

Bimodal Hearing: Technological advancements and patient benefits

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Continuous Relaxation of Indication Criteria

- 1995: profound hearing loss



- 2000: max. 30% monosyllables

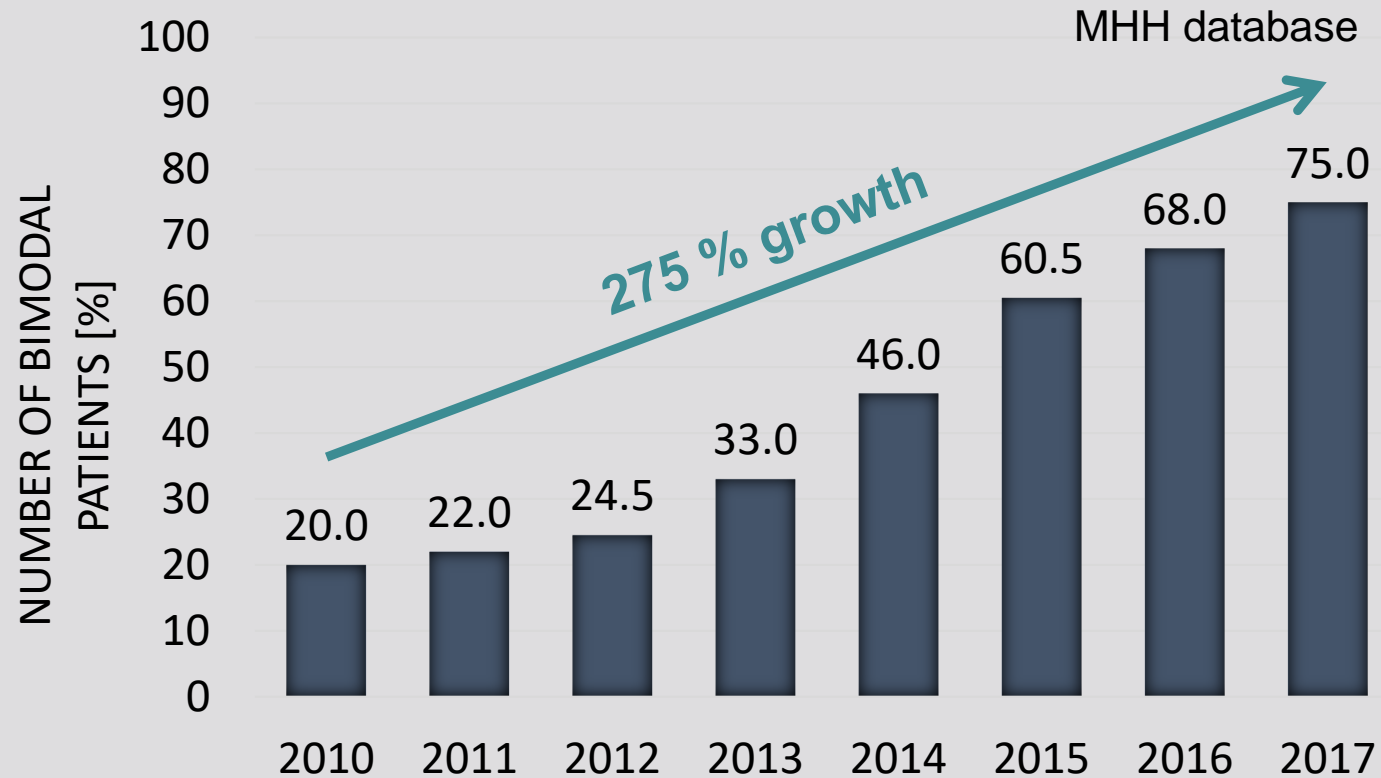


- 2008: max. 50% monosyllables

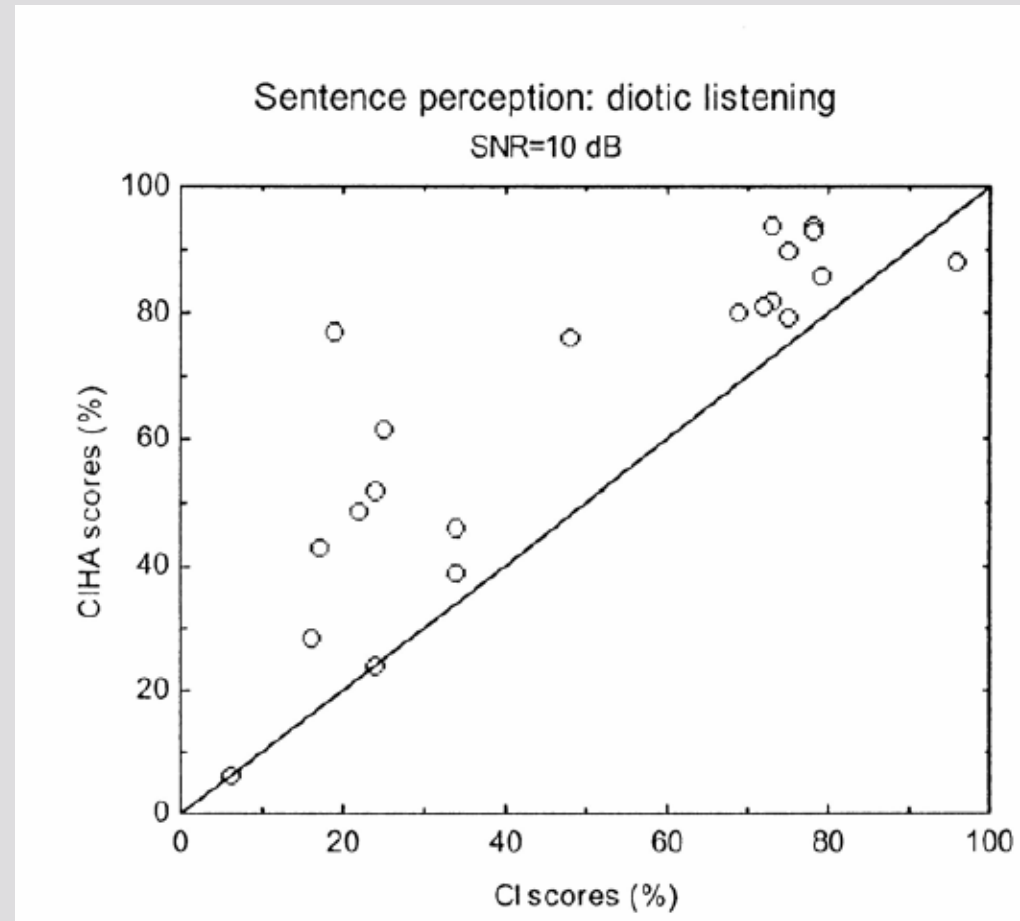
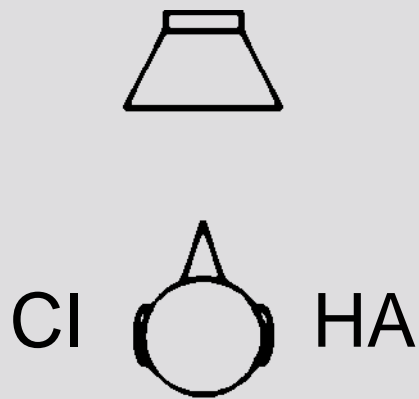


- 2010: max. 60% monosyllables with EAS

Development of Bimodal Population

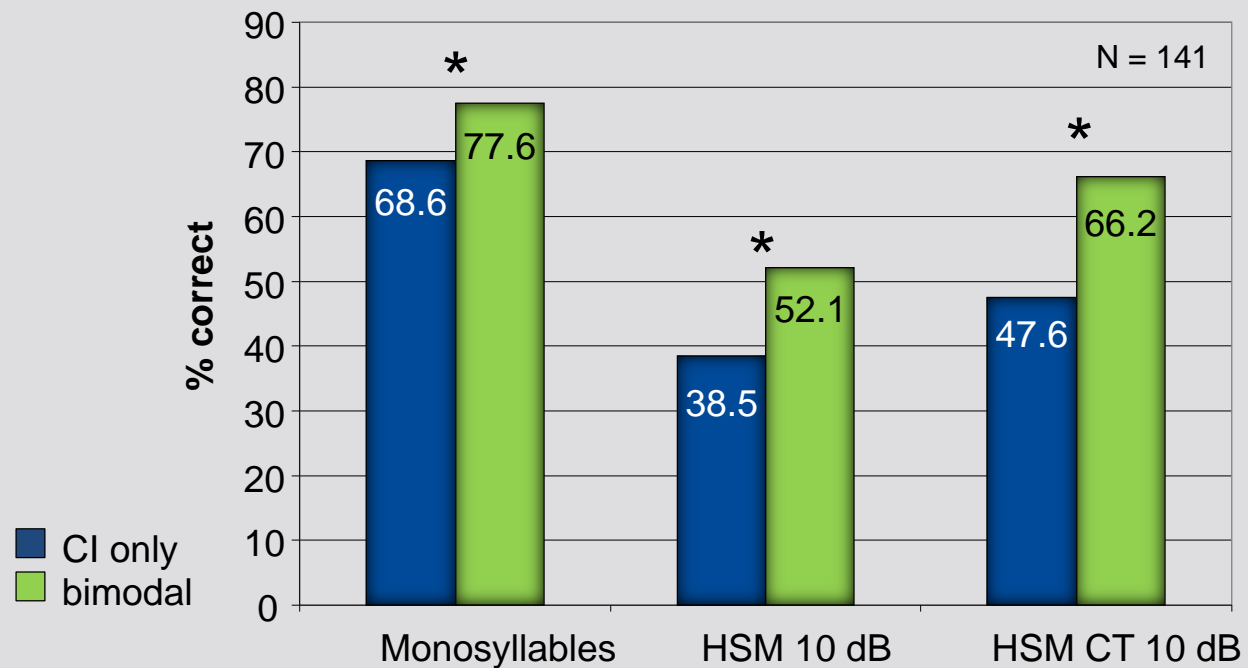


Advantages of Bimodal Hearing



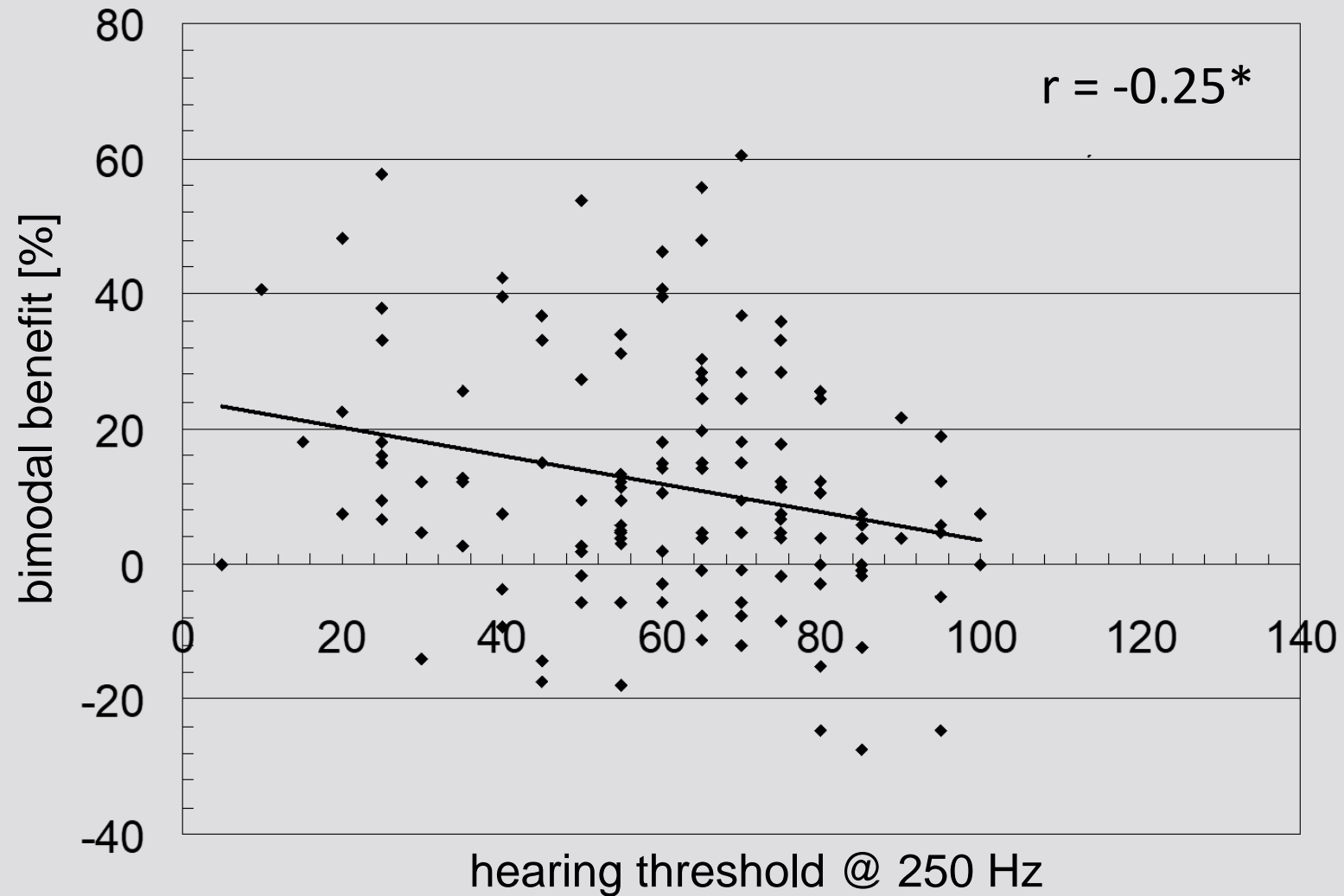
Ching, T. Y. C. , Incerti, P. , Hill, M.: Binaural benefits for adults who use hearing aids and cochlear implants in opposite ears. *Ear and hearing* 2004;25;1:9-21

Benefit of Bimodal Hearing

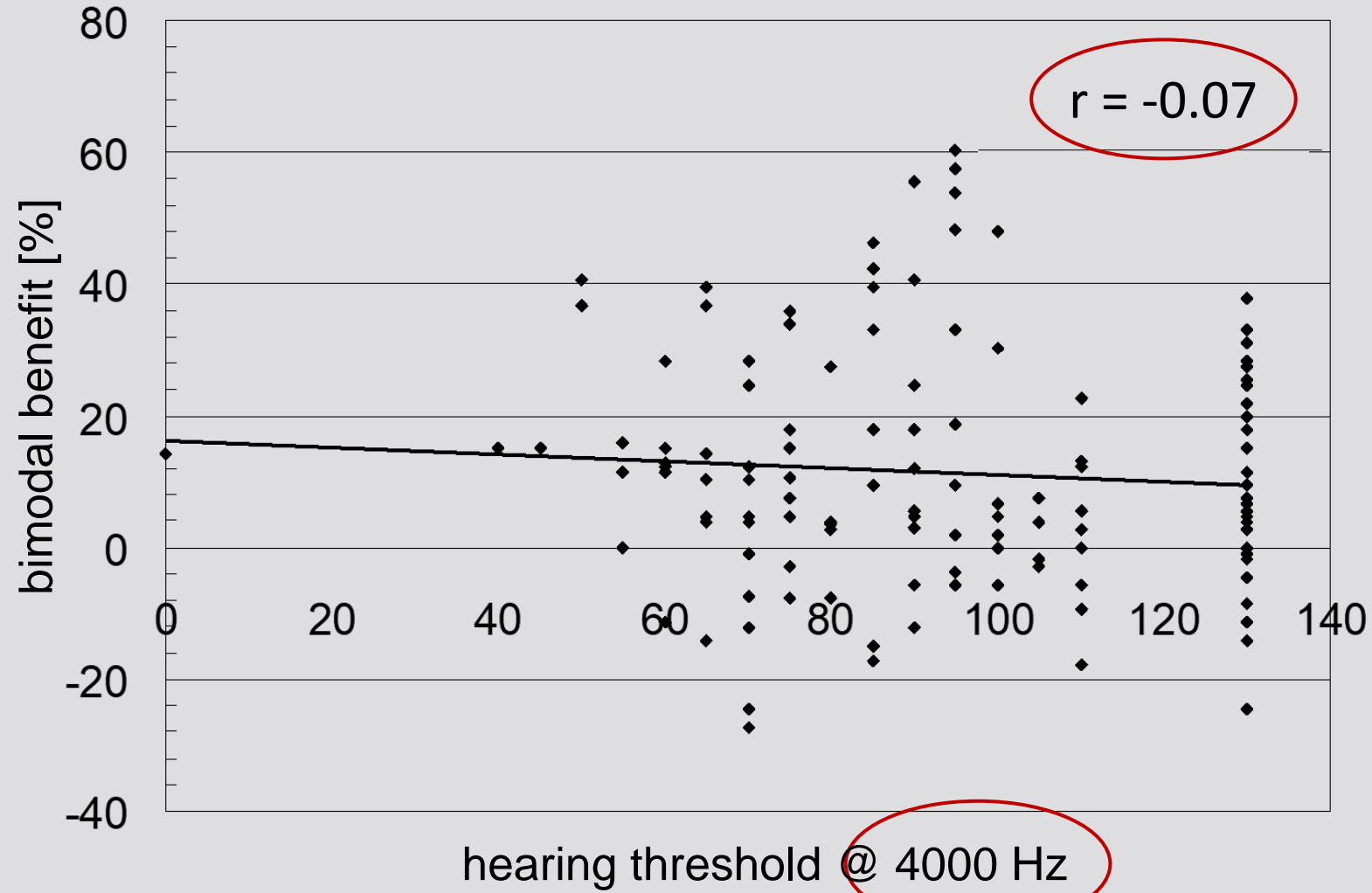


Illg et al. *Otol Neurotol.* 2014 Oct;35(9):e240-4.

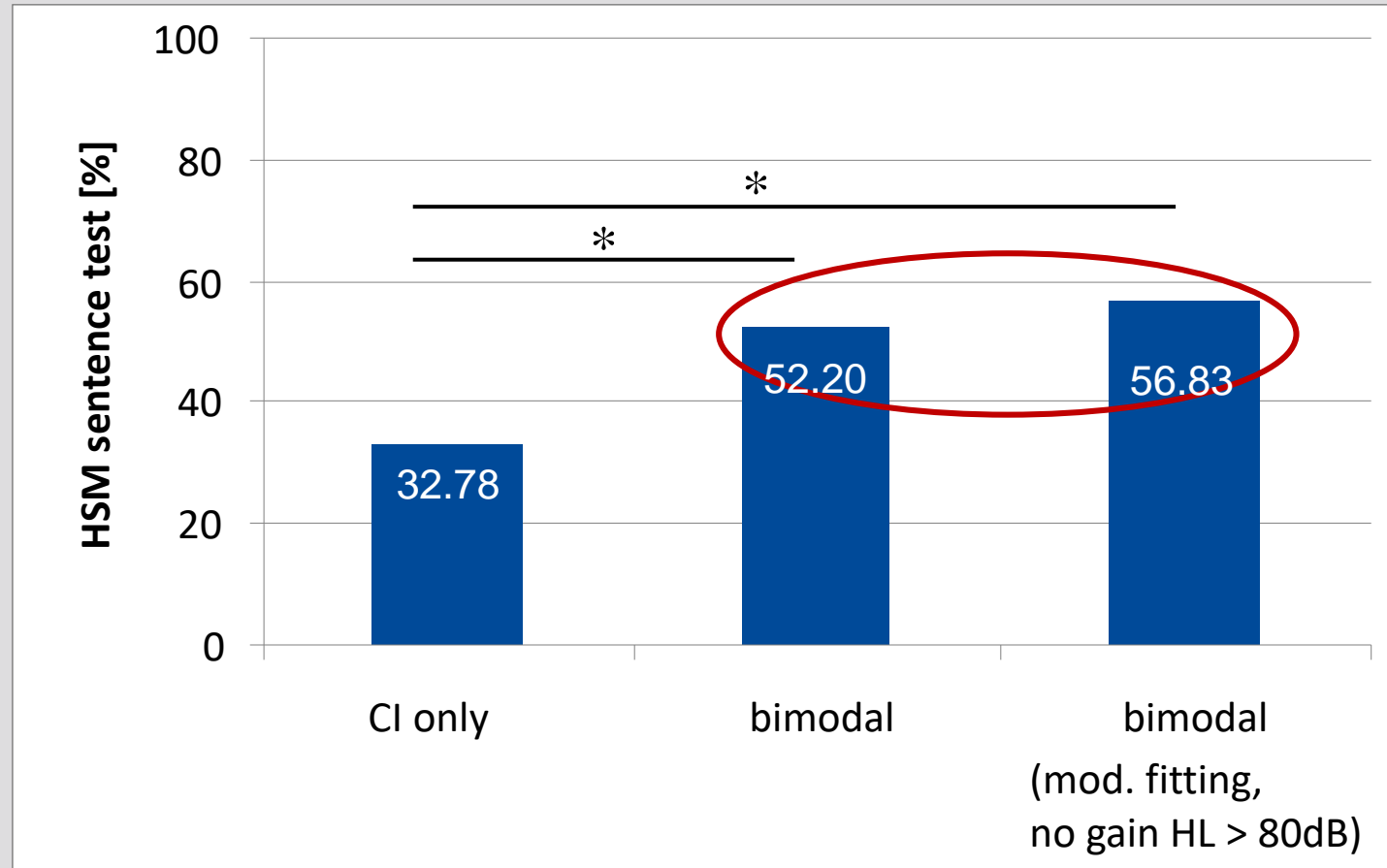
Low-freq. Hearing Loss vs. Bimodal Benefit



Low-freq. Hearing Loss vs. Bimodal Benefit



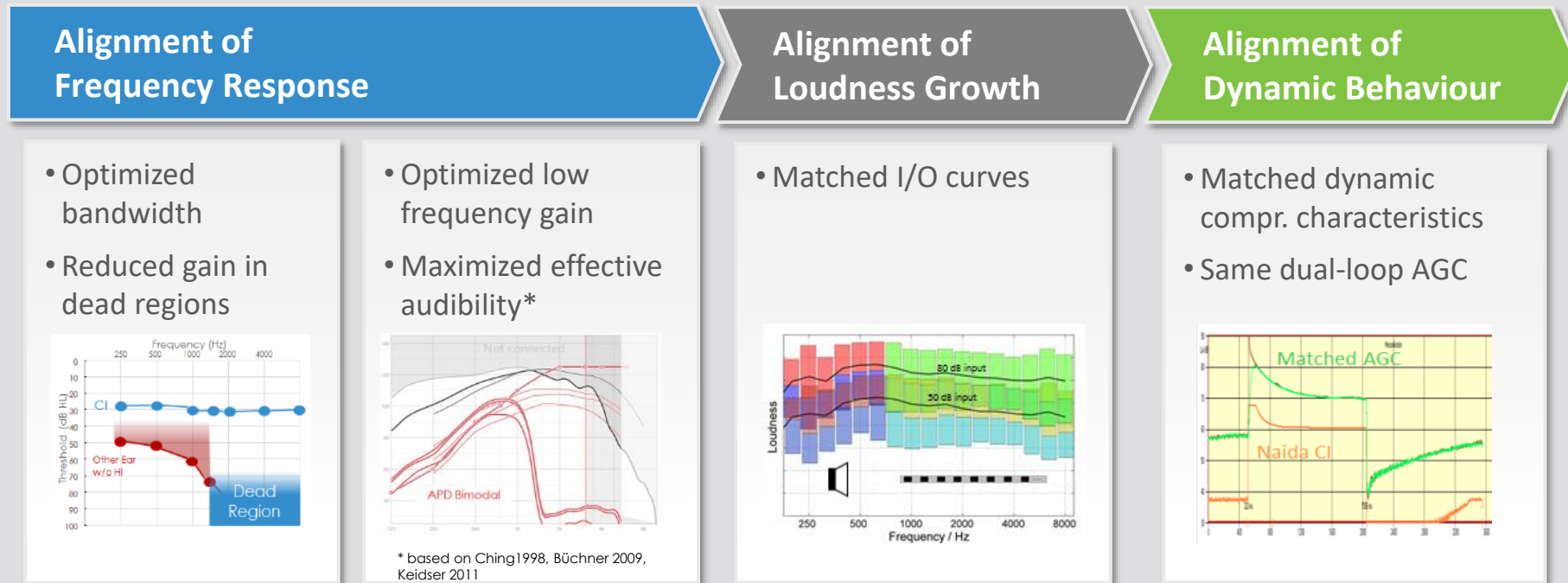
Modified Fitting Formula for Hearing Aids



Büchner A, Schüssler M, Battmer RD, Stöver T, Lesinski-Schiedat A, Lenarz T:
Impact of low-frequency hearing. Audiol Neurootol. 2009;14 Suppl 1:8-13

Adaptive Phonak Digital Bimodal Fitting Formula

Automatic calculation steps of the 1-click procedure:



Büchner A, Schüssler M, Battmer RD, Stöver T, Lesinski-Schiedat A, Lenarz T:
Impact of low-frequency hearing. *Audiol Neurootol.* 2009;14 Suppl 1:8-13

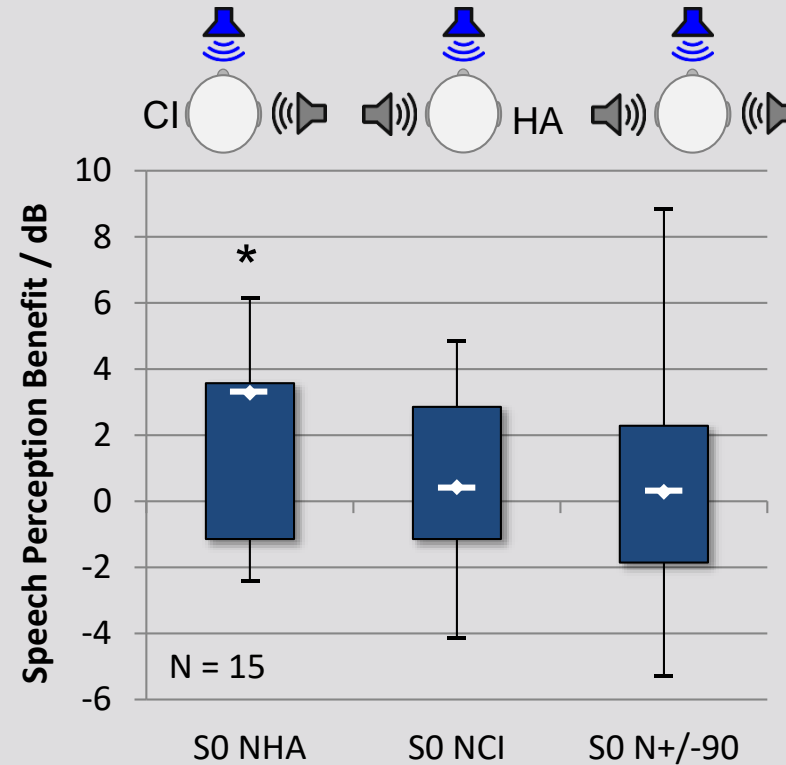
Speech Understanding in Multitalker Babble

- List, adaptive, 50% correct SRT
- Noise, 65dB, IFFM
- S_0N_{HA} , S_0N_{CI} , $S_0N_{+/-90}$
- Commercial AGC (syllabic) vs. aligned AGC with slow time constants

Improvement of speech understanding by 0.3 to 3.3dB in competing talker situations through aligned AGC settings.

Matching Automatic Gain Control Across Devices in Bimodal Cochlear Implant Users

Lidwien C. E. Veugen,¹ Josef Chalupper,² Ad F. M. Snik,³ A. John van Opstal,¹ and Lucas H. M. Mens³

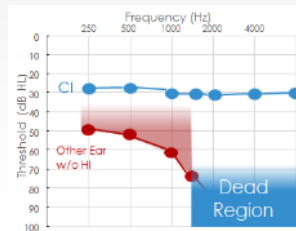


Adaptive Phonak Digital Bimodal Fitting Formula

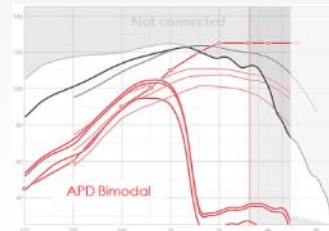
Automatic calculation steps of the 1-click procedure:

Alignment of Frequency Response

- Optimized bandwidth
- Reduced gain in dead regions



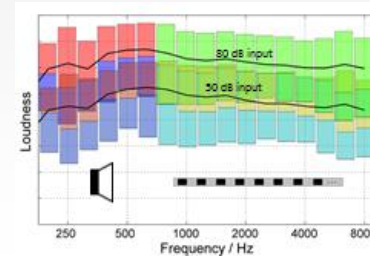
- Optimized low frequency gain
- Maximized effective audibility*



* based on Ching 1998, Büchner 2009, Keidser 2011

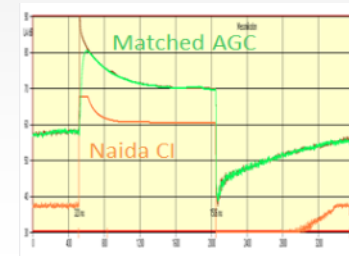
Alignment of Loudness Growth

- Matched I/O curves



Alignment of Dynamic Behaviour

- Matched dynamic compr. characteristics
- Same dual-loop AGC

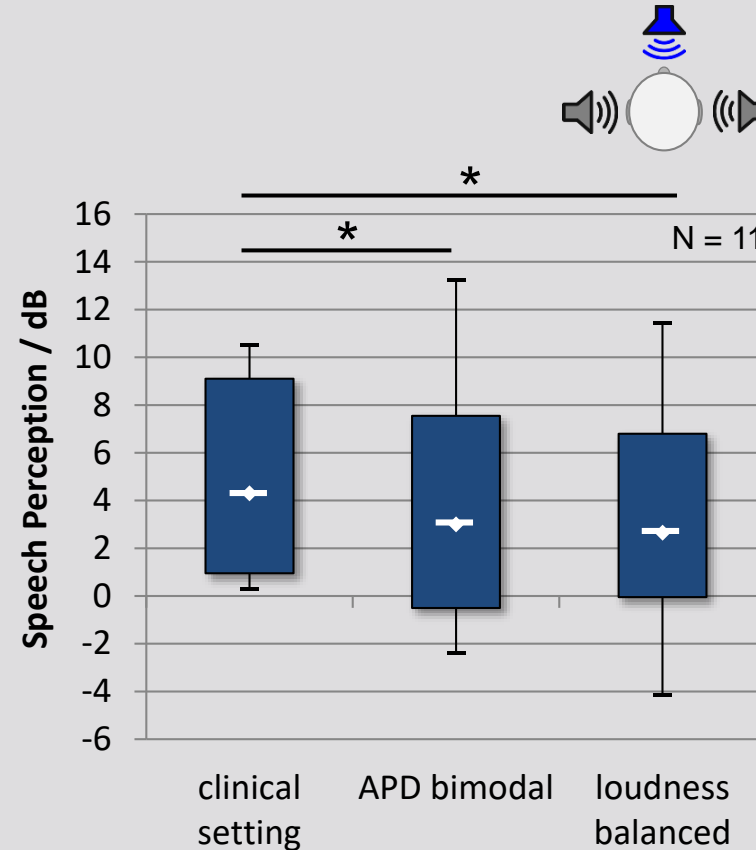


Büchner A, Schüssler M, Battmer RD, Stöver T, Lesinski-Schiedat A, Lenarz T:
Impact of low-frequency hearing. Audiol Neurootol. 2009;14 Suppl 1:8-13

Bimodal Fitting Formula & Naida Link HA

- OISa, adaptive, 50% correct SRT
- Noise, 65dB, IFFM
- $S_0N_{+/-90^\circ}$
- Clinical setting vs. bimodal fitting formula vs. loudness balanced fitting

Improvement of speech understanding by 1.3dB with bimodal fitting formula immediately after fitting.

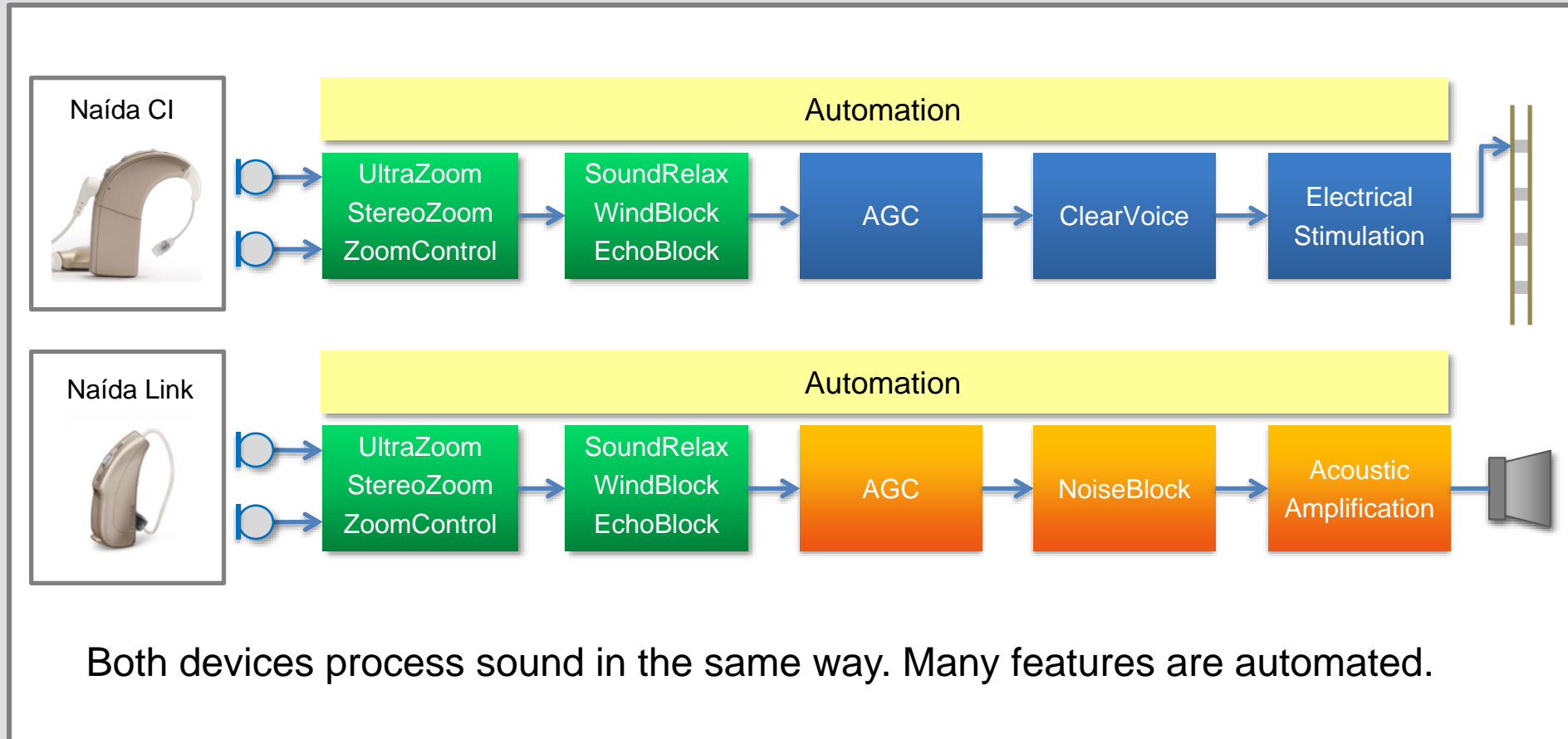


Bimodal Hearing Solution: Naída Link HA

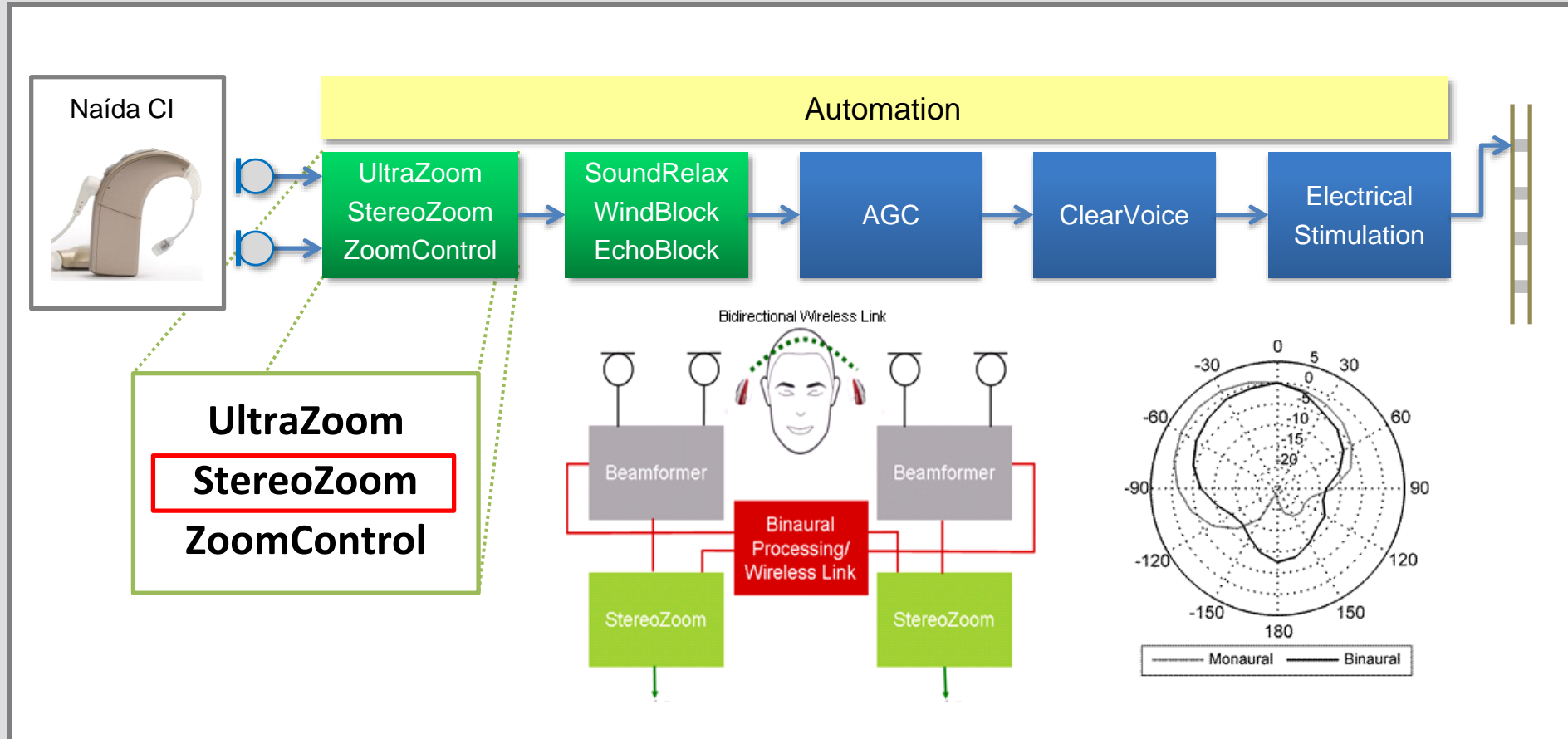
- New Phonak Naída Link hearing aid specially designed to work with the Naída CI Q70 and Q90
- Distinctive Bimodal Fitting Formula
- Shared Front-End Processing and Automation
- Shared Controls (QuickSync)
- Bimodal wireless solutions
- Ear-to-Ear Audio Sharing (Binaural VoiceStream Technology™)



Shared Front-end and Processing



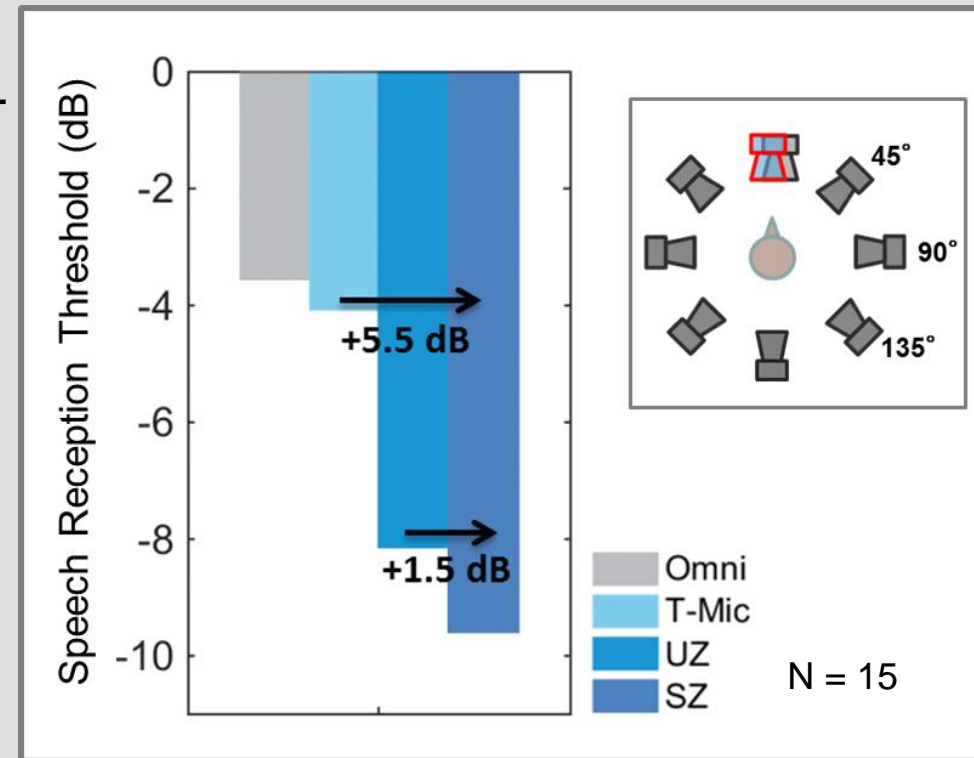
Shared Front-end and Processing



Bilateral StereoZoom (Binaural Beamformer)

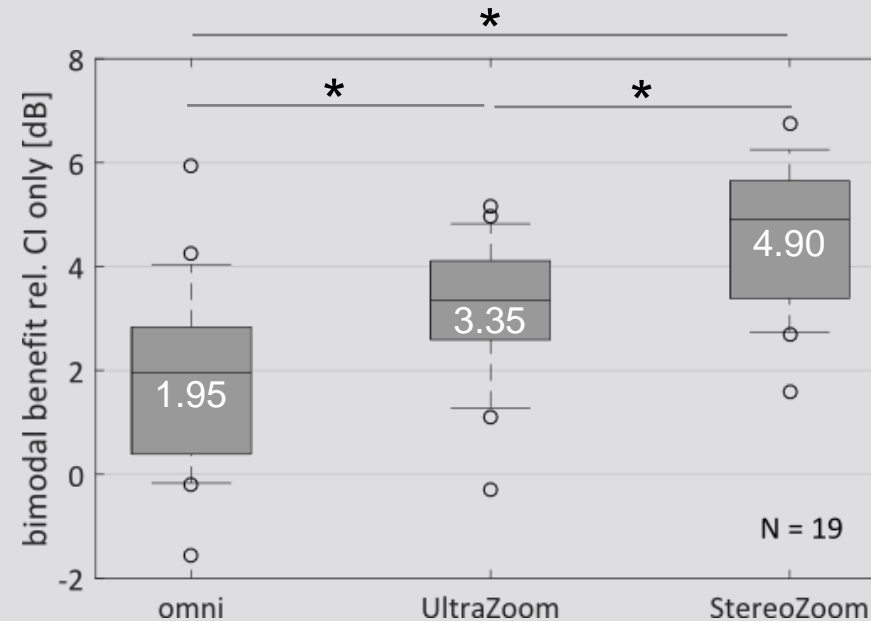
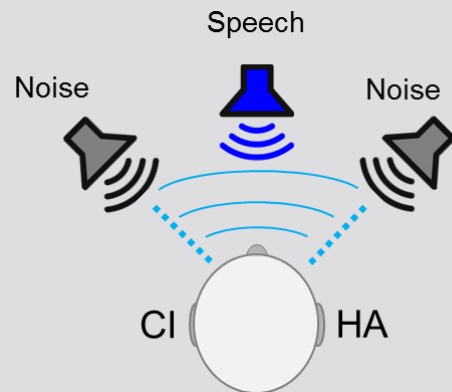
- OISa, adaptive, 50% correct SRT
- Noise, 65dB, stationary
- $S_0N_{45^\circ-360^\circ}$
- BTE mic vs. T-Mic vs. UltraZoom vs. StereoZoom

Improvement of speech understanding by 5.5dB with StereoZoom.



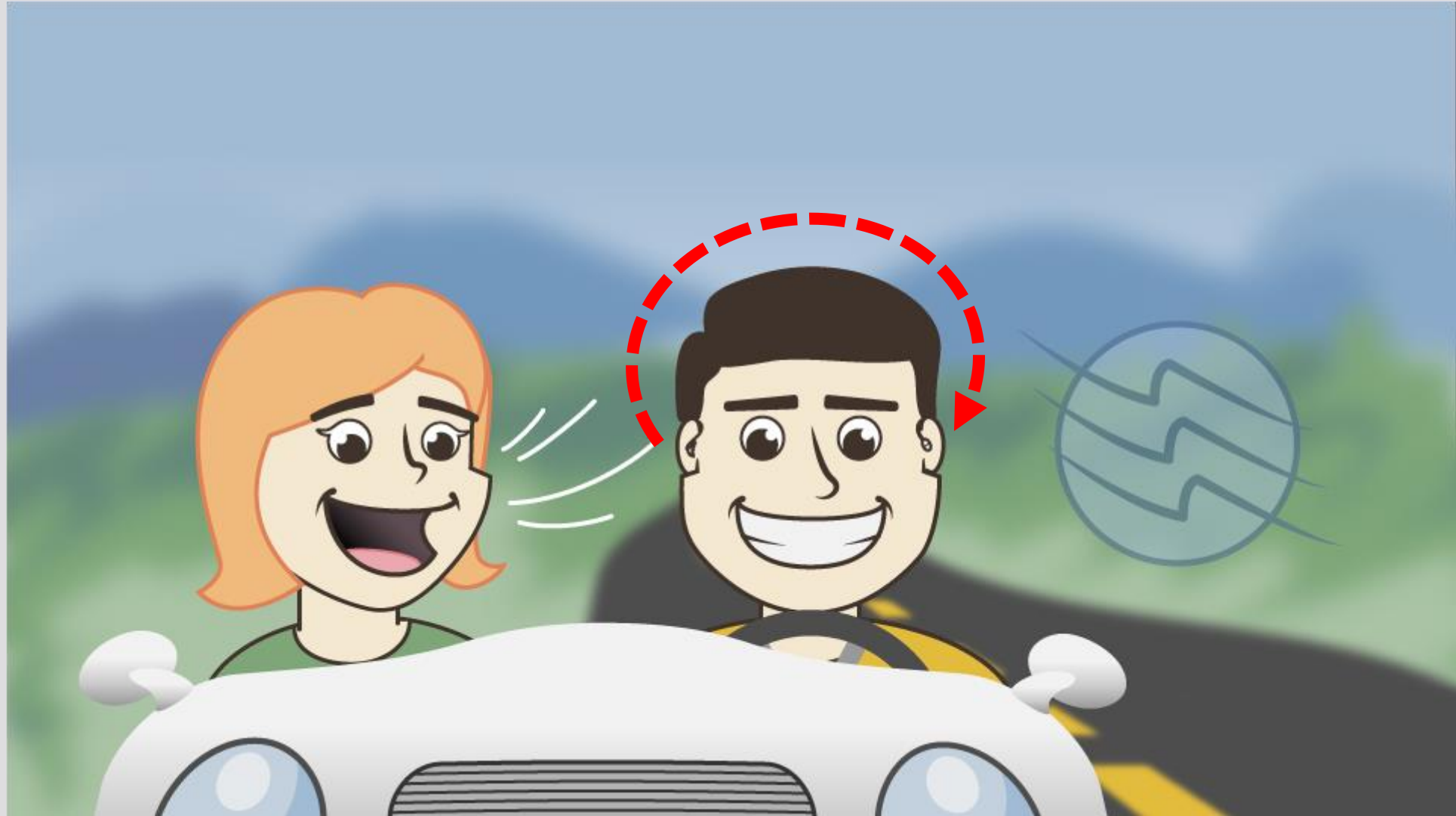
Bimodal StereoZoom (Binaural Beamformer)

- OISa, adaptive, 50% correct SRT
- Noise, 65dB, OINoise
- $S_0N_{+/-45^\circ}$
- Omni vs. UltraZoom vs. StereoZoom



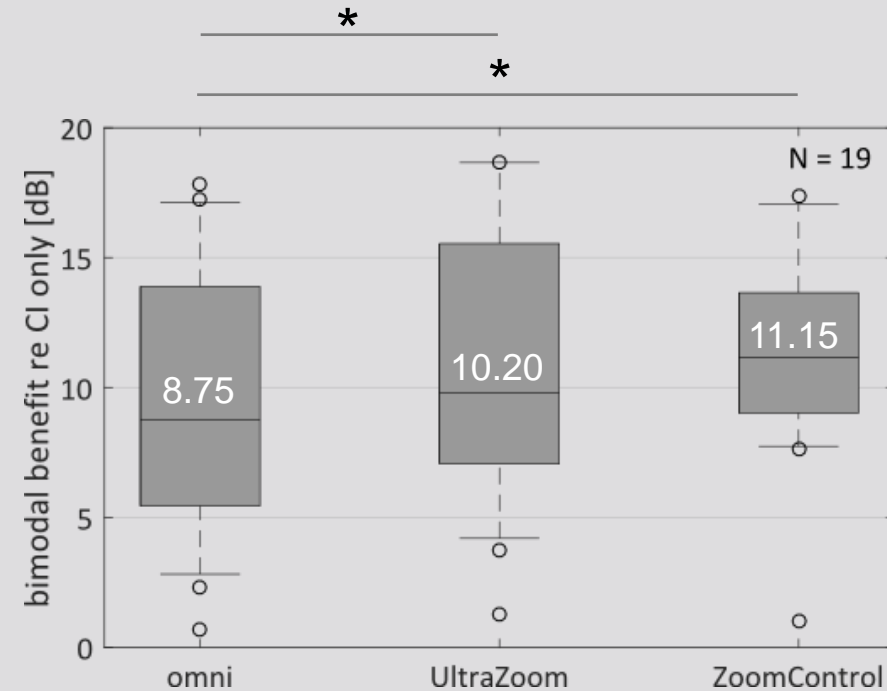
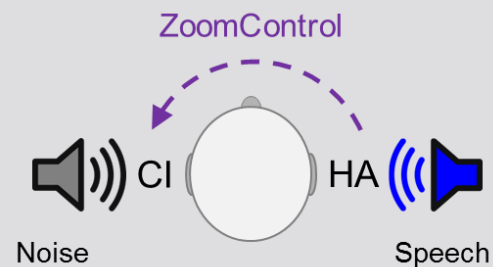
Improvement of speech understanding by 3.0dB with StereoZoom.

ZoomControl: Ear to Ear audio streaming



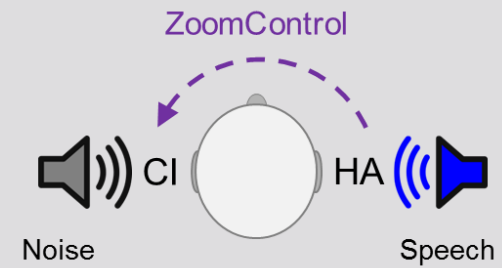
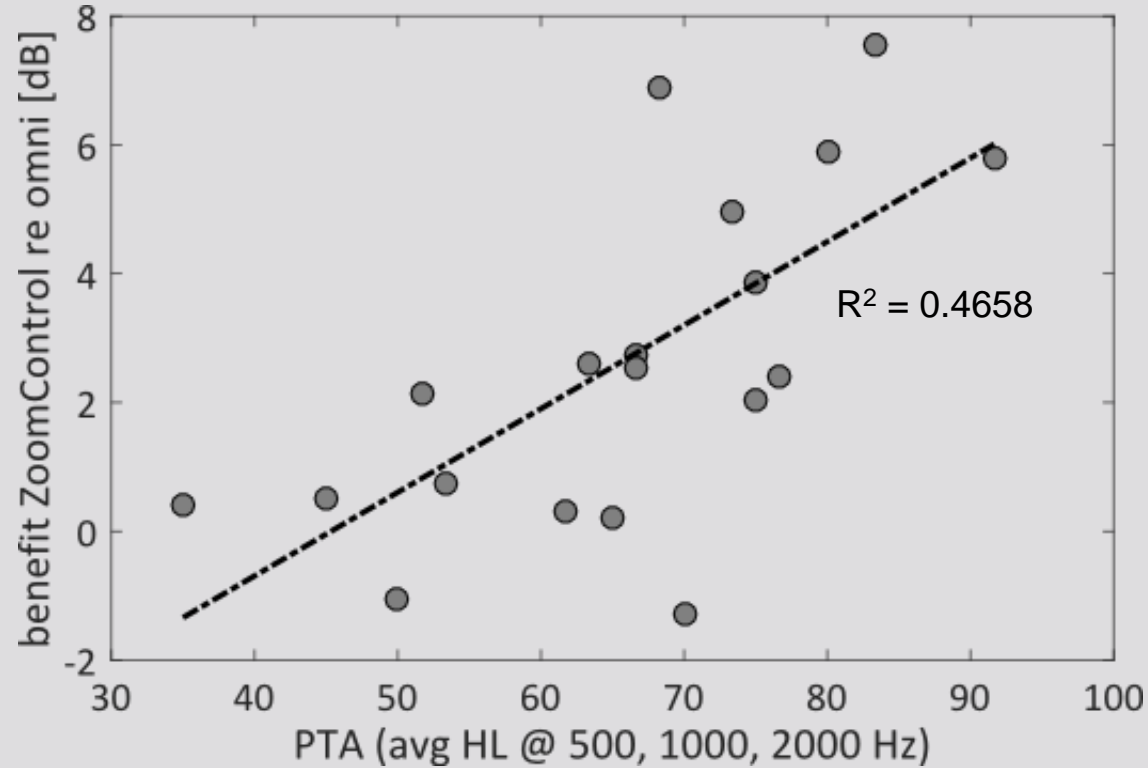
Bimodal ZoomControl (Streaming of Audio Signal)

- OI_{SA}, adaptive, 50% correct SRT
- Noise, 65dB, OI_{Noise}
- $S_{HA} N_{CI}$
- Omni vs. UltraZoom vs. ZoomControl

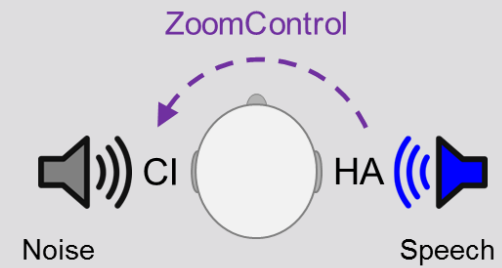
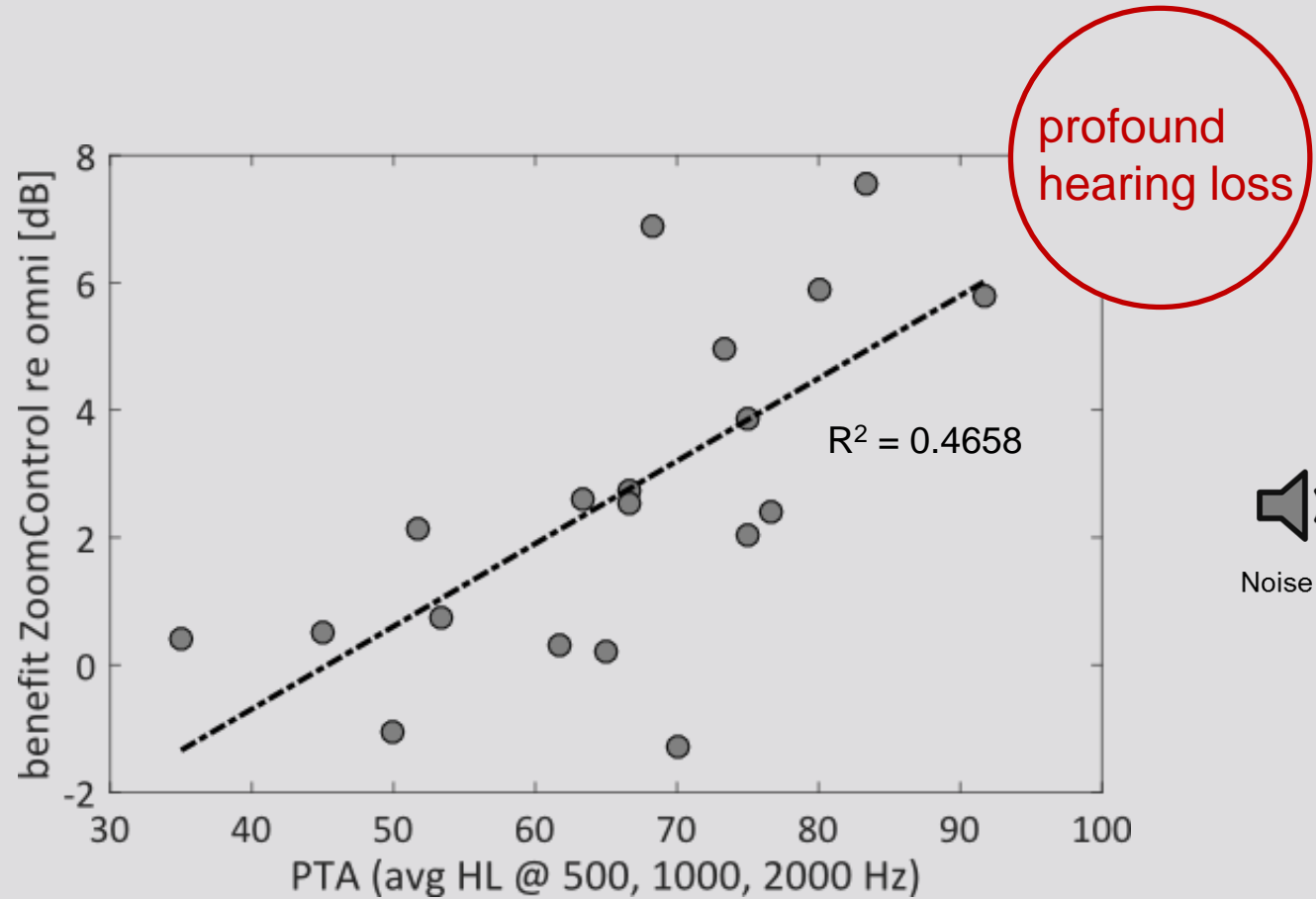


Improvement of speech understanding by 2.4dB with ZoomControl.

Bimodal ZoomControl (Streaming of Audio Signal)



Bimodal ZoomControl (Streaming of Audio Signal)



Summary

- Significant increase in performance in adverse listening conditions when using a second hearing device
- Group of unilateral CI users with aidable contralateral hearing continuously growing: special bimodal hearing solutions required
- Aligned “one click” fitting procedure does give at least comparable hearing performance and is extremely time saving
- Wireless streaming technologies (StereoZoom, ZoomControl) lead to additional benefits in speech perception outcomes in challenging listening situations and work across all device combinations