

## **BIAP Recommendation 06/11:**

### **Hearing aids for children in the first year**

#### **General foreword**

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Comments on this document are welcomed and should be sent to the Secretary-General of the International Bureau for Audiophonology BIAP. The address can be found on the BIAP website at [www.biap.org](http://www.biap.org).

#### **Introduction**

The maturation of neurosensorial functions in deaf children – including hearing and the processes of language development – is enhanced by hearing aids when they are of high quality and fitted early on.

Hearing aids for children differ significantly from those for adults.

#### **Recommendation**

##### **1. Elements of the prosthetic orientation assessment**

The measure of a hearing aid's success must be based on auditory threshold. This must be implemented separately for each ear and each frequency. To ensure consistent results, the various methods of audiometric assessment must be considered.

Before a child has reached the age of one, this includes an otoscopy, the results of behavioral audiometry, tympanometry (226Hz and 1000Hz), otoacoustic emissions (TEOAE and DPOAE), electrophysiological testing with a click threshold search and specific frequencies (as much as possible with the earpiece inserted into the auditory canal and, if necessary, using the osseous conduction).

Data provided by the doctor to the hearing-aid audiologist will be complemented by specific tests of the prosthetic fitting procedure.

##### **2. Listening situations**

Listening situations in infancy are different from those in adulthood. Children in their first year are often lying down, sitting on their parents' lap or held in their arms. At first, they do not yet control their head movements. With increasing mobility, listening situations are changing constantly. It is therefore necessary to change the gain depending on the child's psychomotility (different LTASS<sup>1</sup> acoustic feedback).

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<sup>1</sup> LTASS – Long Term Average Speech Spectrum

### 3. Anatomical conditions

The pinna and the auditory canal are constructed of very flexible tissue. The auditory canal is narrower, shorter and straight, with a smaller volume. Compared with adults, the sound pressure is higher and the resonance frequency moves toward the high frequencies. For these reasons, hearing aid settings must be made via technical measures that take into account the evolution of the ear's individual transfer function (RECD<sup>2</sup> measurement).

### 4. Tips

Because of anatomical specificities in young children, taking an impression of the ear requires great experience to ensure the production of quality tips and reduce the risk of acoustic feedback. When a feedback problem is encountered, it is recommended to measure the tip's acoustic seal or to remake another more efficient tip. To minimize traumatic risk, the use of flexible material is recommended.

### 5. Fitting procedure

RECD measurements integrate the acoustic qualities of the child's canal and the tip's acoustic influence via a probe in the auditory canal. After measuring, adaptation of hearing aids can begin to be simulated without further measurements on the child. The use of a specific fitting method for children (DSL m [i/o] v 5.0 or NAL-NL2...) is recommended as the initial setting algorithm. Algorithm calculation results and the setting of hearing aids should be checked using the SPLogram, audiometric measurements, and observation of the child's evolution. It is important to emphasize the use of measuring instruments with signals simulating speech (Ref. by Thomas Wiesner).

With SPLogram, there is evidence of an optimized long-term average speech spectrum (LTASS) transmission. This means that the soft and loud sounds of speech are transferred into the child's residual dynamic range. Where appropriate, the reasons for insufficient transmission of soft sounds and high frequencies must be justified.

Behind-the-ear type aids are most recommended for fitting very young children. They must be solid and with a high setting flexibility to correct complex and developing deafness. They must also be equipped with an audio input and battery blocking. The signal processing modifying acoustic amplification (multi-microphones, noise reduction, multi-programs, volume control, etc.) should be disabled. To control a possible acoustic feedback, only systems working in opposite phase should be used.

### 6. Monitoring efficiency and evaluation

The final oversight must be documented via SPLogram, a measure of free-field functional prosthetic gain (behavioral audiometry), and via observation questionnaires for parents and professionals involved in reeducation. It must be demonstrated that the hearing aids worn are free of hissing and are accepted by the child. The SPLogram must show an average speech transmission with a 30 dB dynamic range in the child's residual hearing range.

During the first year, the measure of hearing must be regularly reassessed. It is also necessary to verify the devices' functioning and settings, the RECD values and the functional prosthetic gain (growth, condition of the middle ear). A modification of hearing must be communicated to the team in charge of the child's early reeducation. Moreover, a speech therapy assessment should be regularly performed.

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<sup>2</sup> RECD – Real Ear Coupler Difference

During fitting, parents must be informed of the service, care, accessories and any additional technical support. When hearing aids are delivered, a “map of hearing aids” and documentation is given to parents.

*The equipment in the first year is a multidisciplinary task that requires the close cooperation of all the specialized disciplines participating!*

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## References

BIAP Recommendation [06/8](#), [07](#), [21/2](#), [21/3](#), [25/1](#)

MCHAS, Guidelines on Hearing Aid Fitting, audit and evaluation in children, UK 2005

Canadian Working Group on Childhood Hearing, in 2005

Pediatric Amplification Protocol, the United States AAA, in 2003

Guideline for Audiologic Assessment of children from birth to 5 years of age, ASHA, USA 2004

Papier de consensus à l’approvisionnement d’appareils auditifs dans l’enfance, vers.3, DGPP, Germany 2007

The DSL Method for Pediatric Hearing Instrument Fitting Trends in Amplification Volume 9, Number 4, in 2005

Audiométrie comportementale du très jeune enfant, Monique Delaroche, Edition De Boeck - Université 2001

**This recommendation was created and approved in a multidisciplinary cooperation between professionals of all audiophonologic disciplines, which are medicine, pedagogy, speech therapy, psychology and hearing instrument audiology.**

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