Opn for Infants and Children with Hearing Loss

Dave Gordey, PhD
Director of Clinical Research & Professional Relations, Oticon A/S

oticon PEDIATRICS

Children live and learn in a beautifully chaotic world

Being able to make sense of sound is crucial to children's development and growth

“

*On average, children spent **80% of their total time in a mixture of speech in noise** … and seldom were in situations classified as quiet, speech alone, or noise alone”*

Cruckley et al., 2011

oticon PEDIATRICS

Listening challenges of children with hearing loss

Learning and development

Noise impairs speech understanding and word learning

(Riley & McGregor, 2012)

Learning is negatively affected by noise and hearing loss – a **double disadvantage**

Well-fitted hearing aids have a positive influence on language development

(e.g. Pittman 2017; Tomblin et al., 2015)

oticon PEDIATRICS

In Noise, Omni Directional Technology may Overload Young Minds

oticon PEDIATRICS

Traditional Directional Technology Closes Down Sound

oticon PEDIATRICS

Oticon Opn Play and Open Sound Navigator a breakthrough in paediatric hearing care

oticon PEDIATRICS

Oticon
BrainHearing™
Technology

Powered by
Velox S™

Oticon Opn Play™

oticon
PEDIATRICS

OpenSound Navigator

Speech Guard LX

YouMatic LX

Speech Rescue LX

Spatial Sound LX

Clear Dynamics

OpenSound Optimizer

Wind Noise Management

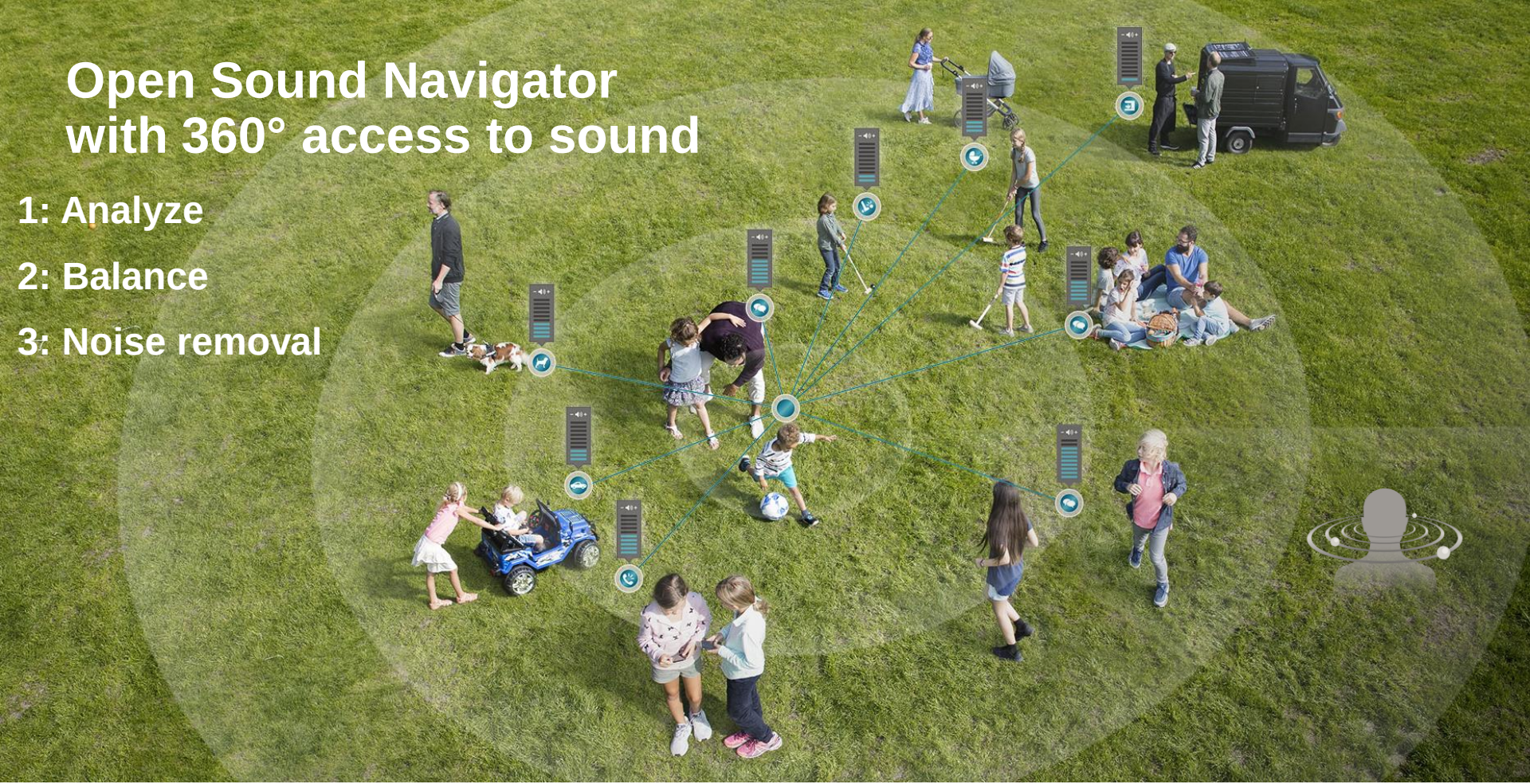
OpenSound Navigator

Open Sound Navigator with 360° access to sound

1: Analyze

2: Balance

3: Noise removal

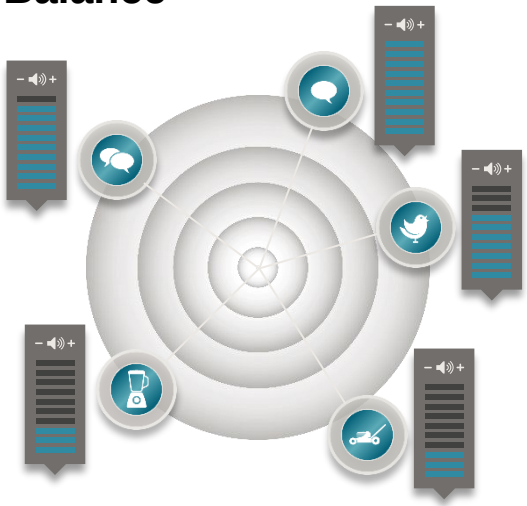


oticon PEDIATRICS

OpenSound Navigator

Analyze

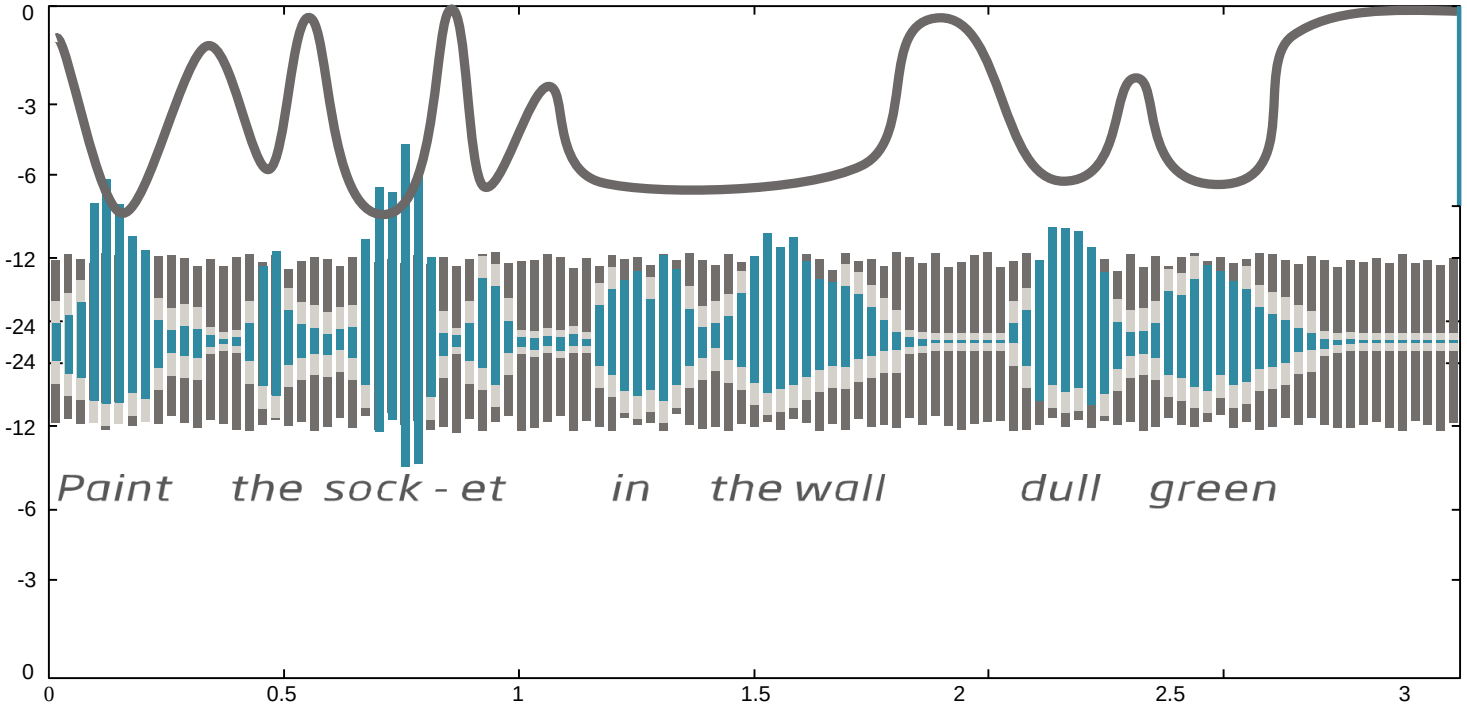
Balance



Noise removal

oticon PEDIATRICS

Noise Removal



9dB

Noise reduction

3dB

oticon PEDIATRICS

OpenSound Optimizer

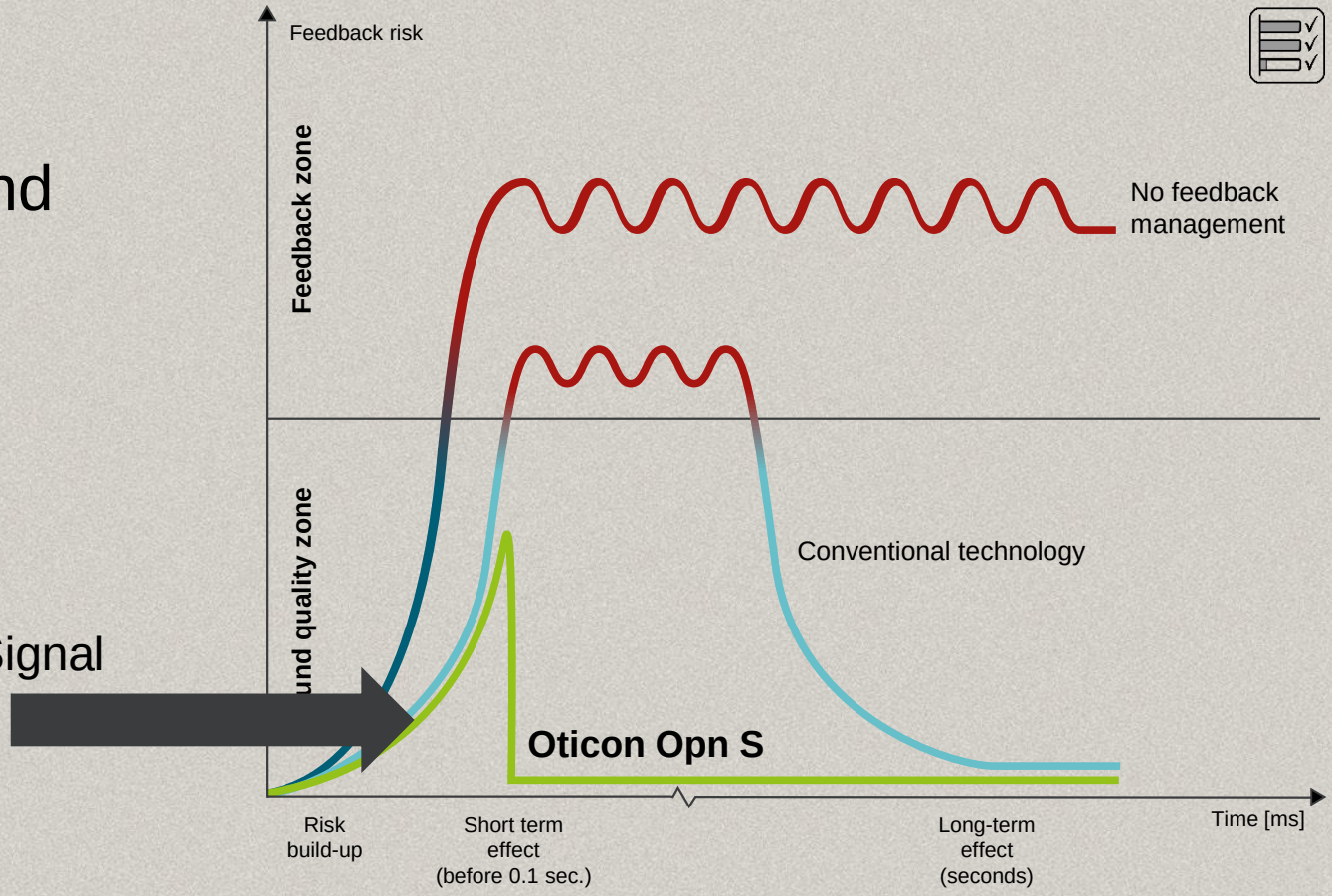
Open Sound Optimizer: Rethinking Feedback!

From FEEDBACK MANAGEMENT TO FEEDBACK PREVENTION

*For prescribed fittings, according to best practice

Open Sound Optimizer

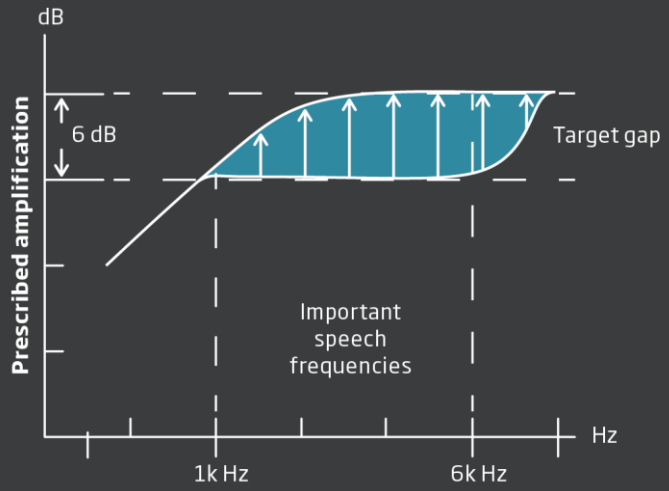
Patented Breaker Signal

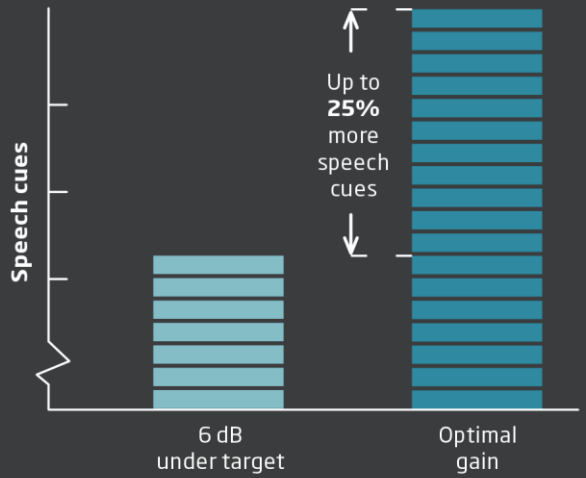


oticon PEDIATRICS

Up to 25% more speech cues to the brain

Oticon Opn Play breaks a law of physics with OpenSound Optimizer





oticon
PEDIATRICS

Evidence Supporting OSN

Tween and Teen Focus Group: What do they want from their hearing devices?

OpenSound Navigator™ and Benefits for Speech Understanding in Noise for Children.

The influence of OpenSound Navigator on Listening Effort and Speech Recognition in Noise for Children.

The Usability and Listening Experiences of Tweens and Teens using the Oticon Opn and ConnectClip Microphone.

oticon PEDIATRICS

Research Studies

Building Evidence Supporting the Use of Opn for Children and Teens with Hearing Loss

- Tween and Teen Focus Group:
- What do they want from their hearing devices
- (Spangler and Gordey, 2016)

Understanding barriers and facilitators to consistent hearing device use

oticon PEDIATRICS

If you could create the perfect hearing aid, what would it look like and what are the things it could do?

- It would have batteries that would last longer/rechargeable.
- Lightweight, slim, small.
- Eliminate all feedback.
- All controlled by my phone.

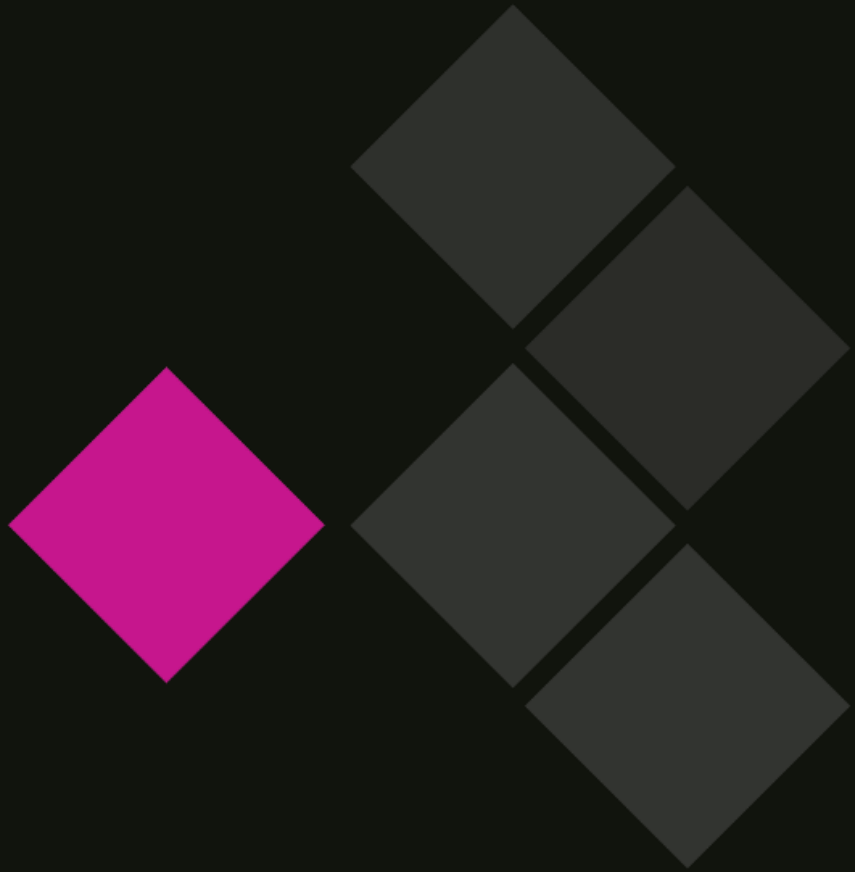
oticon PEDIATRICS

If you could create the perfect hearing aid, what would it look like and what are the things it could do?

- Better retention options for sports; sports mode for hearing aid so they can work well underneath a hockey or football helmet.
- Tracking device via an app in case they get lost.
- Hearing aid could connect to electronics, computers, internet.

OpenSound Navigator and Benefits for Speech Understanding in Noise for Children

Boys Town National Research Hospital, Omaha NE



oticon PEDIATRICS

Benefits of OpenSound Navigator™ (OSN) in Oticon Opn™ Hearing Aids for Children

Based on the study: "Integrated directionality and noise reduction: Effects on Children's masked thresholds"
by Jenna M. Browning, Emily Buss, Mary Flaherty, Lori J. Leibold.

Human Auditory Development Laboratory, Boys Town National Research Hospital, Omaha, NE,
and Department of Otolaryngology/Head and Neck Surgery, The University of North Carolina at Chapel Hill , Chapel Hill, NC

oticon PEDIATRICS

A realistic test environment replicating real life

Scenario 1: Facing speaker vs facing away

Purpose:

To investigate the benefit of OSN on speech understanding in noise when the children directly faced and faced away from the target speech

Participants:

- 14 participants with hearing impairment
- Mean age = 10 years
- Mild to severe sensorineural hearing loss

Stimuli in free field:

- Word recognition test
- Target speech from 0º or 60º
- Masking noise: Steady-state noise

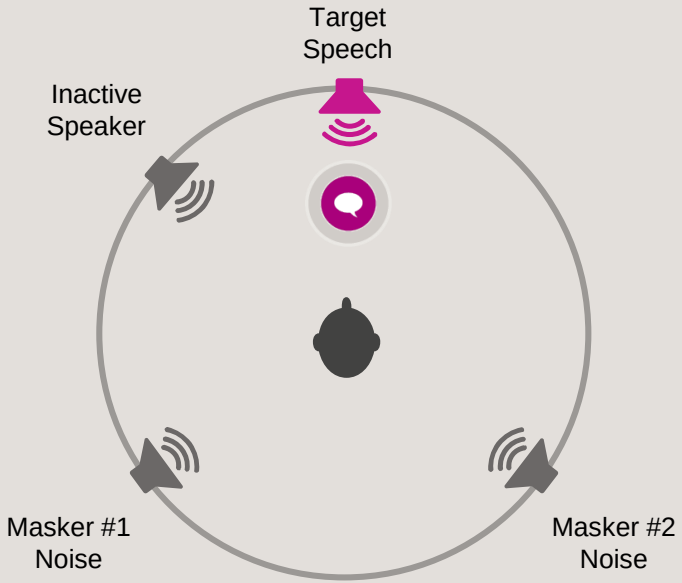
Oticon whitepaper, 2017

oticon PEDIATRICS

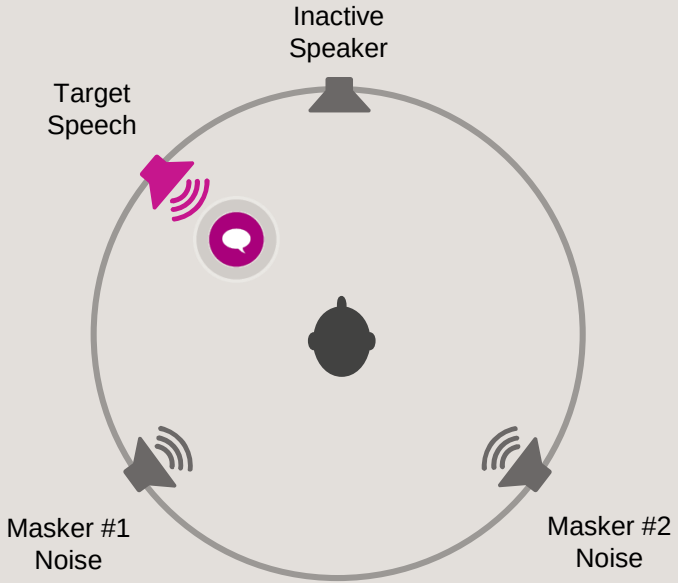
Scenario 1:

Facing speaker vs facing away in steady-state background noise

Facing



Facing away



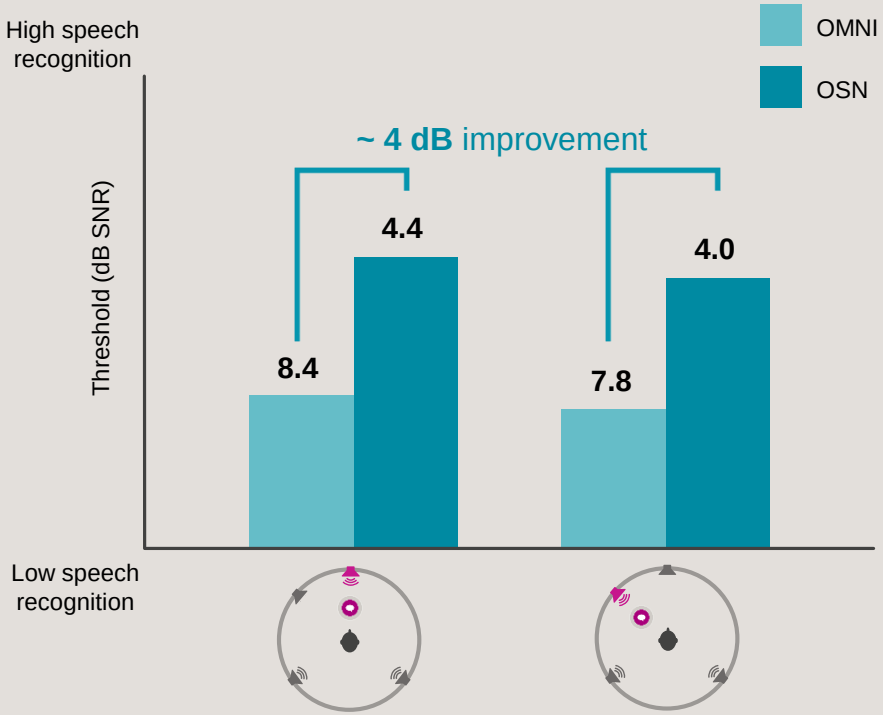
oticon
PEDIATRICS

Results

Equal benefit regardless of facing or facing away from the talker

- OSN gives around 4 dB of benefit regardless of facing or facing away
- Children do not need to face the talker directly (unlike traditional directionality)

Up to 30% improvement in speech recognition



oticon PEDIATRICS

A realistic test environment replicating real life

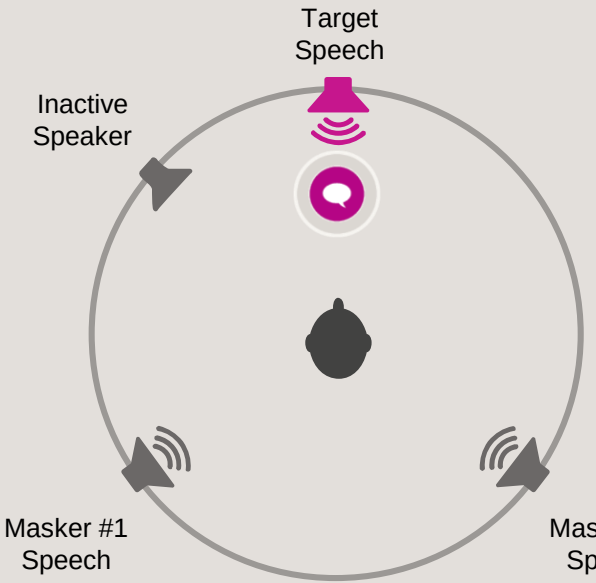
Scenario 2: Multi-talker speech

Purpose:

To investigate whether OSN preserves competing speech coming from different directions behind the listeners

Stimuli in free field:

- Word recognition test
- Target speech from 0º
- Masking noise: Speech (2-talker babble)



Oticon whitepaper, 2017

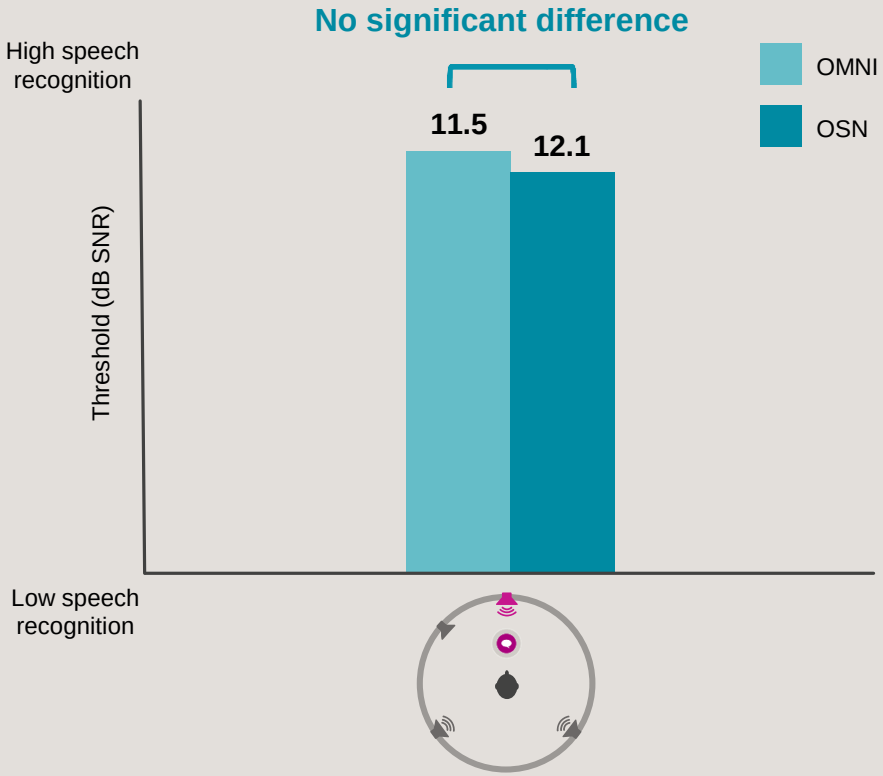
oticon
PEDIATRICS

Results

Speech recognition

- Speech recognition in omni-directional technology versus in OSN did not differ statistically

OSN preserved competing speech coming from behind



oticon PEDIATRICS

OpenSound Navigator offers optimal conditions to listen and learn

OpenSound Navigator offers significant benefits compared to traditional technology regarding

- Speech understanding (with or without facing the speaker directly)
- Preserving competing speech, hence allowing children to overhear

Study 1

oticon PEDIATRICS

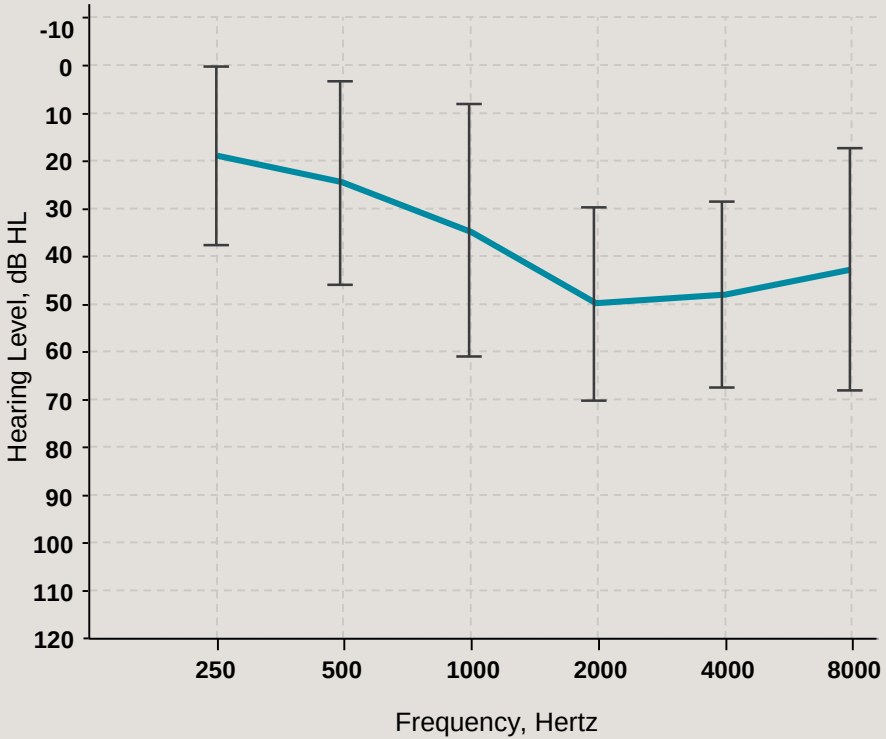
The influence of OpenSound Navigator on Listening Effort and Speech Recognition in Noise for Children

VU University Medical Center, Amsterdam, The Netherlands

oticon PEDIATRICS

Study: OpenSound Navigator – Effort

Background



Purpose:

Investigate the influence of OpenSound Navigator on listening effort and speech recognition in noise for children.

Participants:

- 10 participants with hearing impairment
- Mean age = 14.1 years old
- Mild to severe hearing loss

Oticon whitepaper, 2018 (in prep)

oticon PEDIATRICS

Study: OpenSound Navigator – Effort

Methods

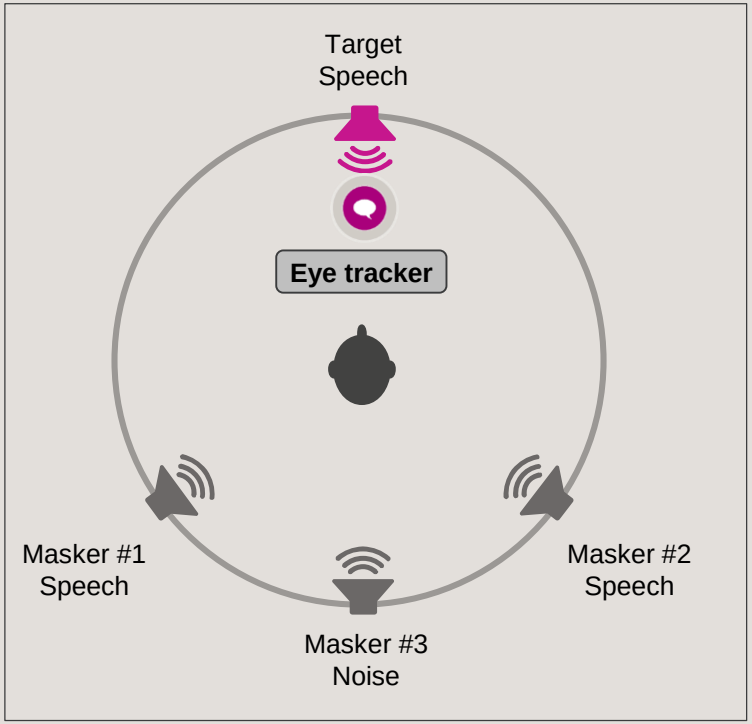
Stimuli in free field:

- Sentence recognition in noise
- Listening effort
  - Self-reported (subjective measure)
  - Pupillometry (objective measure)
- Target speech from 0º
- Masking noise: Speech and steady-state noise

Sound processing:

- Prescription target: DSL v5.0

Omni-directional OSN



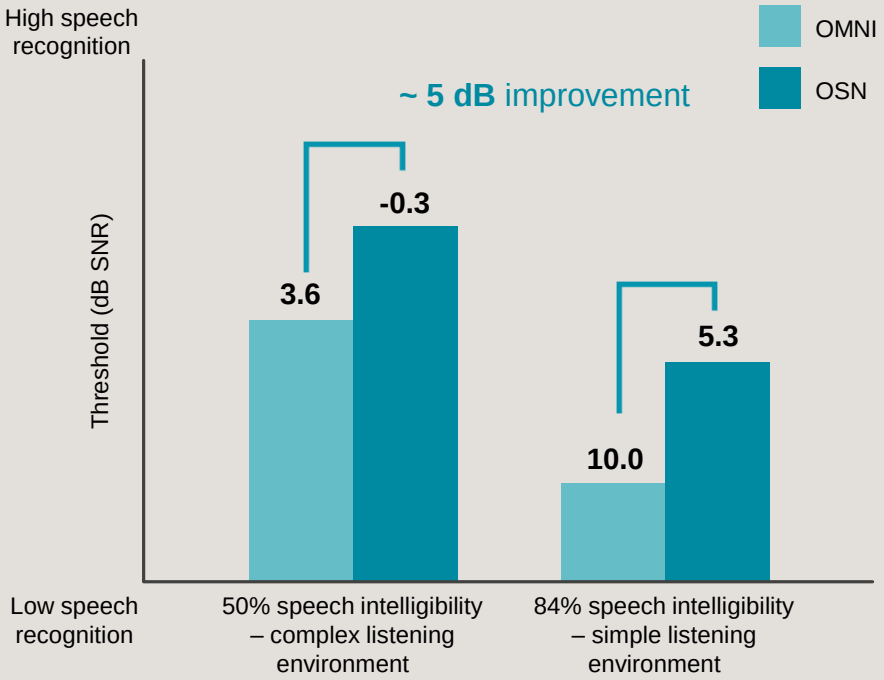
oticon PEDIATRICS

Results

Speech recognition

- OSN improved speech recognition in noise in both listening environments by up to **5 dB SNR**

Results are consistent with previous findings



oticon PEDIATRICS

Results

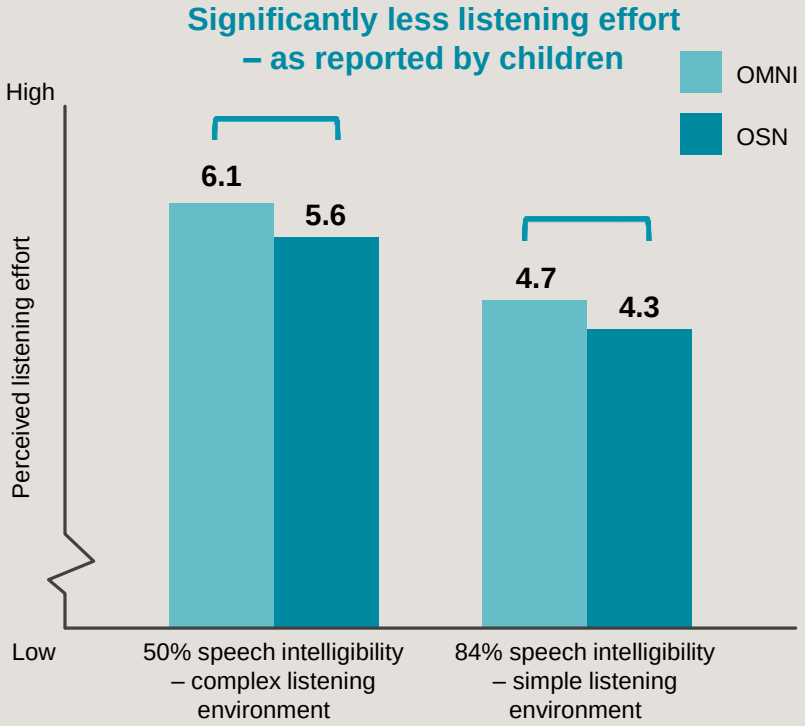
Listening effort

Subjective listening effort

- Children perceived less effort while listening to speech in noise with OSN

Objective listening effort

- Pupillometry results showed a tendency that OSN slightly reduced the average pupil response in the simple listening environment, indicating less listening effort



oticon PEDIATRICS

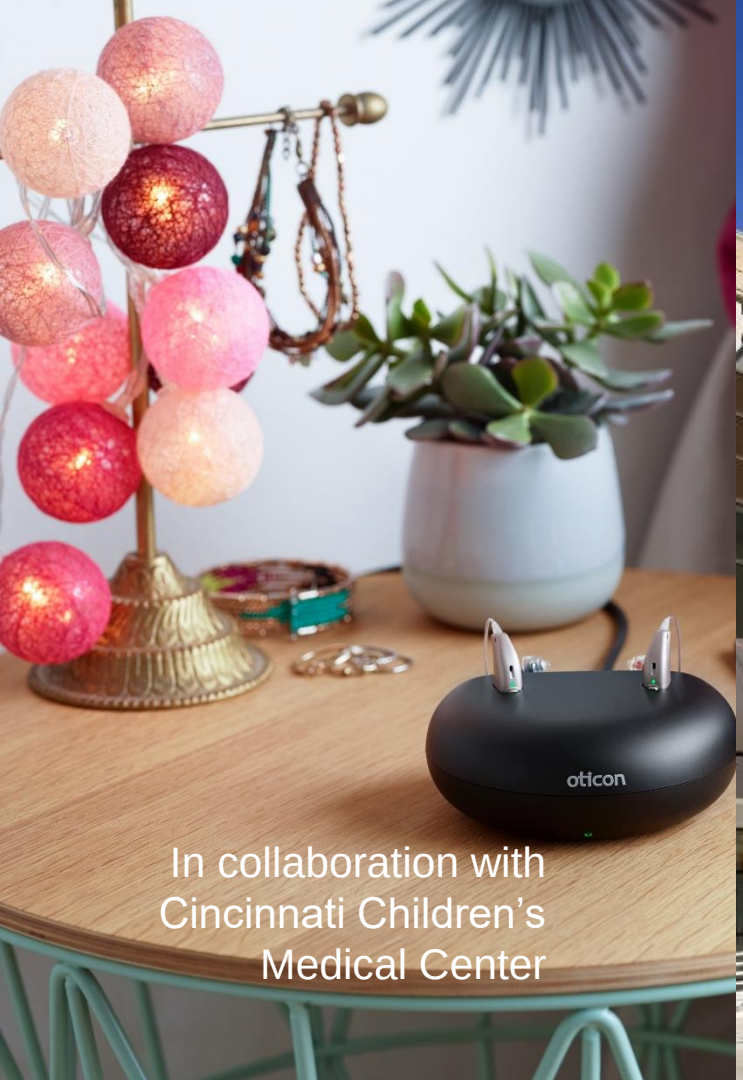
Open sound experience with less effort

OpenSound Navigator offers improved benefits compared to traditional technology regarding

- Less effort while listening in noise
- May allocate more resources to acquire new skills and other activities

Study 2

oticon PEDIATRICS



In collaboration with
Cincinnati Children's
Medical Center

Thin Tube Hearing Aids in Tweens and Teens: User Experiences with the Oticon OPN and Connect Clip Remote Microphone

Aim(s)

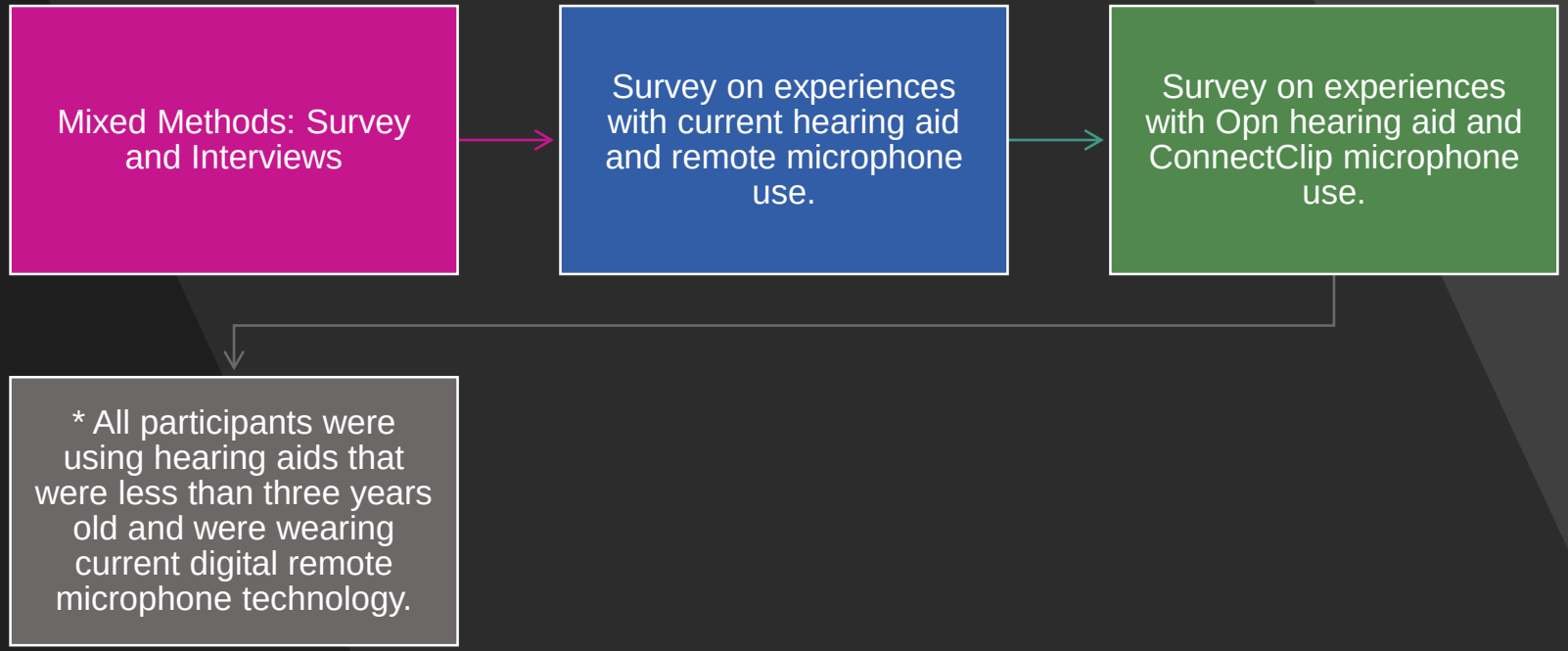
- Learn more about the objective and perceived changes with OPN processing versus previous hearing processing strategies
- Comparing previous hearing device technology to receiver-in-the-ear or slim-tube technology
- Comparing the use of the Connect Clip remote microphone to traditional or Roger FM

oticon PEDIATRICS

Study Design

- Mixed Methods
- Purposeful sampling
- Survey
- Interviews

Study Design



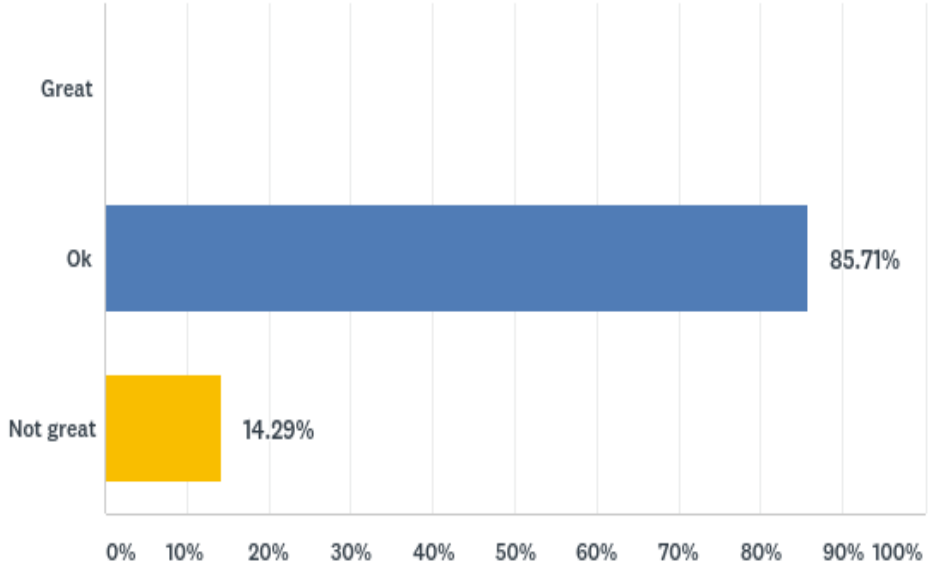
Inclusion Criteria (n=20)

- Typical developing 12-18 year olds (high school or lower)
- Bilateral sensorineural hearing loss that fits within the OPN fitting range
- Previous use of remote microphone technology but does not have to be currently using
- No contraindication for receiver-in-the-ear technology
- Willingness to utilize Connect Clip in educational setting
- No previous use with OPN technology/processing

oticon PEDIATRICS

Preliminary Results (n=8) Survey

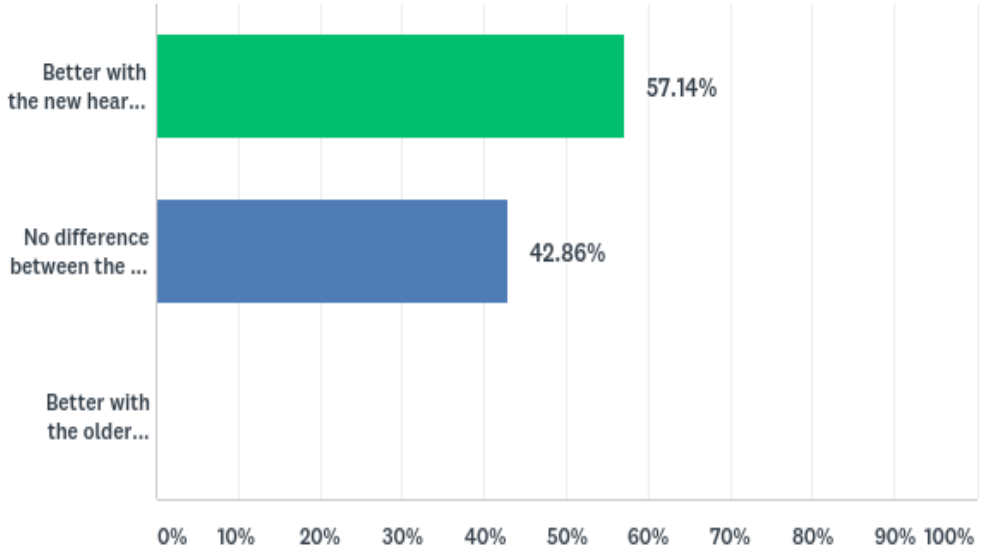
Q10 With my current hearing aids, my understanding of speech in noisy places is (select one):



oticon PEDIATRICS

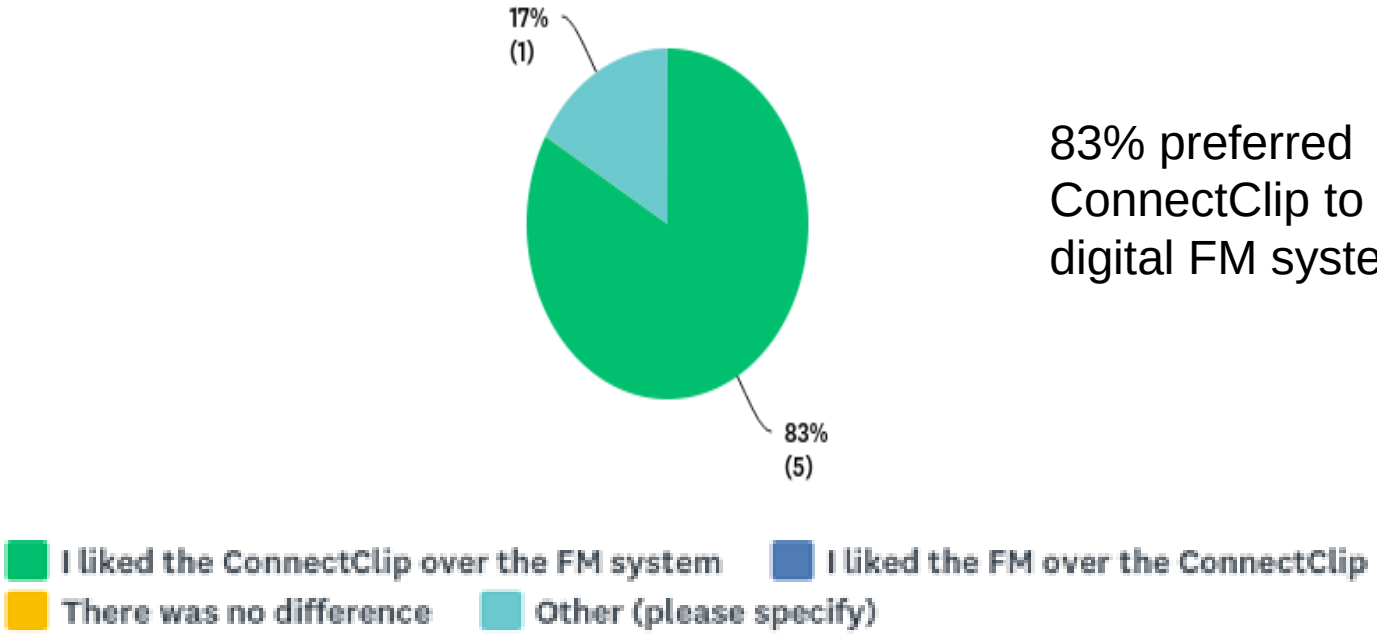
Preliminary Results (n=8) Survey

Q11 Compared to my older hearing aids, my understanding of speech in noisy places with the new hearing aids are (select one):



oticon PEDIATRICS

Q31 Overall, how satisfied were you with the ConnectClip? How did it compare with your old FM system?

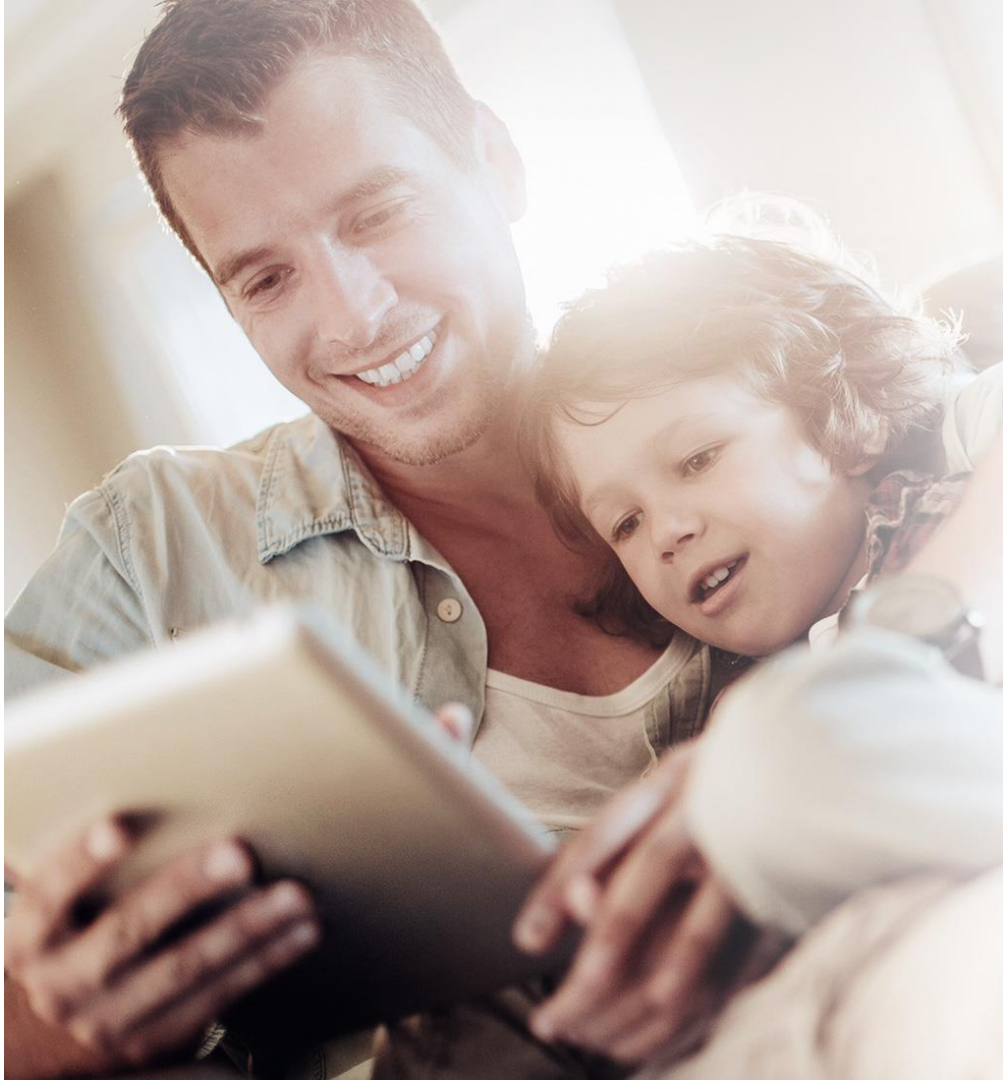


83% preferred ConnectClip to their digital FM system

Preliminary Results (n=6) Skype/Phone Interviews

Emerging Themes

- Inclusion
- Confidence
- Comfort
- Access
- Ease of Use



Participant Quotes

"I never knew music had so many layers! I'm hearing parts of the music I've never heard before!"

"Really, it was just being able to hear better in a noisy environment, like a crowded cafeteria or a crowded store. It was a lot easier to hear, then. Makes life easier."

"I felt like I didn't have to really ask people around me to repeat what they said more often, which made me feel a lot better, and it just made me feel less ... I guess you could say anxious about it."

"Well it makes me more comfortable with speaking to people and answering them when they ask me something. I know that I'm saying the right thing instead of just guessing because I don't really know what they said."

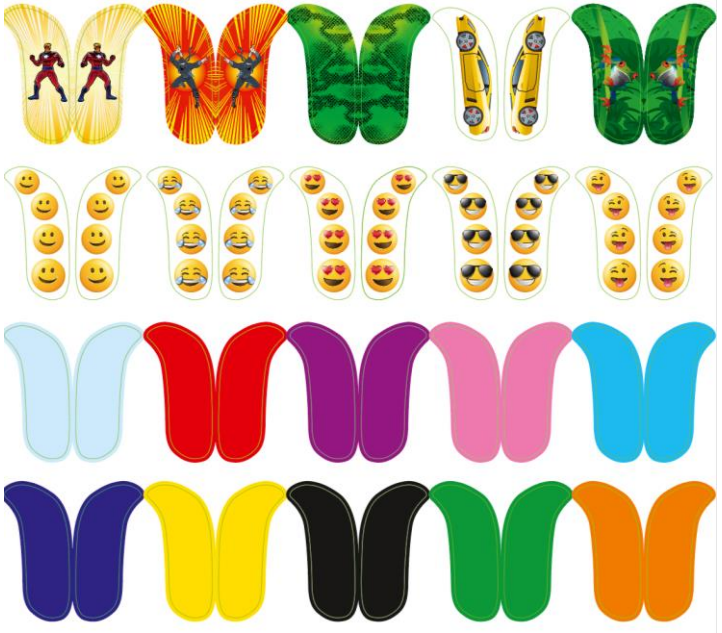
oticon PEDIATRICS

12 colors to meet the needs of children

oticon PEDIATRICS

And decorative stickers to accompany them

For more personality



OTICON | **Opn Play**

oticon
PEDIATRICS

Oticon Opn Play is Rechargeable

Designed to stand up to the test of childhood

Offering the best hearing care without compromising safety and wellbeing

- Robustness
- IP68 certified
  - Also with adapter drawer
- Nano-coated
- Tamper-resistant battery drawer
- LED light
- Free of allergens

A Full Range Of Easy-to-use Solutions For The Classroom

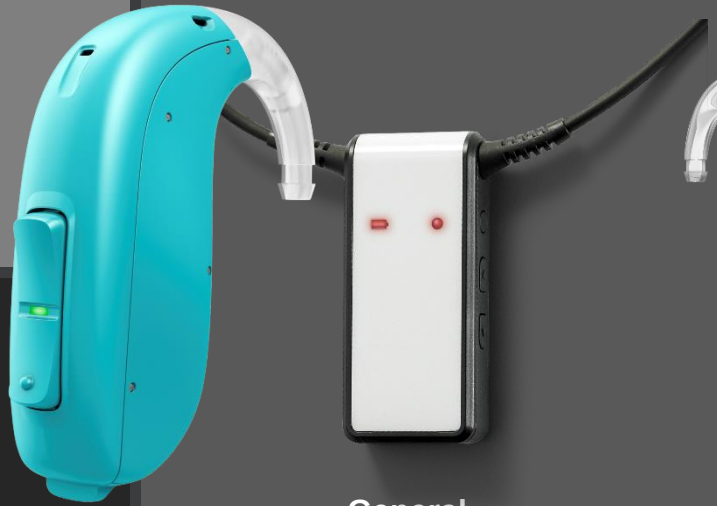
TwinLink
NFMI + 2.4 GHz

Completely integrated solution

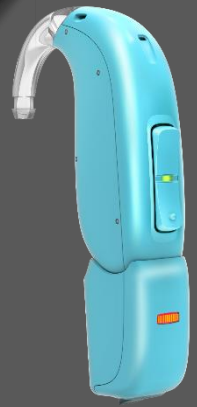
Other systems

Universal ear-level solution

Amigo FM



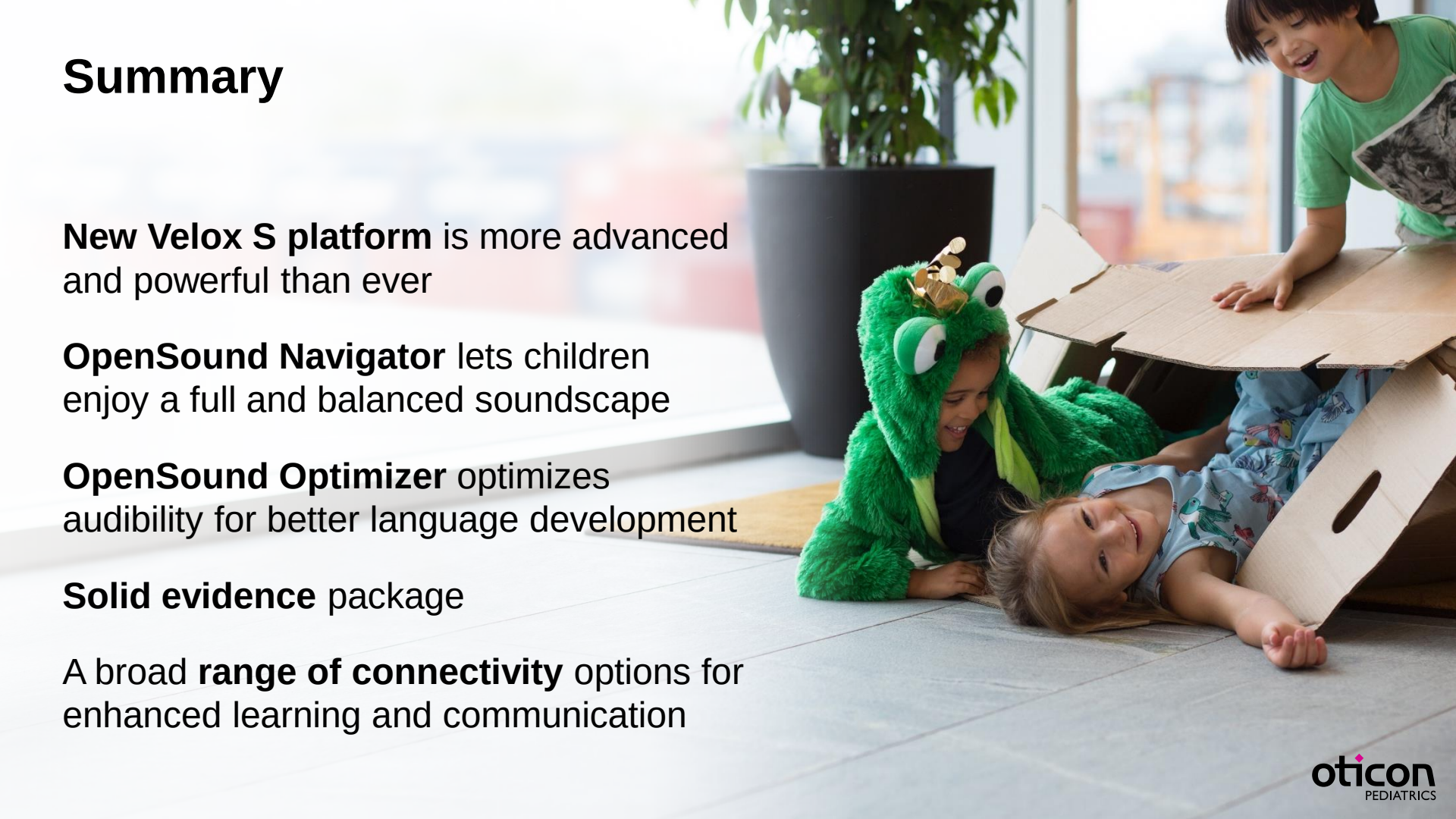
General neckloop solution



Design integrated solution

oticon PEDIATRICS

Summary



New Velox S platform is more advanced and powerful than ever

OpenSound Navigator lets children enjoy a full and balanced soundscape

OpenSound Optimizer optimizes audibility for better language development

Solid evidence package

A broad **range of connectivity** options for enhanced learning and communication

oticon PEDIATRICS

Let every child open up to the world

– even in complex learning environments

Thank you
davg@oticon.com