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

NUMBER OF BIMODAL PATIENTS [%]


20.0 22.0 24.5 33.0 46.0 60.5 68.0 75.0

MHH database

275 % growth
Advantages of Bimodal Hearing

Benefit of Bimodal Hearing

r = -0.25*

Low-freq. Hearing Loss vs. Bimodal Benefit
Low-freq. Hearing Loss vs. Bimodal Benefit

$r = -0.07$

bimodal benefit [%] vs. hearing threshold @ 4000 Hz
Modified Fitting Formula for Hearing Aids

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

**Alignment of Loudness Growth**
- Optimized low frequency gain
- Maximized effective audibility*

**Alignment of Dynamic Behaviour**
- Matched I/O curves
- Matched dynamic compr. characteristics
- Same dual-loop AGC

*B based on Ching1998, Büchner 2009, Keidser 2011

Speech Understanding in Multitalker Babble

- List, adaptive, 50% correct SRT
- Noise, 65dB, IFFM
- $S_0 N_{HA}$, $S_0 N_{CI}$, $S_0 N_{+/-90}$
- 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.
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

### Alignment of Loudness Growth
- Optimized low frequency gain
- Maximized effective audibility* 

### Alignment of Dynamic Behaviour
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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™)
Both devices process sound in the same way. Many features are automated.
Shared Front-end and Processing

UltraZoom
StereoZoom
ZoomControl

UltraZoom
StereoZoom
ZoomControl

SoundRelax
WindBlock
EchoBlock

AGC
ClearVoice
Electrical Stimulation

Bi-directional Wireless Link

Beamformer

StereoZoom
StereoZoom
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)

- OLSa, adaptive, 50% correct SRT
- Noise, 65dB, OLNoise
- $S_0 N_{+/45^\circ}$
- 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)

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

**Improvement of speech understanding by 2.4dB with ZoomControl.**
Bimodal ZoomControl (Streaming of Audio Signal)

R² = 0.4658
Bimodal ZoomControl (Streaming of Audio Signal)

\[ R^2 = 0.4658 \]

profound hearing loss
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