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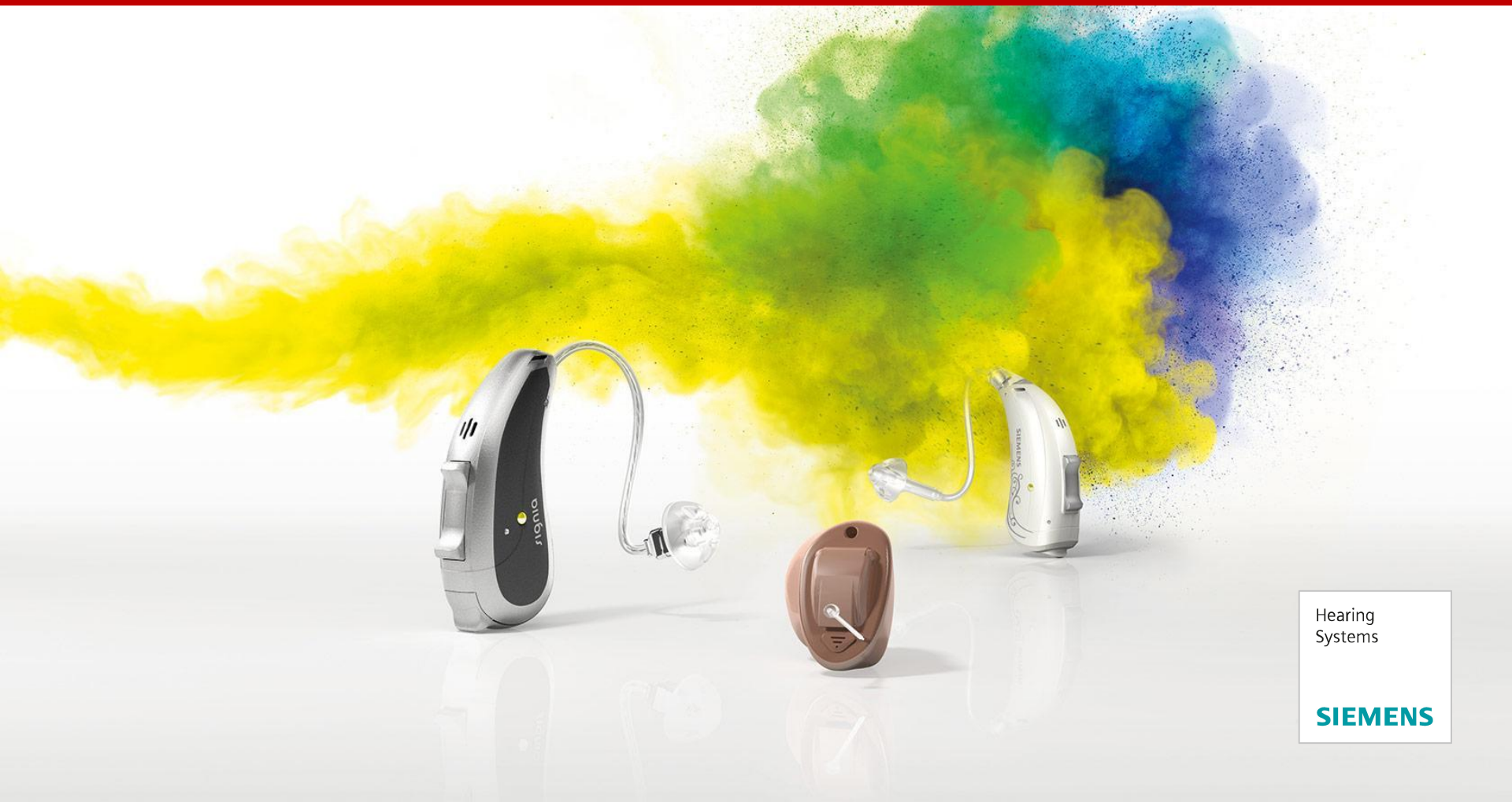
Technology in 10: Benefits of Binaural Beamforming for Individuals with Severe Hearing Loss



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Benefits of Binaural Beamforming for Individuals with Severe Hearing Loss

Presented by:
Dianna Theokas, AuD

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Hearing Review – May 2016

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http://www.hearingreview.com/2016/04/benefits-binaural-beamforming-individuals-severe-hearing-loss/

The Hearing Review

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TECH TOPIC

Benefits of Binaural Beamforming for Individuals with Severe Hearing Loss

Published on April 29, 2016

Tech Topic | May 2016 *Hearing Review*

By Thomas A. Powers, PhD, and Veronika Littmann, PhD

Historically, one of the most effective methods to improve speech understanding in background noise has been the use of directional technology. In recent years, through the use of wireless full-audio transmission between a bilateral pair of hearing aids, binaural beamforming technology has taken the benefit of directional technology to a new level.[1,2] Clinical trials with these new products have shown a substantial benefit over omnidirectional, and in fact two independent studies have shown that hearing-impaired individuals fitted with these instruments experience significantly better speech recognition in background noise than their normal-hearing counterparts.[3,4]

New research shows it is reasonable to expect the same speech recognition benefit for individuals with severe hearing impairment when using binax beamforming technology as previously reported for those with mild-to-moderate losses.

History of Binaural Beamforming

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- Through the use of wireless full-audio transmission between a bilateral pair of hearing aids, binaural beamforming technology has taken the benefit of directional technology to a new level
- Clinical trials with these new products have shown substantial benefit over omnidirectional
- Research has focused on hearing-impaired with mild-to-moderate hearing losses, since this is the profile of the most common hearing aid user
- Can we expect the same speech recognition benefit from those with severe hearing losses?

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The focus of research

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- The research with these beamforming instruments has focused on hearing-impaired individuals with mild-to-moderate hearing losses

  ➢ The primary goal is to restore lost audibility due to outer hair cell damage

- However, a significant minority of people who use hearing aids have a severe impairment

  ➢ When a severe hearing loss is present, we expect there will also be inner hair cell damage

  1. This is associated with broadened auditory filters causing loss of frequency selectivity
  2. Reducing the ability to separate two signals in the frequency domain
  3. Broad filters allow more noise to pass

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Directionality

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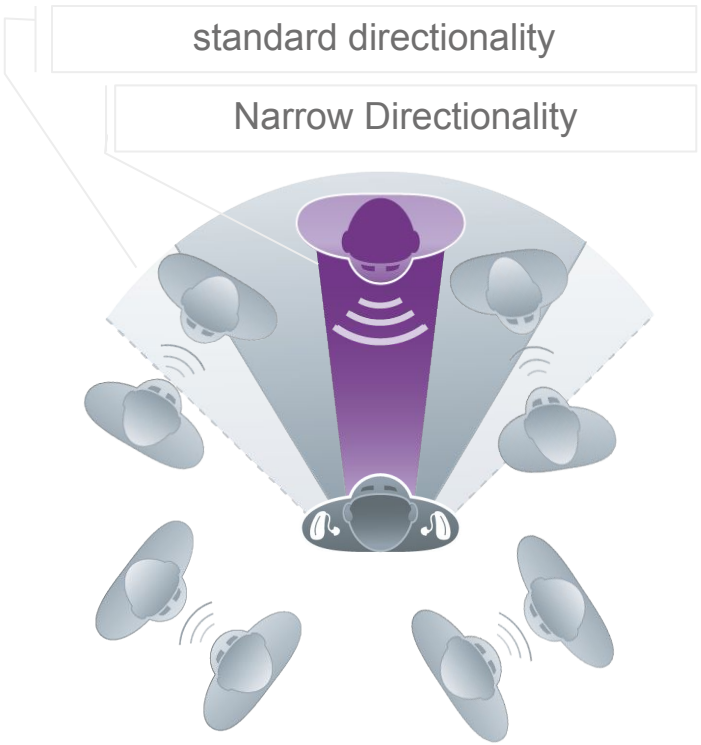

TruEar (Mild Directional)

Simulates the acoustics of the pinna to allow for better front/back localization of BTE/RIC fittings

Standard Directionality (Adaptive directional)

Attenuates noise from the sides to behind the listener, but not in the listener's angle of focus

Narrow Directionality (Frontal beamforming)

Narrows directional microphone focus and results in better-than-normal hearing in demanding environments

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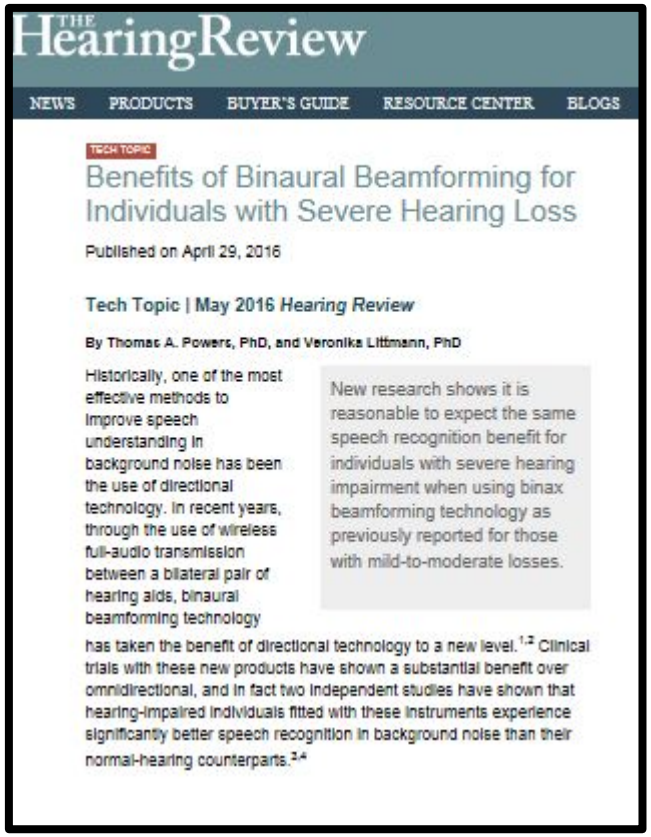

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New research shows it is reasonable to expect the same speech recognition benefit for individuals with severe hearing impairment when using binax beamforming technology as previously reported for those with mild-to-moderate losses.

Subjects

- Experienced hearing aid wearers
- Bilateral symmetrical severe SNHL
- Age 61-78 years (mean age = 70.3)

Instruments:

- Binaural fitting of Pure 7 bx with DoubleDomes

Programmed for each individual based on their hearing thresholds:

- First Fit using binaxFit
- Mild directional (TruEar)
- Adaptive directional
- Frontal beamforming (ND)

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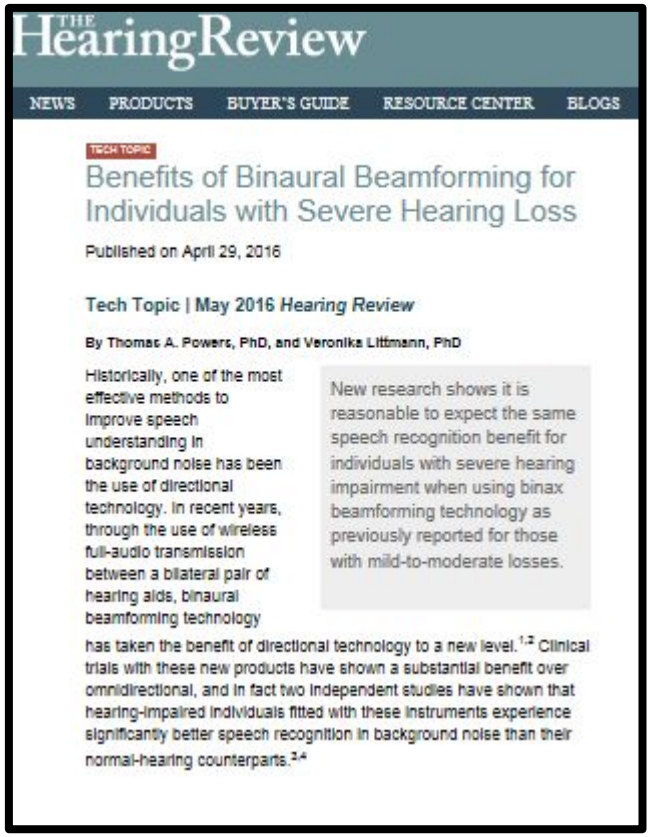

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Test set-up:

- The array for the presentation of the target and competing speech material consisted of eight loudspeakers surrounding the participant
  - Sentences of the English version of the Oldenburger Satztest (OLSA) presented from speaker at 0 degrees
  - Competing OLSA sentences presented at 68 dBA through seven, equally spaced loudspeakers surrounding subject
  - The competing signal remained constant for all testing
- Following a practice list, one list of 20 sentences of the OLSA was administered and scored
- The threshold in noise signal-to-noise ratio (SNR) was automatically calculated

Clinical Evaluation

Binaural beamforming with severe hearing loss

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Results

- Adaptive directional ~ 3dB better than mild directional
- Binaural beamforming added another 2 dB adaptive directional benefit
- Same speech recognition benefit as reported for those with mild-to-moderate hearing loss as reported in separate clinical study (Froehlich, et al 2015) Hearing Review 2015

Summary

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- Purpose: Compare the benefit observed for this severe hearing loss group to previous research for individuals with mild-to-moderate hearing loss

- As reported in the earlier research (Froehlich, et al 2015) and using the same experimental design, the benefit of beamforming, compared to mild directional, was an identical 5.0 dB for both test sites (using the German OLSA and the English HINT material)

- In the present research (as shown in Figure 2), the mild directional SRT-in-noise was -3.0 dB, and mean performance for the beamforming technology was -7.9 dB minus a 4.9 dB advantage

- Results: When using the binax beamforming technology, it is reasonable to expect the same speech recognition benefit for individuals with severe hearing impairment as previously reported for those with mild-to-moderate losses

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- Objective Measurement of Listening Effort

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- eWindScreen binaural

August 16, 2016 at 12 PM EDT

- Signia wireless CROS and BiCROS

August 24, 2016 at 11 AM EDT

- Directional microphones

August 30, 2016 at 4 PM EDT

- Spatial SpeechFocus

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