



Improving Speech Understanding without Facing the Speaker

Bilateral ZoomControl Feature

Bilateral cochlear implantation can provide additional listening benefits compared to using only one device. Benefits include improved speech perception in noise, better sound localization, enhanced music appreciation, and improved sound quality.

Bilateral AB implant recipients can take advantage of Binaural VoiceStream Technology™ to communicate more easily in everyday listening environments. Binaural VoiceStream Technology is a proprietary Phonak technology that allows two AB Naída CI Q70 and Q90 sound processors, two Phonak hearing instruments, or a Naída CI sound processor and Naída™ Link hearing aid* to be linked wirelessly. Binaural VoiceStream Technology streams full bandwidth audio signals from ear to ear in real time with low power consumption.

The ZoomControl feature harnesses the streaming capability of Binaural VoiceStream Technology

to improve speech understanding when the talker is to the side of the listener. This everyday challenge occurs when the listener cannot easily face the speaker, for example, when driving a car. ZoomControl streams audio input from the Naída CI sound processor on the side of the target talker to the contralateral Naída CI sound processor. At the same time, the audio input from the contralateral processor is attenuated by 12 dB so that the signal-to-noise ratio (SNR) is improved even further.

This clinical study assessed the benefit of using ZoomControl to improve speech understanding in noise when the signal is on the side of the poorer (or less preferred) ear in bilateral AB implant recipients. Speech understanding was evaluated in quiet and in noise using bilateral T-Mic™ microphones with ZoomControl turned off, then in noise with ZoomControl turned on. Results were compared to assess the benefit provided by ZoomControl for communicating in noise when the talker is not in front of the listener.

STUDY METHODS

Subjects

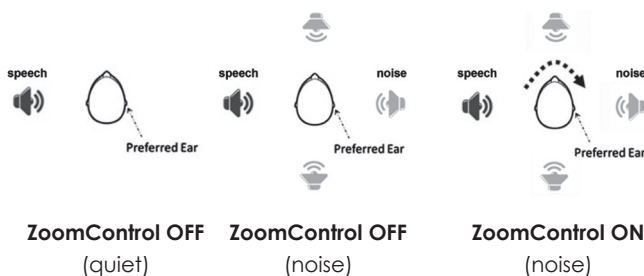
Subjects were 12 experienced adult CII/HiRes 90K™ bilateral implant recipients (10 sequential, 2 simultaneous). There were 9 men and 3 women. Mean age at time of testing was 50.3 years (range 26 to 63 years). Mean duration of bilateral listening experience was 4.5 years (range 0.5 to 12 years) with a mean duration of first implant use of 6.1 years (range 0.5 to 13 years).

Materials and Procedures

AzBio sentences were presented at 65 dBC from the poorer/less-preferred ear ("poorer" determined via subjective report). Subjects first were tested in quiet with bilateral T-Mic™ microphones with ZoomControl OFF. Then noise (Phonak cantina noise) was added to determine an SNR for each subject that yielded an AzBio score of approximately 50% of their score in quiet. That custom SNR (range -1 to +5 dB) was used to evaluate the benefit of enabling ZoomControl, where the speech signal was streamed from the ipsilateral processor to the contralateral processor. Results are expressed as percent correct.

Test Room Configuration

Subjects were tested in a double-walled sound booth. Speech was presented from a loudspeaker located at 90° or 270° azimuth (depending upon which ear was designated the poorer ear). Noise was presented from loudspeakers located at 0°, 180°, and 90°/270° (towards better/preferred ear) azimuth.



Clinical Study Results

Results show that sentence perception in noise improves significantly when ZoomControl is enabled ($p < .0005$) (Figure 1). Figure 2 compares each individual's sentence score in noise with ZoomControl OFF (x-axis) and ZoomControl ON (y-axis). Data points on the diagonal or within the 95% confidence limits (dotted lines) would indicate statistical equivalence. Data points above the dotted range would indicate better performance with ZoomControl ON.

Study results show that subjects benefited from enabling ZoomControl, although there was variability in the degree of benefit.

Figure 1

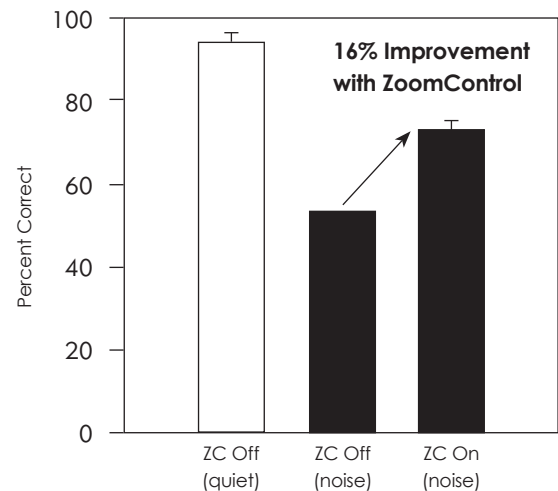
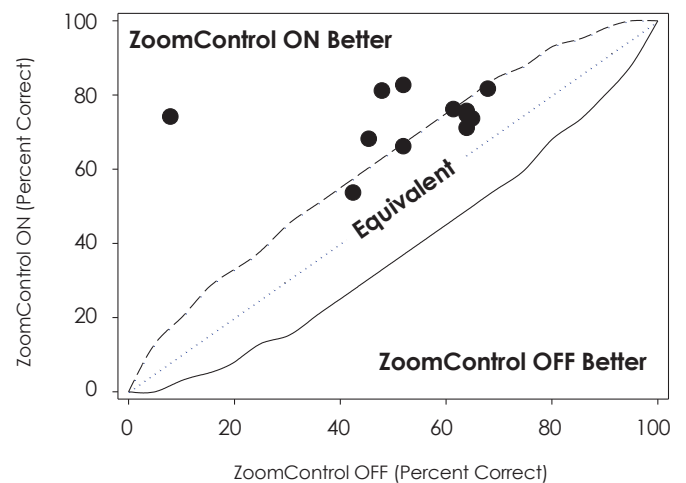


Figure 2



Discussion

When speech originates from front and noise is spatially separated, cochlear implant recipients typically show improved sound localization and better speech perception when using two implants compared with using one implant alone.¹⁻⁵ However, in realistic environments where noise is all around or the listener cannot face the talker, bilateral benefit can be compromised.

This study shows that the ZoomControl feature provides significant communication benefit in noise when the talker is to the side of bilateral AB implant recipients. Thus ZoomControl provides a signal-processing solution to the problem of head shadow, the situation in which the input to the ear contralateral to the signal of interest is attenuated. ZoomControl also is potentially beneficial to bilateral implant recipients with asymmetric performance when the signal is on the poorer side. In addition to directing a signal from the side to both ears as evaluated in this study, ZoomControl also can be programmed to focus toward the back for improved listening when the talker is behind the listener.

Using advanced acoustic signal-processing techniques to increase the signal-to-noise ratio at the input to both ears can enhance the communication abilities of bilateral AB implant recipients. ZoomControl is only one feature supported by Binaural VoiceStream Technology™. The StereoZoom, DuoPhone and QuickSync features also use Binaural VoiceStream Technology. StereoZoom enhances one-on-one, face-to-face conversations in extreme noise.⁶ DuoPhone improves speech understanding on the phone in quiet and noise.⁷ QuickSync allows simultaneous bilateral adjustments to volume and program settings. Binaural

VoiceStream Technology currently is available for bilateral Naída CI Q70 and Q90 sound processor users, for bilateral Phonak hearing aid wearers, and for bimodal listeners who use a Naída CI processor and a Phonak Naída™ Link hearing aid.^{8*}

Note: This study was conducted at the Advanced Bionics facilities in Valencia, California, USA.

*The Phonak Naída Link hearing aid is not yet available in all regions. Please contact your AB representative for approval status in your region.

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