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Oticon Realo: Audiological Innovations

Virginia Ramachandran, AuD, PhD
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oticon
life-changing technology

Disclosures

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Author & Associate Editor, Plural Publishing, Inc.

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President, American Academy of Audiology

Disclaimer

The opinions and assertions presented are the private views of the presenter and are not to be construed as official or as necessarily reflecting the views of the American Academy of Audiology or of Oticon, Inc.

Learning outcomes:

- 1) After this course, participants will be able to describe the components of Oticon Real's Real Sound Technology features
- 2) After this course, participants will be able to explain the patient benefits of effective management of wind and handling noise via Oticon Real.
- 3) After this course, participants will be able to explain the patient benefits of effective management of sudden sounds via Oticon Real.

Optimal
comfort



Optimal
clarity

Optimal
comfort

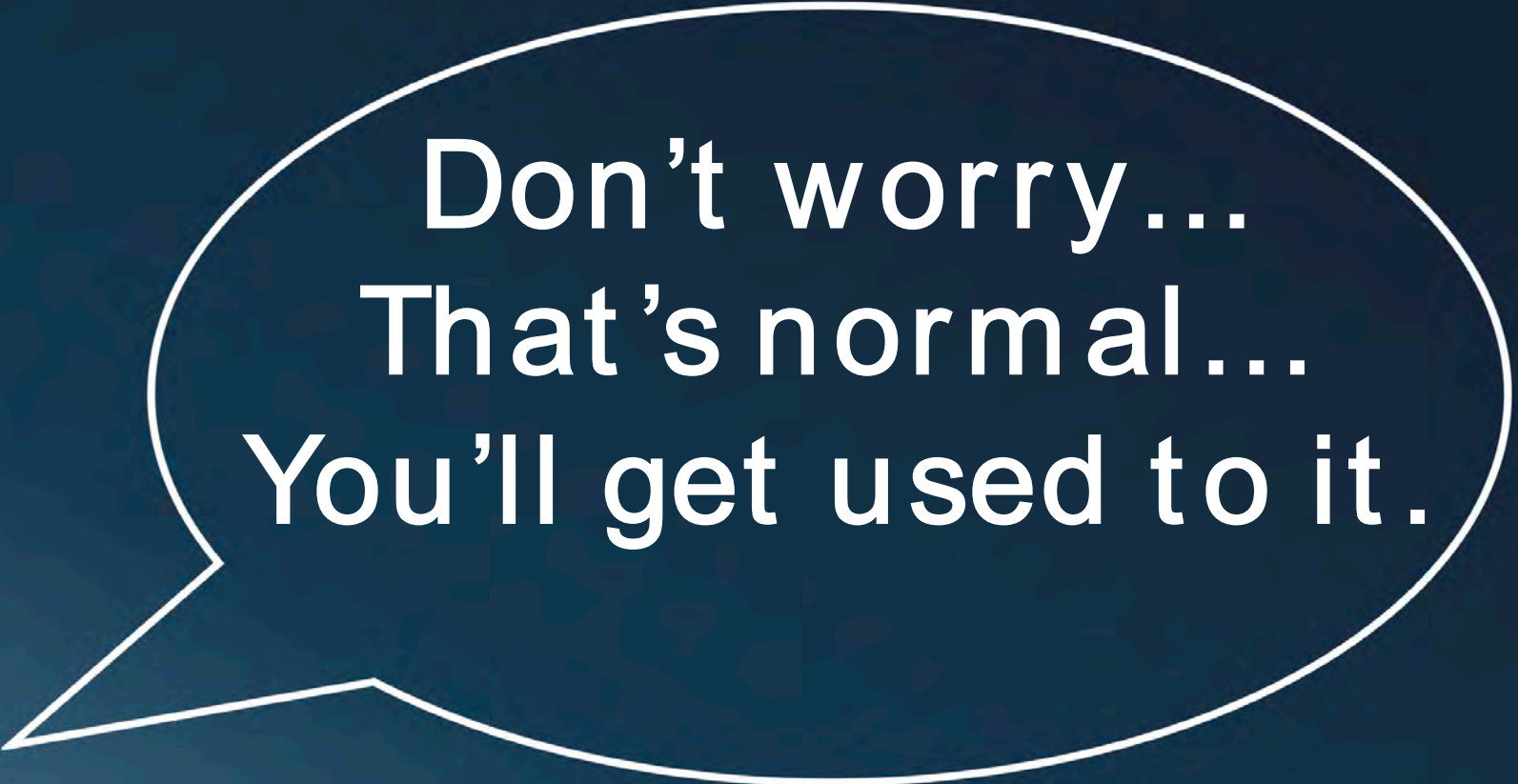


Optimal
clarity

Optimal
comfort



Optimal
clarity



Don't worry...
That's normal...
You'll get used to it.

**For hearing aids to be effective
they must be...**

1) Fit well

2) Worn consistently

Optimal
comfort



Optimal
clarity

Polaris Ro

**Powers
RealSound Technology
in Oticon Realo**

**Runs new detectors for
fast and precise processing
of disruptive sounds**

**Features an onboard
Deep Neural Network
(DNN)**

**Future ready for wireless
updates**

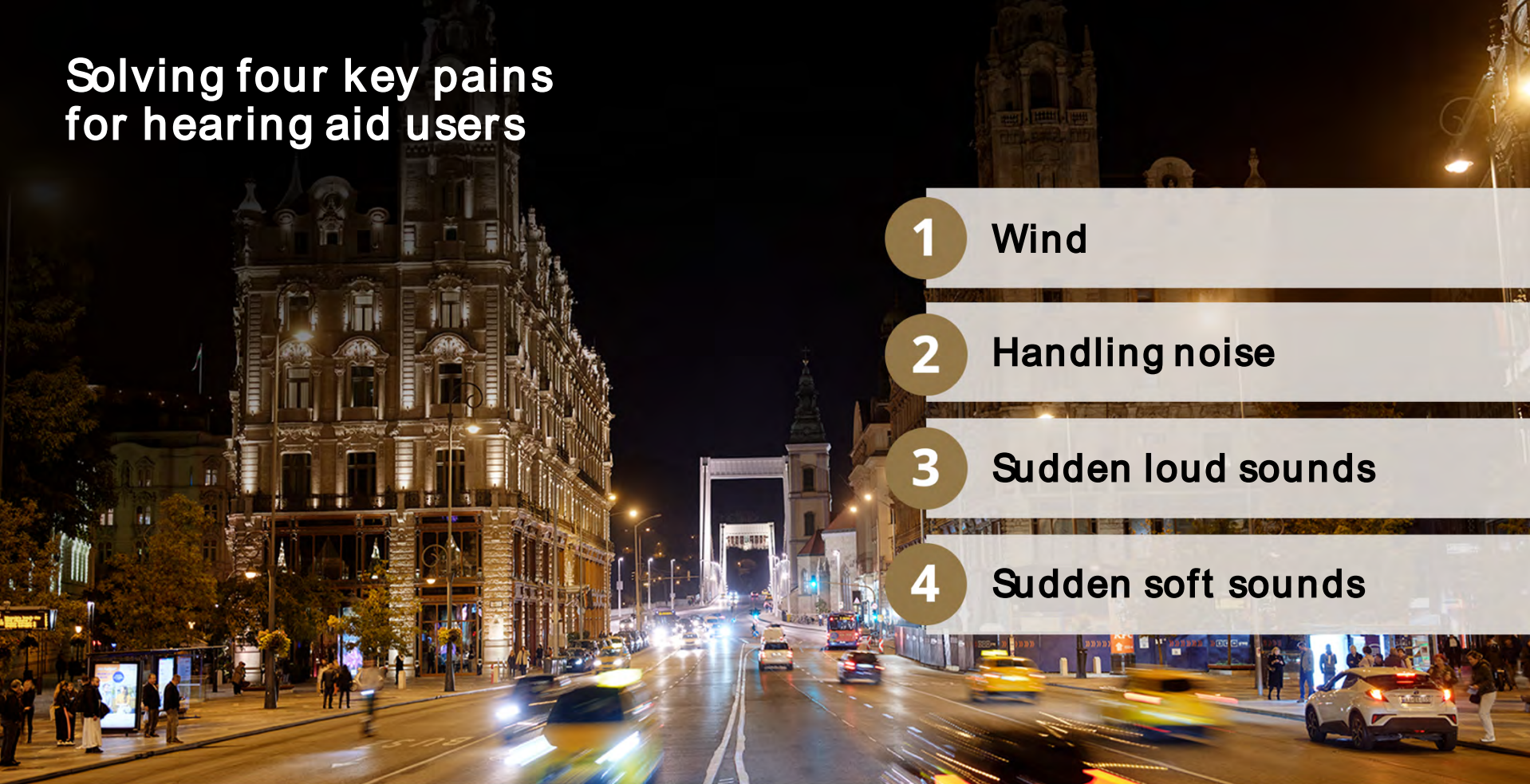


RealSound Technology 0

Helps users stay sharp in the real world



Solving four key pains for hearing aid users



1 Wind

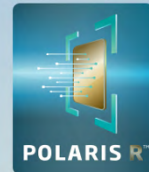
2 Handling noise

3 Sudden loud sounds

4 Sudden soft sounds

New MoreSound Intelligence 2.0

With Wind & Handling Stabilizer



**MoreSound
Intelligence™ 2.0
with DNN**

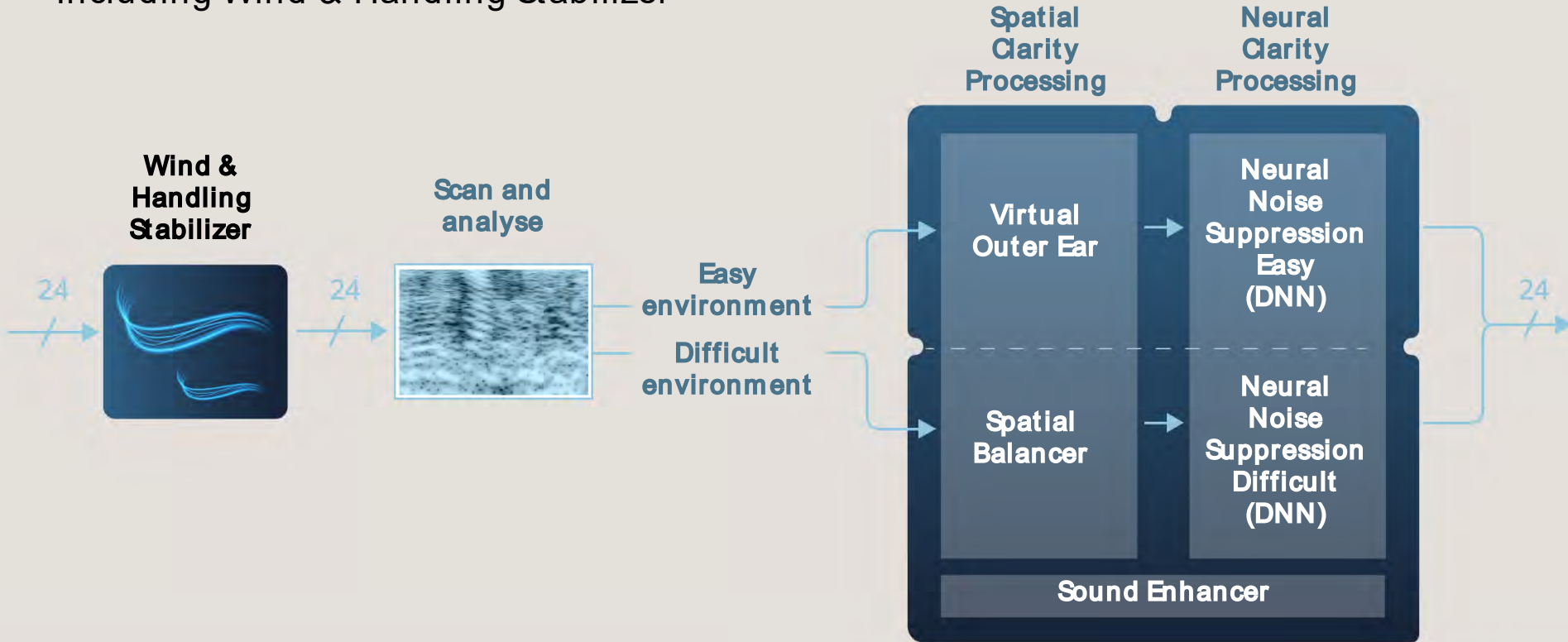
**Wind & Handling
Stabilizer**

World's first wind & handling
prevention system

Improves access to speech in windy
environments

MoreSound Intelligence 2.0

Including Wind & Handling Stabilizer

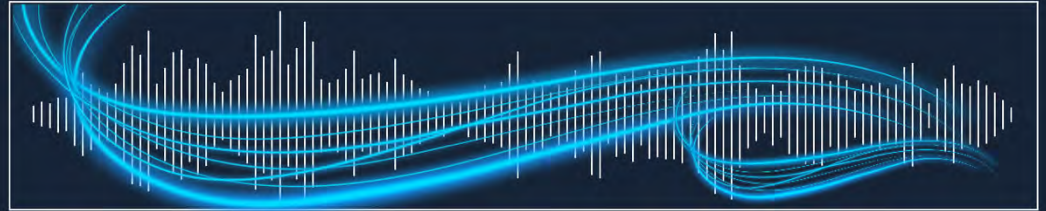


Wind & Handling Stabilizer

Speech and wind in hearing aids



Traditional technology



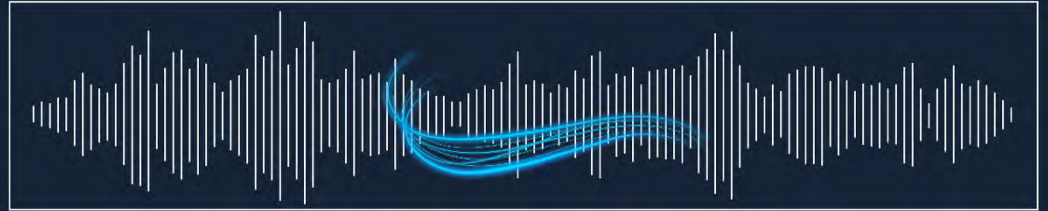
Wind & Handling Stabilizer

Speech and wind in hearing aids



Mic 2

Wind & Handling Stabilizer in Oticon Real



Wind & Handling Stabilizer

Example

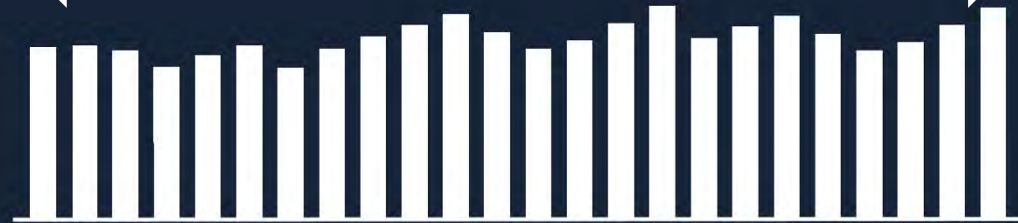


Mic 1



← up to 10,000 Hz →

Mic 2



Settings in Oticon Genie 2

File Genie 2 Edit Hearing Instrument Preferences Tools Help

DISCONNECT

oticon

Real 1 85 Bass dome, double

CLIENT WELCOME SELECTION **FITTING** END FITTING

Real 1 85 Bass dome, double

P1

FITTING

MORE TOOLS

- Fitting Assistant
- Automatic Adaptation Manager
- Automatics**
- Tinnitus
- Speech Rescue
- Data Logging
- In-situ Audiometry

WIND & HANDLING STABILIZER

Wind & Handling Stabilizer constantly monitors the sound environment and automatically suppresses the unnatural noise caused by wind and handling to improve speech intelligibility and user comfort.

OFF ON

SPATIAL NOISE MANAGEMENT

Spatial noise management uses the spatial information shared between ears via binaural wireless technology. It allows the client to focus attention on the ear with the best signal-to-noise ratio. The audibility of speech is maximised on this ear.

OFF ON

BINAURAL BROADBAND

Binaural Broadband controls all wireless binaural communication between hearing instruments. This includes binaural synchronisation and binaural coordination of features and controls such as VC, mute and programs. If you turn Binaural Broadband off, all binaural processing will be off.

OFF ON

FEEDBACK MANAGEMENT

NORMAL is the default setting. It compensates for acoustic feedback across the entire frequency range. LOW provides a reduced level of feedback margin and may be suitable in listening situations in which the client complains about compromised sound quality. If you turn this feature off, feedback may occur.

RIGHT SIDE LEFT SIDE

OFF LOW **NORMAL** OFF LOW **NORMAL**

Remote Care

Documenting the benefits of Wind & Handling Stabilizer

Better access to speech



Outperforming competition



Taking the test setup to the next level

Hearing aids recorded in a true-to-life controlled setting

Poul la Cour Tunnel

**One of the largest university-owned
wind tunnels in the world**

**Better access
to speech**



Better access to speech

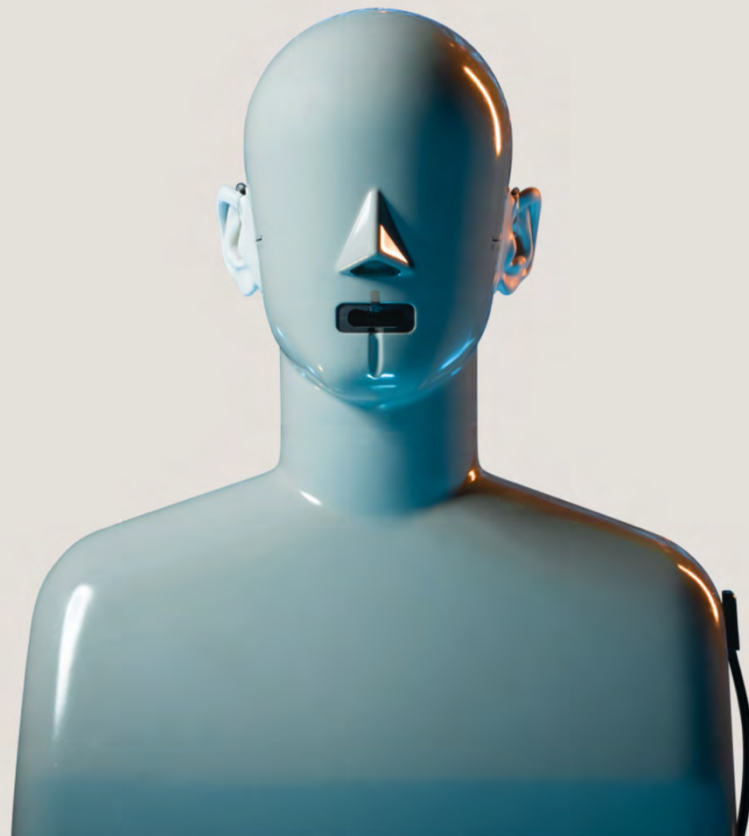
Technical evidence

ON vs. OFF

measuring the effect of
Wind & Handling Stabilizer

Oticon Real vs. Oticon Moreo

measuring the improvement
compared to previous generation

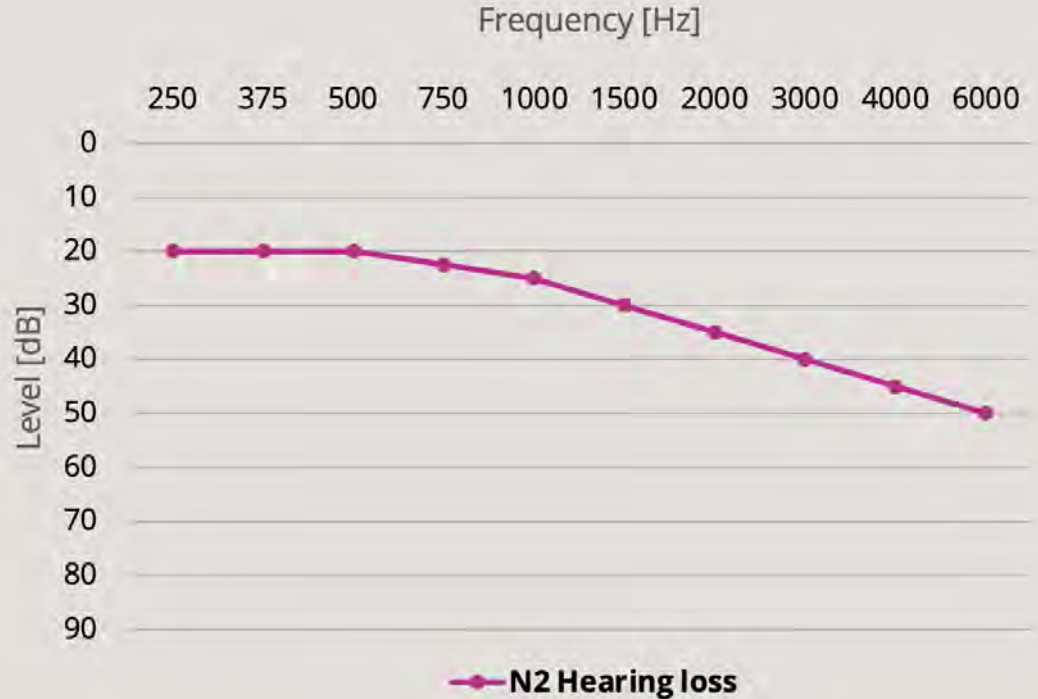


Method

Hearing aid settings

Hearing aid settings:

- Standard N2 hearing loss
- Oticon Real
 - Wind & Handling Stabilizer ON/OFF
- Oticon More
 - Wind Noise Management ON



Methods

Test setup

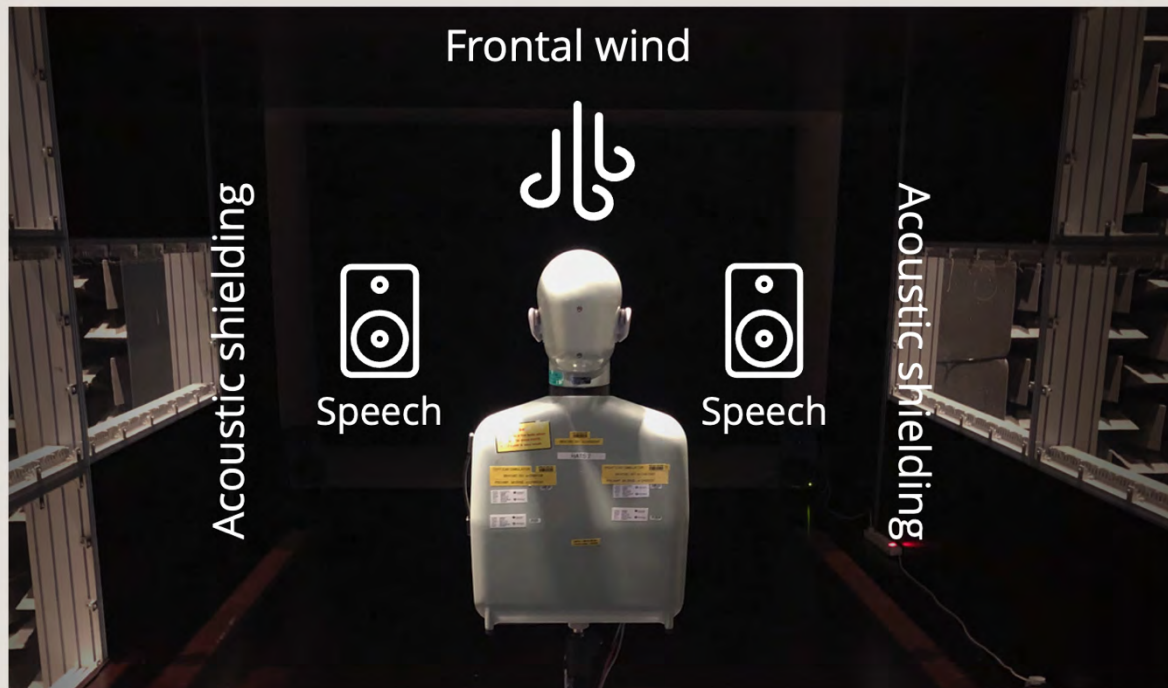
- HATS with hearing aids facing upstream
- Hearing aid output measured in ear canals
- Wind speeds:
 - Moderate: 5-7 m/s
 - Strong: 9-10.5 m/s



Method

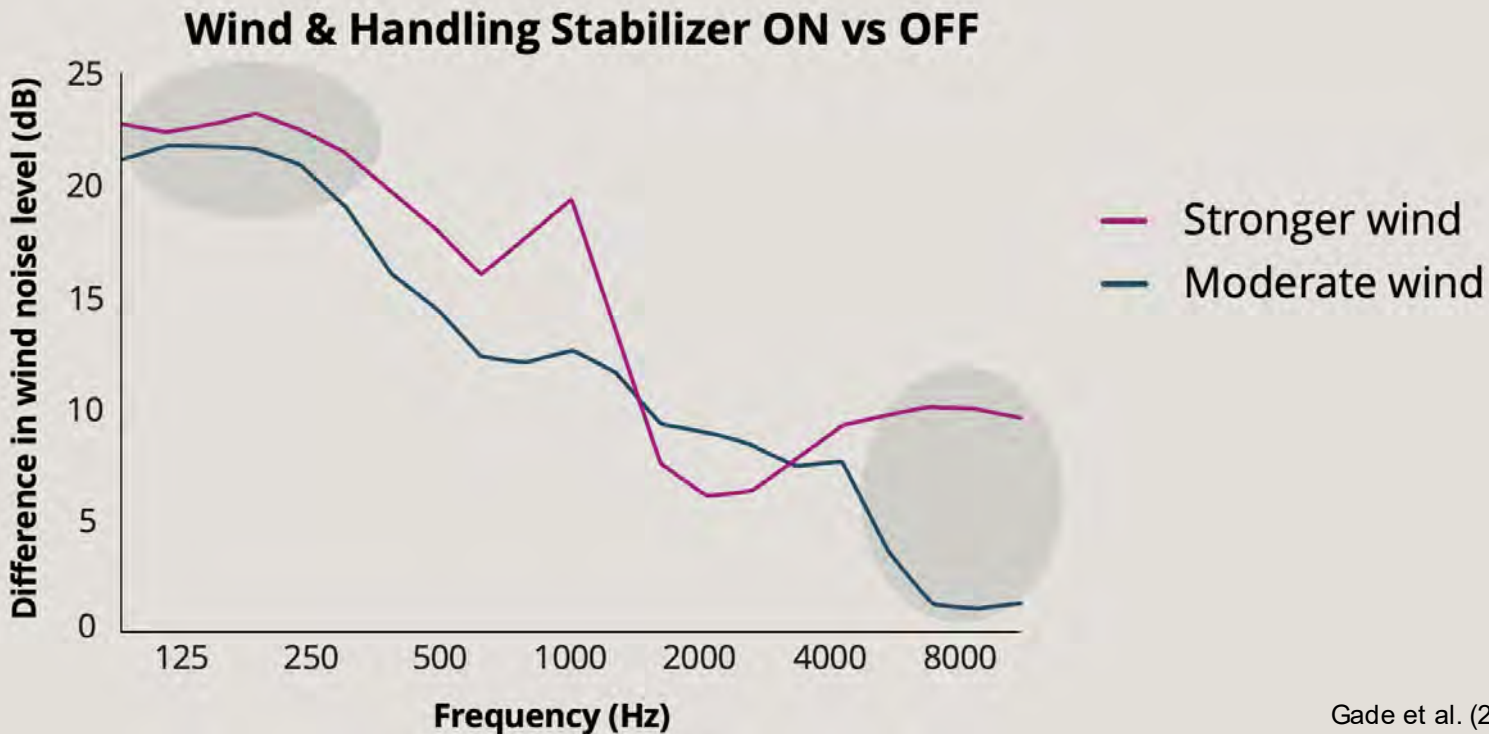
Test setup

- **Speech from one speaker in front at 80 dB SPL**
- Output signal-to-noise ratios (SNR) estimated based on 64 recordings



Results

Wind & Handling Stabilizer ON vs OFF

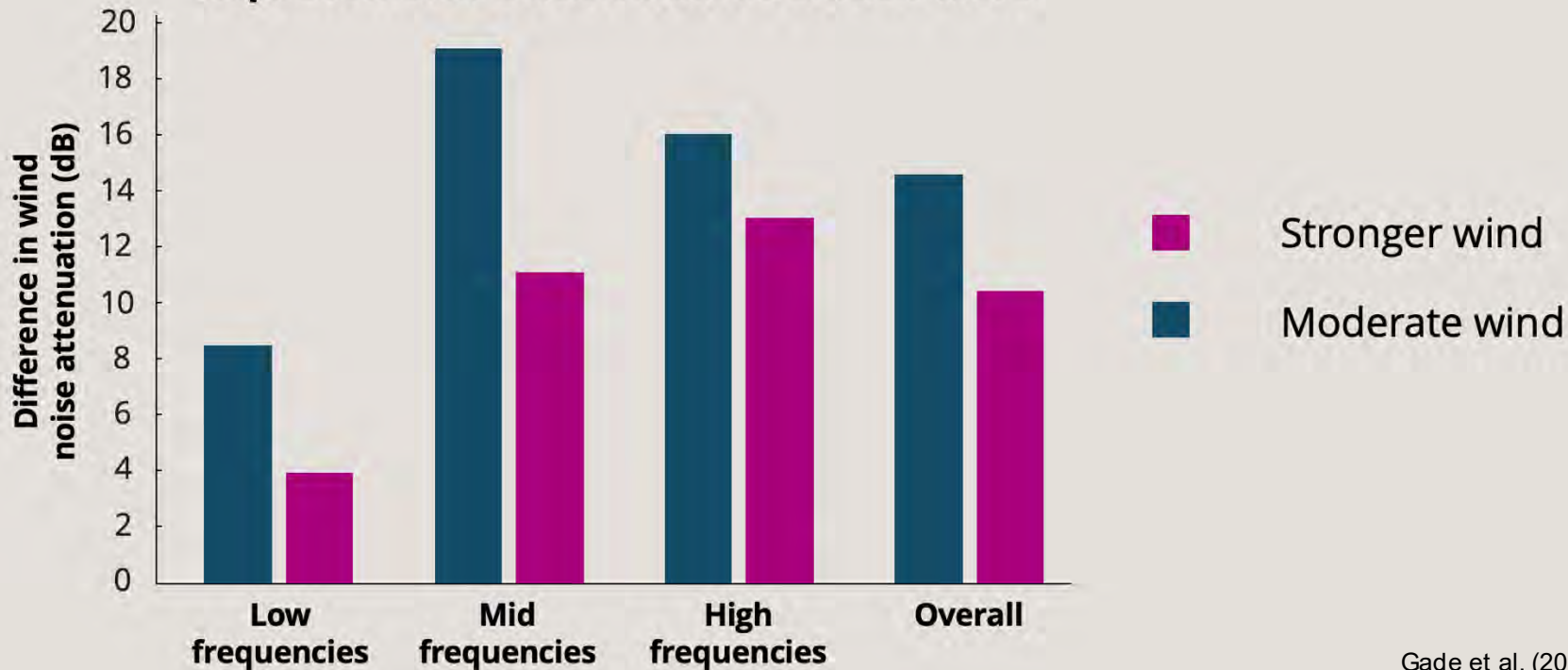


Gade et al. (2023)

Results

Improvement with Wind & Handling Stabilizer

Improvement: Oticon Real vs Oticon More



Gade et al. (2023)

Results

SNR improvement

4.3 dB

higher speech in Oticon Real
than in Oticon More



Gade et al. (2023)

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Outperforming competitors



Methods

Test participants and test setup

Participants:

- 12 experienced users
- Average age: 70.6 years
- Mild-moderately severe hearing loss

Test conditions:

- Speech at 65 dB SPL
- Wind speed: 6 m/s



Which hearing aid is preferred?

Comparing perceived loudness of the wind noise and clarity of speech

OTICON | Real



Competitor 1



Competitor 2

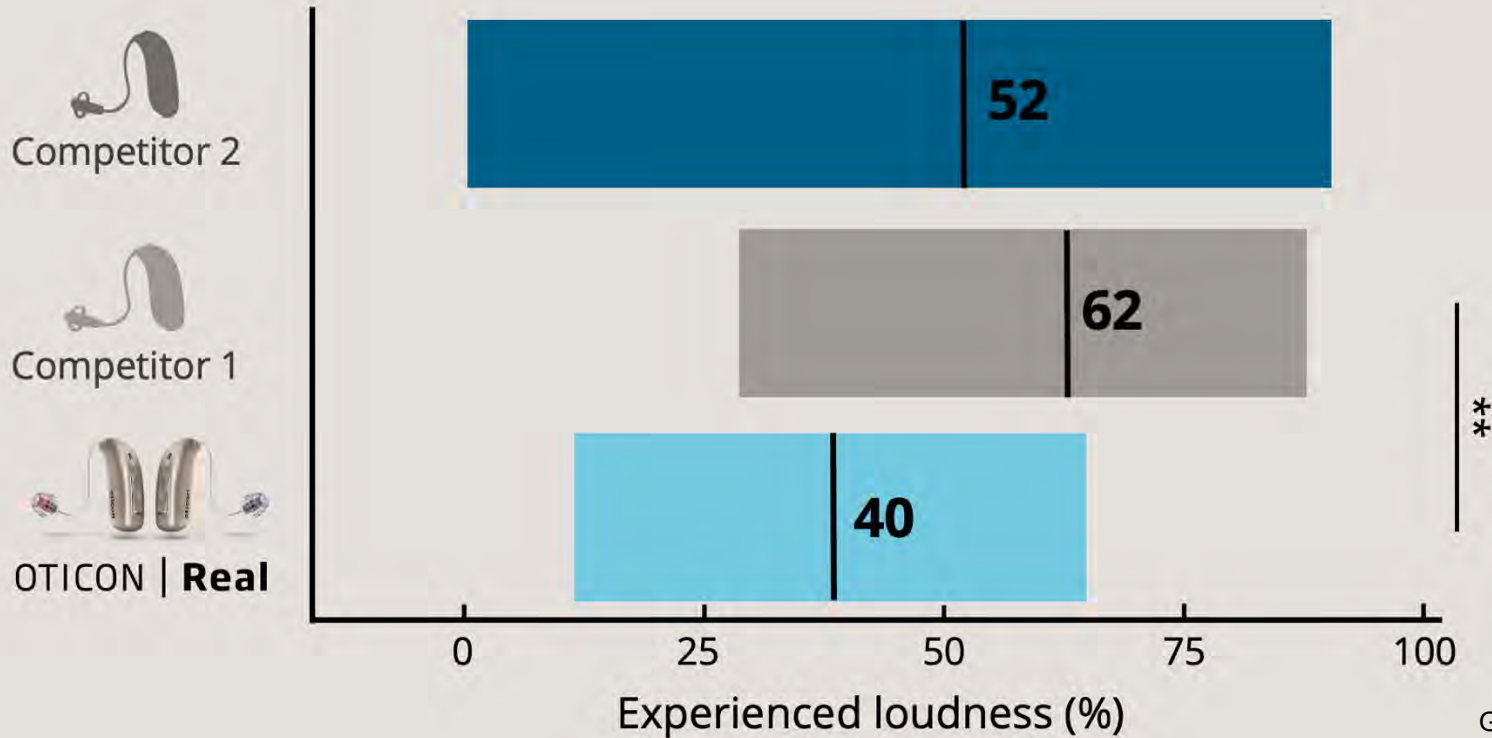
Test setup

Experiencing the sound scenes through different technologies

- Blinded test
- Rate **loudness** of wind noise
- Rate **clarity of speech**
- Rating scale from 0-10

Results

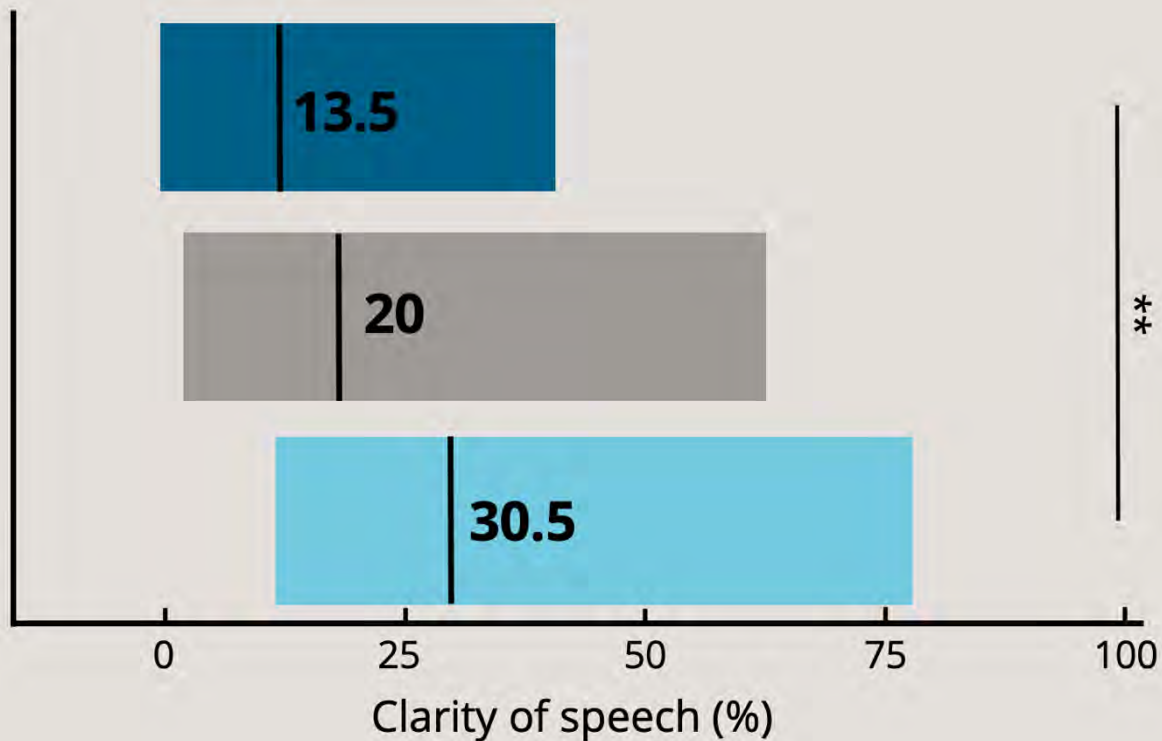
Loudness of wind noise



Gade et al. (2023)

Results

Clarity of speech



Gade et al. (2023)

Exceptional at reducing wind noise and providing better speech clarity

	Loudness of wind noise	Speech clarity in wind
Oticon Real	✓	✓
Competitor 1	22% louder than Oticon Real ✗	✓
Competitor 2	✓	17% Less clear than Oticon Real ✗

✓ Performed well

✗ Significantly outperformed by Oticon Real

Gade et al. (2023)

oticon

Documenting improved handling noise

Background

- Handling noise is not widely explored
- Handling noise occurs in many situations daily
- **44%** of users express experience with bothersome handling noise
- **93%** of users wear glasses on a daily basis

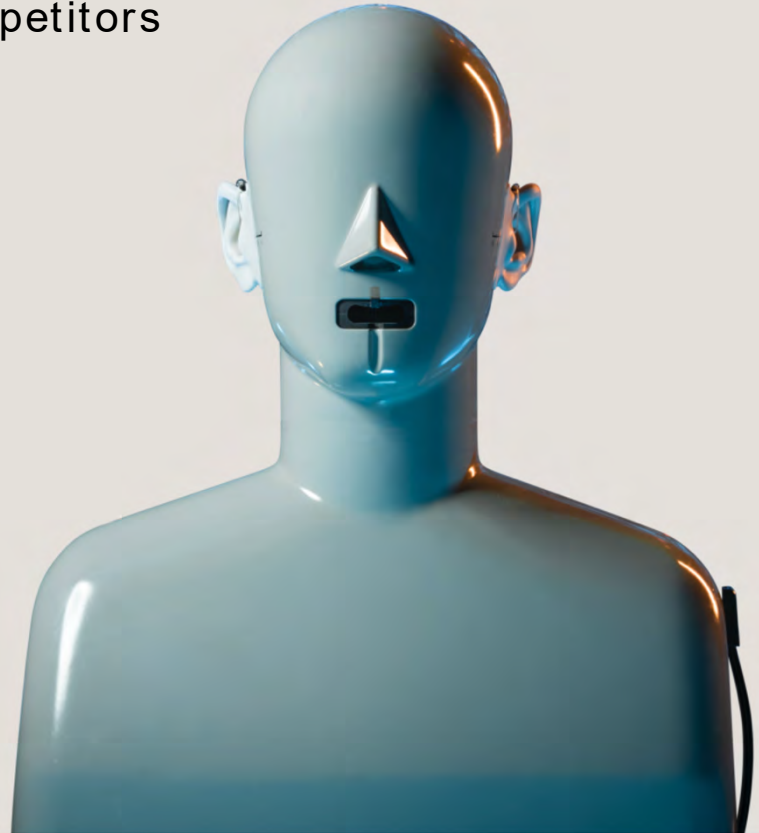
Gade et al. (2023)



Method

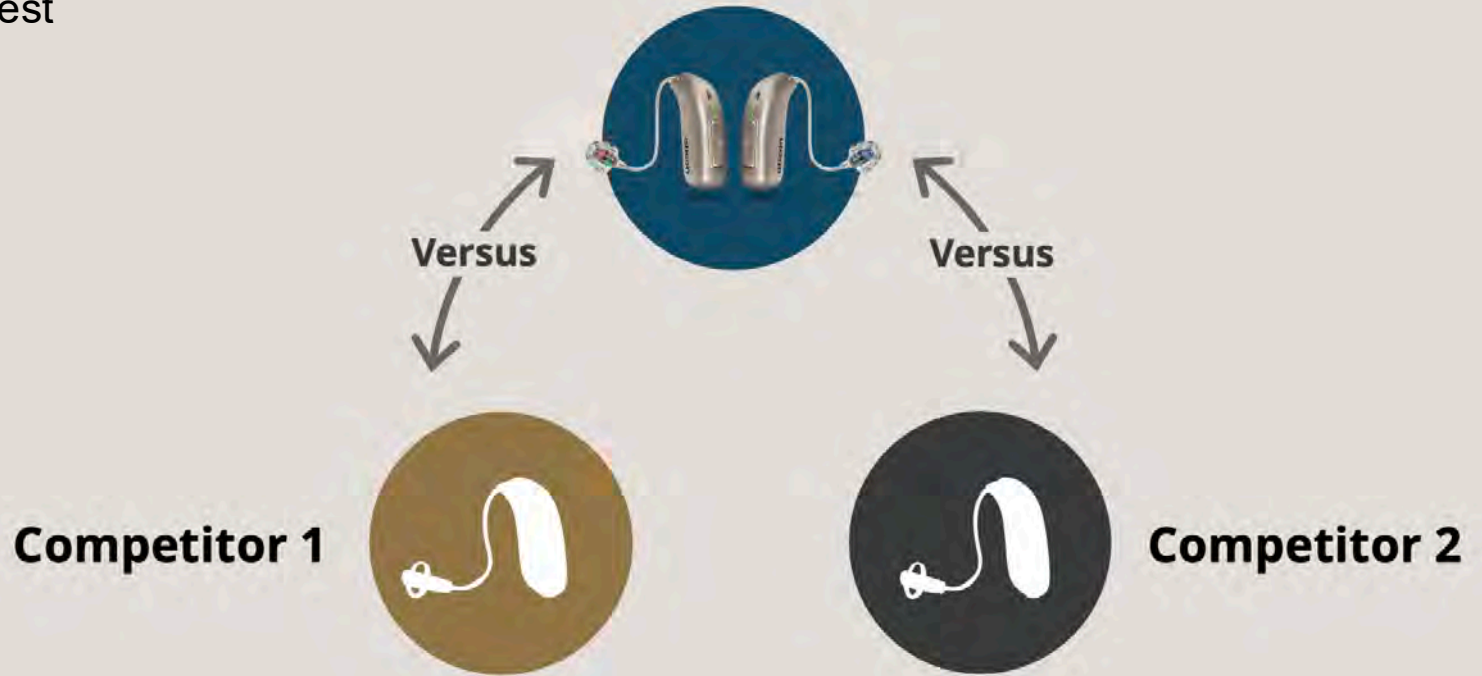
Comparing Oticon Real to two premium competitors

- HATS with hearing aids
- Standard N3 hearing loss
- Two test conditions
 - Brushing hair
 - Brushing microphones with a finger
- 12 trials handling events in 2 trials



Paired comparisons

Shapiro-Wilk test



Results

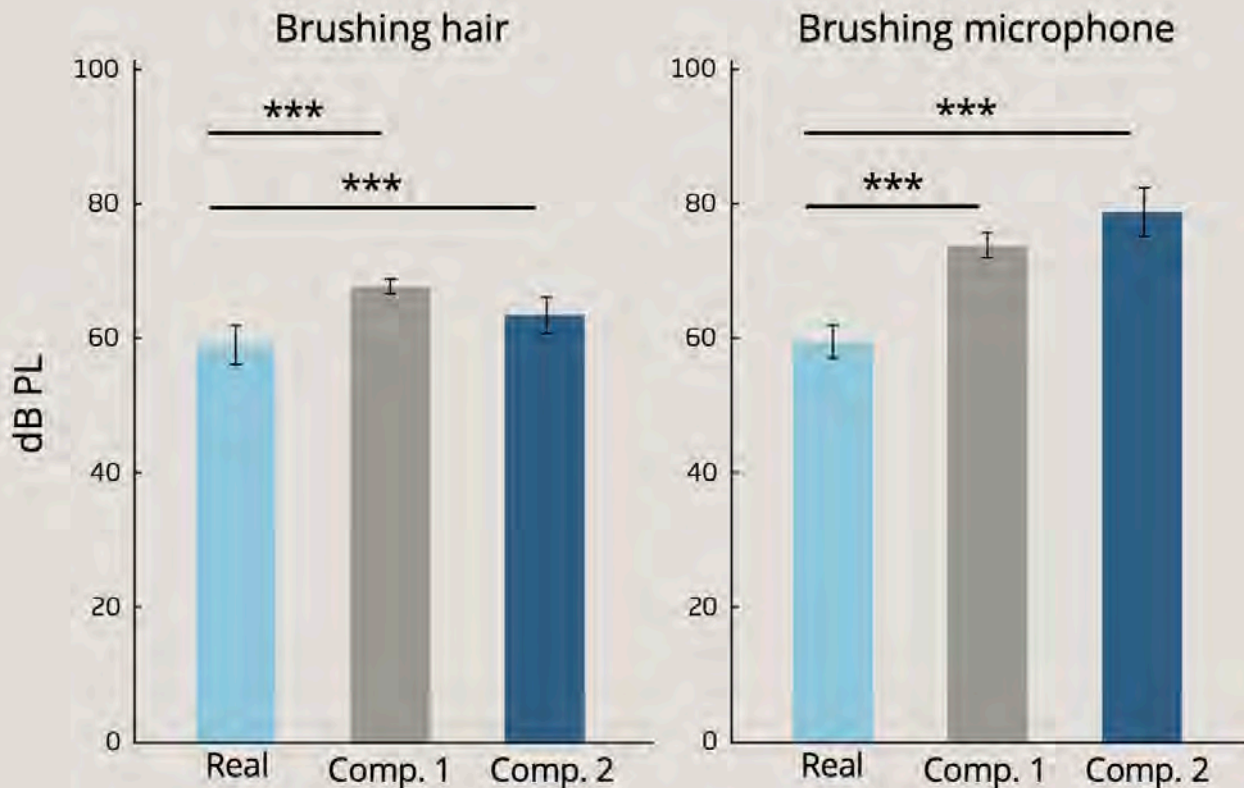
Significant difference between Oticon Real and both competitors

Brushing hair

Oticon Real: 59 dB SPL
Competitor 1: 68 dB SPL
Competitor 2: 64 dB SPL

Brushing mic

Oticon Real: 60 dB SPL
Competitor 1: 74 dB SPL
Competitor 2: 79 dB SPL



Gade et al. (2023)

Oticon Real vastly outperforms competitors in reducing handling noise

Oticon Real



Competitor 1
14 dB louder
than Oticon Real



Competitor 2
19 dB louder
than Oticon Real



Gade et al. (2023)

In summary

Oticon Real provides better access to speech than Oticon More in windy situations

Oticon Real outperforms competition in terms of loudness of wind noise and clarity of speech in wind

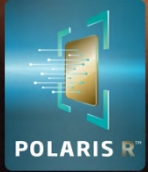
Oticon Real significantly reduces handling noise, with competitors being up to 19 dB louder



Gade et al. (2023)

New MoreSound Amplifiero 2.0

With SuddenSound Stabilizer



MoreSound
Amplifier[™]
2.0

SuddenSound
Stabilizer

Instantly **detects and controls sudden sounds** for audibility and comfort

Provides **precisely balanced amplification** of all meaningful sounds

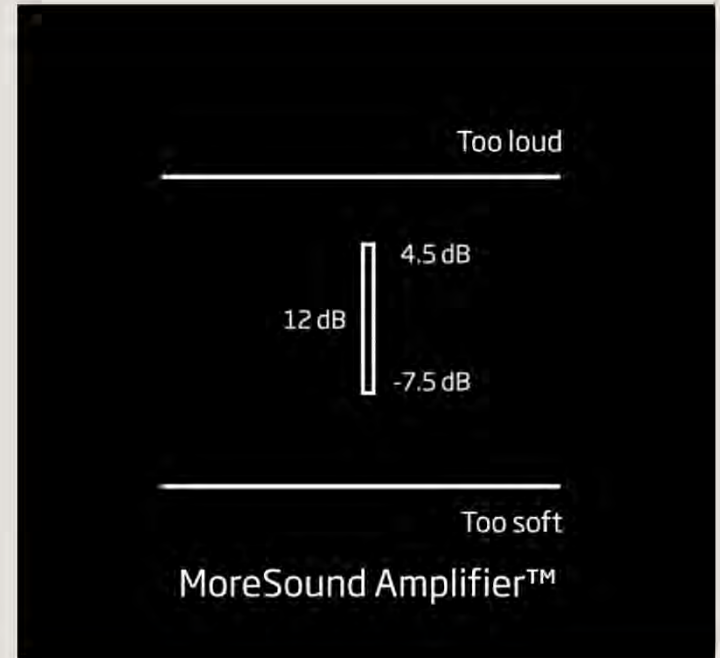
Can be **personalized** to suit every client's individual needs

MoreSound Amplifier

An adaptive amplification approach

- Linear amplification window of 12 dB*
- Adapts quickly to changes in the input signal
- Sounds are kept audible and within a comfortable range
- Peaks and valleys are preserved
- Works within the input range of 113 dB SPL

**Better preservation of
speech cues**



SuddenSound Stabilizer

A part of MoreSound Amplifier 2.0



SuddenSound Stabilizer finalizes the processing in MoreSound Amplifier 2.0

SuddenSound Stabilizer

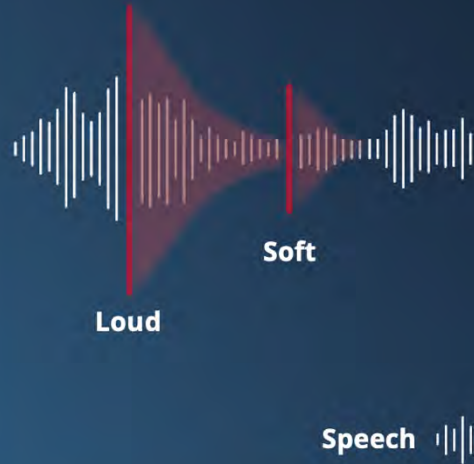
Access to speech

Instant attack and release

High precision

Better access to speech

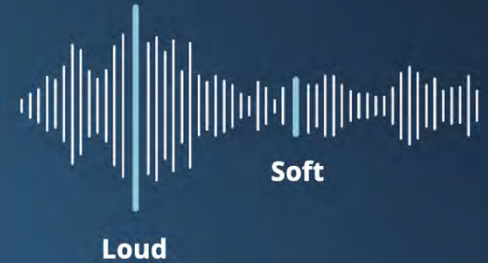
Traditional technology
Affects speech audibility



Sudden sound



SuddenSound Stabilizer
Preserves speech audibility



Sudden sound



SuddenSound Stabilizer effect

OFF vs High setting

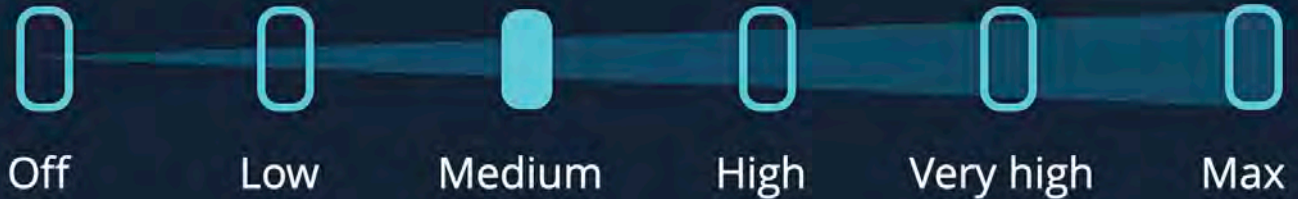


— SuddenSound Stabilizer OFF

— SuddenSound Stabilizer ON (High setting)

SuddenSound Stabilizer for personal preferences

	OFF	LOW	MEDIUM	HIGH	VERY HIGH	MAX
Activation level	-	60 dB SPL	55 dB SPL	40 dB SPL	40 dB SPL	40 dB SPL
Max. attenuation	0	10 dB	15 dB	20 dB	25 dB	30 dB



Settings in Oticon Genie 2

The screenshot displays the Oticon Genie 2 software interface during the fitting process. The top menu includes File, Genie 2, Edit, Hearing Instrument, Preferences, Tools, and Help. A toolbar contains icons for DISCONNECT, a bell, a document, a question mark, and SAVE AND EXIT. The main navigation bar shows CLIENT, WELCOME, SELECTION, FITTING (highlighted), and END FITTING. The user's name 'Real 1' and device type 'Bass dome, double' are visible on both sides.

The left sidebar lists various fitting tools: FITTING (with sub-options like Fine-tuning, Feedback Analyser, REM, REM AutoFit, MoreSound Intelligence, Program Manager, and Acoustics), and MORE TOOLS.

The central area features two frequency response graphs for 'P1: GENERAL, VAC+'. Both graphs show 'Insertion gain Target and simulated' in dB on the y-axis (0 to 80) and frequency in Hz on the x-axis (125 to 8k). The left graph has a red 'Reserve gain' indicator set to 10 dB. The right graph has a blue 'Reserve gain' indicator set to 10 dB. Both graphs show a target curve and several simulated curves.

Below the graphs are three tabs: GAIN CONTROLS, SOUND CONTROLS, and SUDDEN SOUND STABILIZER. The SUDDEN SOUND STABILIZER is currently selected, showing a slider with settings Off, Low, Medium (selected), High, Very High, and Max. An information icon (i) is present next to the slider.

i SuddenSound Stabilizer removes the discomfort of loud transient sounds, without sacrificing audibility. The setting Max is appropriate for people with severe sound sensitivity challenges.

Documenting the benefits of SuddenSound Stabilizer

**Performance and
benchmark**



**Improved speech
clarity**



**Reduced listening
effort**



Performance and benchmark



Performance and benchmark

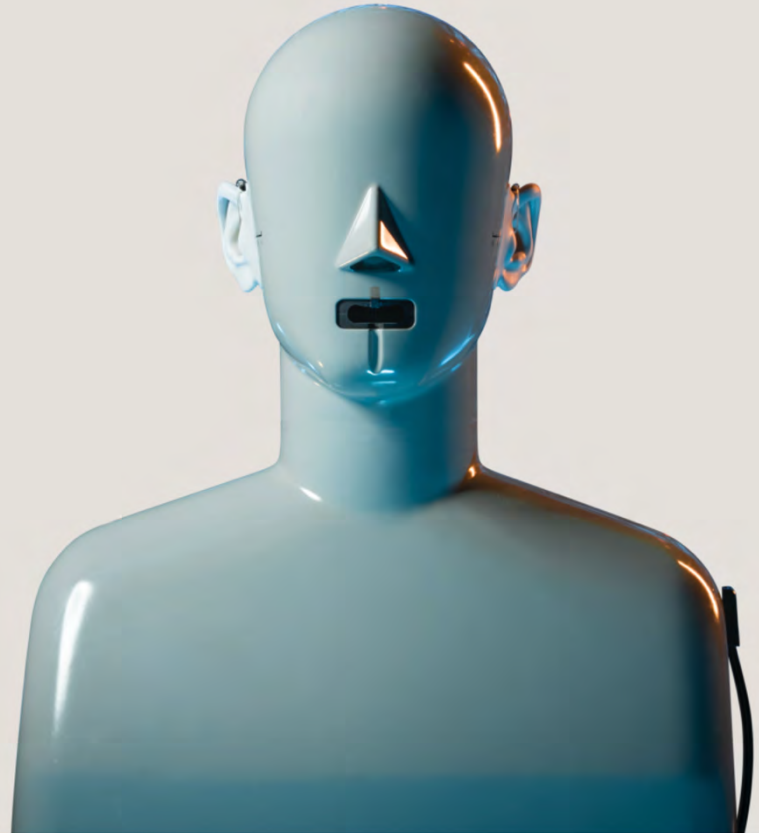
Technical evidence

SuddenSound Stabilizer effect

measuring the impact of the
SuddenSound Stabilizer settings

SuddenSound Stabilizer vs. other technologies

measuring the improvement
compared to Oticon More as well as
other premium devices

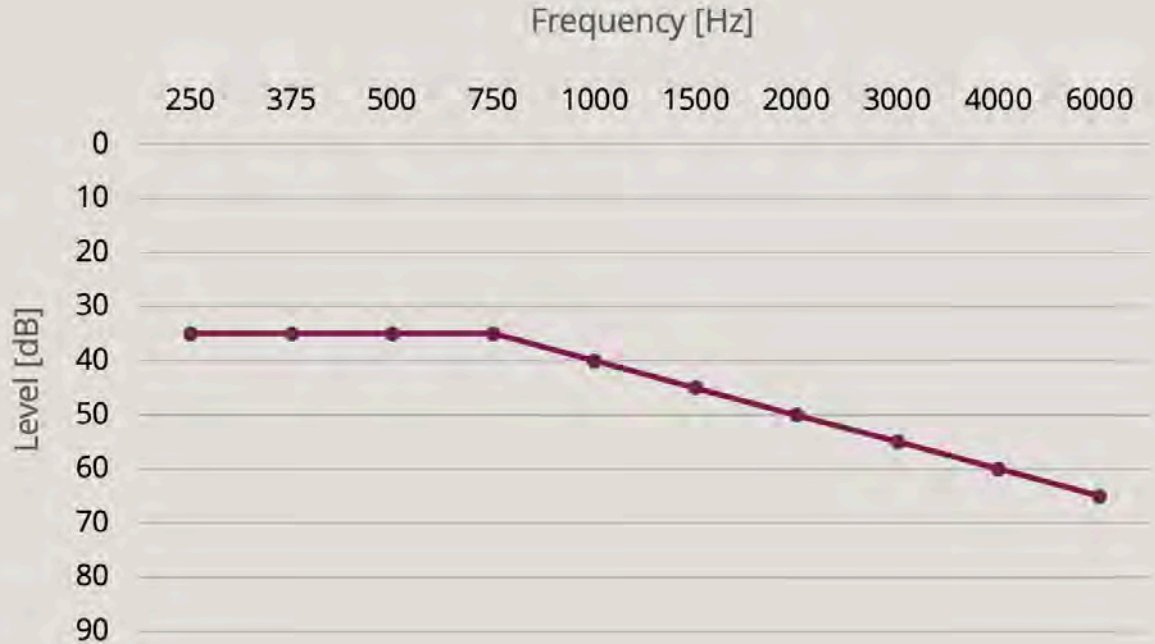


Method

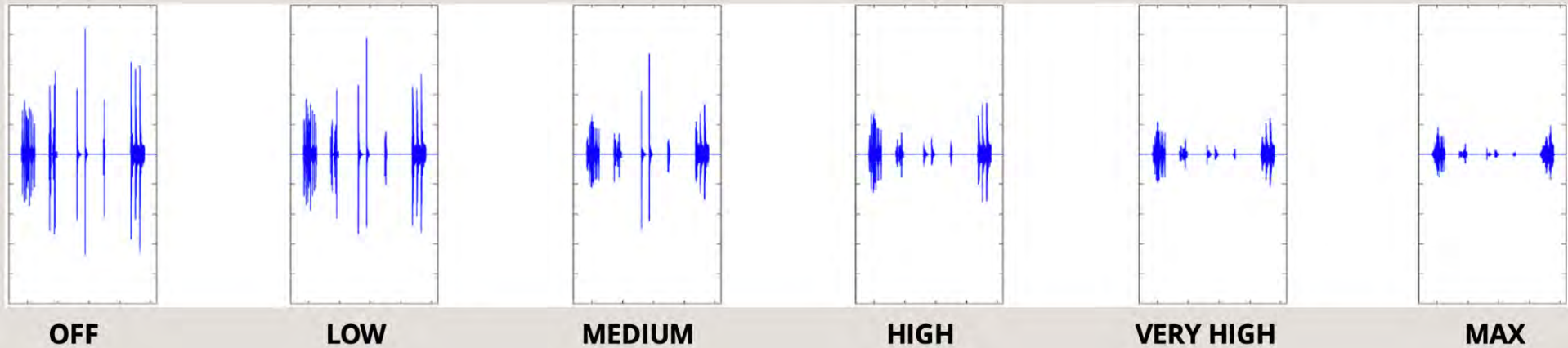
SuddenSound Stabilizer ON vs. OFF

Test conditions:

- HATS with Oticon Real hearing aids
- Standard N3 hearing loss
- “First fit” prescription
- 20 diverse sudden sounds
- Hearing aid output measured in ear canals



Amplitude of sudden sounds with different SuddenSound Stabilizer settings



Method

SuddenSound Stabilizer vs. other technologies

Test conditions:

- HATS with 4 pairs of hearing aids
- 20 sudden sounds
- Standard N3 hearing loss
- NAL-NL2 fitting
- Transient noise management:
 - Minimum/OFF
 - Maximum setting



Competitor 1



Competitor 2



OTICON | More

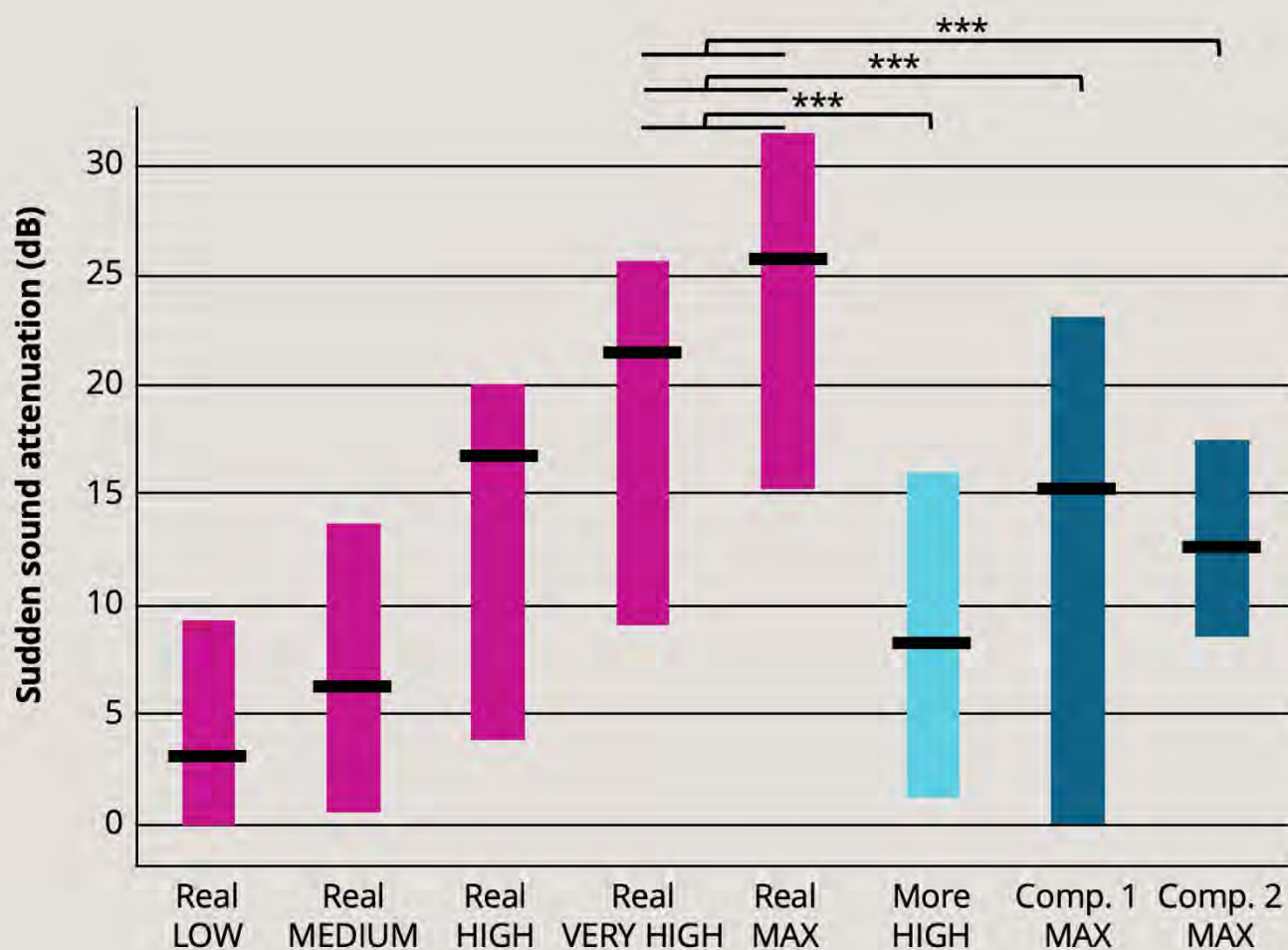


OTICON | Real

Results

SuddenSound
Stabilizer effect

Allowing for
better comfort in
the presence of
sudden sounds



Santurette, S., Brændgaard, M.,
Wang, J., & Sun, K. (2023)

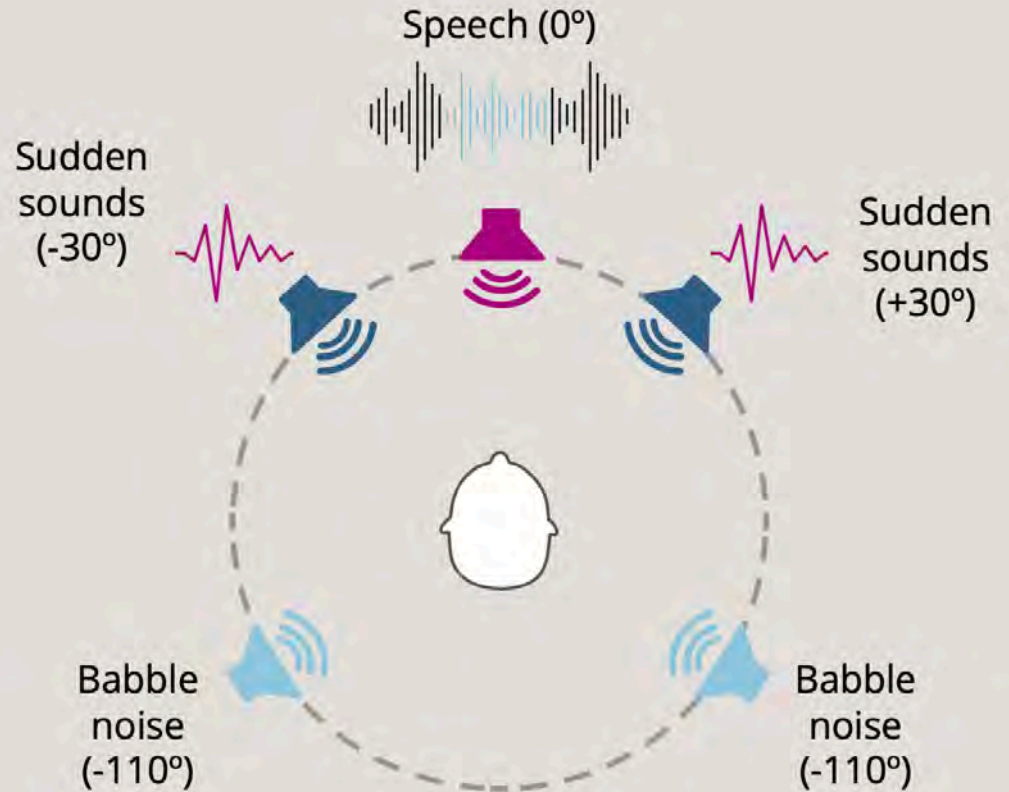
**Improved speech
clarity**



Method

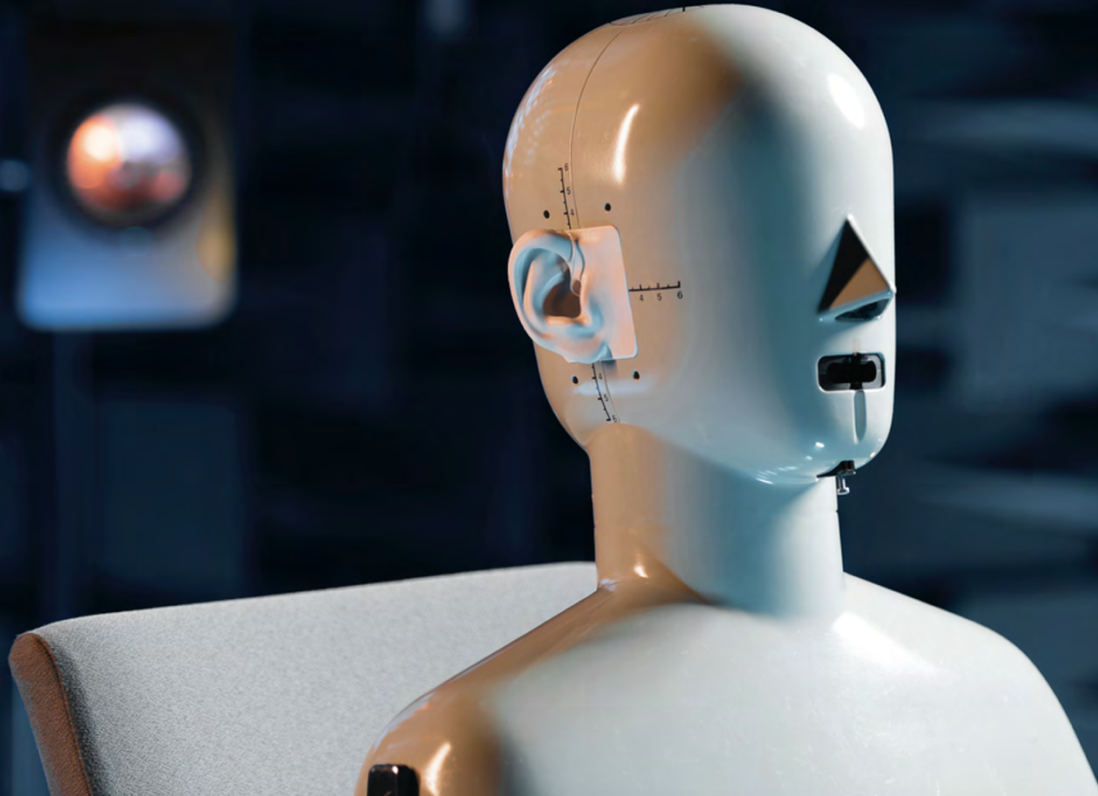
Test setup

- Female talker from front at 70 dB SPL
- Sudden sounds at +/- 30°
- Four-talker babble noise from 100° and 260° at either 60, 65, or 70 dB SPL
- HATS in the middle (1.6 m from speakers)



Method

Test conditions



- HATS with Oticon Real or Oticon More
- Power domes to prevent leakage
- Standard N3 hearing loss
- NAL-NL2 fitting
- Advanced features: Default settings

Method

Comparing SII weighted output SNRs

OTICON | **Real**



SuddenSound Stabilizer settings:

- OFF
- MEDIUM
- MAXIMUM

OTICON | **More**



Transient Noise Management settings:

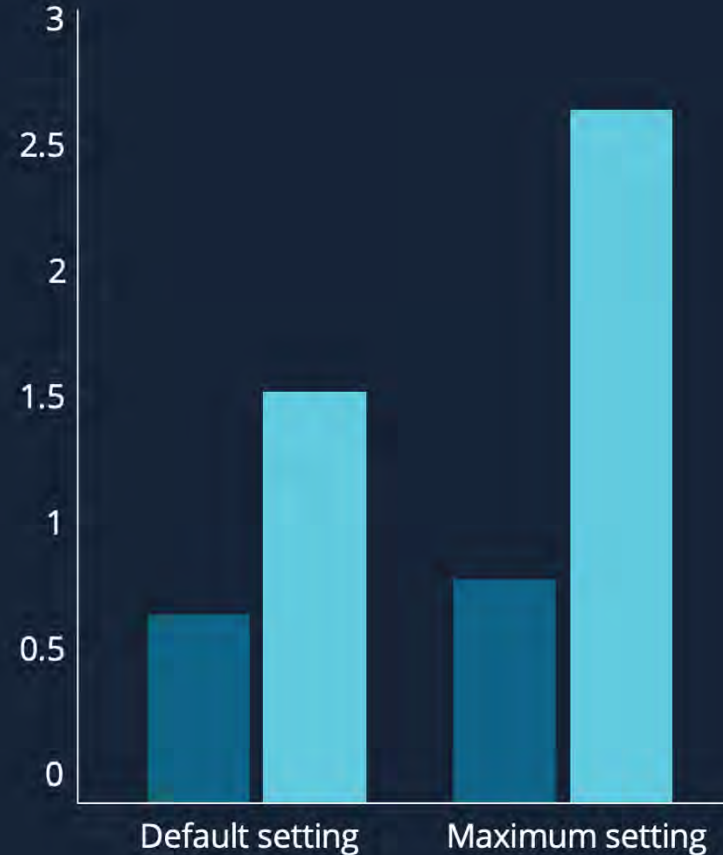
- OFF
- MEDIUM
- HIGH

SuddenSound Stabilizer improves speech clarity

Better access to speech
in the presence of
sudden sounds

■ Oticon Real
■ Oticon More

Santurette, S., Brændgaard, M., Wang, J., & Sun, K. (2023)



Reduced listening
effort



Pupillometry

An other perspective of what happens in the brain



- Records pupil dilation over time
- Effort is reflected by the change in the pupil size
- Can determine if people can engage effortlessly

Ohlenforst et al. 2018

Background on pupillometry

Pupil size can reflect cognitive effort

- Pupil changes are controlled by muscle activity in the iris
- Adaptive response to changes in the environment
- Reflect changes in attention/stress and **effort***

Less effort



More effort



*Kahnemann et al. 1973

Method

Task

Participants:

- 29 participants
- Mild-moderate hearing loss

Hearing aid settings:

- VAC+ default prescription
- Advanced features: Default settings
- SuddenSound Stabilizer:
 - ON
 - OFF



Method

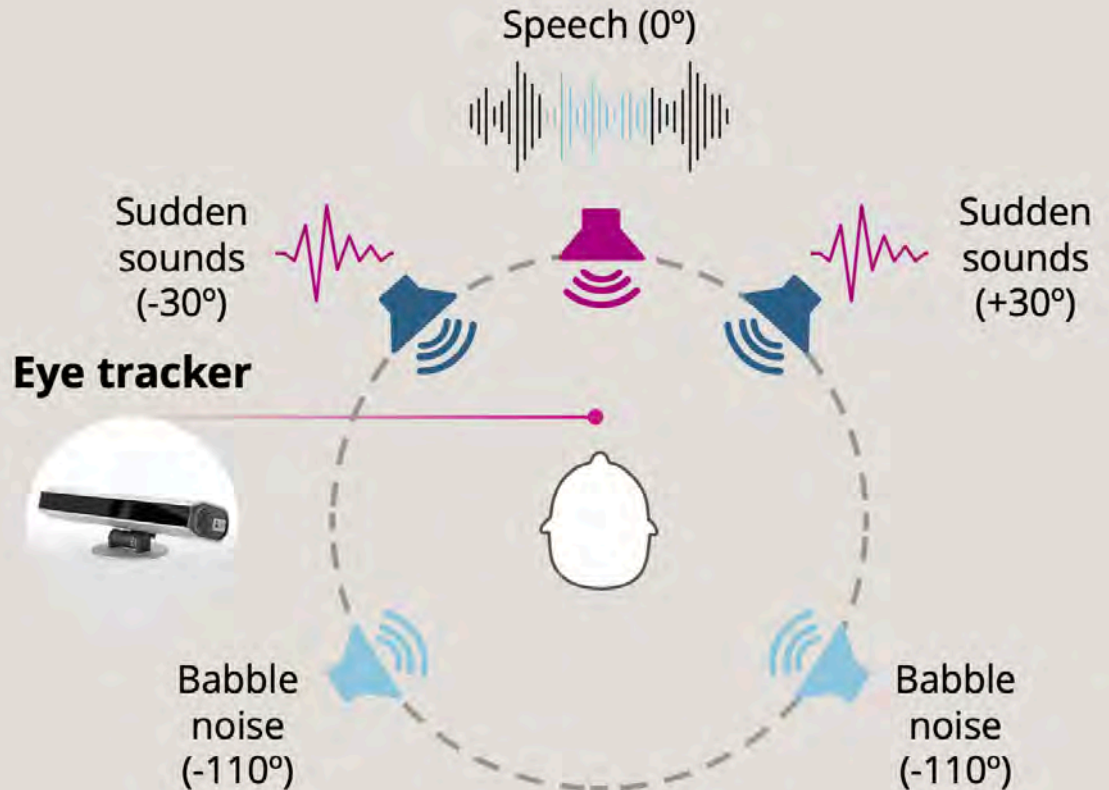
Test setup

Test conditions:

- Same speaker setup
- Eye tracker to monitor pupil dilation
- Target speech at 70 dB SPL
- Background noise adjusted to ensure 80% speech intelligibility
- Speech understanding and pupil responses were recorded


Task:

- Repeat two keywords
- Subjective evaluation through questionnaire



Results

Speech understanding

A woman with curly hair is sitting at a desk in a studio setting. She is wearing a grey sweater and has a small microphone clipped to her collar. In front of her is a laptop. To her left and right are two black speakers on stands. The background is a plain, light-colored wall.

Independently of whether sudden sounds were present or not, the activation of **SuddenSound Stabilizer** did not have any significant effect on speech understanding

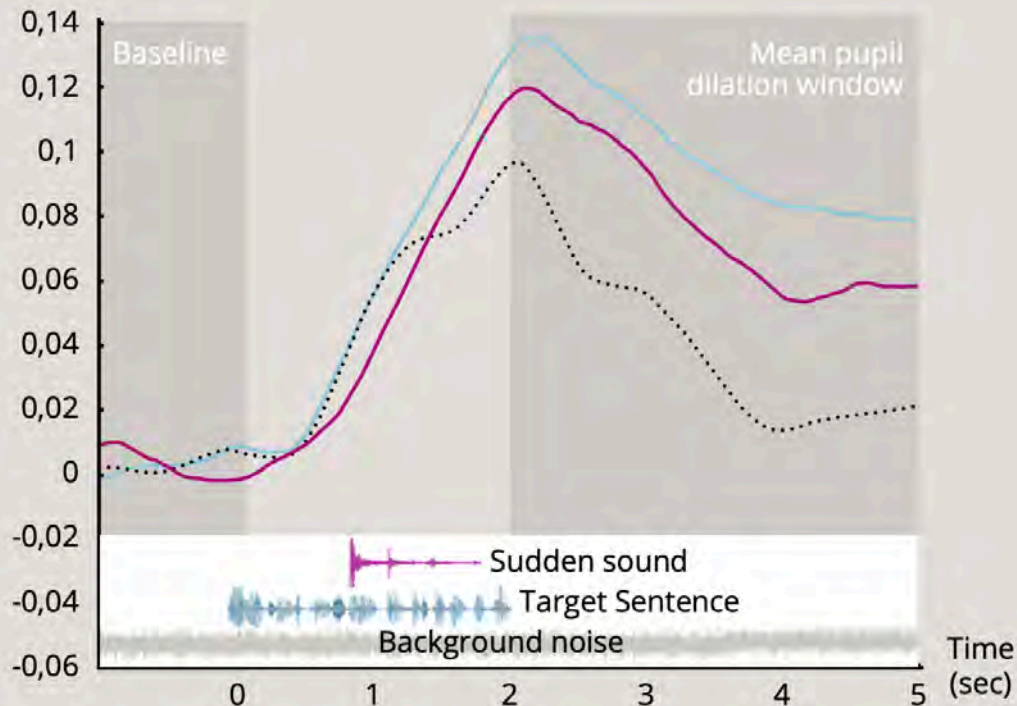
Santurette, S., Brændgaard, M., Wang, J., & Sun, K. (2023)

Results

22% reduced listening effort in the presence of sudden sounds, as shown by reduction in mean pupil size



- Without sudden sounds
- SuddenSound Stabilizer OFF
- SuddenSound Stabilizer ON



Santurette, S., Brændgaard, M., Wang, J., & Sun, K. (2023)

Results

Subjective assessment

Less tendency to give up

More engagement in the activity

Santurette, S., Brændgaard, M., Wang, J., & Sun, K. (2023)

Summary

SuddenSound Stabilizer **offers...**

Better comfort in the presence of sudden sounds

Better access to speech compared to the traditional technology

22% reduced listening effort in the presence of sudden sounds

Santurette, S., Brændgaard, M., Wang, J., & Sun, K. (2023)

**For hearing aids to be effective
they must be...**

1) Fit well

2) Worn consistently

Learn more

Wind & Handling Stabilizer Whitepaper

WHITEPAPER
2023

Wind & Handling Stabilizer - Evidence and user benefits

Improved wind and handling noise removal for better clarity

ABSTRACT

In a recent survey with hearing aid users, about half of respondents indicated wind noise in their devices being an issue. This feature paves the way to improve how they hearing aids process sound in windy situations.

This whitepaper presents the results of three research studies carried out on Oticon Real™, providing evidence on the new Wind & Handling Stabilizer feature. To test Oticon Real in the toughest and most compromising environment possible, we used one of the world's largest university-owned wind tunnels. A technical study found that Oticon Real removed wind noise more effectively and provided more access to speech than Oticon More. When tested by hearing aid users, Oticon Real is the easy hearing aid out of those which provided benefits both in terms of soundness of wind noise and clarity of speech in windy situations. Furthermore, even through hearing noise has a huge clinical impact, in a less well-researched area. In a clinical study, we found that Oticon Real significantly reduced handling noise compared to two leading competitors.

EDITORS OF ISSUE
Doreen Ashby Cole, Marco Brambilla, Hella Finken,
Daniela Peraloni, Sebastian Santarini
Contact: sp@oticon.com, oticon.it

oticon
Oticon Hearing Technology

- 01 RealTech™ Technology™
- 02 Personalizing and
- 03 A neural network
- 04 Technical performance of
- 05 Clinical performance in
- 06 Evidence on handling
- 07 Researcher

MoreSound Intelligence Technical paper

TECH PAPER
2020

An introduction to MoreSound Intelligence™

MoreSound Intelligence (MSI) is the new "brain-inspired sound scene (classification) system in Oticon More™ hearing aids. MSI consists of several sub-networks, and this tech paper aims to provide you with a deeper insight into all of these.

Firstly, you will be presented with an overview of the complete MSI feature, and then you will dig into the individual sub-features one by one in the order they appear in the processing flow.

Some important highlights:

- **Virtual Outer Ear** - the new true-to-life pinna model effective in any environments, with three settings in Oticon Genie 2 for user preference
- **Neural Clarity Processing** - the Deep Neural Network is trained in real-life sound scenes in the development phase to optimally support the brain, and is embedded in the new Polaris™ platform
- **Sound Enhancer** - dynamic gain primarily for speech, given its complex environments, with three settings in Oticon Genie 2 for user preferences

EDITORS OF ISSUE
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