

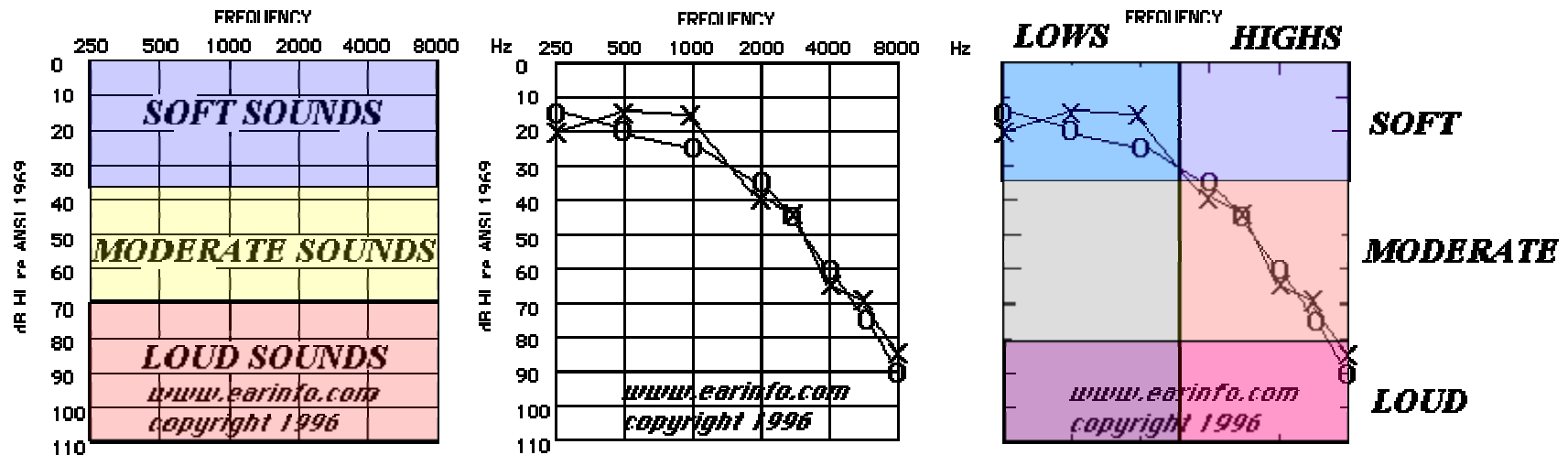
# An insight into audiology and hearing loss

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Audiology

# Insight into audiology and hearing loss

- On terminology and hearing loss
- State-of-the art-fittings: Current solutions
- Re-thinking audiology: a new approach for the mild losses

# Hearing loss classification



- Common classifications of hearing impairment include mild (21-40 dB), moderate (41-60 dB), moderate-severe (61-70 dB), severe (71-89 dB), and profound (90+ dB)

## State-of-the-art fittings: Current solutions

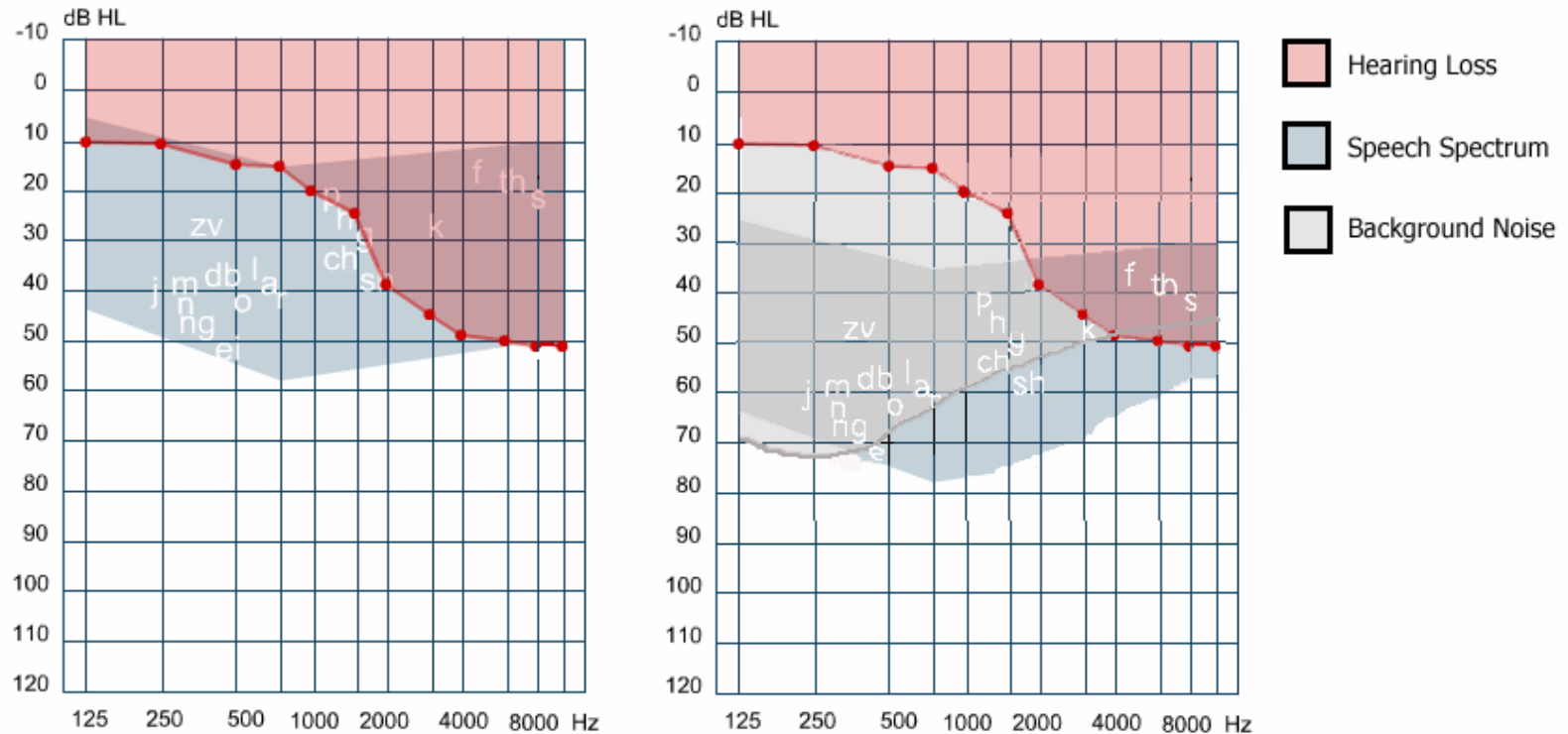
- **First digital aids introduced 10 years ago:**
  - The new promise: programmability, flexibility, directionality, noise cancellation, feedback-handling and first “open” solutions...
  - But: Focus has been on DAMAGE CONTROL and solutions are still based on “classical” hearing loss correction model (for moderate, severe and profound losses)
  - Hearing aids up until now were designed to provide audibility/ loudness compensation/normalization for all listening environments
  - ... And if the cure is worse than the pain...

## A new approach for the mild losses

- Higher expectations and demands with “first-timers”
  - Higher communication requirements
  - Familiar with advanced gadgets
  - Do not know about occlusion effect...
  - ‘Normal’ hearing... They do not accept “hearing loss correction” or audible draw-backs...

# A new approach for the mild losses

- I hear, but I don't understand...



# A new approach for the mild losses

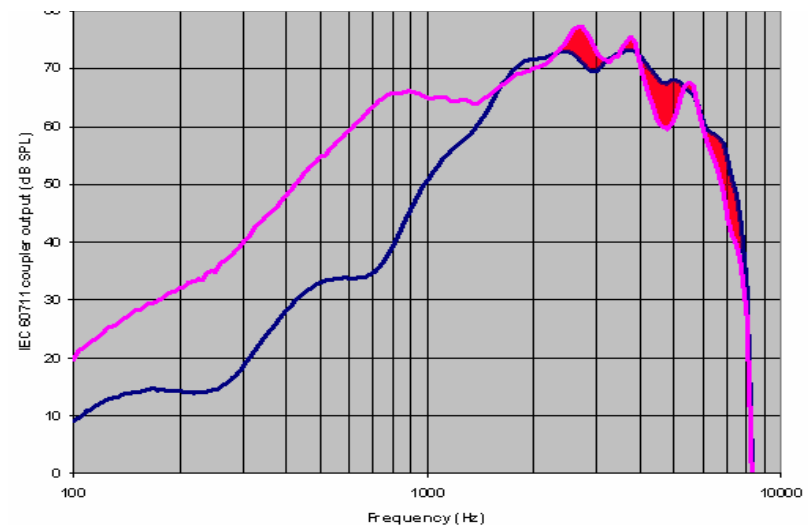
- Prerequisites for a successful fitting:
  - Focus on clarity enhancement
  - Transparency in most situations... no noise!
  - Cosmetics!
  - Best possible delivery of sound to the ear canal (SQ)
  - Enhanced bandwidth
  - Directional microphone benefit
  - Noise management that assures that speech is not removed

# Delta: A new approach for the mild losses

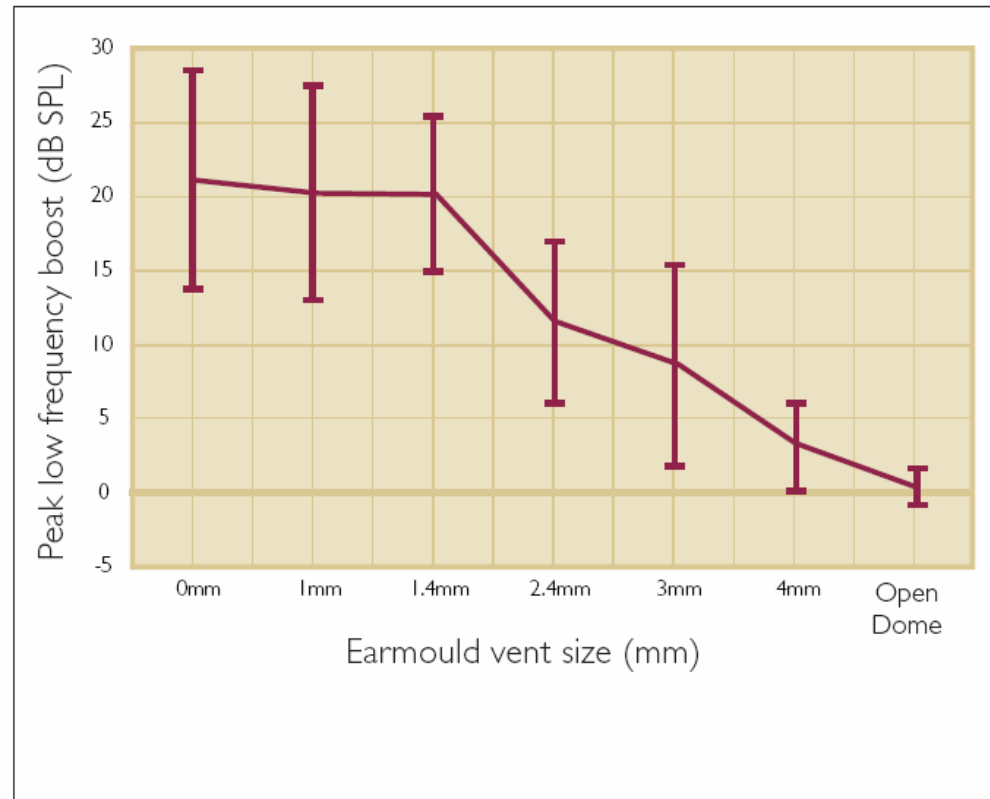


- **RITE: The best of two worlds**

- Open fitting
- Easy to handle
- Flat response (no resonances)
- Excellent sound quality
- Enhanced bandwidth
- Cosmetically very attractive

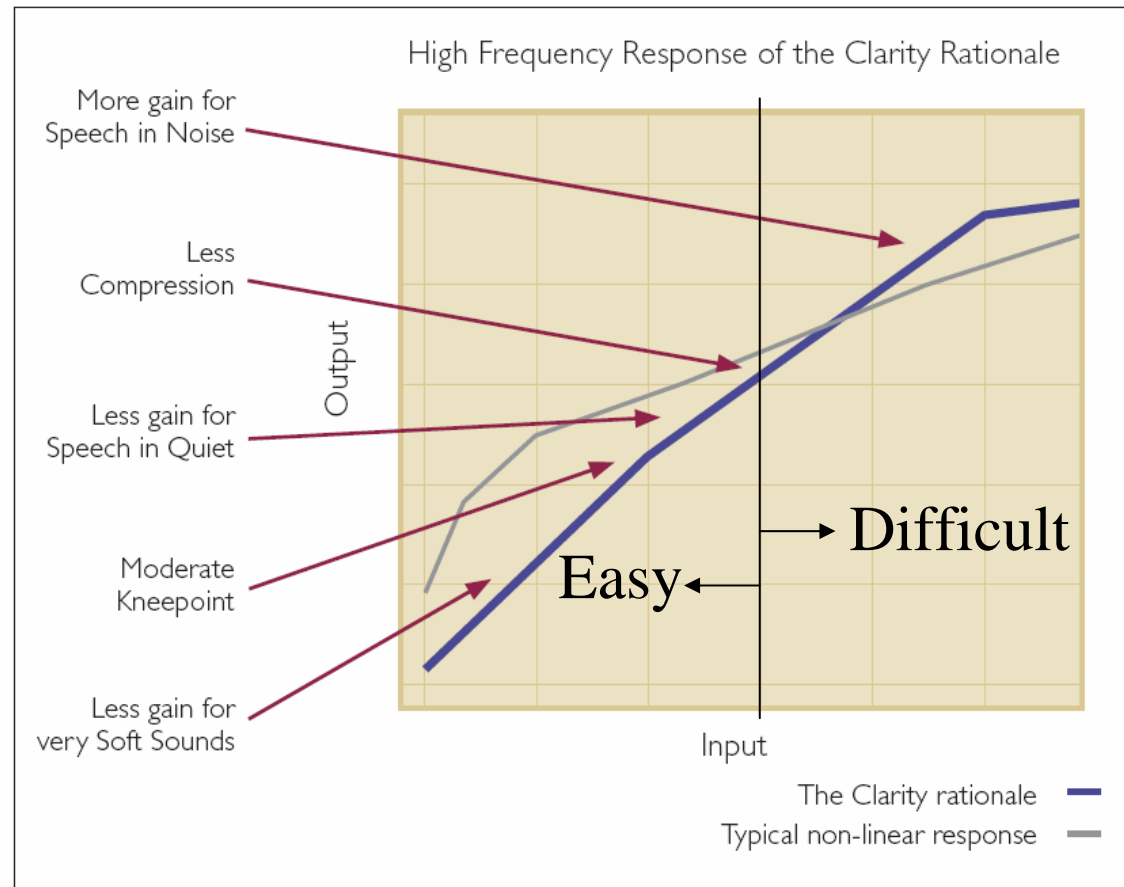


# Open fitting = No occlusion



*Figure 5. Open ear responses from different vent diameters, indicating that the OpenDome has the same response as a totally open ear canal.*

# Re-thinking audiology: Clarity rationale



*Delta's Clarity rationale vs. a typical non-linear response.*

*Capital Market Day, 28 March 2006*

# Re-thinking audiology: Clarity rationale

- Amplification for speech understanding, not just hearing loss correction

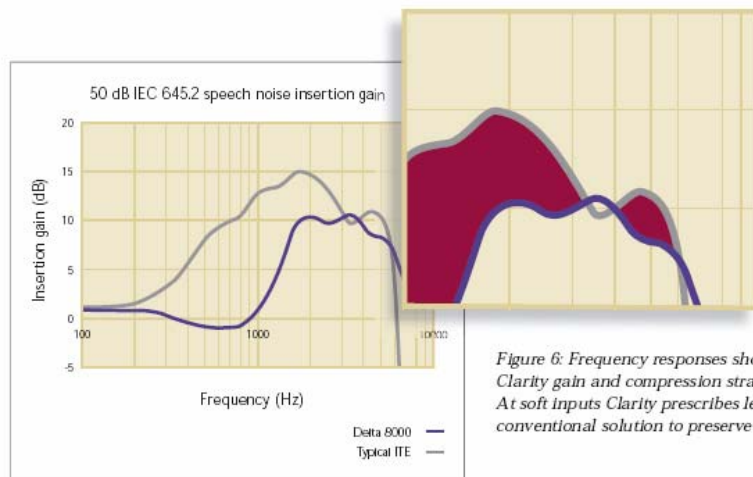


Figure 6: Frequency responses showing the unique Clarity gain and compression strategy in Delta. At soft inputs Clarity prescribes less gain than a conventional solution to preserve comfort.

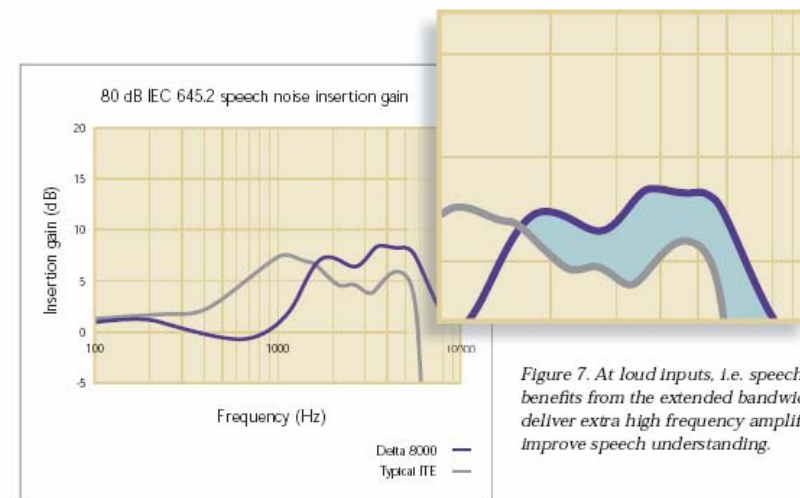
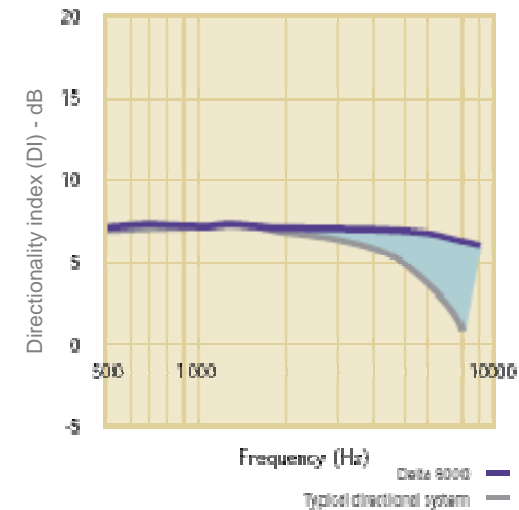
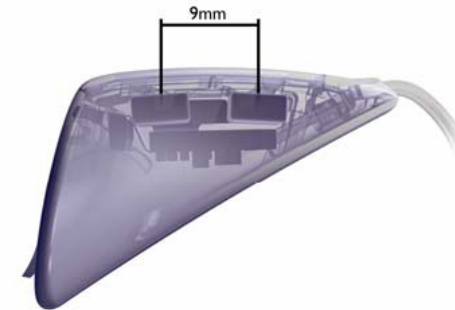


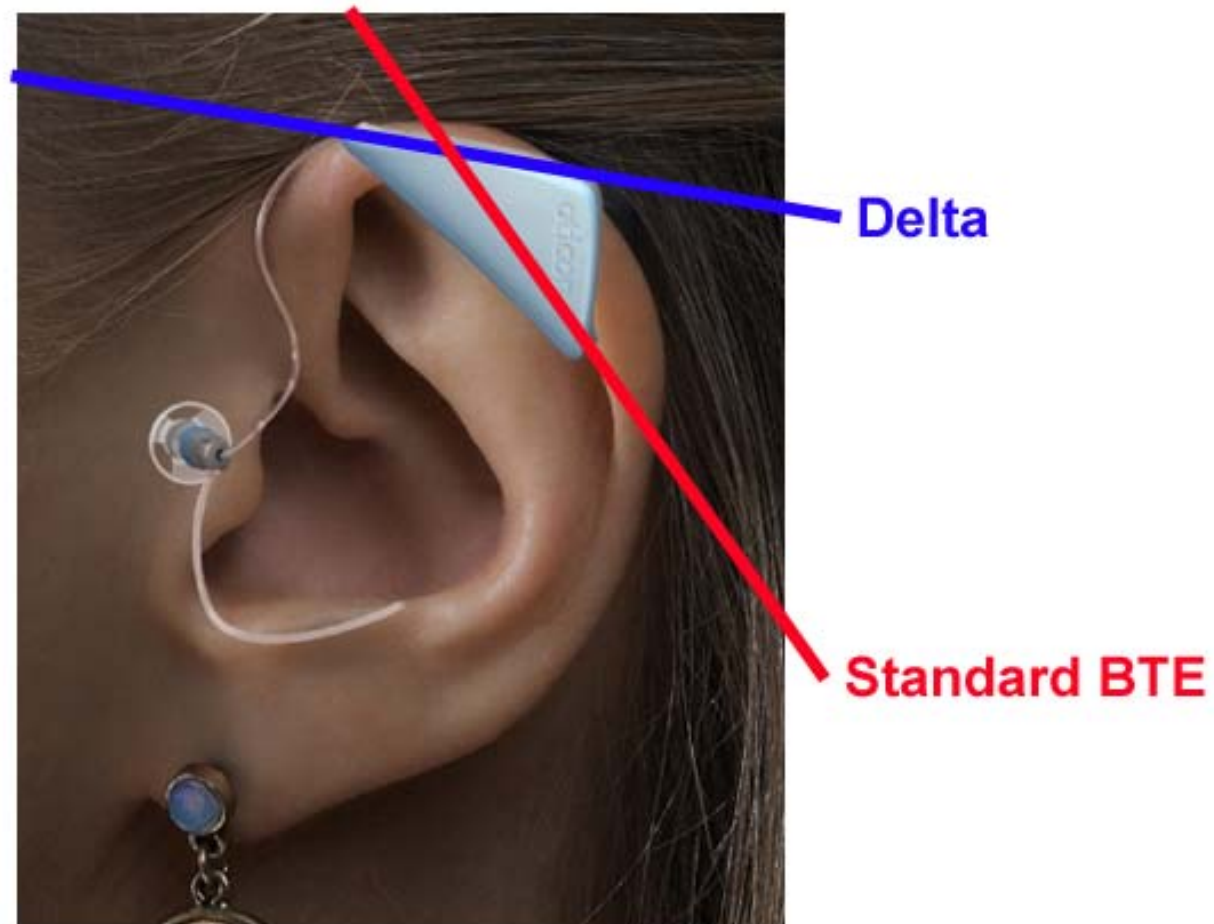
Figure 7: At loud inputs, i.e. speech in noise Clarity benefits from the extended bandwidth in Delta to deliver extra high frequency amplification to improve speech understanding.

# Delta: Tailor-made directionality

- Best way to improve speech in noise
- Most advanced solution – no compromise
- Optimal design for directionality
  - Two microphones
  - Port space for HF dir
  - Right direction
  - No LF noise



## Importance of horizontal directional angle



# Delta RITE: Welcome to the future



- And all of this shows why Delta is not just a micro Syncro!

# Directionality

Benchmark: Open solution from competitor



Figure 9: The Delta design ensures a horizontal placement of the two microphones

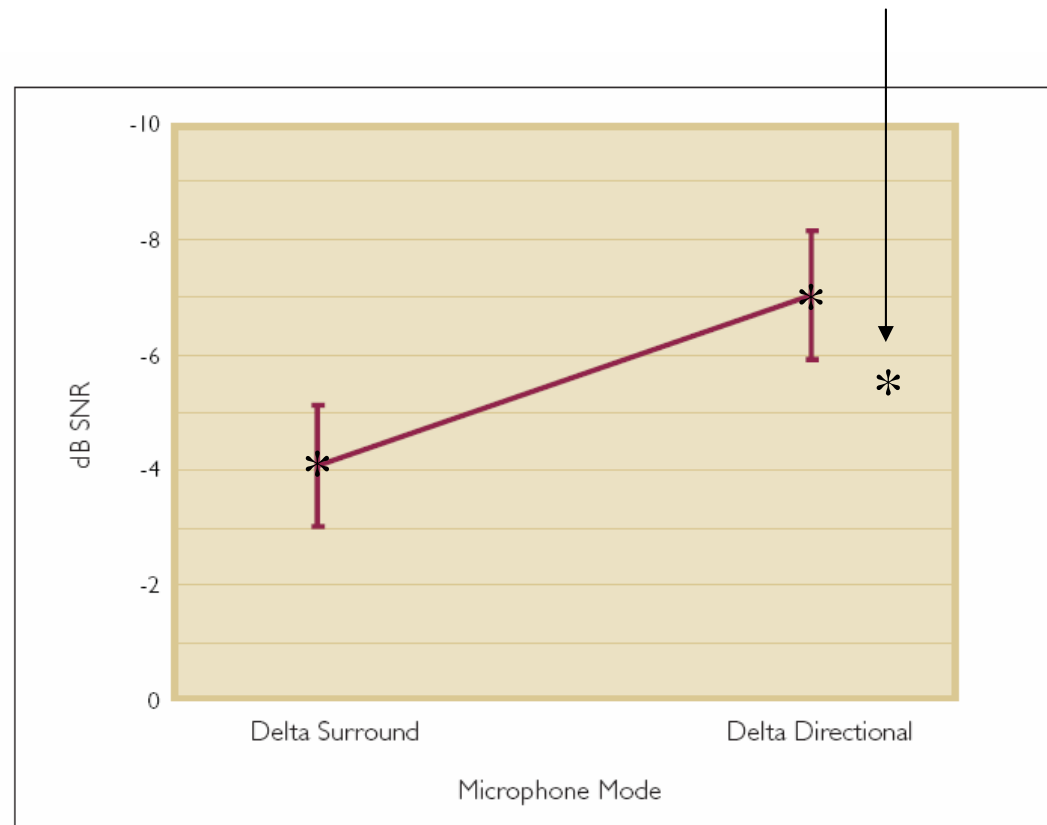
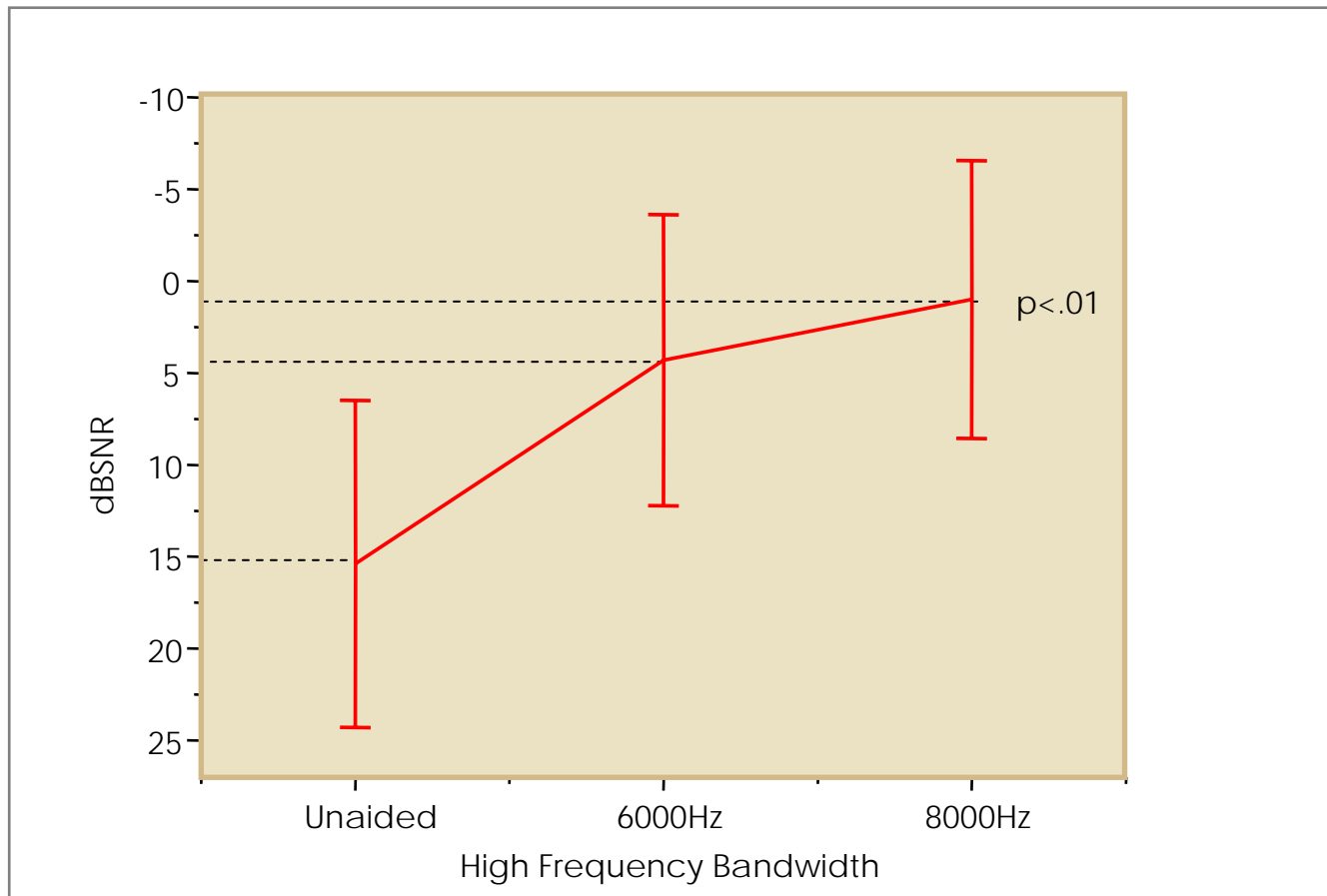
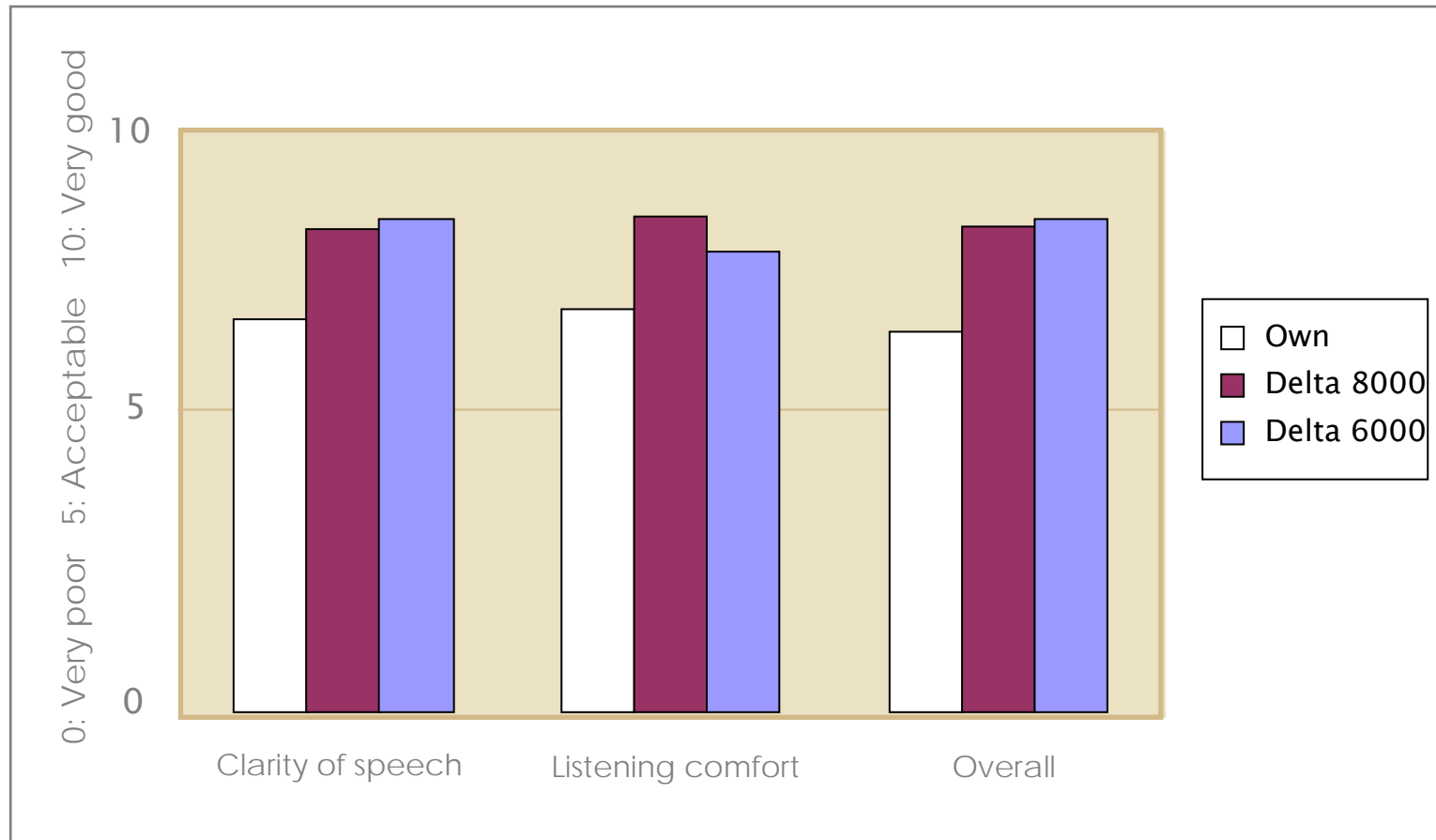


Figure 11. Results from the Dantale-II speech perception test in noise. Showing the significant directional benefit the participants received with the Delta hearing instruments.

# Bandwidth effect: Consonant perception

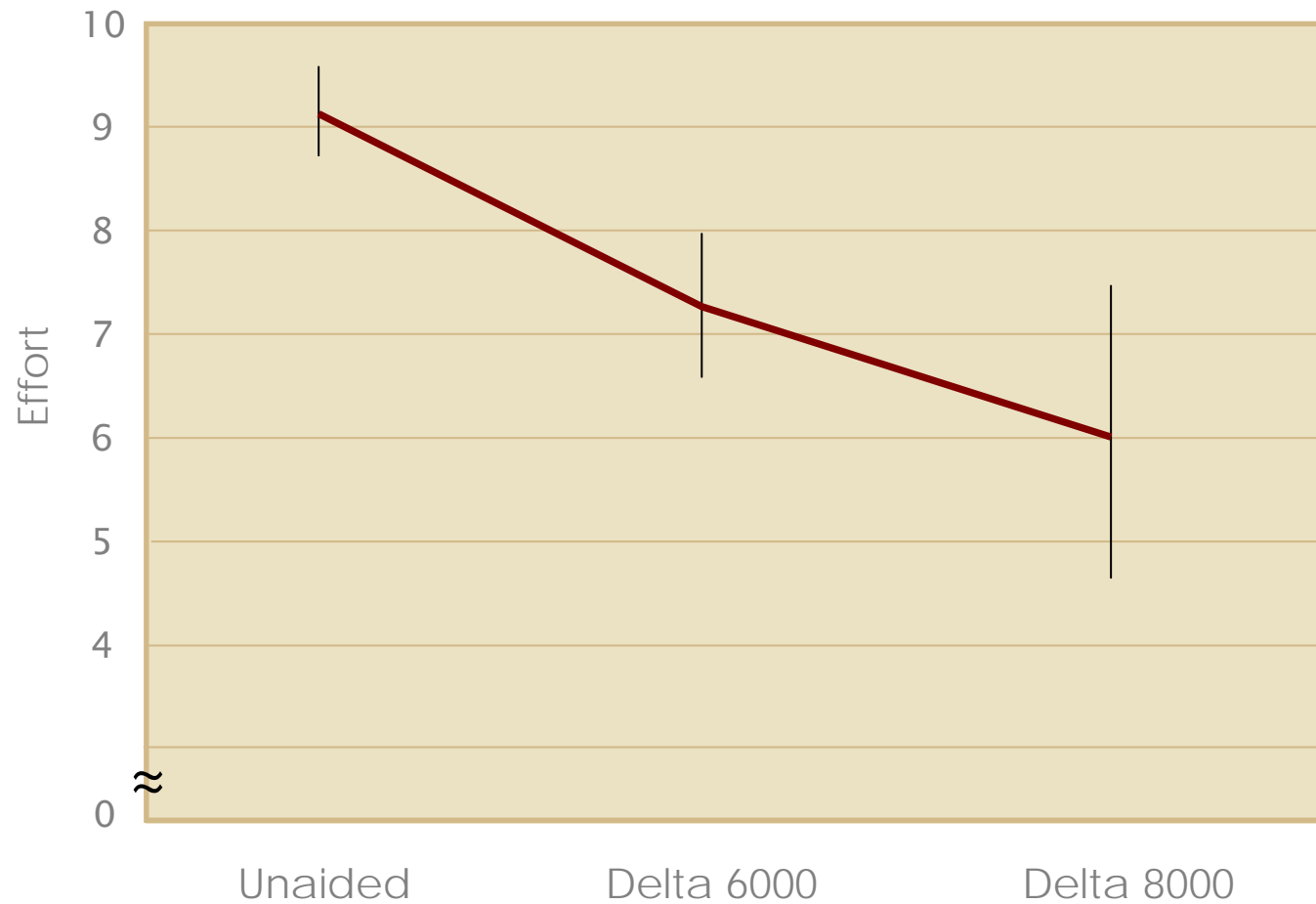


# Overall performance scores

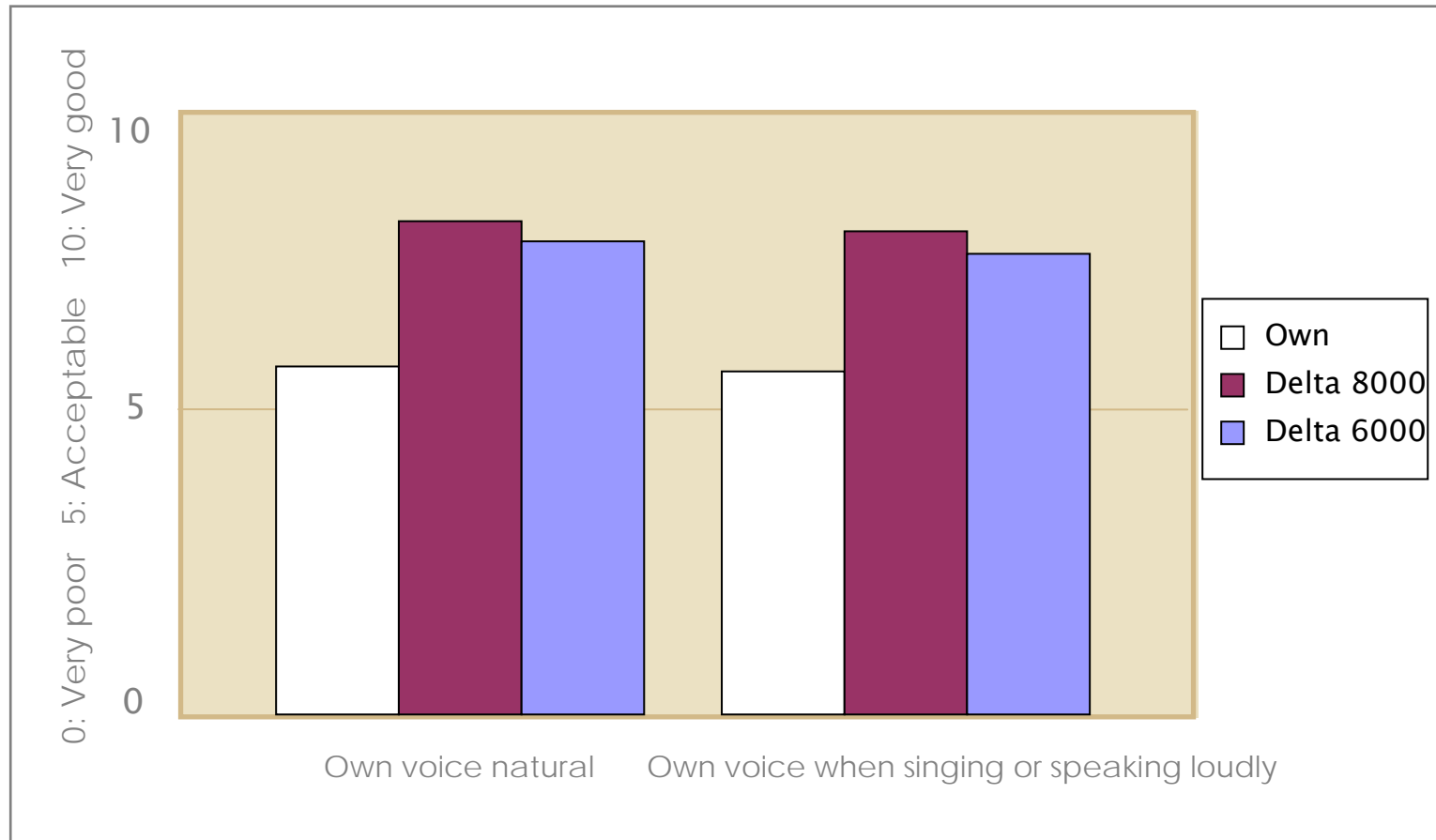


All test subjects were happy with their own HA, but still they experienced an improvement with Delta in relation to own HA.

# How much effort does it take to listen?



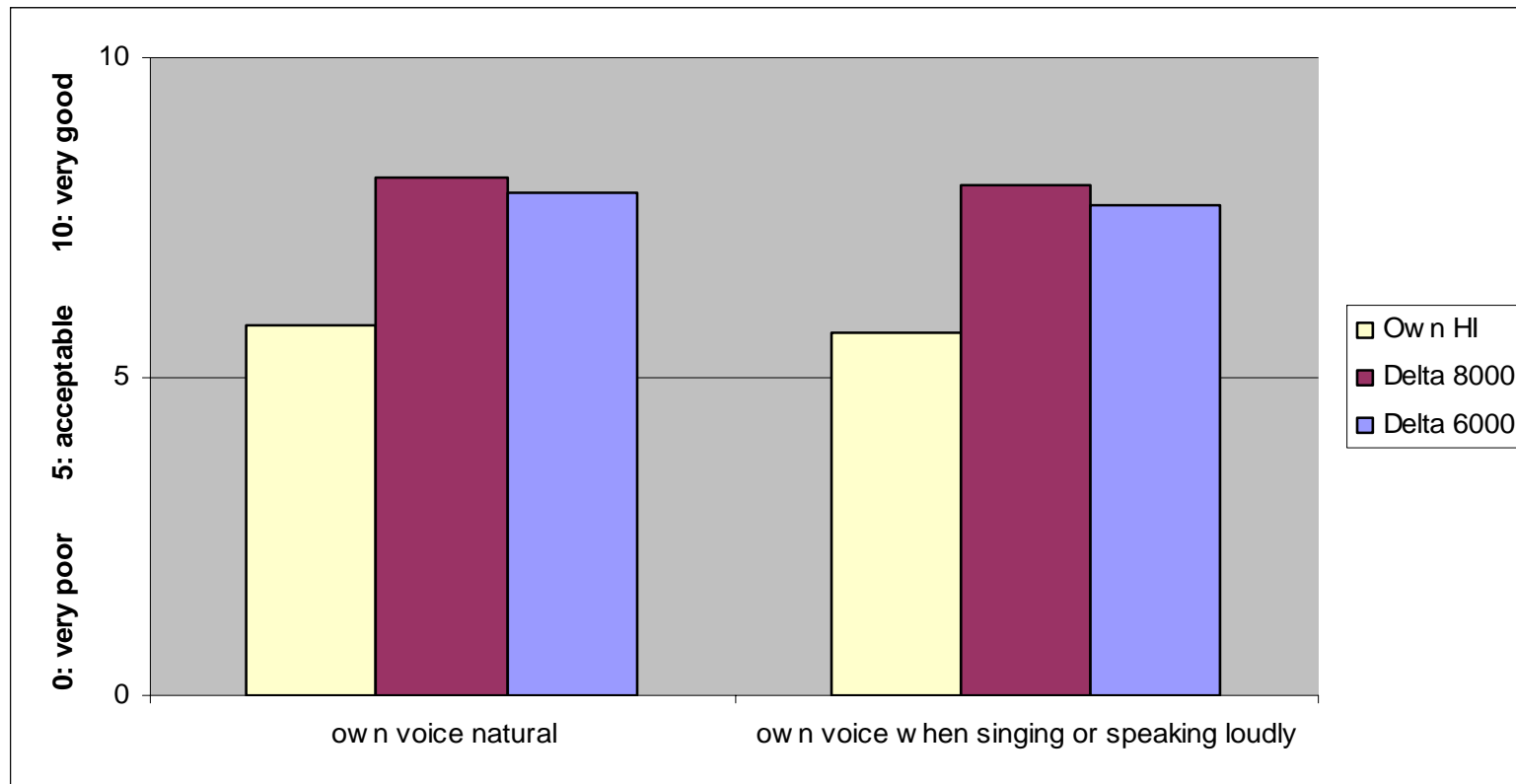
# Own voice



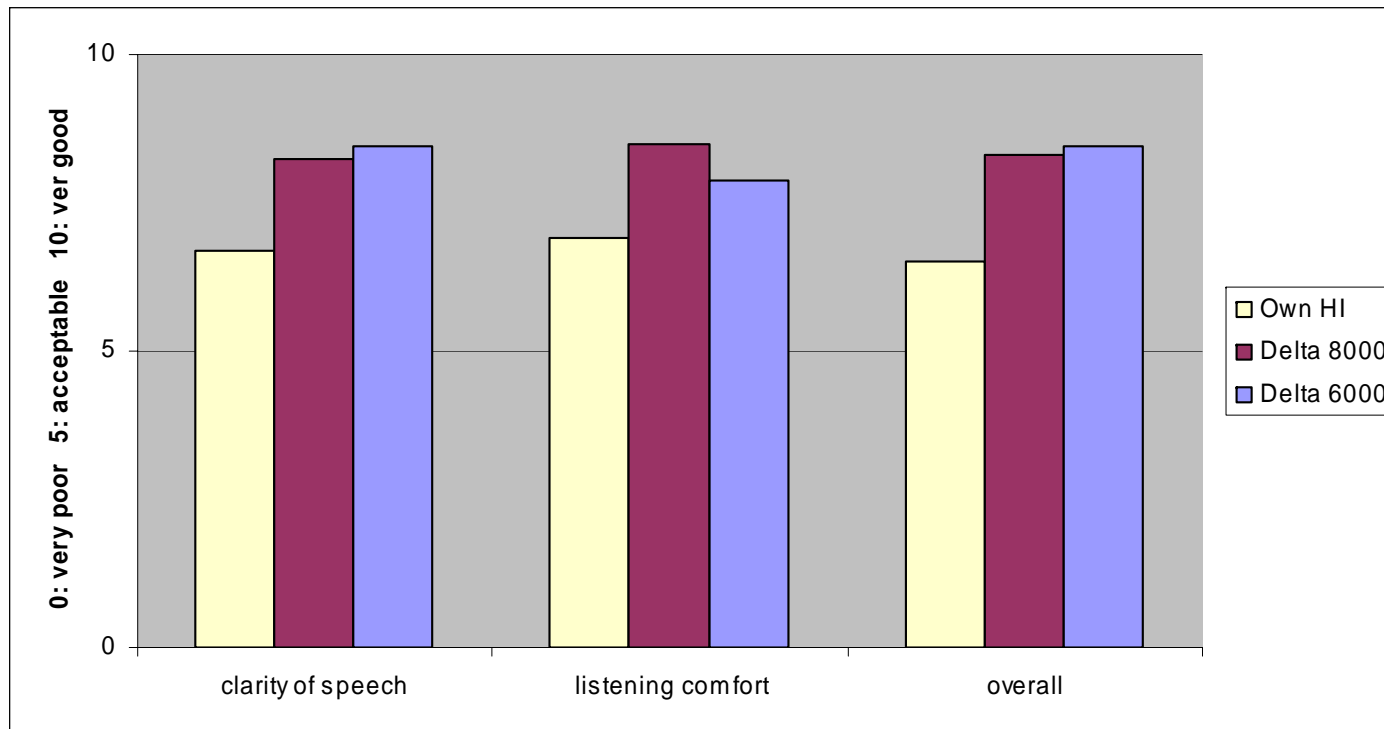
## What our test subjects experienced...

- ~80% of the test subjects (experienced users) preferred Delta to their own HA, because:
  - Better speech understanding in noise (~50% test subj.)
  - Physically more comfortable to wear and easier to handle (~50% test subj.)
  - No occlusion and own voice sounds more natural (~30% test subj.)
  - Better sound quality (~30% test subj.)
  - Cosmetic reasons (~30% test subj.)
- Very good initial acceptance amongst new users!
  - All decided to use Delta after the test

# Own voice



# Overall performance scores



All test subjects were happy with their own HA, but still they experience an improvement with Delta in relation to own HA.

## How much effort does it take to listen?

