What Parents Should Know about Hearing Aids:

What’s Inside, How They Work, & What’s Best for Kids

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Goals

- Characterize the unique needs of children with hearing loss.
- Describe some of the advanced signal processing features of hearing aids.
- List the hearing aid features that are helpful to children with hearing loss.
Children with Hearing Loss are Unique

1. There aren’t as many of them.
Children with Hearing Loss are Unique

2. Their hearing losses are different.

Pittman & Stelmachowicz (2003)
Children with Hearing Loss are Unique

3. Their needs are different.

Adults use their residual hearing to *continue* to communicate,

Children use their residual hearing to *learn* to communicate.
Styles

- In-the-canal
- In-the-ear
- Behind-the-ear
On The Outside

- Earmold
- On/off switch (maybe)
- Volume control (maybe)
- Battery compartment
On The Inside

- Microphone
- A/D converter
- Signal Processor
- D/A converter
- Receiver

Picture courtesy of Sonic Innovations
On The Inside

Microphone

0101000
1011101
0101010
1101101
0010101
0010110

0101010
1011101
0101110
1100101
0010111
0011110

f(x)

0101010
1011101
0101110
1100101
0010111
0011110

Receiver

Acoustic  Electrical  Digital  Processor  Digital  Electrical  Acoustic
Signal Processing Technology

- Advanced signal processing solved a number of problems common to hearing aids
  - Improved fitting precision
  - Accommodate loud and soft sounds
  - Listening in different environments
  - Limiting acoustic feedback
  - Listening in noise
Compact BTE hearing instrument with switchable directional microphone, 6-channel digital Wide Dynamic Range Compression (dWDRC), digital Noise Canceller (dNC) for comfort and ease of listening in noisy environments, plus additional features for convenient and successful operation.

**Key data**
- Max. gain: 63 dB
- Max. power output: 130 dB SPL
- Frequency range: <100-4700 Hz

**General features**
- Directional miniature electret dual microphone; directional or omnidirectional function can be set with mech. switch
- Compact, digital Phonak BTE
- Battery size 13
- Telecoil
- Automatic and manual volume adjustment
- Manual volume adjustment with programmable digital volume control (Range ± 6 dB, ± 10 dB or deactivated)
- O-T-M manual switch
- Audio input, MicroLink compatible
- Individual acoustic signals for start up, maximum/minimum volume and low battery warning

**Accessories/Options**
- FM receiver: MicroLink MLx, MLLx or MLL
- Audio shoe AS 5 or AS-MLx
- Ear hook HE2 1000
- Mini ear hooks HE2, HE1000
- Tamperproof system KSE
- CROS/SICROS
- Cover for volume control
- Choice of 11 ColorLine colors

**Processing features**
- 6-channel digital Wide Dynamic Range Compression
- Feedback Manager
- MAXX noise suppression technologies:
  - 6-channel digital Noise Canceller (dNC)
  - Soft squelch

**Software**
- PPG software version 8.3 or later

**Hardware**
- Programmable with PC (IBM compatible), and HI-PRO interface
Microphone Technology

- Omni-Directional Microphone
Microphone Technology

- Directional Microphone
Microphone Technology

- Advantages
  - Adjustable
  - Adaptive

- Disadvantages
  - Can be noisy
  - Requires sophisticated listener
  - Not all noise is always noise
Challenges for the Pediatric Audiologist

- Hearing aids are complex
- There are thousands of different hearing aids to choose from
- Children are not able to participate in the hearing aid fitting process
- Children’s needs change as they grow and mature
Hearing Aid Features for Children

- Durability
  - Wear and tear
  - Growth
- Auditory Access
  - Bandwidth
  - Gain
- Connectivity
  - Telephone
  - Classroom
  - Personal Audio Device
Questions?