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Why evidence matters



Lana Ward, Au.D.
Education & Training Specialist – Central Region

Learner outcomes

After this course, participants will be able to:

- . . . describe the innovative research methods Oticon has used to prove their technology benefits for people with hearing loss.
- . . . discuss why conventional technology does not support the brain's natural ability to process sound.
- . . . explain how Oticon research findings can be incorporated into benefit statements they can use during technology discussions with patients.

Is all hearing technology
essentially the same?

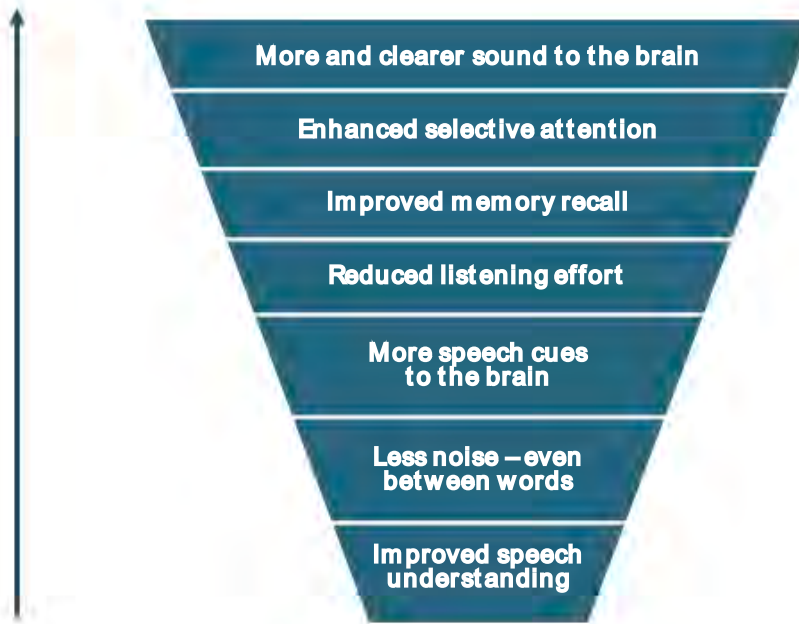
BrainHearing benefits



Key BrainHearing features

- MoreSound Intelligence
- MoreSound Amplifier
- MoreSound Optimizer
- OpenSound Navigator
- OpenSound Optimizer
- Speech Guard LX
- SuperShield
- Noise Reduction LX

BrainHearing benefits





Life-changing technology



Building Trust



Did you know?

Satisfaction with
hearing instruments
has continued to
increase



83%



9 out of 10 current hearing aid wearers reported being very satisfied with the quality of service provided by their HCP.*

* MarkeTrak 2022

Following a different path



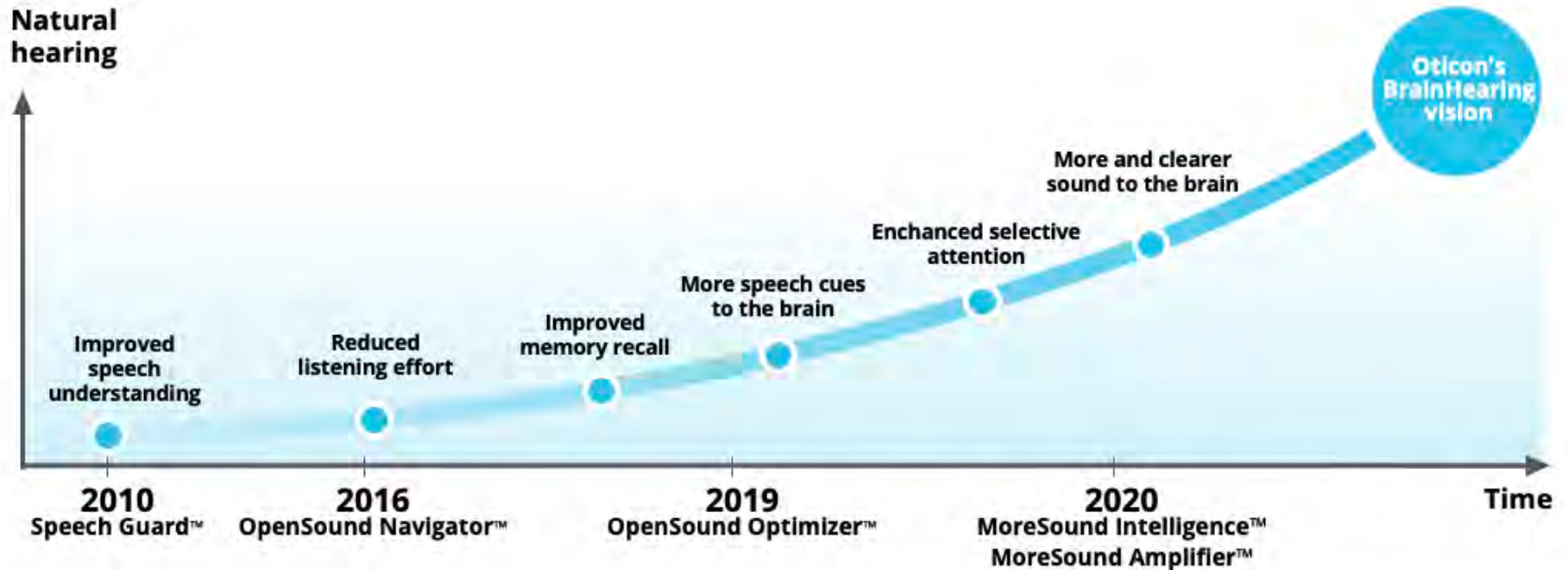
life-changing
technology

Brain Hearing™

Our foundation for more than 30 years



A visionary journey of Oticon's BrainHearing philosophy



Improving Speech Understanding

Adaptive compression



A deeper level assessment

Andrea Pittman et al. 2014 (JAAA)

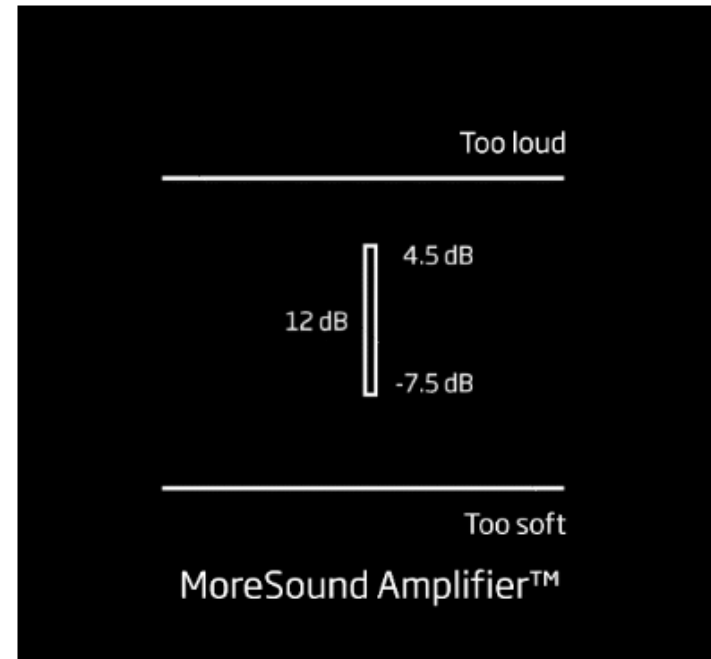
**Children and adults with
hearing loss achieved
improved performance
with adaptive
compression i.e.
Speech Guard™ E
especially in complex
listening environments**



MoreSound Amplifier

- 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



* Oticon More 1, Oticon Own 1 & Oticon Play PX 1

** Oticon More 1 & 2, Oticon Own 1 & 2, and Oticon Play PX 1

Why this evidence matters

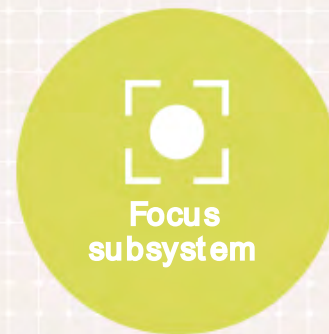
- Speed and amplitude of the compression system affects the details of the speech envelope
- This has implications for both children & adults
- Preserving more details of the speech envelope across a wide variety of listening environments supports the brain's natural way of processing sound

How does the brain make sense of sound?



The auditory cortex consists of **two subsystems**

Different functions for making sense of sounds







Traditional assumptions

FOCUS

Focus on front

Focus on speech only

Focus on compressing sound

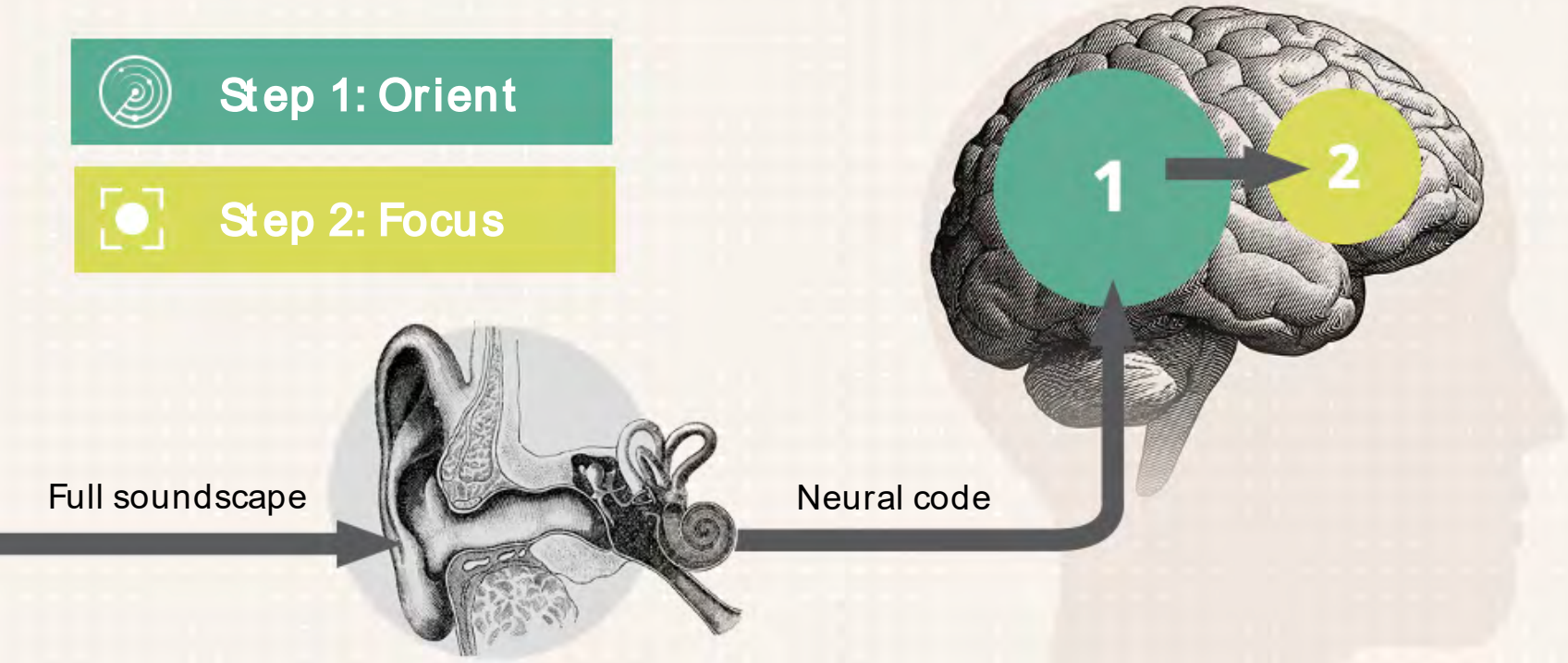
The neural code is crucial for making **sense of sounds**



Step 1: Orient



Step 2: Focus



O'Sullivan et al., 2019, Puvvada & Simon, 2017

Backed by science

ORIENT & FOCUS

Access to the full sound scape

Make sound more distinct

Preserve information in sound

Does orient & focus help
people with hearing loss?

Reduced listening effort

OpenSound Navigator



Opn Clinical Trials

Comparing OpenSound Navigator to
Alta 2 Pro

30% better understanding***

20% less processing effort*

20% better memory recall**

* Wendt et al 2016

** Ng et al 2016, Individual benefit will depend on prescription

*** Ng et al 2016



Building our body of evidence

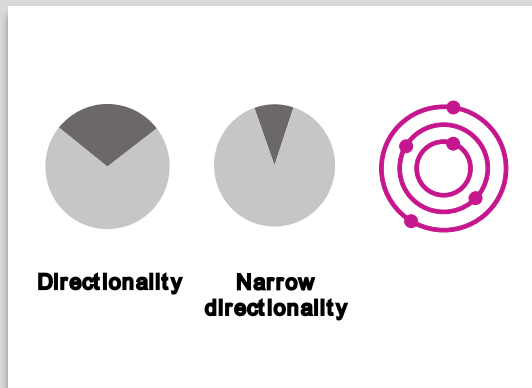
Our journey to give you more

Pioneering innovative research methods



Better understanding
less processing effort
better memory recall

Benchmarking against traditional directionality



Improving speech
understanding

Closing another gap

Hearing loss with
amplification

Hearing loss with OpenSound
Navigator

Normal hearing

HL & OpenSound Navigator
vs.
normal hearing

BrainHearing^o benefits

Objective and proven methods for hearing research

Pupillometry to document reduced load on the brain



Wendt et al 2016

Recall more from conversations to enrich social interaction



Ng et al 2016, Individual benefit will depend on prescription

Speech Understanding continuing to improve well-known benefits



Ng et al 2016

Why this evidence matters

- It used new innovative research methods to objectively prove benefits
- It benchmarked benefits against traditional technology
- If we could support the brain's natural processes better the hearing-impaired person's experiences come closer to individuals with normal hearing

More speech cues to the brain

EEG test method objectively measures how the brain organizes sound



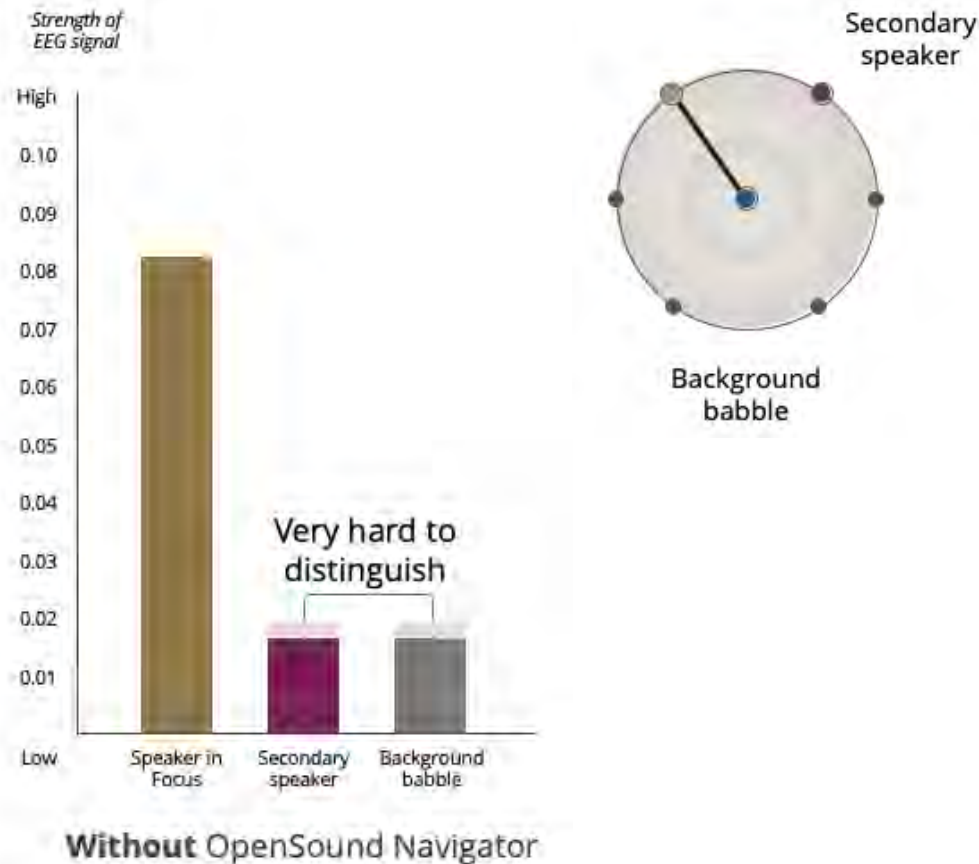
Can you see the brain tracking the speech signal?



Results

Without OpenSound Navigatoro

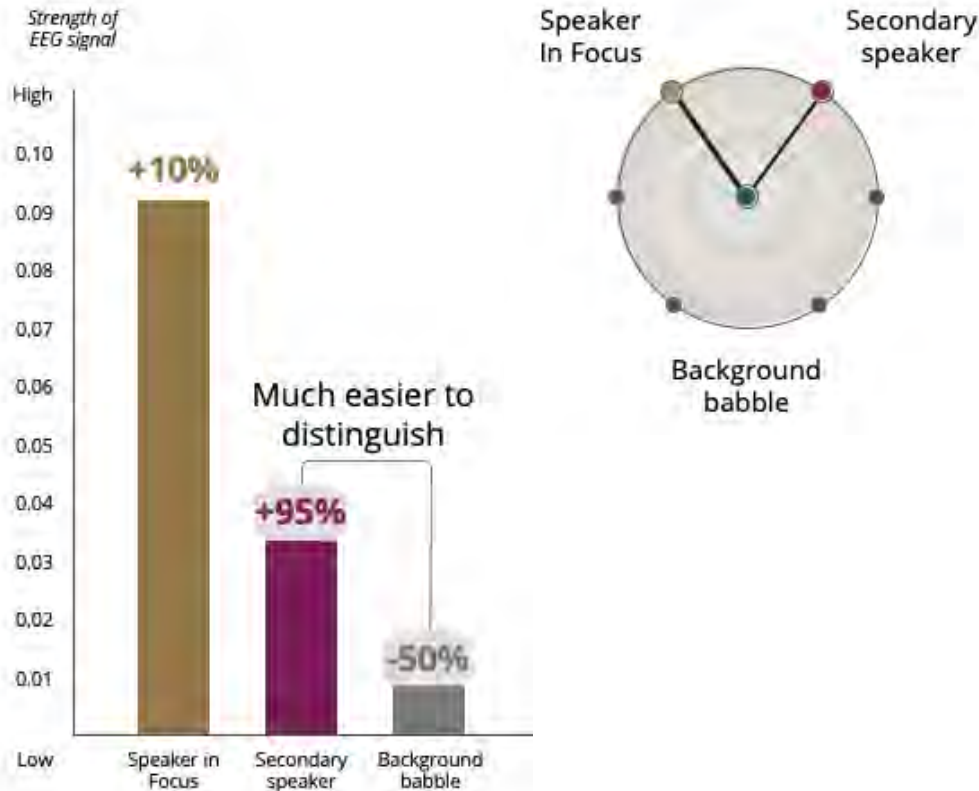
- Clear representation of **focus speaker** in the brain
- **Secondary speaker** and **background babble** are equally represented in the brain



Results

With OpenSound Navigator

- **Focus speaker** was significantly more distinct in the brain
- **Secondary speaker** was much clearer represented in the brain
- **Background babble** was reduced by the brain



With OpenSound Navigator

Enhancing selective attention

Opn S

**OpenSound Navigator
helps the brain focus and
switch attention
effortlessly when needed.**



Why this research matters

- EEG data demonstrates that the brain receives good clear information preserving the neural code
- Proof that by focusing on helping the brain process sound as naturally as possible patients can navigate conversations in challenging situations more effortlessly

A fundamentally new approach to sound processing



A photograph of a sound lab or recording studio. The room has a curved, light-colored wall and a ceiling with recessed lights. Several large, black, rectangular speakers are mounted on tall, black, adjustable stands. The stands are arranged in a semi-circle around a central area. On the floor, there are several smaller, black, rectangular speakers. A person is visible in the background, sitting at a desk or console. The floor is covered with a red carpet. The text "Taking the sounds of real-life into the sound lab" is overlaid in the center of the image.

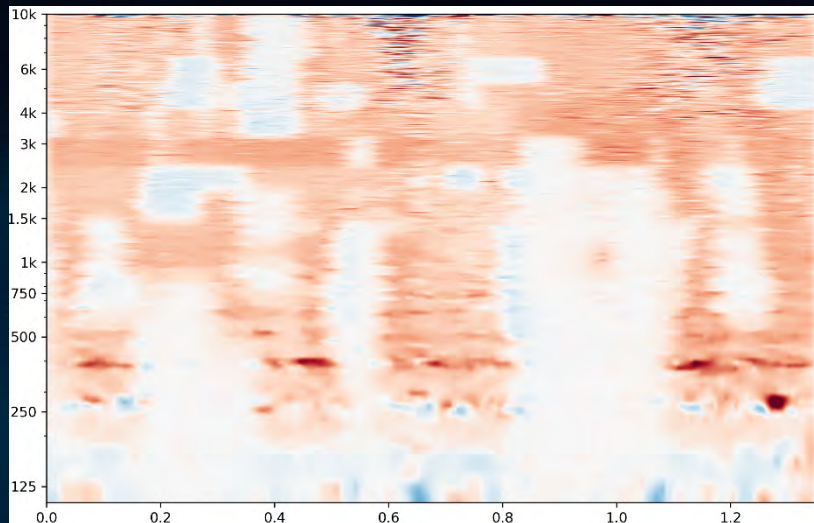
Taking the sounds of real-life into
the sound lab

Deep Neural Network in Oticon More

Making speech stand out more

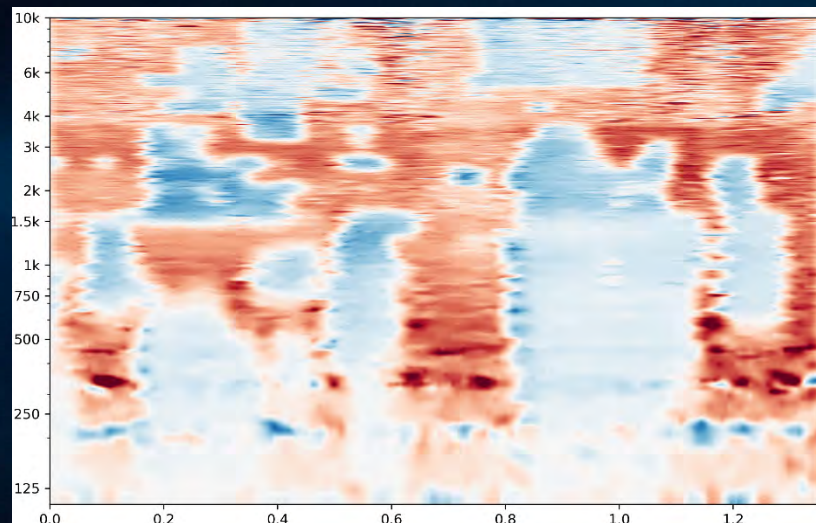
Oticon Opn S:

Noise Reduction



Oticon More:

Deep Neural Network



Red = Reduced level

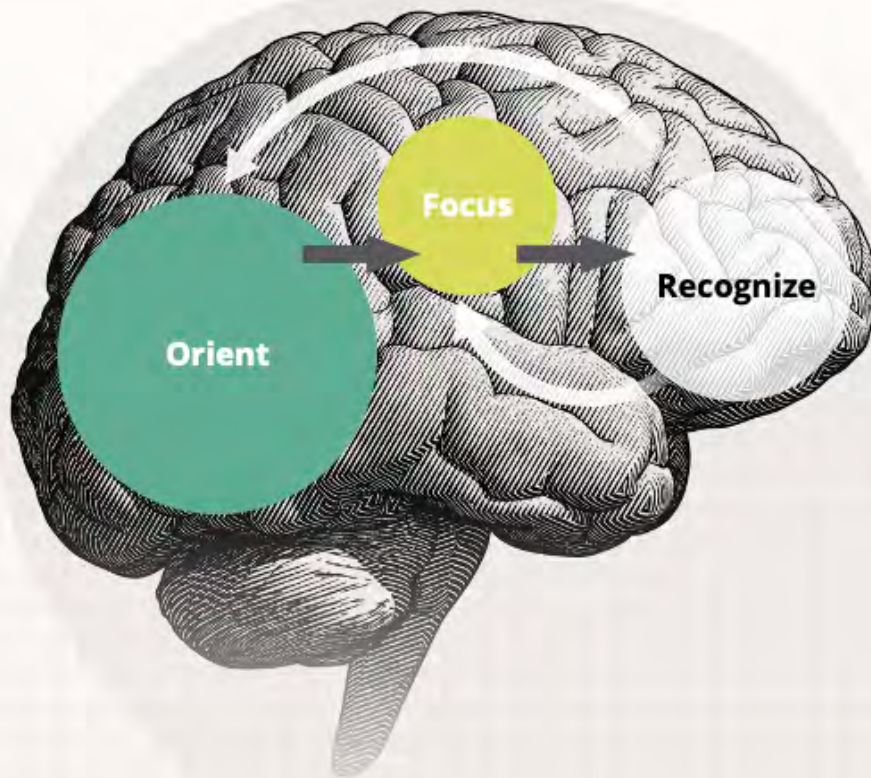
Blue = Increased level

White = Unchanged

Focus of the research

Evidence at three levels

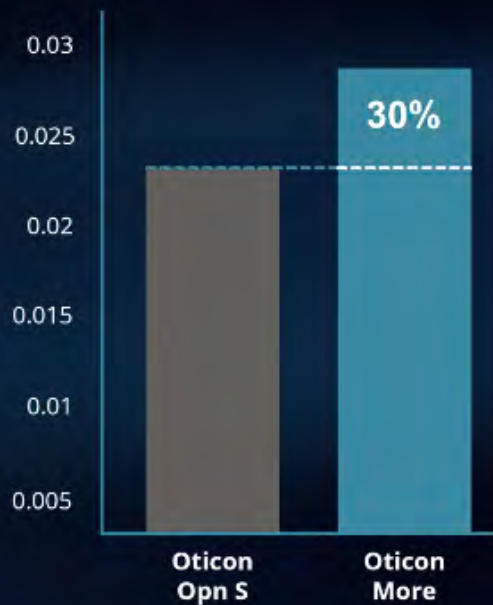
- Sound representation and clarity in the brain
- Ability to understand speech in focus
- Ability to understand and remember speech



Oticon More

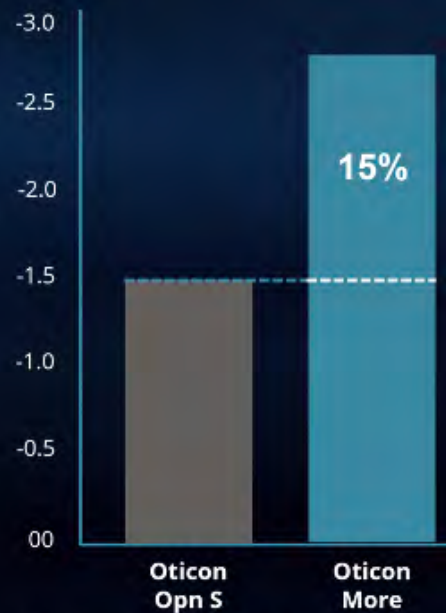
Providing access to a full, precisely balanced sound scene

EEG strength in
orient subsystem



MoreSound Intelligence is
proven to make
the full sound scene
60% clearer

dB SNR



Bar graph correspond to SNR of 70% intelligibility



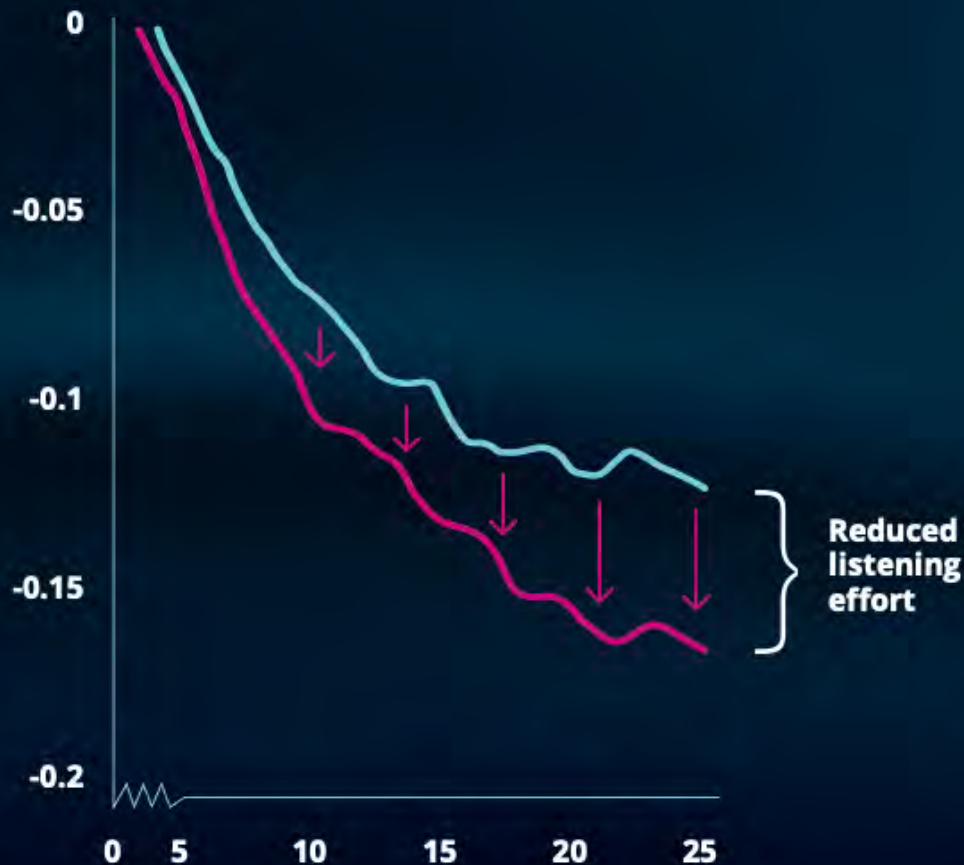
Oticon More
reduces sustained
listening effort
by an astonishing

30%

Long-duration pupillometry

Advanced testing shows how Oticon More helps the brain work properly

— **MoreSound Intelligence OFF**
— **MoreSound Intelligence ON**



Murmu Nielsen & Ng, 2021

Conclusions

Significantly less listening effort over time

Even though the brain is getting more sound with Oticon More, **less effort is required to listen to speech in noise**



**What does this mean for real
world listening environments?**

Why this research matters

- It underscored the importance of understanding how the brain processes sound by clearly identifying the two sub systems and what information they need to perform optimally.
- By using a fundamentally different signal processing strategy we were able show we could provide the brain access to a full, precisely balanced sound scene.
- The embedded Deep Neural Network was shown to be able to more precisely and accurately provide contrast between speech and noise allowing for more clarity, contrast and balance.

Addressing the needs of special populations

BrainHearing benefits
for people with
severe/profound HL



Hoi Ning Ng & Skagerstrand, 2019

Documenting benefits
for single-sided
deafness



Callaway & Gade, 2019

BrainHearing benefits
for children



Ng, 2017
Gordey & Ng, 2021

**What role does evidence have
in patient counseling?**

BrainHearing

Changing the conversation with patients



Oticon
BrainHearing™
Technology

Discussing the implications of untreated hearing loss and brain health first

Provide education first

Strong recommendation supported by evidence

Why do you recommend Oticon products?



- Oticon's approach to helping you understand speech in all the listening environments that are important to you is backed by science
- They use innovative research techniques to determine and prove what benefits their technology can provide
- Your brain needs a complete picture of all the sounds around you to make sense of sound. Oticon's BrainHearing technologies have been proven to support how your brain naturally processes sound
- Oticon hearing instruments are easy to use. Their hearing instruments function across listening environments without you having to adjust your hearing aids throughout the day

Discussing BrainHearing benefits



- Oticon is known for developing sound processing technology that helps the brain make sense of sound
- New research tells us the brain can handle access to the full sound scene to naturally make sense of sound*
- Oticon's BrainHearing technology is designed to give your brain more of the relevant information it needs to make sense of sound

* O'Sullivan, et al. 2019. Puvvada KC, Simon JZ. 2017

Replacing current hearing instruments

New benefits



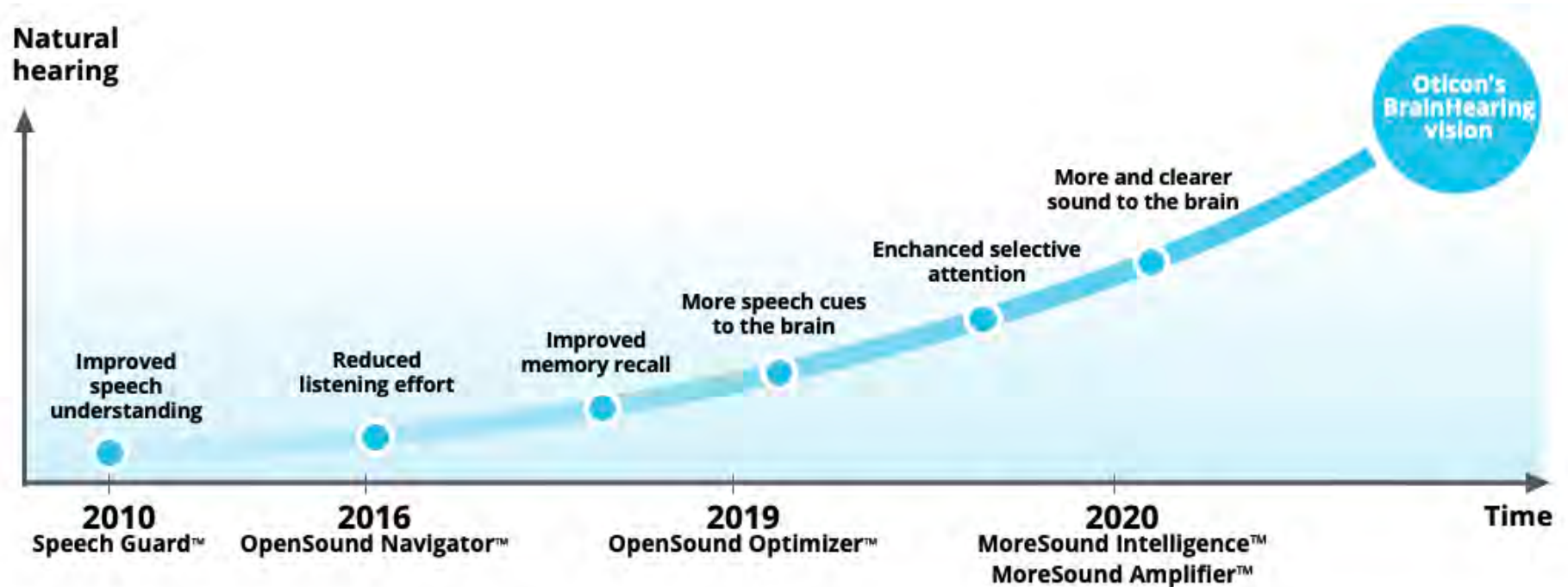
- Ask if there are any listening situations where their current devices don't meet expectations
- Focus on BrainHearing benefits newer technology can provide
- Relate these benefit back to the listening situations where their current devices don't perform well

Benefits of higher-level technology



- As you go up in technology your brain doesn't have to work as hard making it easier for you to engage in social activities and remember more
- I have more options to customize your hearing solution to your individual needs
- As you go up in performance levels the BrainHearing technologies are better able to reduce background noise and preserve speech allowing you to engage in conversations more effortlessly

A visionary journey of Oticon's BrainHearing philosophy



Stay tuned...





Questions