Cochlea Implant and Hearing Aid

Optimizing the fitting of the bimodal situation

- A Case Study -

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Studies

• Morera et al., Acta Oto-Laryng.: 2005
• Tyler et al., Ear and Hearing: 2002
• Ching et al., Ear and Hearing: 2001
• Armstrong et al., Am J Otol: 1997
• Blamey et al., Cochlear Implants: 1997
• Chmiel et al., Ann Oto Rhin Laryng suppl. 1995
• Dooley et al., Arch Otolaryngol HNS: 1993
• Shallop et al., J Sp Lang Path Aud: 1992
Protocol

- CI optimization
- HA optimization
- Speech tests in quiet and in noise
- Loudness-scaling tests
- Questionnaires for the child, parents and teacher
The Method

Hearing Aid
- RECD-Measurement / In-situ-Measurement
- DSL[i/o]-Method / SPL-O-Gram
- Loudness-scaling (WHF-System)

CI-System
- Loudness-scaling (WHF-System)
- Loudness-scaling (WHF-Scale)
The Method

Touchscreen

Presentation of Results
The Method

Procedure for CI:

- WHF with CI only
- CI-optimization
- WHF with optimized CI only

AIM:

- WHF-profile with optimized HA only should be similar to profile with optimized CI
The Method

Procedure for HA:

- Fitting on the basis of DSL[i/o]
  - Verification with SPL-O-gram
  - WHF with HA only
  - Localising deviations in the WHF
  - Checking SPL-O-gram for possibilities of fitting correction due to the WHF results
The Method

Procedure for HA

- Changing HA parameters in area of deviations
- Verifying the finetuning with WHF / SPL-O-gram
A Case Study

- 12 - year old male
- Hearing impairment since birth
- Cause may be hereditary
- Hearing loss L > R
- First presentation in clinic at 9 months
- First HA-fitting (both ears) at 11 months
- First CI-fitting (left ear) at 7 years

- HA Phonak Supero 412
- CI MED-EL Combi 40+ / Tempo+
Audiogram
WHF
only CI (L) - after optimization
Speech audiogram

CI only after optimization / HA + CI before optimization

Speech audiogram Göttinger II
WHF
only HA (R) - before optimization
SPL-O-Gram

HA (R) - before / after optimization
Changes of Hearing Aid Parameters

![Bar chart showing changes in hearing aid parameters before and after optimization at different frequencies.](chart.png)

- **Frequency (Hz)**: 200, 600, 2300, 4400
- **dB**: 42, 53, 61, 53
- **Legend**:
  - Red: before optimizing
  - Green: after optimizing
  - Yellow: difference

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WHF

only HA (R) - after optimization
WHF
HA + CI - after optimization
Speech audiogram

CI only - after optimization / HA + CI - before optimization
HA + CI after optimization

Speech audiogram Göttinger II
Speech audiogram

CI only after optimization / HA + CI before optimization
HA + CI after optimization

Speech audiogram Göttinger II with competing noise
Validation

- assessment of real word outcomes
- use of questionnaires for the child, parents and teachers
Validation

When using both devices, parents comment

- he asks for repetition less often
- he is not so tired after school
- his concentration is better
- he picks up the conversation of others
- his speech is clearer
Summary

• Careful optimization of the bimodal situation can improve the outcome of

  - speech perception in quiet and in noise
  - functional performance in school
  - functional performance in everyday life
Thank You for Your Attention!