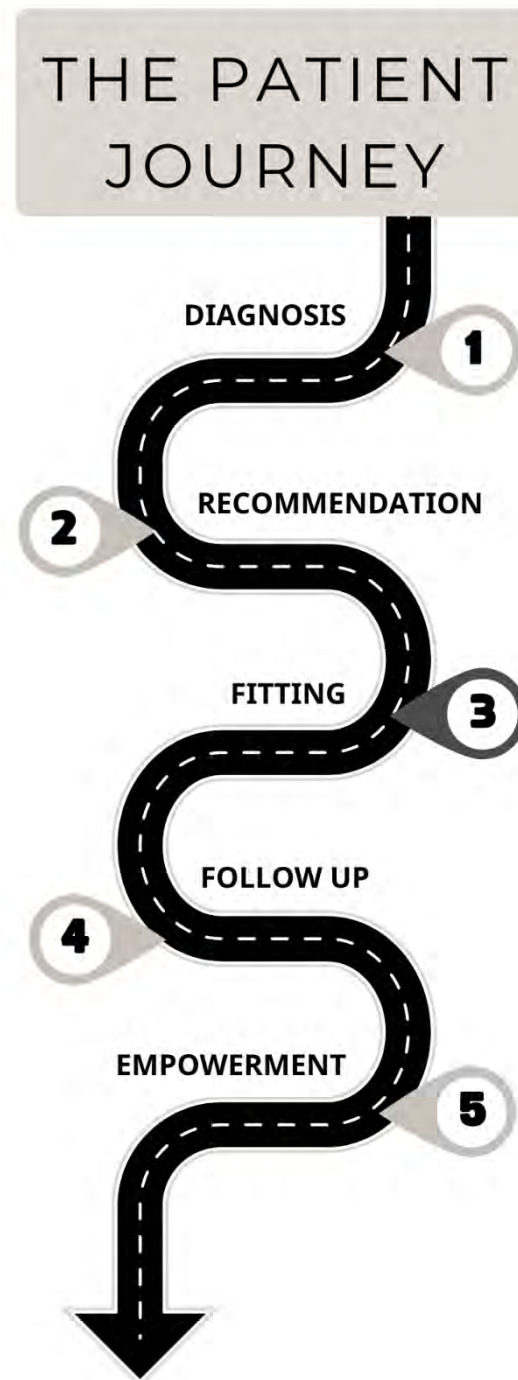
- Use a time-domain filter bank
- Mimic natural ear sound processing
- Provide access to more sounds

Result:

Eliminate hearing aid delay, avoid distortion, and produce a natural sound that wearers appreciate

FITTING

- Precise from the very beginning
- Quick and easy
- Optional in-situ tools for additional personalization

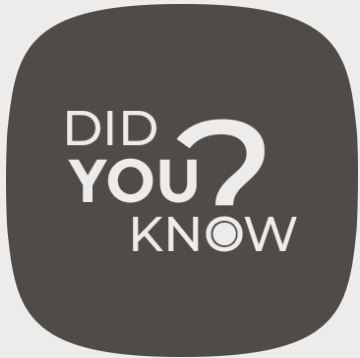


TRUACOUSTICS

THE SMART WAY OF INDIVIDUALIZING FITTING

AS UNIQUE AS YOUR FINGERPRINT

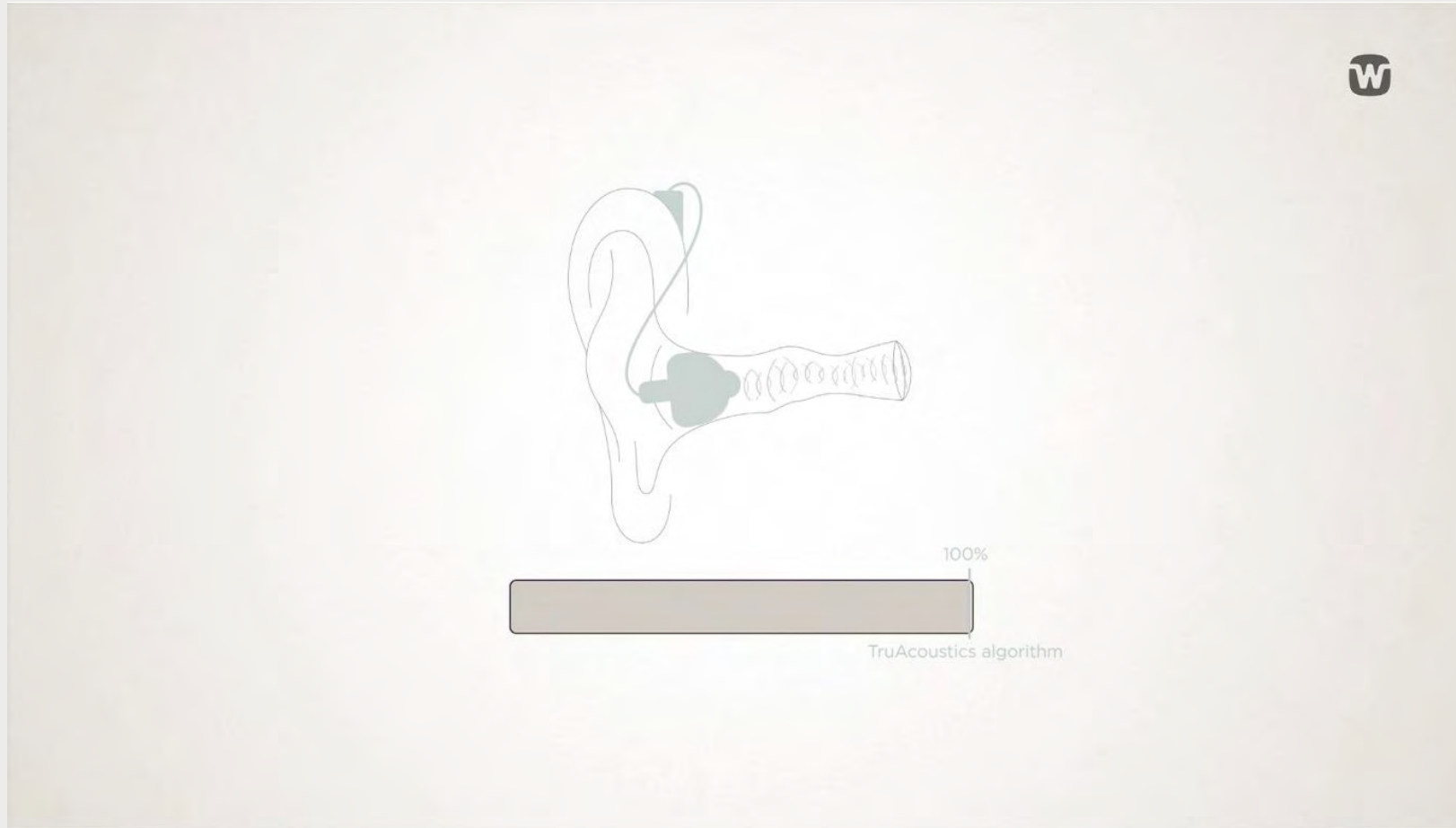
TAILOR
TO
THE USER



Your ear canal is as unique
as a fingerprint

- Sound needs to be accurate for each unique ear canal
- Shape, size, grooves, twists, and curves affect the sound resonance
- Sound that arrives at the eardrum is not necessarily the sound as programmed





THE EFFECT OF EAR-TIPS

TAILOR
TO
THE USER

The kind of earpiece affects sound that arrives at the eardrum:

Instant ear-tips

Put the accuracy of the amplified sound at risk

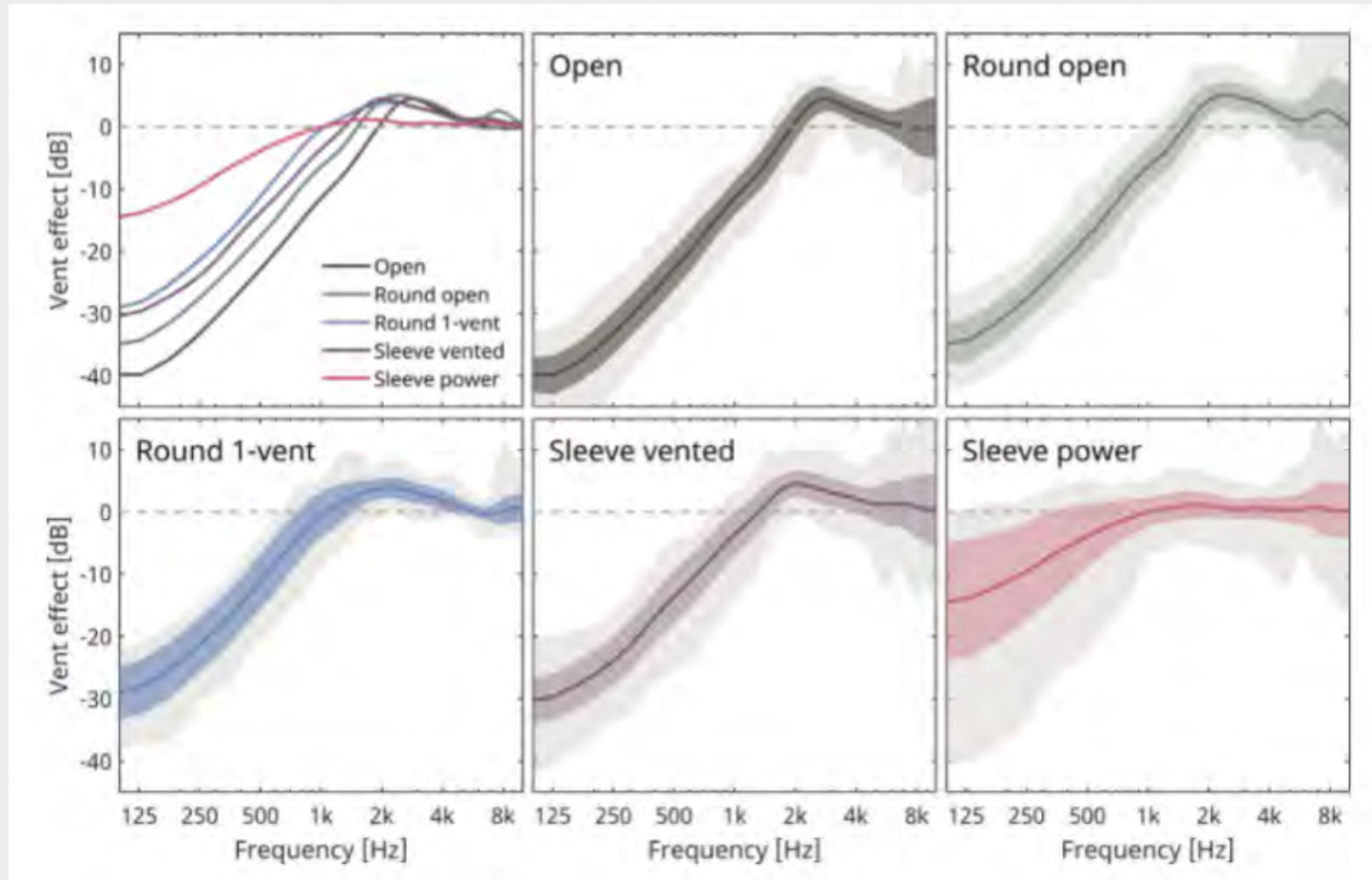
Open/semi-open ear-tips

Certain amount of sound will 'escape' the ear canal, known as the vent effect

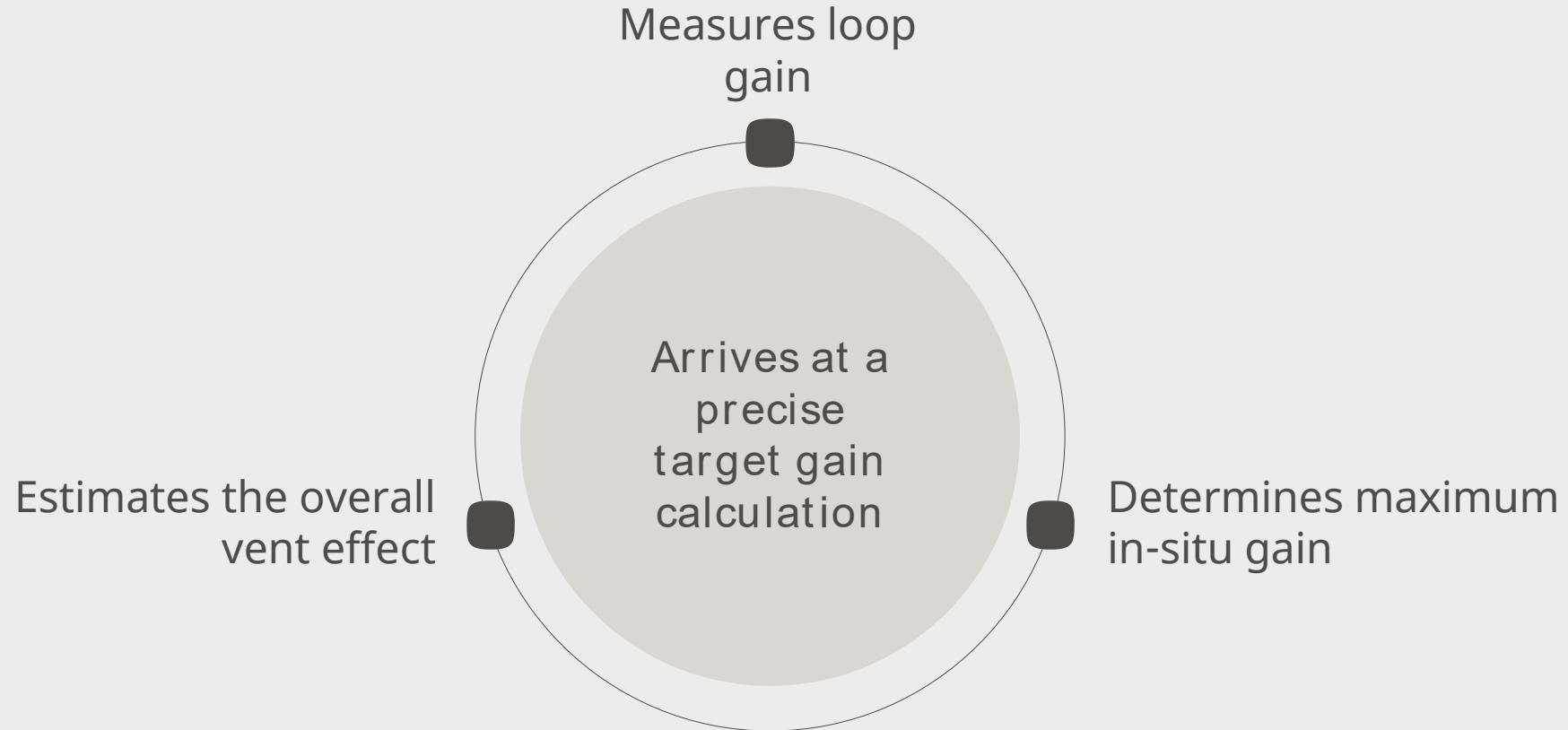


THE ACOUSTICS OF EAR-TIPS

TAILOR
TO
THE USER



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

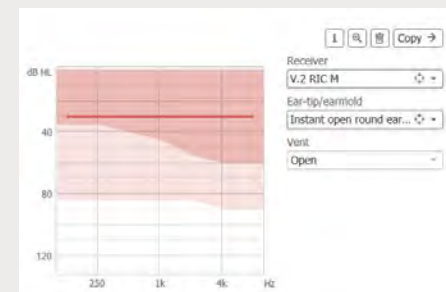


A PRECISION FIRST FIT – EVERY TIME

TAILOR
TO
THE USER

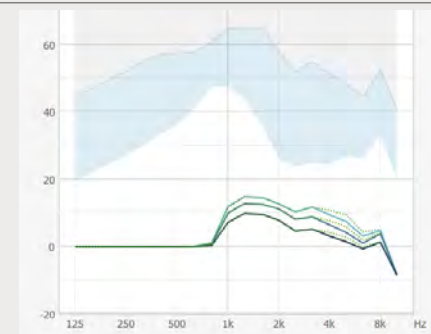
1

Select the correct ear-tip in COMPASS™ GPS: we can predict the vent effect and compensate for it based on the data we've gathered.



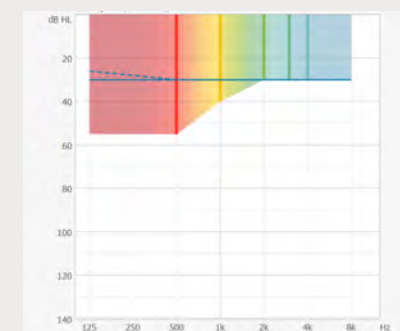
2

Feedback calibration: we can accurately measure the precise impact of the ear canal acoustics and the type of ear-tip and compensate for it accurately (TruAcoustics).



3

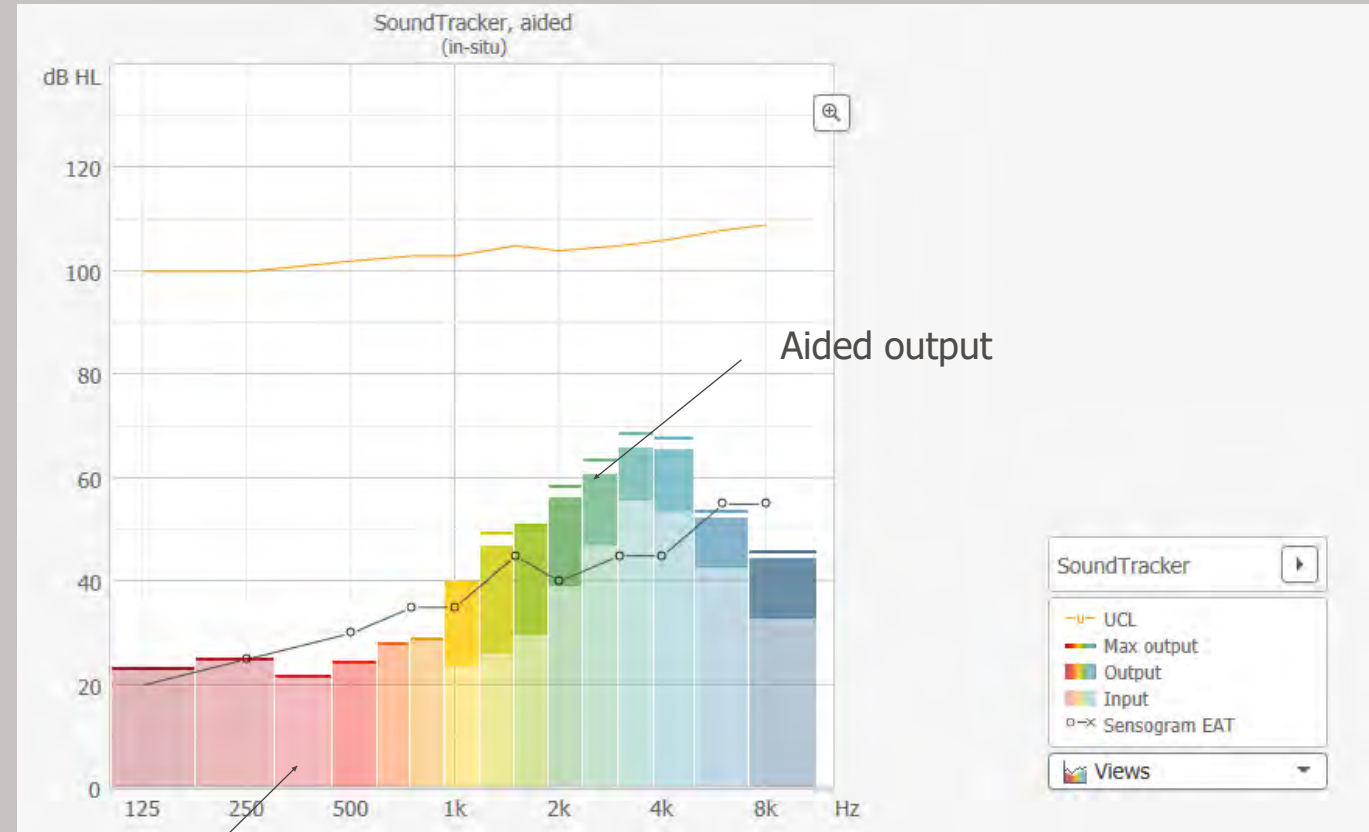
Sensogram (optional): we can provide fully individualized sound according to in-situ hearing thresholds and vent-corrected data from TruAcoustics.



SOUNDTRACKER: SEE IT REAL-TIME

Instantly validate prescriptive gain/predicted output

Also good for fine-tuning, demonstration, and counseling purposes



SOUNDTRACKER ACCURACY

SoundTracker estimated sensation level falls within 2 dB of measured sensation level using REM

J Am Acad Audiol 24:660–670 (2013)

Differences in Sensation Level between the Widex SoundTracker and Two Real-Ear Analyzers

DOI: 10.3766/jaaa.24.8.3

Kristi Oeding*
Michael Valente*

Abstract

Background: SoundTracker is an algorithm in Widex's Compass fitting software that could potentially be used to estimate a patient's aided sensation level (SL). SoundTracker's accuracy of estimating a patient's SL has never been verified in comparison to SL measured with commercially available real-ear analyzers.

Purpose: Determine whether statistically significant differences are present between the estimated SL of the Widex SoundTracker software application and the measured SL of the Audioscan Verifit and Frye 6500 real-ear analyzers at 500, 1000, 2000, and 4000 Hz.

Research Design: This study used a randomized repeated measures design to determine differences in SL between SoundTracker and the Verifit and 6500.

Study Sample: Ten subjects (N = 20 ears) were recruited who were experienced users of behind-the-ear hearing aids with conventional vented earmolds and had bilateral sensorineural hearing loss that was >30 dB HL below 1000 Hz and ≤70 dB HL to 4000 Hz.

Data Collection and Analysis: Real-ear in-situ thresholds (dB sound pressure level [SPL]) and real-ear aided responses (REAR; dB SPL) were measured at 500, 1000, 2000, and 4000 Hz to determine differences in SL between SoundTracker, Verifit, and 6500. A three-factor repeated measures analysis of variance (ANOVA) was utilized to determine differences between method (real-ear analyzers and SoundTracker), analyzer (Verifit and 6500), and frequency (500, 1000, 2000, and 4000 Hz).

Results: Mean differences in measured SL for the Verifit and 6500 were ≤2 dB when compared to the estimated SL using SoundTracker. A statistically significant difference in SL was present between the Verifit and SoundTracker at 2000 Hz ($p < 0.01$), but no significant differences were present at 500, 1000, and 4000 Hz. A statistically significant difference in SL was present between the 6500 and SoundTracker at 4000 Hz ($p < 0.01$), but no significant differences were present at 500, 1000, and 2000 Hz. Mean differences in measured SL between the real-ear analyzers (difference of SoundTracker SL minus Verifit SL compared to the difference of SoundTracker SL minus 6500 SL) were ≤2 dB with a statistically significant difference present at 2000 Hz ($p < 0.01$), but no statistically significant differences were present at 500, 1000, or 4000 Hz.

Conclusions: Nearly 85% of the differences between the estimated SoundTracker SL and the measured SLs of the Verifit and 6500 were ≤2 dB. Despite some limitations of this study, SoundTracker could be useful as a counseling tool to illustrate to patients which sounds are audible or inaudible when unaided and aided.



What it is:

A smart fitting algorithm

How it works:

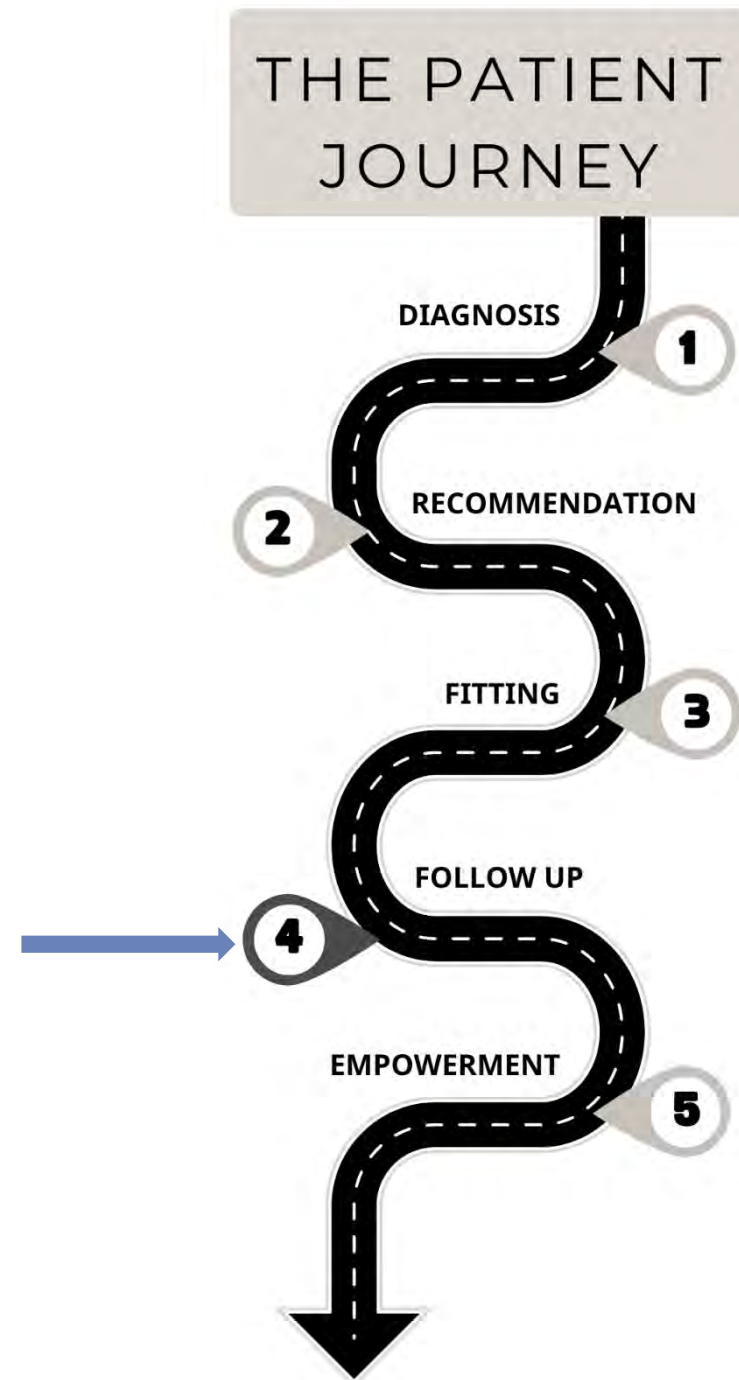
Integrates the unique ear canal acoustics and vent effect with the programmed hearing aid settings

How it benefits:

Ensures greater accuracy of fit, better sound and more precise recommendations

FOLLOW UP

- Wearer has experienced the Widex sound out in the real world – what can you expect?
- Minimal fine tuning
- Easy and effective personalization options if needed



SURVEY RESULTS ARE IN

74%

Easy to
acclimate to
Widex

Fewest

Follow up
appointments
needed with Widex

Lowest

Return rate with
Widex

Ziegler, J., et al. (2024). The Importance of Natural Sound for Hearing Aid Users and Clinicians. *Hearing Review*, June 2024



SPEECH ENHANCER

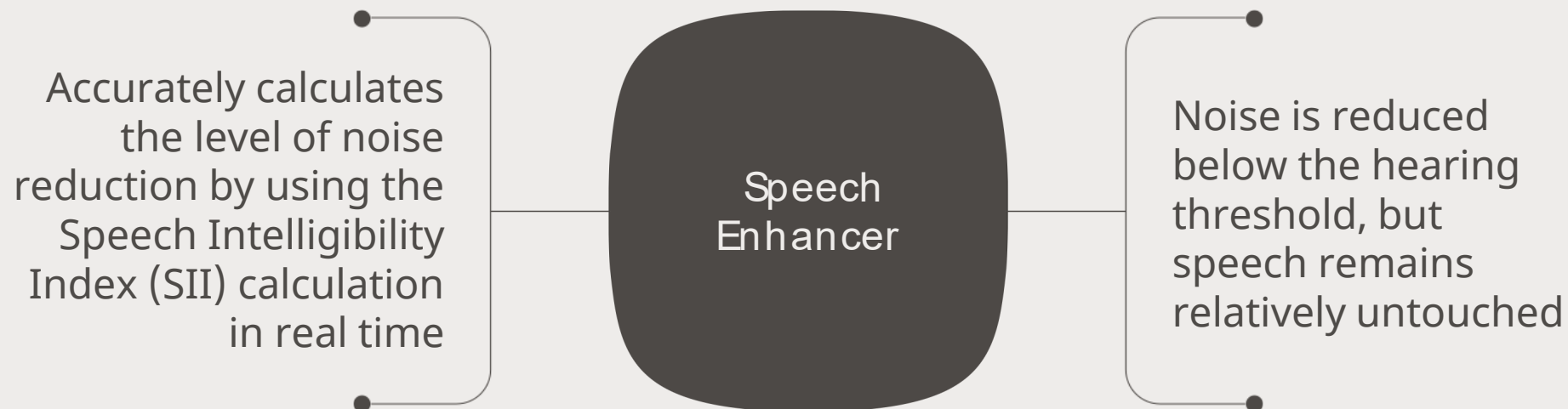
THE SMART WAY TO HANDLE NOISE

INTRODUCING SPEECH ENHANCER

FOCUS ON
WHAT
MATTERS

Main benefit:

Reduces background noise without compromising speech intelligibility



Definition

The measure of the total speech information available to a user in a listening environment

Requirements for calculation

- Noise spectrum level
- Speech spectrum level
- Hearing thresholds of the user

Estimation provided

Intelligibility of speech is based on the audibility of the speech signal

Definition

The measure of the total speech information available to a user in a listening environment

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Definition

The measure of the total speech information available to a user in a listening environment

Requirements for calculation

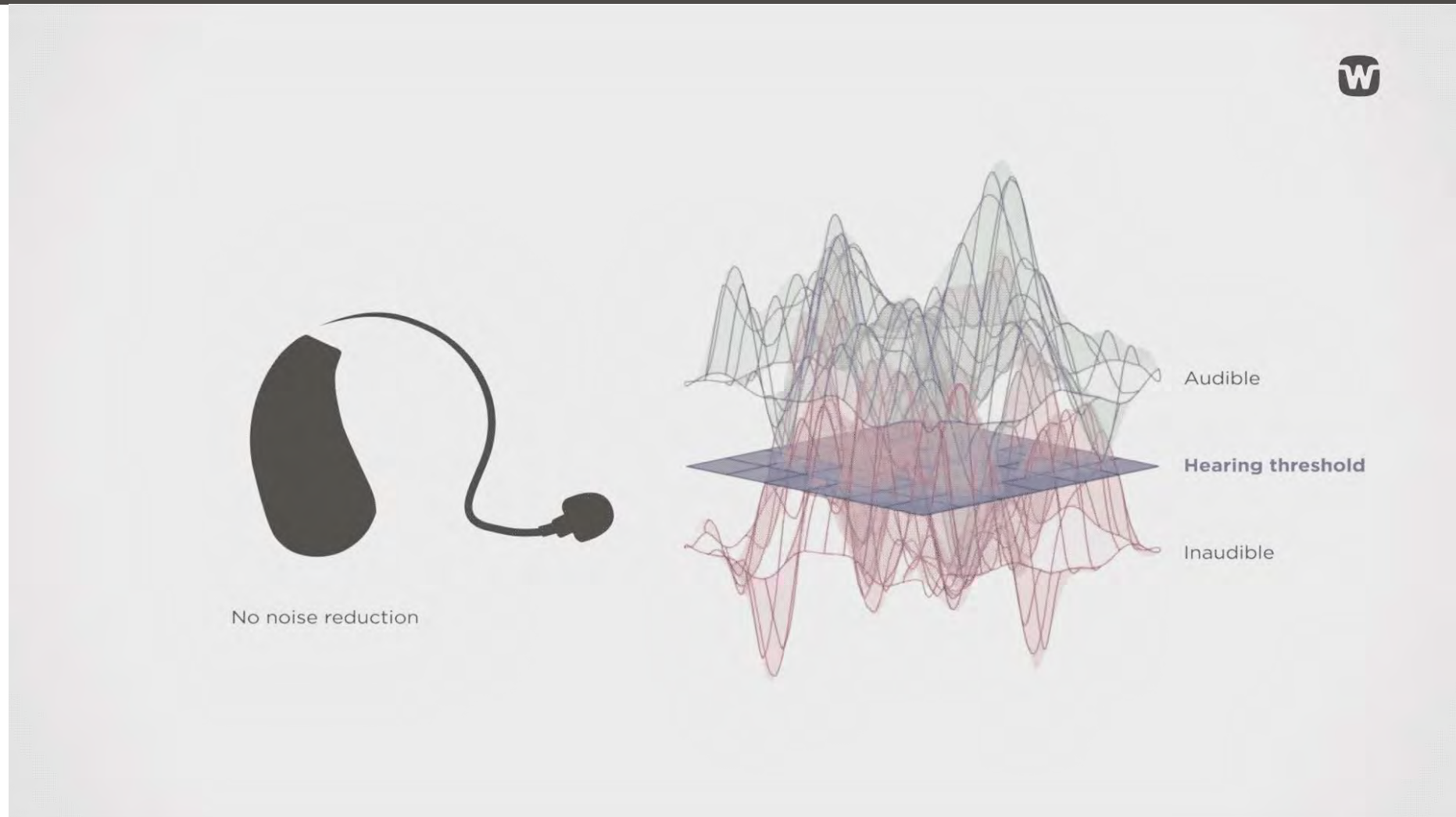
- Noise spectrum level
- Speech spectrum level
- Hearing thresholds of the user

Estimation provided

Intelligibility of speech is based on the audibility of the speech signal

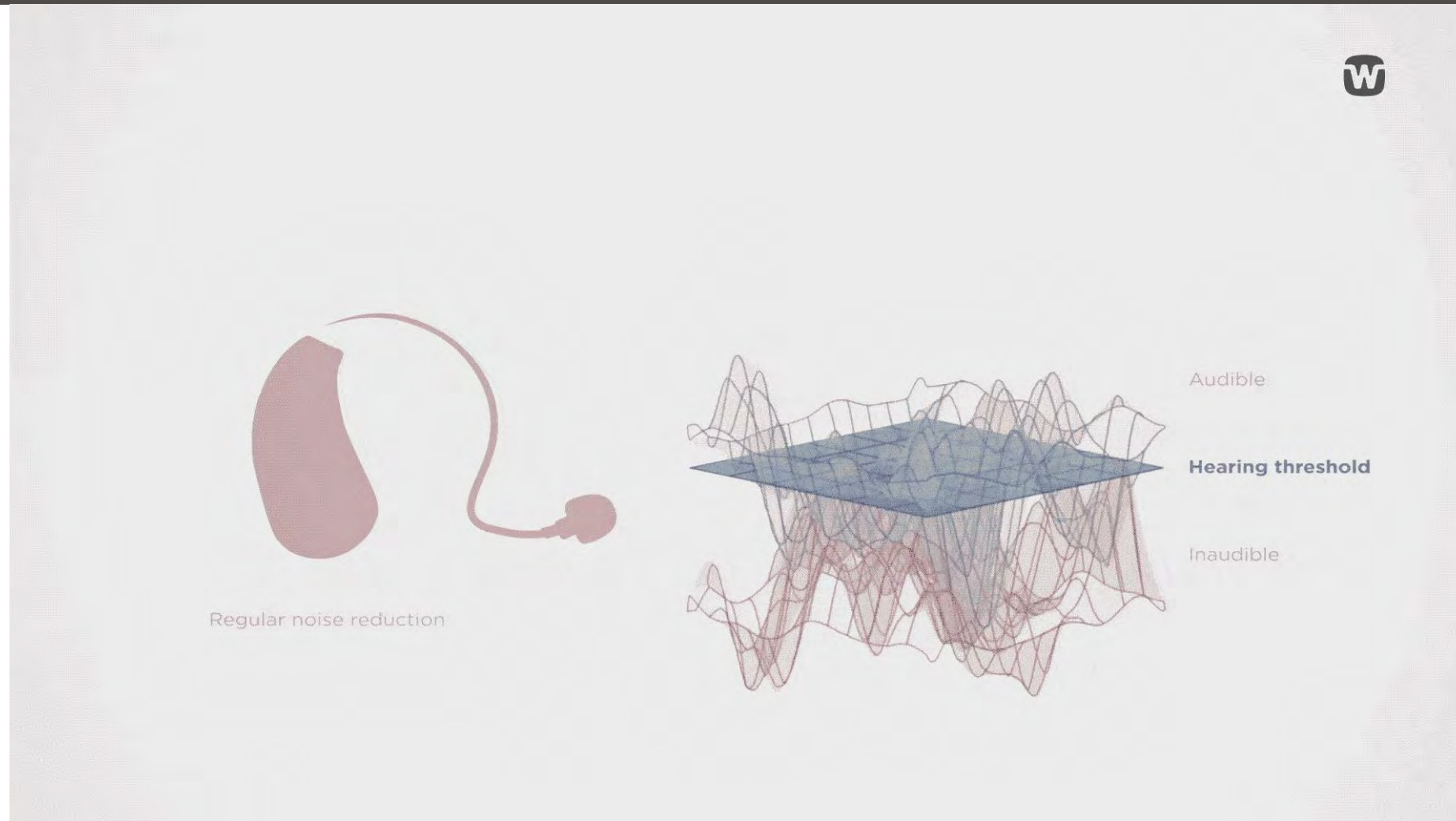
SPEECH ENHANCER

FOCUS ON
WHAT
MATTERS



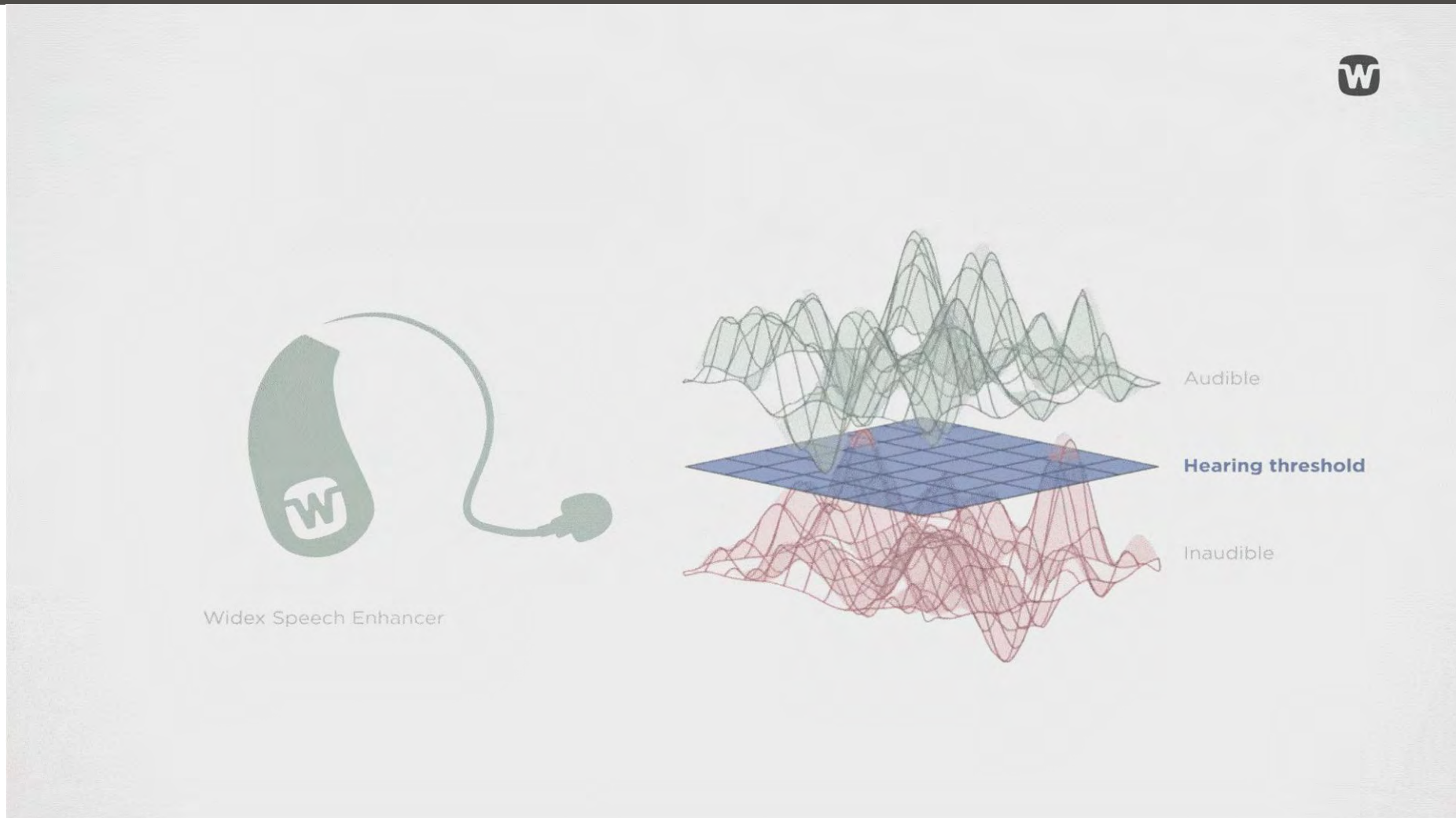
SPEECH ENHANCER

FOCUS ON
WHAT
MATTERS

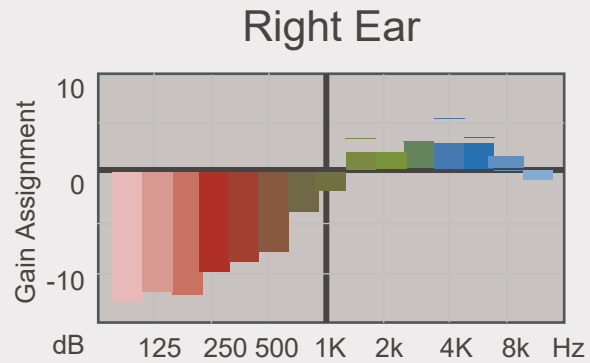


SPEECH ENHANCER

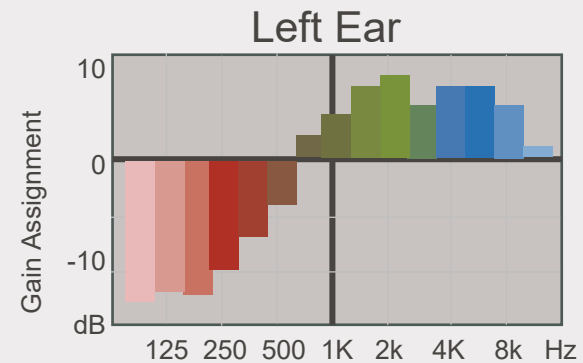
FOCUS ON
WHAT
MATTERS



SPEECH ENHANCER



Reduces noise gain
in the far ear



Enhances speech gain
in the ear near the
communication partner



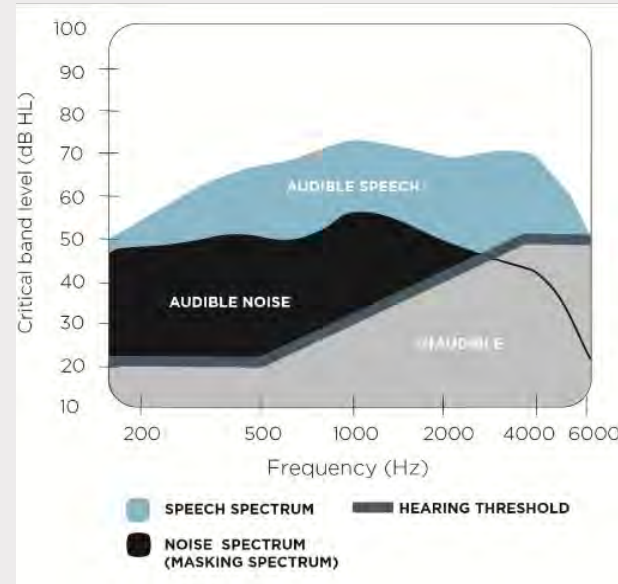
Single out the speaker while attenuating background noise

SPEECH ENHANCER – NOT YOUR TYPICAL NOISE REDUCTION SYSTEM

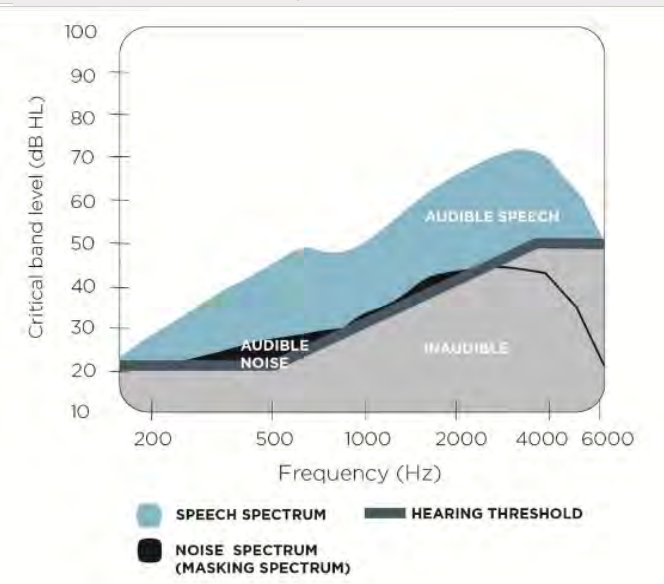
Standard noise
reduction
systems =
Reduce gain for
comfort

Widex speech
enhancer =
2 dB SNR
improvement

Without Speech Enhancer – very
audible noise



With Speech Enhancer – speech is
maintained, noise is minimized

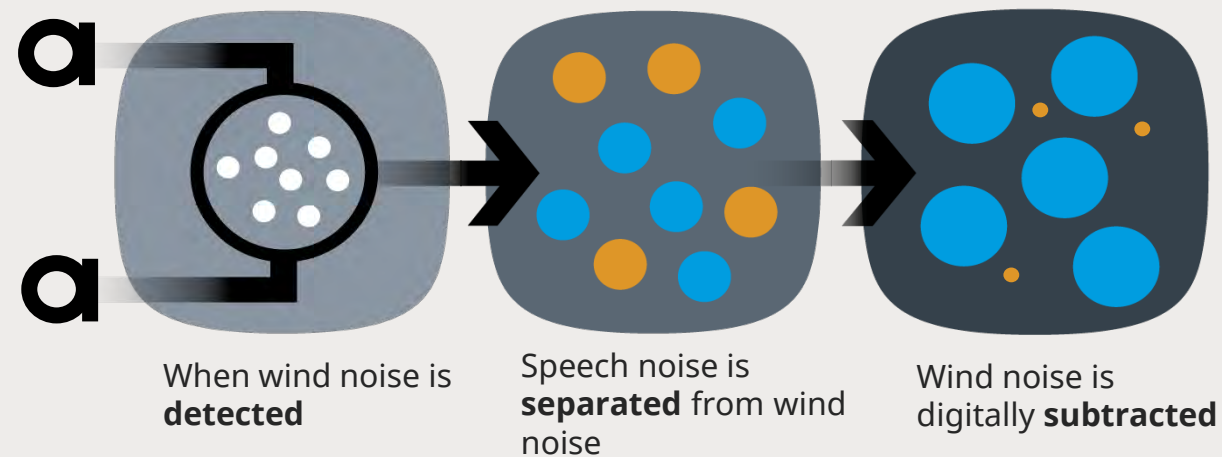
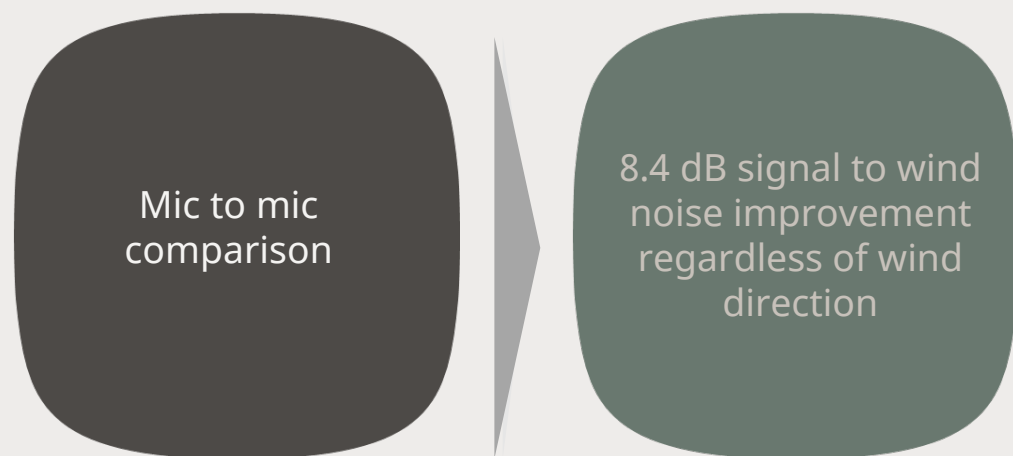


*330 and 440 only

SMARTWIND™ MANAGER

THE SMART WAY TO HANDLE WIND NOISE

SMARTWIND MANAGER



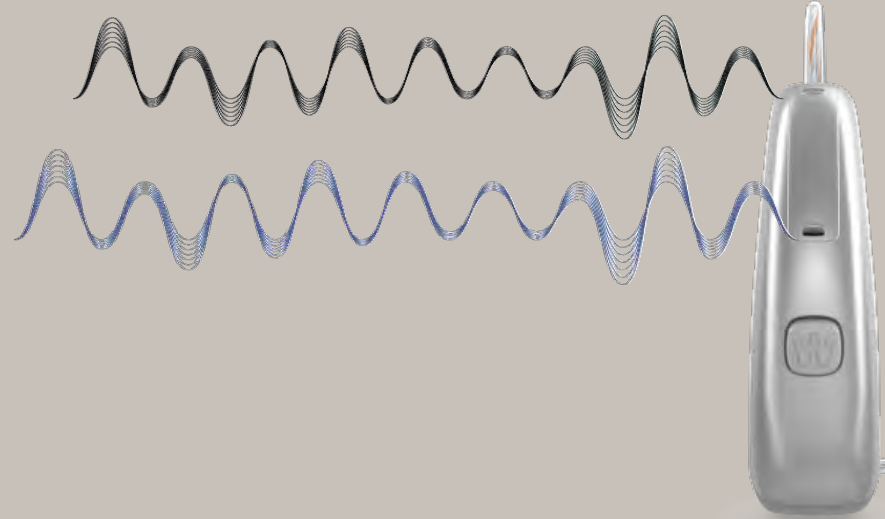
Korhonen P, Kuk F, Seper E, Morkebjerg M, Roikjer M. Evaluation of a wind noise attenuation algorithm on subjective annoyance and speech in wind performance. J Am Acad Audiol. 2016

*440 only

SMARTWIND MANAGER™ – STAGE 1 (DETECTION)

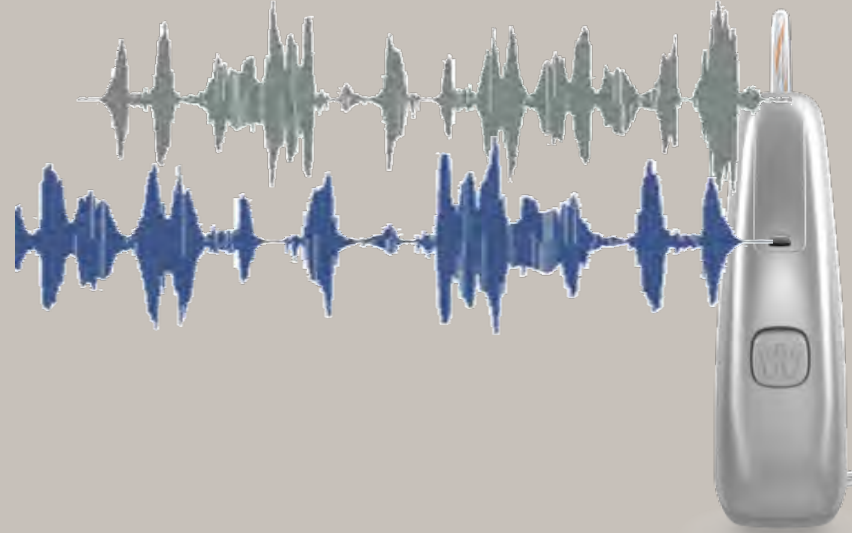
Speech

- Correlated Signal
- Identified as “speech”
- Amplified

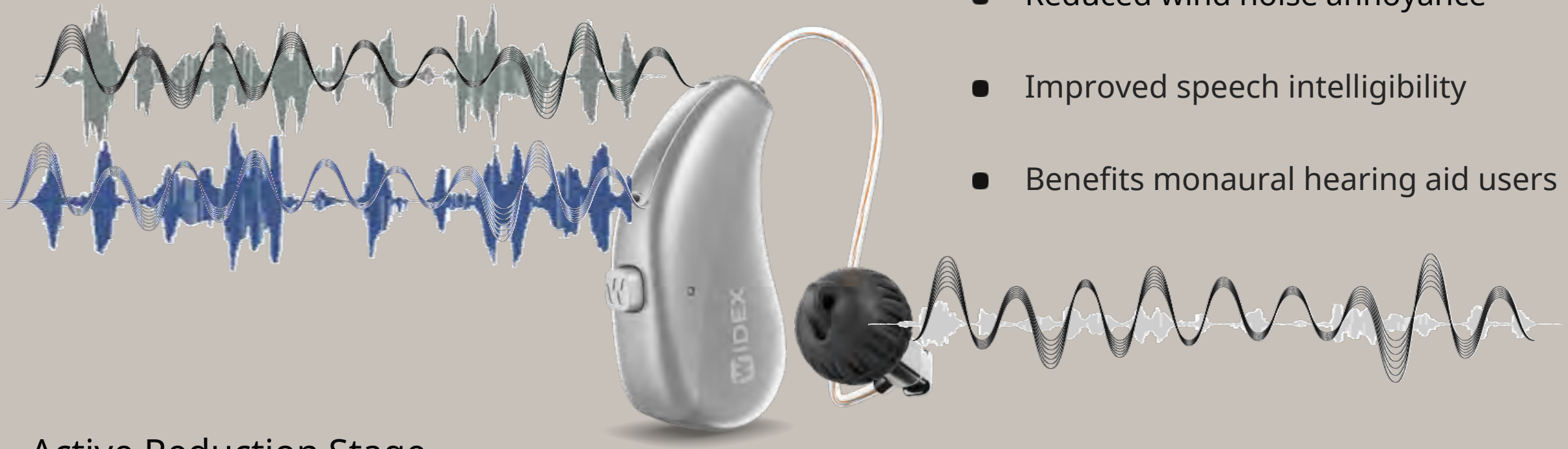


Wind

- Un-Correlated Signal
- Identified as “wind noise”
- Ignored by the processor



SMARTWIND MANAGER™ – STAGE 2 (SUBTRACTION)



- Reduced wind noise annoyance
- Improved speech intelligibility
- Benefits monaural hearing aid users

Active Reduction Stage

- Subtracts the wind noise from the signal
- Results in 8.4 dB SNR improvement

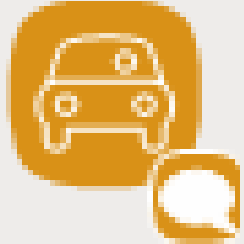
SOUND CLASS TECHNOLOGY

THE SMART WAY TO AUTO-ADJUST SETTINGS

Real-Life
Hearing

Sound Class
Technology for
Real-Life
Preference
Control

- Mapping real-life hearing scenarios
- Anticipating needs with and w/o speech
- Focus on social participation
- Different music styles



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											
WIDEX MOMENT 330 7 Available Sound Classes											
WIDEX MOMENT 220 4 Available Sound Classes											
WIDEX MOMENT 110 3 Available Sound Classes											

pa



10

Log overview

Program use

Environment

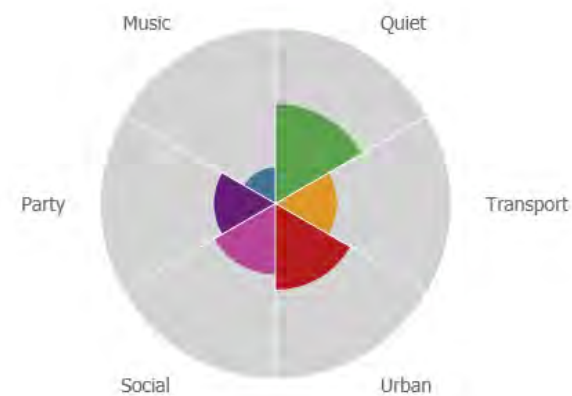
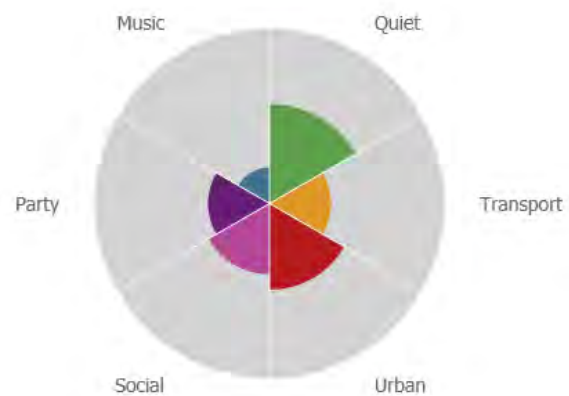
Input level

Log period: June 8, 2021 - January 5, 2022

Select program

Universal P1

MT P2



Go to Sound classes

COMPREHENSIVE NOISE MANAGEMENT

FOCUS
ON WHAT
MATTERS



Our priority:

- Seamless and effortless hearing
 - Reduce distracting sounds while enhancing important ones
-

Our methods:

- Speech Enhancer
 - SmartWind Manager
 - Sound Class Technology
-

Result:

Wearers can forget they are wearing a hearing aid, moving seamlessly throughout their daily life and engaging fully

EXCEPTIONAL FOCUS WITH WIDEX SMARTRIC

Up to

20 dB

improvement in wind noise*

Up to

88%

reduction in touch noise*

Up to

5 dB

SNR improvement (speech in noise)**

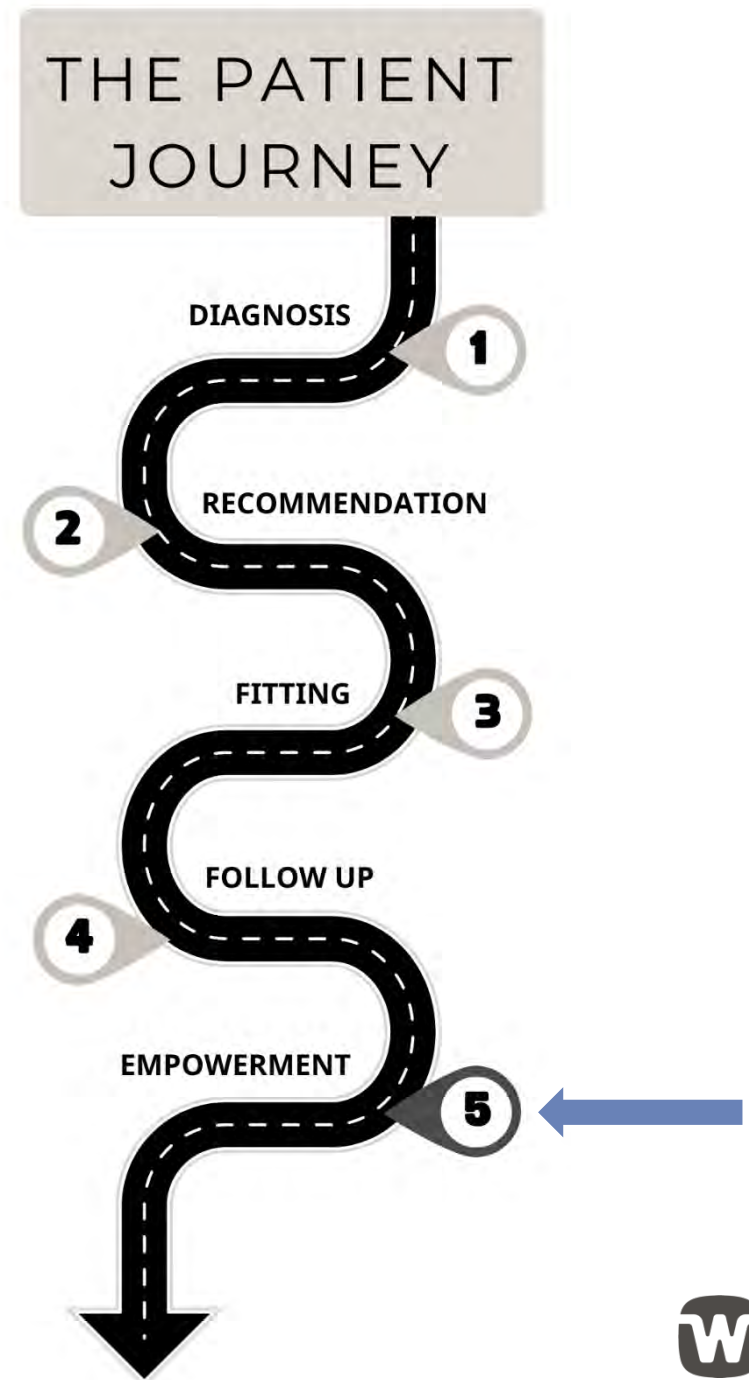


*Balling L, Radoslav D, Meister, B, Parker D, Scheeper, P, and Tiana-Roig E. (2024) Introducing The Widex SmartRIC: When Design Meets Performance. WidexPress, 54.

**Kuk F, Slugocki C, Korhonen P, Peeters H. (2024). Forms influence functions: Importance of microphone angle and speech-in-noise performance. *Hearing Review*, 14-18.

EMPOWERMENT

- Empower patients to help themselves in the moments they need it most!
- Reduce unnecessary follow-up/fine-tuning appointments



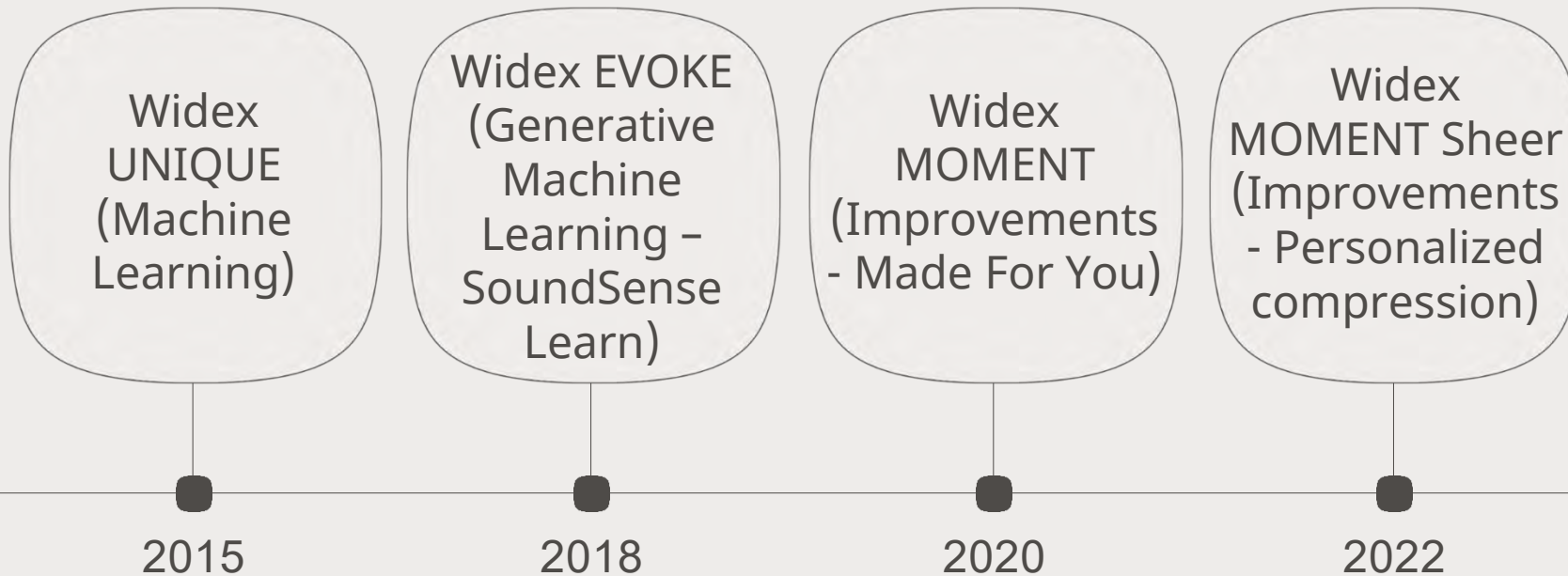
MYSOUND

THE SMART WAY OF USING AI

OUR HISTORY IN ARTIFICIAL INTELLIGENCE

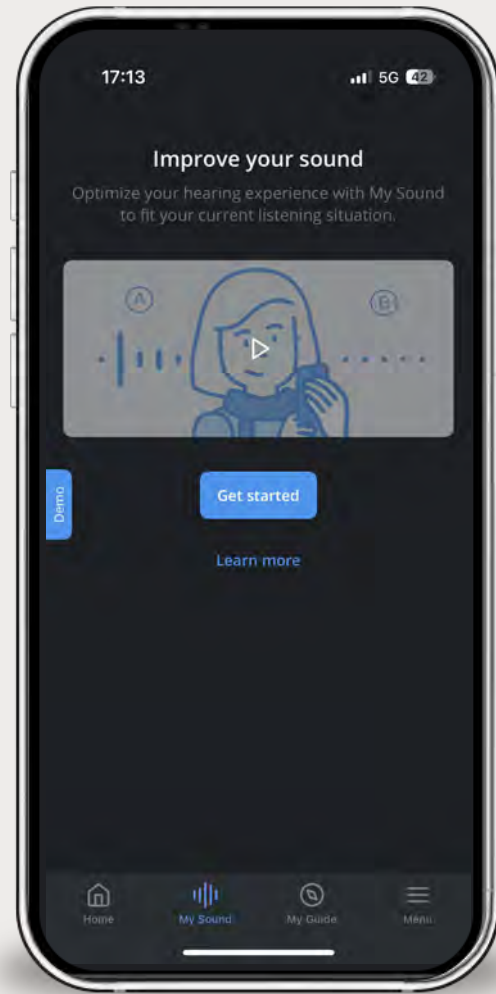
TAILOR
TO
THE USER

We have been using artificial intelligence for quite some time



MYSOUND—OUR AI FEATURE

TAILOR
TO
THE USER



Bridges the gap between:

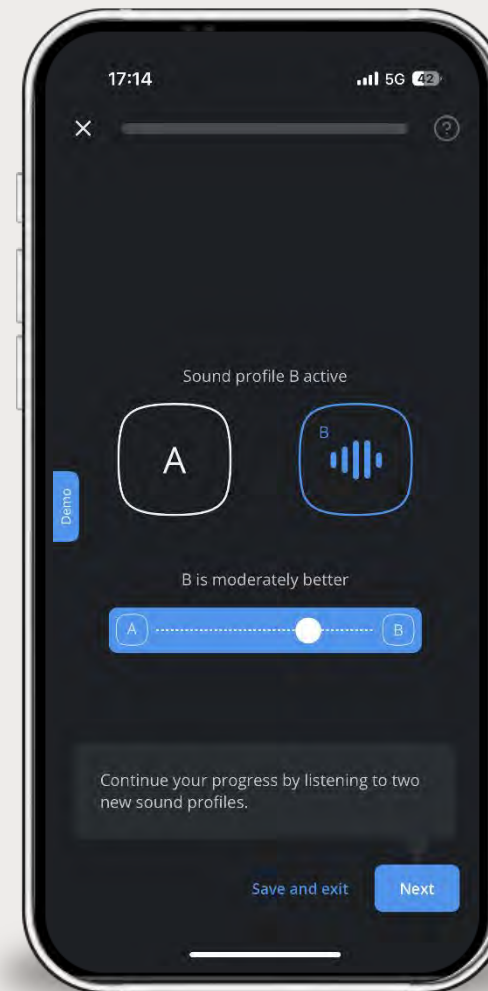
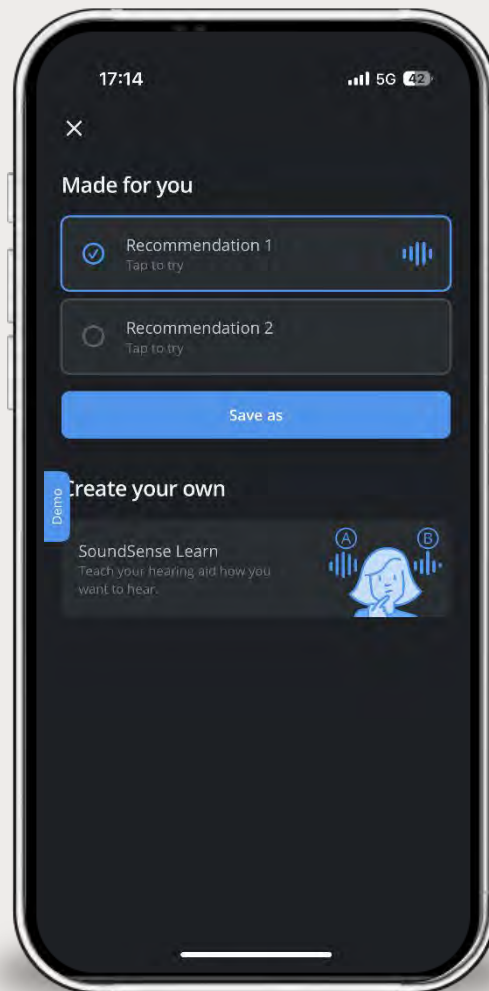
- The auditory environment
- The auditory intention
- The hearing aid settings

MYSOUND—TWO AI-DRIVEN FUNCTIONS

TAILOR
TO
THE USER

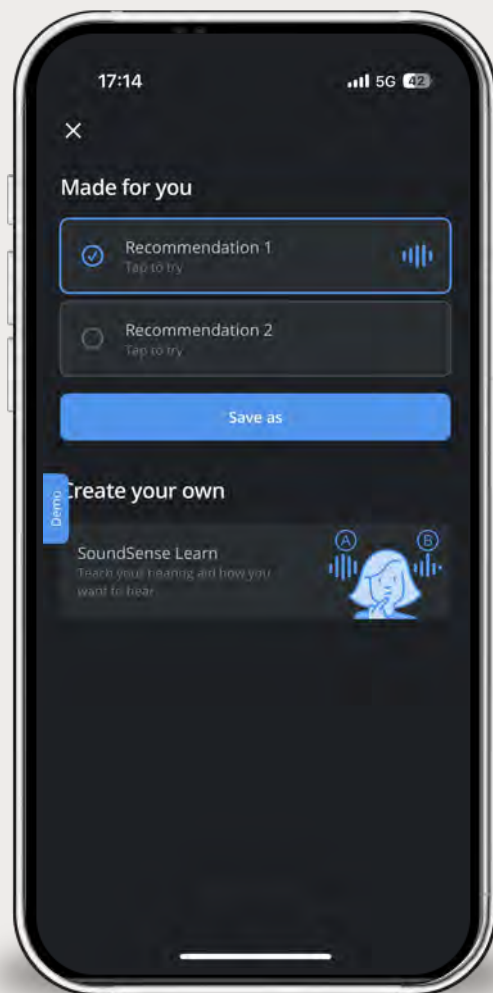
Made For You

Optimizes HA settings based on data collected from thousands of user adjustments worldwide and makes two recommendations

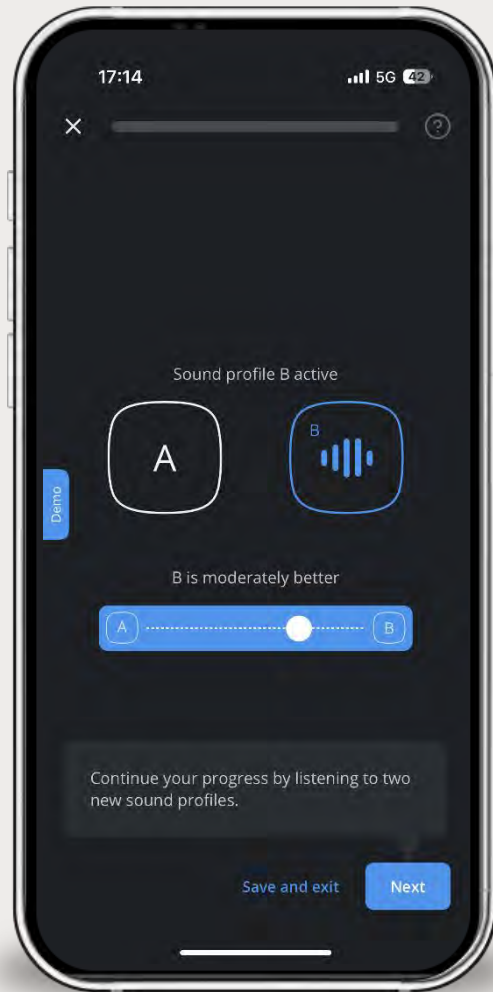


Create Your Own (SoundSense Learn)

Optimizes HA settings based on the user's input and machine learning



- Recommendations are based on real data collected from thousands of users' input in the SoundSense Learn feature
- Observations made of the trends of user preferences in different situations
- Machine learning used to make the best prediction of settings suited to current user's needs



Step1

Starts off by selecting the environment/situation and intent

Step2

Selects the sound profile as per preference in an A/B comparison

Step3

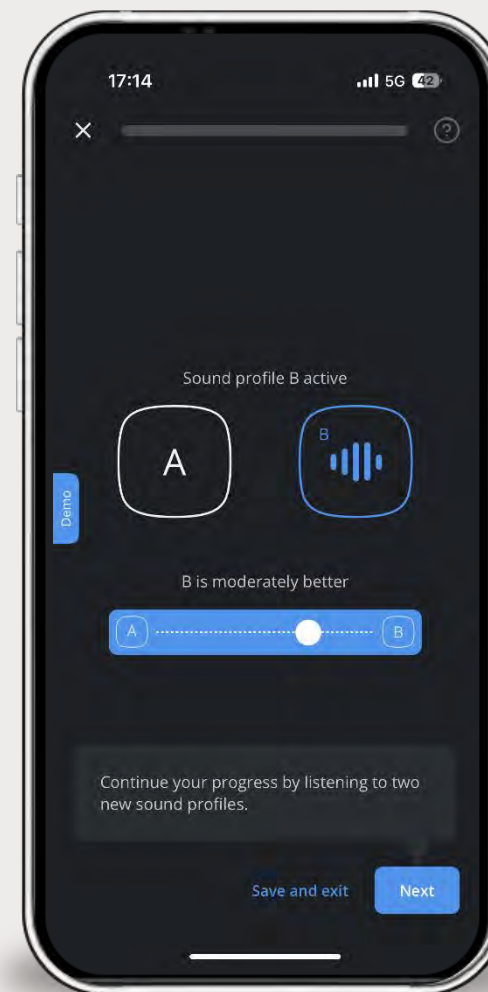
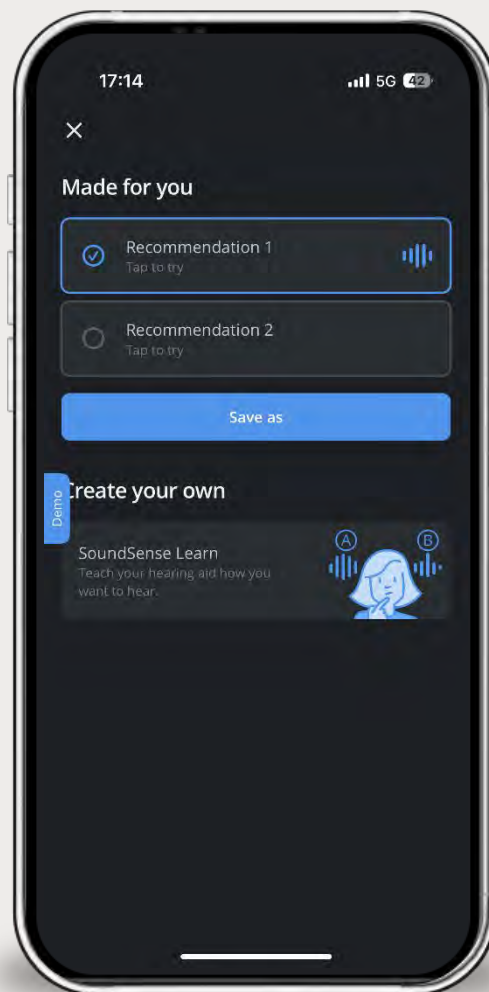
The algorithm uses the response to tailor settings and make a new recommendation

MYSOUND—TWO AI-DRIVEN FUNCTIONS

TAILOR
TO
THE USER

Made For You

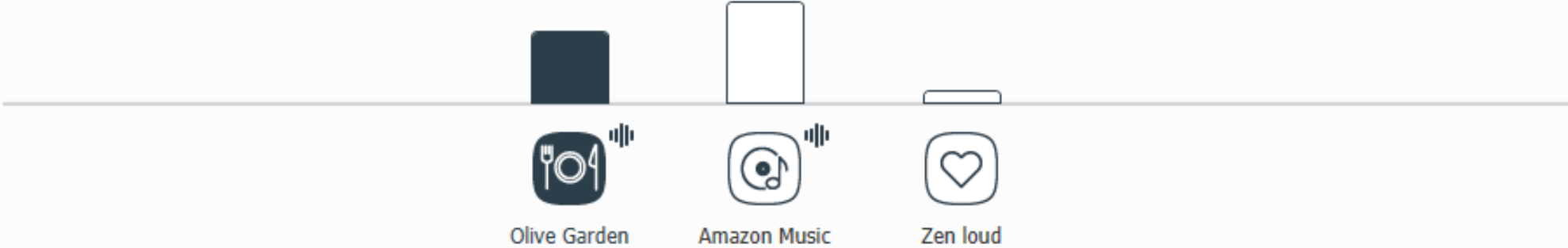
Optimizes HA settings based on data collected from thousands of user adjustments worldwide and makes two recommendations



Create Your Own (SoundSense Learn)

Optimizes HA settings based on the user's input and machine learning

REAL LIFE INSIGHTS



Program name
Olive Garden



Program settings

My Sound

Activity

Intent

Dining

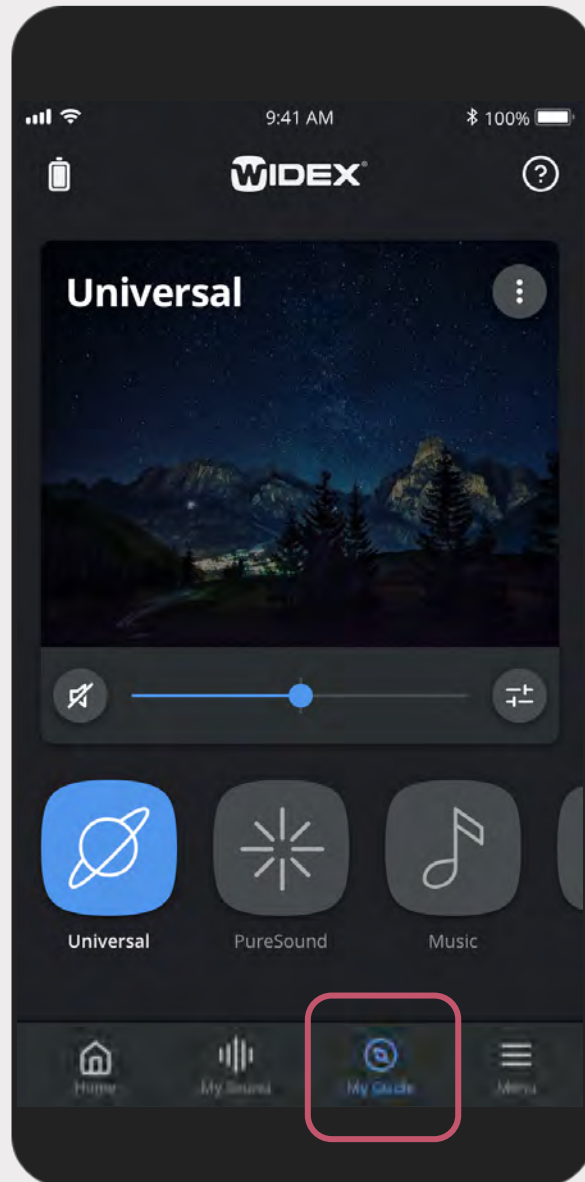
Concentration

This recommended sound profile has been created using artificial intelligence.

Number of users the analysis is based on:

2,072

Based on Universal
Created March 31, 2021
Program use 0.3
My Sound Made for you (recommended sound profile) 



My Guide provides help, guidance and inspirational material to strengthen the users' ability and motivation to continue wearing their hearing aids.

- Introduction to life with hearing aids
- Create wearing habits
- Relevant information about hearing and hearing aids
- Support becoming a successful hearing aid use

THE RESULTS SPEAK FOR THEMSELVES

94% find sound quality very or extremely important

90% of users are satisfied with the sound quality in Widex hearing aids

Users want to stay with Widex: 87% are likely to request Widex again

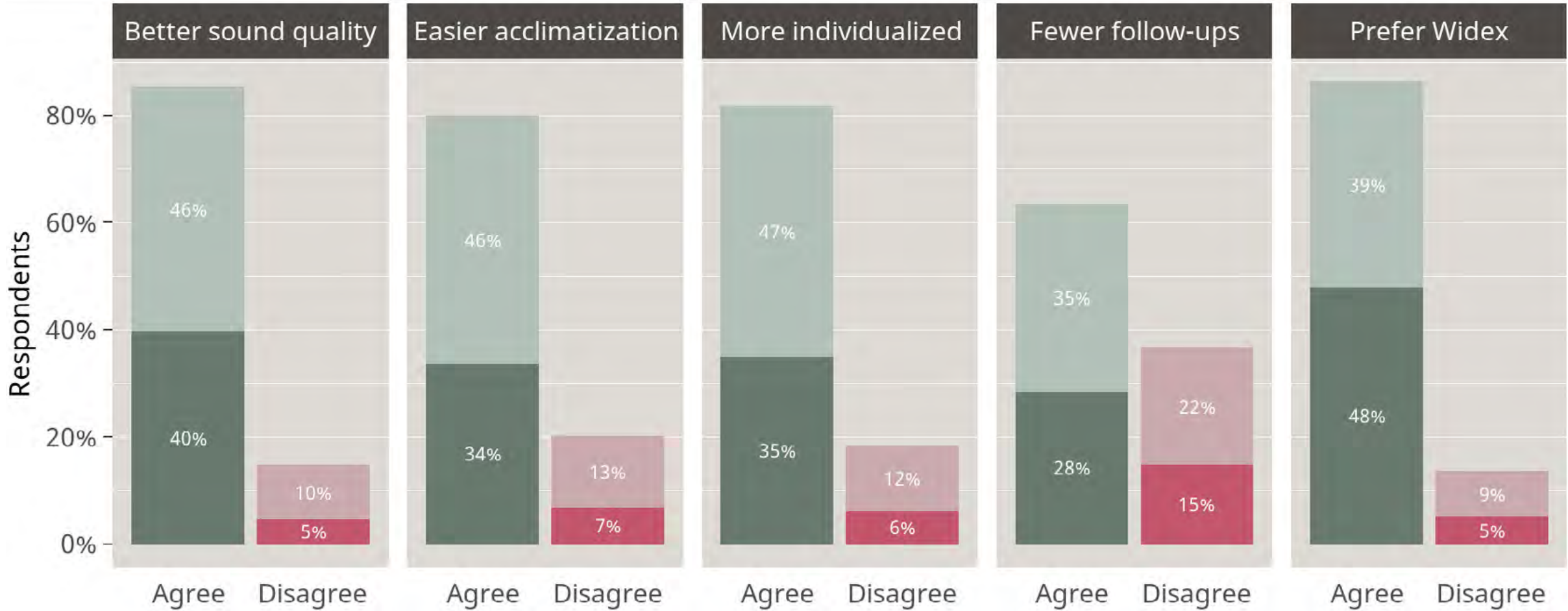


Survey of 3877 Widex Moment App users

Ziegler, J et al (2023) *The Widex Sound Philosophy: A Global Perspective on Natural Sound, Innovative Technology, and User Satisfaction* (WidexPress53).



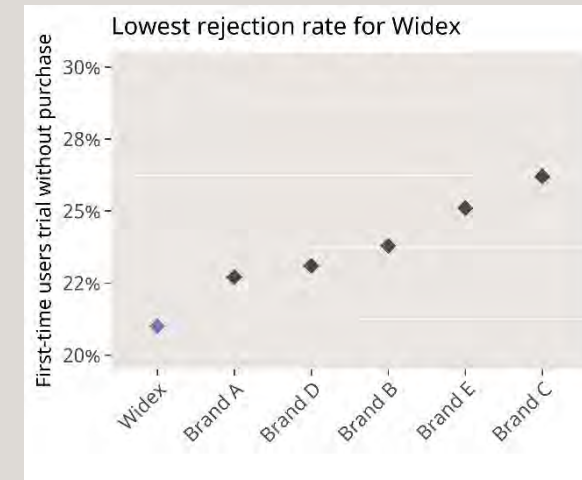
WHAT DO WEARERS THINK ABOUT WIDEX?



HELP MORE PEOPLE WITH WIDEX



With the **lowest rejection rate on first time users** and **fewer follow-ups**, the HCP who fits Widex can waste less time on unsuccessful fittings and use that time to help other potential hearing aid wearers.



2023, Survey with 246 HCPs in US



THE WIDEX
SOUND
PHILOSOPHY

Respect All
Sounds

Tailor to the
User

Focus on
What Matters

WIDEX IS HERE FOR
YOU!

Order on mywidexpro.com

Contact your local Widex Team

Call us at 1-800-221-0188



THE WIDEX SOUND PHILOSOPHY

OUR PROMISE TO DELIVER
SOUND LIKE NO OTHER