



**Pediatric Audiological Mission**

**A better future  
for every child  
with hearing loss**

# A better future for every child with hearing loss...

...that's our mission. Read more about how we will do this together. And how we will support you in meeting the challenges you face, ensuring children with hearing loss receive the best possible hearing care.

Oticon's audiological mission is to help hearing care professionals create a better future for children with hearing loss. We want to assist children in realizing their full potential with instruments capable of meeting their individual needs as they journey towards adulthood.

At Oticon, we believe by optimizing auditory and cognitive habilitation and by embracing the complexities associated with growing up with hearing loss, we will empower you to adapt solutions to fit children's needs at every stage of their development.

We want to deliver solutions, tools and techniques that offer everything you need to give every child with hearing loss a better future. That's our mission. That's where we want to go. **Together.**

child  
friendly  
hearing  
care



# Your role is crucial

## Safeguarding the future of children with hearing loss

We acknowledge the intricate and critical responsibilities you have as pediatric audiologists in tying together the right intervention with the practical needs of the child.

Your ability to take the emotional reactions of children and their parents into consideration when providing counseling and treatment is essential - finding and adapting the right solution.

We recognize that you help children achieve this by combining the right intervention to suit the very individual needs of children with hearing loss at each stage of their development. This ensures that intervention enables the efficient processing of auditory information that will have a long-term positive impact on cognitive, academic, social and emotional development throughout childhood.

### Did you know?



Around the world, Oticon runs clinical trials, conducts market research and collaborates with the KIPA (Knowledge Implementation in Pediatric Audiology) Work Group to improve the implementation of best practices in pediatric audiology.



# Three dimensions define our mission

And through them, we develop the support tools and core features that power our pediatric solutions

The strength of Oticon's pediatric audiological mission lies in focusing on a combination of three cornerstones. From these we will channel our resources in order to empower you with the solutions and tools you need to help children attain the future they want and deserve.

## Three defining dimensions:



### Individualization

To empower you to adapt solutions to meet each developmental stage of every child according to their individual educational and lifestyle needs.



### Performance

To deliver technology that will optimize auditory and cognitive habilitation, giving children the best possible speech understanding in every situation while minimizing their cognitive load.



### Living

To acknowledge the very real and challenging every day complexities of growing up with hearing loss and accordingly develop support to assist children, parents and audiologists.

We will continue to ensure that our core features culminate in greater speech understanding for children in the many complex educational and social environments they encounter every day.

Key to achieving this are solutions that allow you to adapt hearing technology to suit each child's unique needs. Oticon incorporates the most advanced technological concepts - Speech Guard E, Inium feedback shield, SmartFit™ Trainer, EasyRECD™, VoicePriority i™ and ConnectLine - which together can empower you to give children a better future.

## Bringing our mission to life

**Speech Guard E** helps deliver a full and natural sound experience.

**Inium feedback shield** prevents feedback without artifacts.

**SmartFit™ Trainer** helps parents insert the earmold correctly in their child's ear.

**EasyRECD™** bases gain prescription on individual ear acoustics.

**VoicePriority i™** makes the teacher's voice audible when noise is excessive around the student.

**ConnectLine** is wireless connectivity for both education and entertainment.

**A better future for every child with hearing loss**

Individualization

Performance

Living

It is in the complex interdependencies of these three cornerstones that the true value of Oticon pediatric hearing solutions lies.

# Developing hearing care for the individual

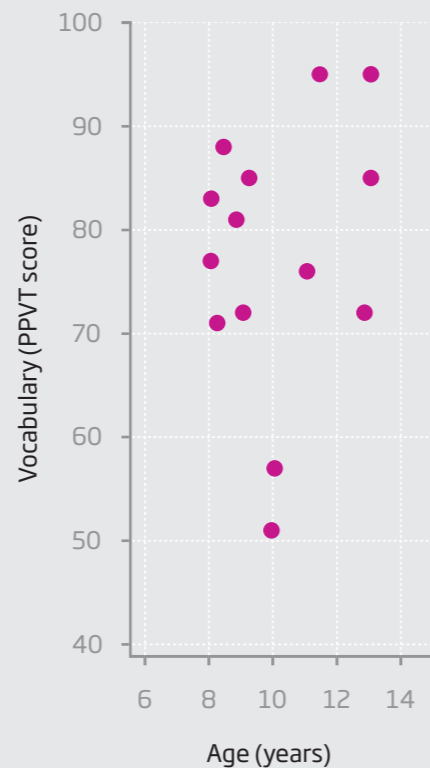
By adapting technology to the child, not the other way around

Since children learn and develop differently, it is important to be able to meet the changing needs of every child and their family. It is also critical to instill ownership and confidence in everyone involved in helping the child. If this is addressed from the start, a positive and constructive attitude to the situation is likely to develop (Sjoblad et al. 2001).

Studies indicate that the basis for learning to read lies in experiencing 20,000 listening hours. Children with hearing loss neither listen naturally nor overhear speech for enough hours in early childhood to fully develop their auditory processing skills (Flexer 2011). In our research and development, we will continue to emphasize the importance of finding ways to stimulate the child's auditory system in a natural and complete manner, while also recognizing the increasing complexity of their auditory world.

That is the reason why we strive to make sure our products match individual diagnoses, and take into account hearing age, hearing loss, co-morbidities and, of course, personal preferences. By meeting their unique and individual needs, we can help you give children the confidence they need to take ownership of their hearing loss during their journey to adulthood.

## Development is an individual process



Results from subjecting a group of school aged children with a moderate to severe sensory hearing loss to a vocabulary test (Peabody Picture Vocabulary Test). Scores show that the children's receptive vocabulary varies greatly within a narrow age range.

Sjoblad, S., et al., Parents' reactions and recommendations after diagnosis and hearing aid fitting. *Am J Audiol*, 2001. 10(1): p. 24-31.

Flexer, C., Cochlear implants and neuroplasticity: linking auditory exposure and practice. *Cochlear Implants Int*, 2011. 12 Suppl 1: p. S19-21.



# High performance in every situation

## A smooth alliance between speech understanding and cognitive load

### Superior speech understanding

Children spend much of their day in complex listening environments (Cruckley et al 2011), which makes them vulnerable to missing out on educational content as well as social conversations.

A main key to attaining the high speech understanding so crucial to their development is to provide full access to the entire range of speech through the course of the day.

At Oticon, the unique needs of children are incorporated into the preliminary stages of product development. Oticon instruments are built using our finest technology. Enhanced with premium features, these solutions offer high performance and a truly holistic pediatric intervention.

### Less cognitive load

Studies show that children with hearing loss use more cognitive resources than their peers in poor signal to noise conditions (Hicks and Tharpe 2002; Pittman 2011). To objectively measure effort levels, dual-task performance studies are used. In these, the subject is asked to do two things at the same time and observations are made on how they divide their attention. Because there is an inherent limitation to the load children's brains can handle, listening with a hearing loss is likely to utilize a larger part of existing cognitive capacity.

We realize that to acquire necessary language, literacy and cognitive abilities, children depend on hearing solutions that offer optimal audibility while preserving energy. This is core to Oticon's pediatric mission.

### Science shows

Stimulation fosters development in the broadest sense and promotes cognitive abilities, educational achievement, social and emotional skills, curiosity and creativity.

Sensory deprivation has a negative effect on brain development. From animal experiments and cochlear implant results, we now know that auditory representation and processing can be modified based on acoustic stimulation (Pienkowski & Eggermont 2012; Sanes & Bao 2009).

It is never too early or too late to stimulate. In fact, during the first three and a half years of childhood, neuronal networks are critically sensitive to stimulation, although the brain remains plastic throughout life (Kral & Sharma 2011).

Cruckley, J., S. Scollie, and V. Parsa, An Exploration of Non-Quiet Listening at School. *Journal of Educational Audiology*, 2011. Vol. 17: p. 23 - 35.

Hick, C.B. and A.M. Tharpe, Listening effort and fatigue in school-age children with and without hearing loss. *J Speech Lang Hear Res*, 2002. 45(3): p. 573-84.

Pittman, A., Children's performance in complex listening conditions: effects of hearing loss and digital noise reduction. *J Speech Lang Hear Res*, 2011. 54(4): p. 1224-39.

Pienkowski, M. and J.J. Eggermont, Reversible long-term changes in auditory processing in mature auditory cortex in the absence of hearing loss induced by passive, moderate-level sound exposure. *Ear Hear*, 2012. 33(3): p. 305-14.

Sanes, D.H. and S. Bao, Tuning up the developing auditory CNS. *Curr Opin Neurobiol*, 2009. 19(2): p. 188-99.

Kral, A. and A. Sharma, Developmental neuroplasticity after cochlear implantation. *Trends Neurosci*, 2012. 35(2): p. 111-22.



Cognitive auditory research indicates that compression schemes must preserve the amplitude modulation as well as the temporal fine structure of speech for a child with hearing loss to cope well in noise.

# Understanding children's lives

## Providing support based on lifestyle practicalities, counseling and listening strategies

The challenges faced by children with hearing loss, their audiologists, parents and caregivers are vast. Consequently, we feel that information and support must be seen as an integrated and essential part of pediatric hearing care.

Through close partnership with audiologists, our long-term goal is to address the many ways in which our hearing solutions empower children to realize their full potential. This covers everything from practicalities of actual use to counseling and listening strategies.

### Practicalities

All too often everyday practicalities stand in the way of the beneficial use of amplification (Moeller et al. 2009). Studies indicate that instruments must be able to adapt to the many situations children encounter, and flexible enough to cover changing needs over time.

### Counseling

The reaction of parents to their child's diagnosis impacts on how well the child will adjust to their hearing instruments (Sjoblad et al. 2001). This can also affect how readily the child strives for independence. Our counseling tools are developed in close collaboration with clinical experts. They are designed to empower audiologists, parents and caregivers to show the child how to cope with the challenges they face.

### Listening strategies

Strategies assist in teaching children to obtain the full benefit from the many listening situations they experience. A child's ability to navigate their way through listening situations can help prevent stigmatization and social isolation (Elberling & Worsøe 2005). We provide material that demonstrates how to support children so they can cope in challenging environments.

Moeller, M.P., et al., Consistency of hearing aid use in infants with early-identified hearing loss. *Am J Audiol*, 2009, 18(1): p. 14-23.

Elberling, C. and K. Worsøe, Fading sounds: about hearing and hearing aids. 2005.

### Transition phases

- **Identification** - Supporting parents in the grief process and in understanding hearing technology.
- **From home to day care** - Informing parents and caregivers about additional hearing needs in new environments.
- **Starting school** - Focusing on education with FM use in the classroom.
- **Developing independence** - Being prepared to meet adult work and life challenges.



# Empower children at every stage of childhood

By giving them what they need to advocate for themselves



## Infants

### NO AUDITORY EXPERIENCE

Maximum audibility achieved with optimal handling of the acoustic signal is key to allowing the auditory and cognitive system to develop as rapidly and fully as possible.

- Less sensitive to sound and have auditory thresholds that are higher than adults
- Frequency resolution reaches maturity at 6 months, but frequency discrimination will not mature until late-childhood

**Strategy:** Immediate amplification coupled with early intervention to support the relationship between sound and meaning, with the broadest frequency range possible.

## Pre-schoolers

### FUNDAMENTAL BINAURAL HEARING

The child's auditory maturity strongly depends on the richness of sensory exposure.

- The maturation of gap detection abilities are developed to ensure appropriate listening skills
- Temporal resolution and localization abilities approach maturity around age six

**Strategy:** Maintain a natural, complete sound picture with the broadest possible bandwidth.

## School age

### COMPLEX BINAURAL AND HIGHER-LEVEL AUDITORY SKILLS

Although the child's world still consists of a broad range of complex listening environments, focus is now on learning vast amounts of spoken and incidental information in school.

- Use of less salient cues.
- Sound-source segregation and auditory attention continue to develop and mature.

**Strategy:** Audibility with focus on speech intelligibility, FM in school and automatic adaptive technology - including noise reduction, comfort and directionality when necessary.

## Teenager

### EMERGING ADULT-LIKE AUDITORY SKILLS

As they prepare for the adult world, it is essential that teenagers enjoy full access to their auditory world.

- The ability to attend to and extract information is still developing
- 15 year-olds are more affected by noise and reverberation than adults

**Strategy:** Adaptive automatic systems to address increasingly complex environments and connectivity options to facilitate access to consumer electronics.

Mattock et al 2009; Werner 2007



## People First

People First is our promise to empower people to communicate freely, interact naturally and participate actively

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