

Supero: *Pointing in the right direction.*

Directional benefits for severe-to-profound hearing loss demonstrated.

Summary

Results from a recently published study¹ demonstrate the benefits of **Supero's** unique directional microphone technology, the Power AudioZoom, for subjects with severe-to-profound hearing loss. Improvements in speech-in-noise intelligibility were found at several Signal-to-Noise Ratios (SNRs), both in auditory only and in audiovisual test conditions. Following former studies^{2,3}, these new results reinforce the assertion that appropriate directional technology can be of significant help for Power instruments users also.

Introduction

The introduction of directional mics has participated in the commercial success of digital hearing aids (HAs) and ranks highly in user benefit and satisfaction with digital HAs. However, there are still particular hearing loss (HL) configurations for which the benefits of directionality are questioned. For example, the benefits of directional mics for open-fitting HAs were recently addressed⁴ and directional advantages were identified when the appropriate technology was employed. Along the same line, the potential benefit of directionality for people with severe-to-profound HL is often debated.

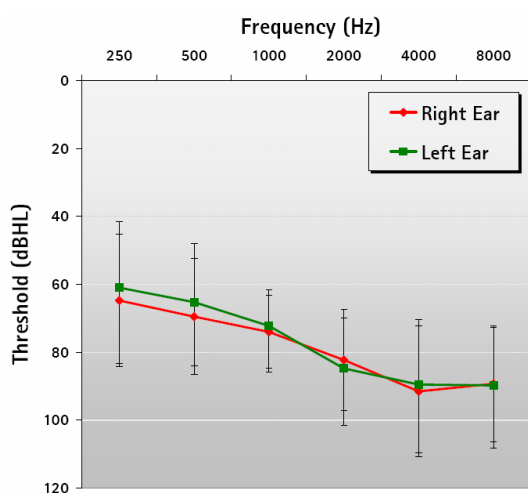
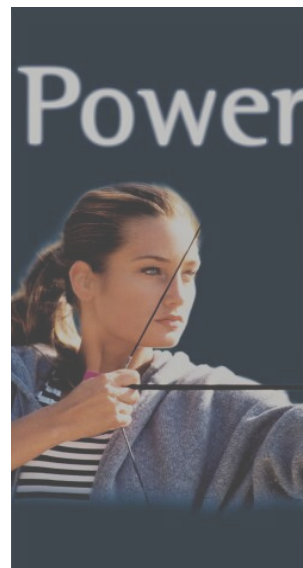


Fig.1: Averaged hearing thresholds for the left and right ears of the 20 participants.

Adapted from ¹ with permission.

According to one theoretical point of view, patients with severe-to-profound HL would experience fewer directional benefits because directional microphones tend to decrease low frequency gain and create effects in the higher frequencies, where these patients may not benefit from them. However: i) until this recent study¹ was published, little reliable data on this topic was actually available to verify these hypotheses and ii) Phonak's Power AudioZoom is different because it was specifically designed to match the special needs of these particular clients.



Setup of the study

Subjects and Hearing Aids

20 participants aged 24 to 72 years (mean = 59 years), with symmetrical severe-to-profound sensorineural HL took part in the study (Fig. 1). Phonak Supero 413 AZ behind-the-ear instruments (BTEs) were binaurally fit using custom full-shell earmolds with a Libby horn and no venting. The directional mode was fit to match the gain in the omnidirectional mode, in order to compensate for reduced low frequency gain. To achieve this equalization, real ear aided response (REAR) targets were matched for both ears.

Speech intelligibility tests

Speech comprehension was measured using the connected speech test⁵. 24 pairs of speech passages, each containing 25 target words, were presented via one loudspeaker situated in front of the subject. Competing noise was played from five other loudspeakers equally spaced around the participants. Baseline SNRs, at which they could only hear very few words in the omnidirectional mode, were defined for each subject. Once these baseline SNRs were individually determined, speech comprehension was tested in the omni and directional modes at three SNRs: baseline SNR,

baseline SNR +4 and +8 dB. Two different test conditions were also examined: i) in an "Auditory only" condition, subjects repeated speech presented in noise without any supplementary cue, and ii) in an "Audio-visual" situation, a video recorded version of the speech passages was also shown to subjects. Indeed, people with severe-to-profound HL often develop compensatory strategies including increased reliance on visual cues to understand speech in natural situations (lip-reading).

Results

Auditory only condition

In the Auditory only condition, results were striking. Performance for patients with severe-to-profound HL was superior in the directional mode compared to the omni mode. This led to statistically significant benefits with Power AudioZoom.

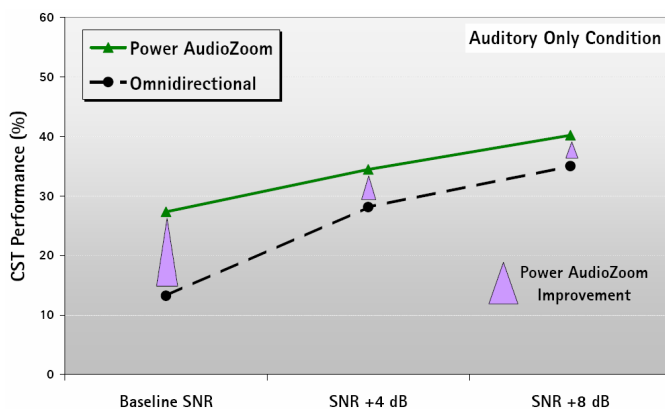


Fig.2: Speech intelligibility (% of retrieved keywords) in the omni- (Black) and AudioZoom (Green) modes. Auditory only condition. *Adapted from ¹ with permission.*

As shown in Fig. 2, directional benefits provided by Power AudioZoom technology, increased progressively as the concurrent noise increases. Intelligibility improvements ranged from approximately +5% when noise was soft (Baseline SNR +8dB) up to about +15% in the most challenging situation tested (Baseline SNR).

Audiovisual condition

The results above are encouraging. However, one could argue that people with severe-to-profound HL have such difficulties that they rely heavily on visual cues when listening to speech. In this situation, it could

make the use of a directional microphone ineffective. To the contrary, results from the present trial indicate that even when visual cues are available, people with severe-to-profound HL benefit from directionality. Moreover, the use of visual cues changed only global scores, not specific microphone mode effects. Power AudioZoom enhanced audiovisual speech comprehension in a noisy environment from around 10% at each considered SNR.

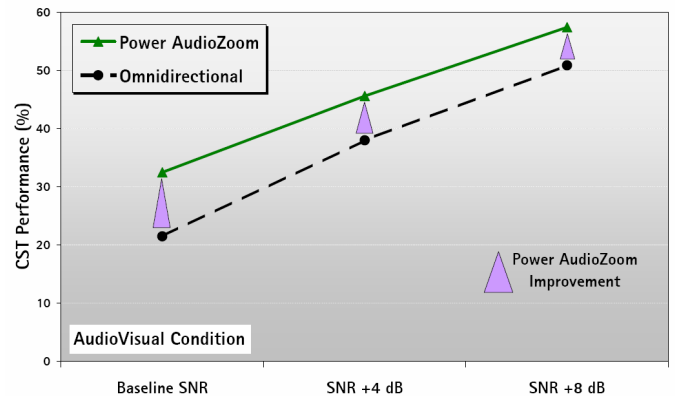


Fig.3: Speech intelligibility (% of retrieved keywords) in the omni- (Black) and AudioZoom (Green) modes. AudioVisual condition. *Adapted from ¹ with permission.*

Conclusions

This study clearly evidenced the benefits of Phonak's Power AudioZoom directional technology for people with severe-to-profound HL. Appropriate directional technology can improve speech in noise intelligibility also for users of Power instruments.

References

- ¹ Ricketts TA & Hornsby BWY, *Int Jal of Audiology*, 45(3):190-7.
- ² Kuhnel V, Margolf-Hackl S, & Kiessling J, *Scand Audiol Suppl*, 52:65-68.
- ³ Phonak Field Study News: March 2004.
- ⁴ Fabry D, *Hear Review*, *in press*.
- ⁵ Cox R, Alexander GC, Gilmore C & Pusakulich KM, *Ear Hear*, 10(1), 29-32.

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