Phonak Belong:
Together, we change lives

Paul J. Kreimer, M.A., CCC-A

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PHONAK
life is on

the POWER of WHY

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Why: Reason we exist

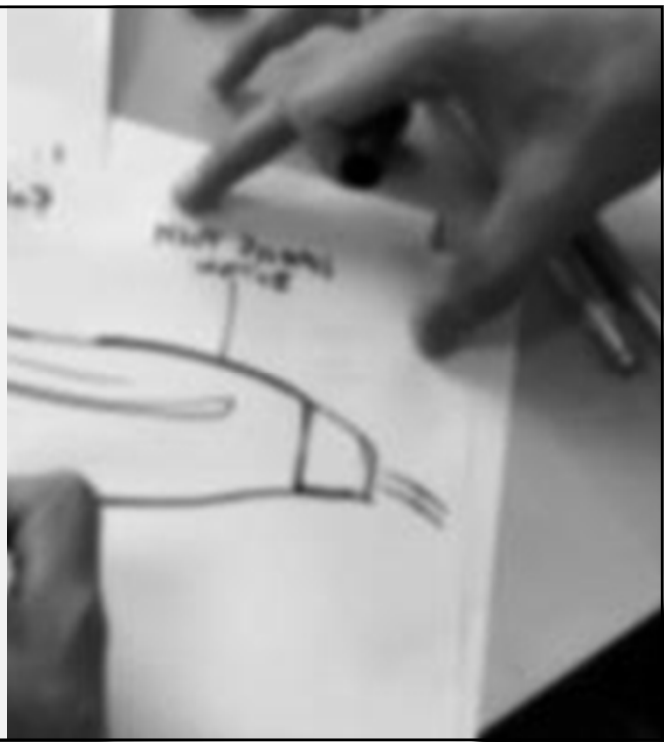
We believe **passionately** in changing lives and designing a world where “Life is On” for everyone.

How: Process of how we do it

By creating leading hearing solutions that empower and **engage** people to thrive socially and emotionally.

What: Proof, what we deliver to fulfill our mission

Together we offer the broadest portfolio of innovative and **pioneering** solutions that change peoples lives



SOLUTION Portfolio

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Passionate

Engaging

Pioneering

Together, we change lives

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9 10/17/2016

The essence of the Belong platform is about simplifying the lives of patients and providers

1 Consumer INSIGHT

Rank	Stated reason for not wearing hearing aids	Number of mentions	Percent of respondents	Estimated number of hearing aid owners
1	Poor benefit from hearing aids	103	29.6%	268,510
2	Background noise/noisy situations	88	25.3%	229,407
3	Fit & comfort	65	18.7%	169,448
4	Negative side effects of H.A.	38	10.9%	99,062
5	Price & cost of repairs	36	10.3%	93,848
6	Don't need help	28	8.0%	72,993
7	Hearing aid is broken	27	7.8%	70,386
8	Sound quality is poor	22	6.3%	57,352
9	Unspecified - do not wear	21	6.0%	54,745
10	Volume control adjustment	17	4.9%	44,317
11	Whistling and feedback	15	4.3%	39,103
12	Nuisance/hassle/annoying	14	4.0%	36,497
13	Poor service from dispenser	11	3.2%	28,676
14	High-frequency loss not helped	10	2.9%	26,069
15	Stigma of wearing hearing aids	10	2.9%	26,069

Source: Reason #10 individuals are not wearing hearing aids: Volume control adjustments MarketTrak V February 2000. Vol 53. No. 2

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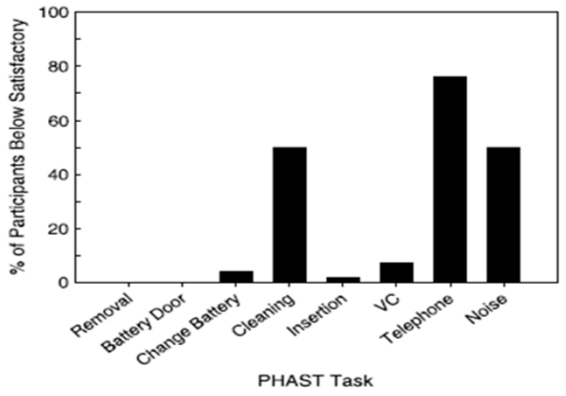
2 Consumer INSIGHT

Even experienced users find it hard use their hearing aids

Figure 3. The percentage of participants scoring below satisfactory for each PHAST skill task. VC = volume control.



Source: Desjardins JL, and Doherty KA. (2009) Do Experienced Hearing Aid Users Know How to Use Their Hearing Aids Correctly? American Journal of Audiology. 18 (June):69-76.

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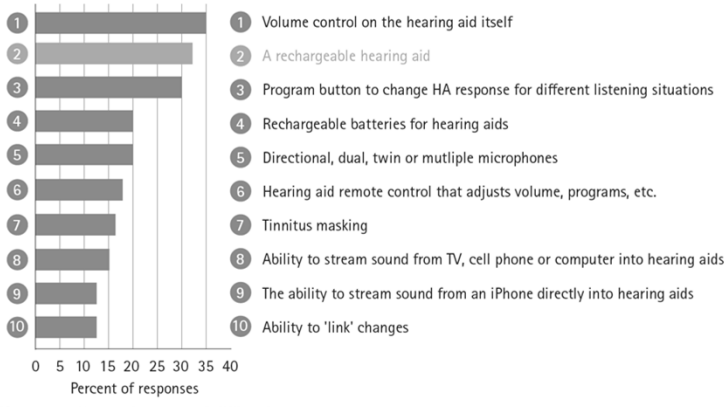
3 Consumer INSIGHT

10 features that would motivate for selecting a hearing aid*



* Source: Marketrak 2015, asked of non-owners only (n=2099) - multiple responses allowed

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Audéo Belong

- New design
- Bigger push button
  + indicator light for the rechargeable model
- IP 68
- New microphone positioning

Phonak CROS B

Continuing the CROS success story

- Extension of CROS portfolio to offer single sided hearing solution for Audéo B
- Same hardware and colors than Audéo B 312 and 13 for the perfect match
- Launched together with Audéo B, no gap between Audéo and CROS

CROS B-312

CROS B-13

	Spice/Quest	Venture	Belong (w/o Audéo B-R)
CROS			
CROS II			
CROS B			

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CROS B

CROS B re-uses the feature set and earpieces of CROS II:

- Same low battery consumption
- Easy to fit and demo with iCube II
- Better speech understanding in noise thanks to StereoZoom

CROS DemoHook | CROS Tip | CROS SlimTube | CROS Hook

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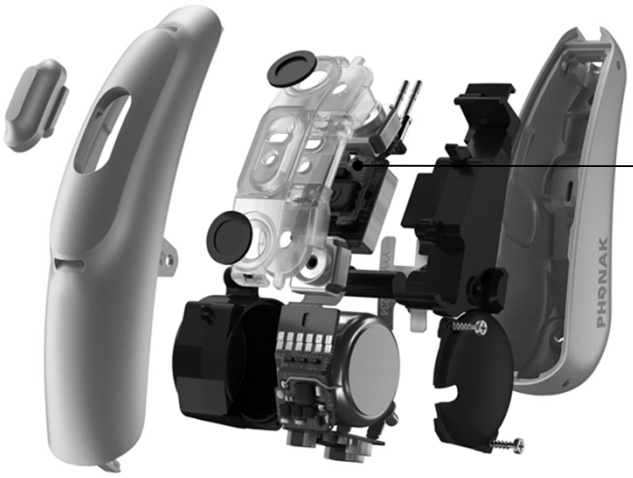
The chip technology that drives Phonak Belong™ performance



- 65 nanometer structure
- 45 million transistors
- Advanced analog to digital processor
- Power management

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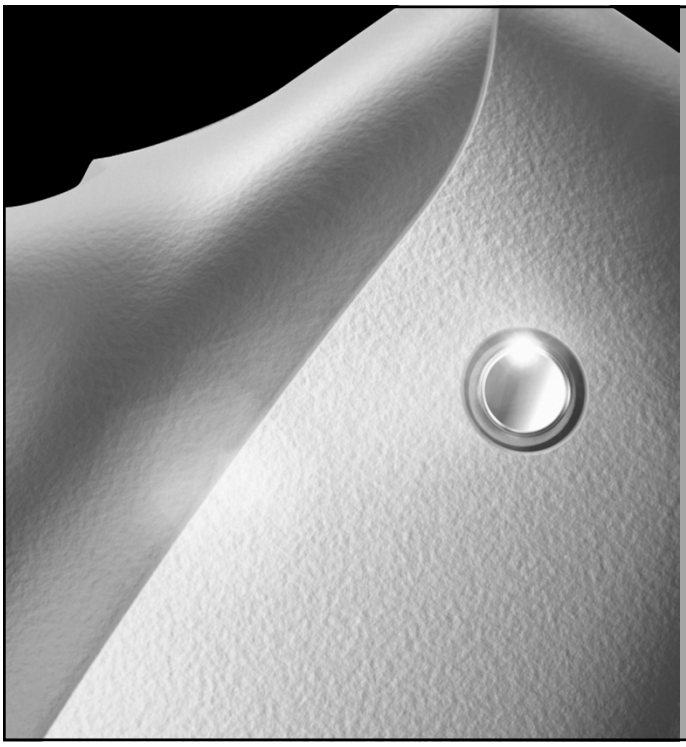


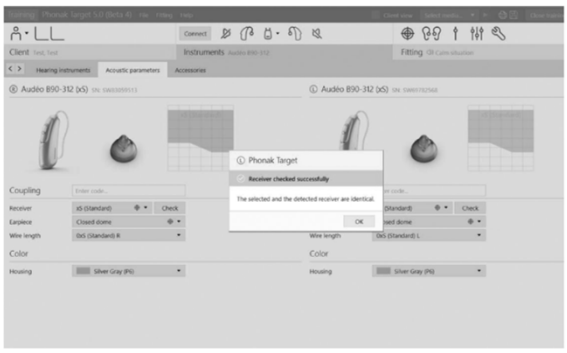
Audéo B-R is the hassle free solution that offers the quickest charging, longest lasting rechargeable hearing aid with 24 hours of hearing on the market.

Phonak market insight online survey 2014 US n192

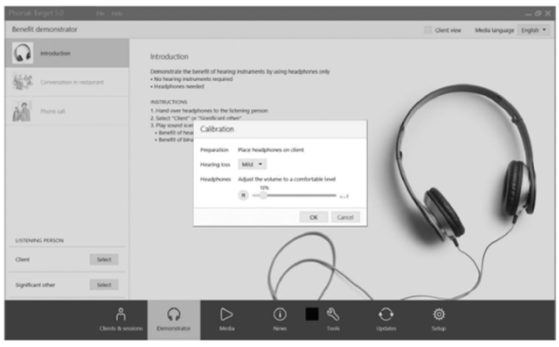
What's new with Phonak Target 5.0

New features include:

1 **Receiver check**
Ensures that the receiver attached matches what is selected in the software



2 **Benefit demonstration tool**
Counseling/demonstration tool for both the patient and family member



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Audéo Belong™
Simplifying life

Audéo B-R Rechargeable:
- 24 hours of hearing with one simple charge
- Quickest charging, longest lasting rechargeable hearing aid ever

Comprehensive Marketing
- Generate leads for participating providers
- Expand reach and create/awareness
- Increase % of people who seek a solution

AutoSense OS
- Accurately and precisely adapts to provide a seamless listening experience
- No manual adjustments
- Unmatched hearing performance in everyday listening situations

AutoSense OS

Seamlessly adapt to any listening situation automatically and provide best sound quality.

Patient benefit:
- Improved speech understanding by 20%
- No need to think about their hearing aid

Provider benefit:
- More satisfied clients
- Less time creating and explaining manual programs

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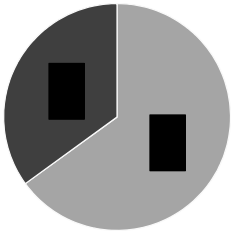
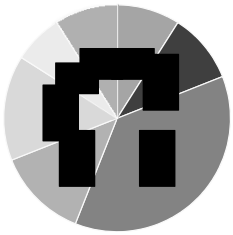
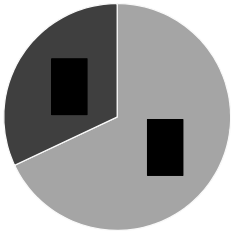
Research
INSIGHT

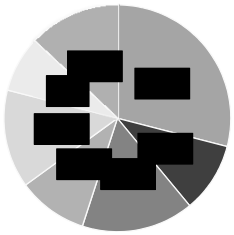
Participant 1





Participant 2





- Quiet program
- Noise program

- Quiet listening
- Quiet conversation
- Small group conversation
- Large group conversation
- Conversation noise
- Just noise

Source: The Hearing Review: Does Current Hearing Aid Technology Meet the Needs of Healthy Aging? February 2015

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hearing aid users should not have to **think** about their hearing

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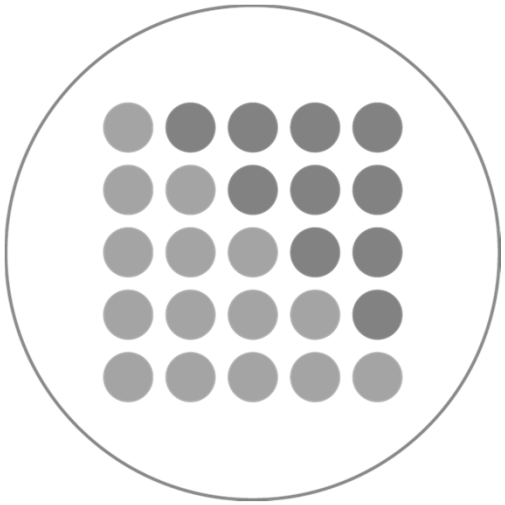
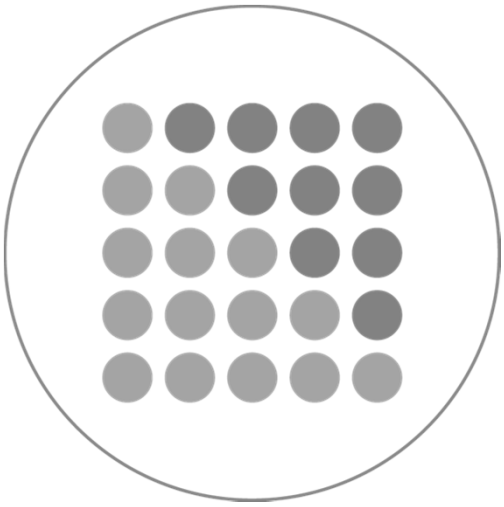


AutoSense OS is making life easier for the hearing aid wearer by dynamically choosing the settings that optimizes best speech understanding, comfort and sound quality in any listening environment.

Phonak market insight online survey 2014 US n192

Audéo Belong™ new AutoSense OS



- SoundRecover2 activated based on hearing level
- Expansion fades to off based on hearing level and program
- Symmetrical gain activated for first time users set to 80% gain level

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SoundRecover 2

- **Maximize stimulation of the hearing nerve** by setting the Maximum Output Frequency at the upper limit of the individual's audible bandwidth.
- **Protect the mid and low frequencies** by setting **(CT2 or upper cut-off)** high enough so that audibile speech (without compression) is <u>not</u> affected.
- If enough high frequency gain can be provided to make high frequency speech sound audible then **frequency compression is often not needed for mild hearing losses**.

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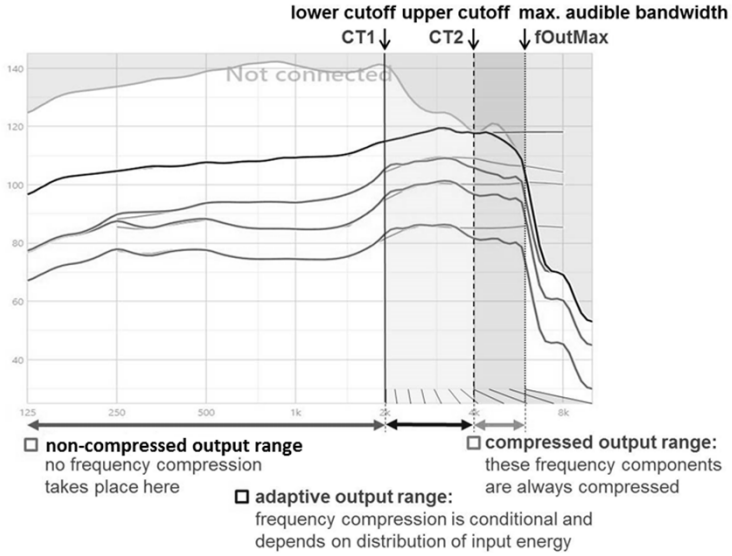
SoundRecover2 - intelligent adaptive frequency lowering algorithm



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SoundRecover2 on or off?

Steps used to determine the SoundRecover 2 on/off default

Step	Audiogram dB	Default
1	Normal high frequency hearing (8kHz HL<=25 dB)	OFF
2	Reverse slope. (HL at 8kHz is >=30dB better than at 3kHz)	OFF
3	Reverse slope but poor high frequency hearing (HL at 8kHz >= 45dBHL)	ON
4	None of the above (calculation based on HL at 3kHz to 8kHz)	ON/OFF

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SoundRecover2 summary

Restores access to high-frequency information, preserving high-frequency discrimination and sound quality.

Utilizes an adaptive algorithm, maintaining the familiarity of low- and mid-frequency sounds.

Extends benefits to those with more severe and profound hearing losses, using a lower cut-off frequency and weaker compression.

SoundRecover2 – the first adaptive frequency compression algorithm

More audibility of high frequency sounds

Phonak led the way in modern frequency lowering technology with the introduction of SoundRecover in 2008. Since then, extensive worldwide field studies with adults and children have found increased detection, distinction and recognition of high frequency sounds, better speech understanding and significant improvement in intonation and overall voice quality for users. For those with more extreme severe-to-profound losses, however, including left corner audiograms and ski-slope losses, the benefits have been limited due to the restricted audible bandwidth in which frequency compression could be applied. The new SoundRecover2 algorithm aims to restore the audibility of relevant high frequency sounds while leaving intact the low frequency structures important for good sound quality. The new frequency lowering scheme retains the essence of the original SoundRecover, utilizes an adaptive algorithm and an additional cut-off frequency in order to successfully extend these benefits to those with more extreme severe-to-profound hearing loss.

Introduction

The remapping of frequencies for extending the perceptual auditory bandwidth of hearing aid users has been commercially available for approximately 10 years now. Phonak introduced SoundRecover, non-linear frequency compression, with the first Naida in 2008, offering a solution for restoring audibility of conventionally unaidable high frequency sounds.

In order to achieve distortion-free amplification of the input signal, SoundRecover exploits the fact that vowels are dominated by greater energy in the low frequencies whereas voiceless fricatives are dominated by greater energy in the high frequencies. For this reason, SoundRecover was designed with a cut-off frequency which is the starting point of compression. For inputs below the cut-off frequency, the input signal is not subject to frequency compression. All inputs above the cut-off frequency are subject to frequency compression. Hence, the output area below the cut-off frequency is unchanged, while the output area between the cut-off frequency and the upper edge frequency is compressed with a constant compression ratio[1]. The upper-edge frequency corresponds to the maximum output frequency and is set according to the audible bandwidth of the individual audiogram. The cut-off frequency is limited to a minimum value of 1.6 kHz. This ensures that important vowel structures are left unchanged, and at the same time allows presentation of the noise-like high frequency components of speech in the individual audible range. A more detailed discussion of the SoundRecover frequency lowering system is provided in the paper by McDermott 2010[2].

Experience has shown that the SoundRecover frequency lowering scheme works very well for speech and for high frequency sounds such as bird song or environmental sounds. It can be successfully applied to hearing losses where aidable hearing is available above 1.6 kHz allowing the high frequencies to be compressed into an audible region. However, the fitting of more extreme severe-to-profound losses, like left corner audiograms and ski slope audiograms, where users have only low frequency hearing thresholds, has presented unique challenges. These losses require more aggressive parameter settings (lower cut-off, stronger compression ratio) than those admissible with SoundRecover due to concerns about impact on sound quality.

In order to widen the reach of SoundRecover, the new SoundRecover2 algorithm is designed to allow operation with lower cut-off frequencies and weaker compression ratios, thereby extending the benefits of frequency compression to a broader audience of children and adults.

[1] The compression ratio is constant if viewed on logarithmically scaled frequency axes.

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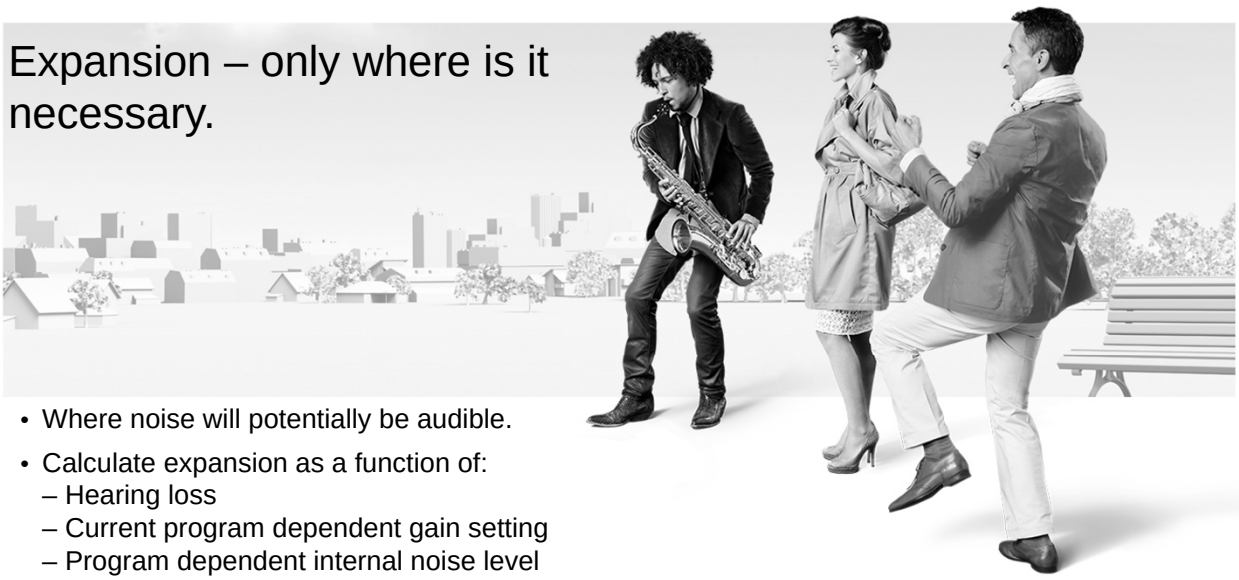
Expansion – only where is it necessary.



- Where noise will potentially be audible.
- Calculate expansion as a function of:
  - Hearing loss
  - Current program dependent gain setting
  - Program dependent internal noise level
  - Acoustical coupling (RECD)
- 10% improvement in soft speech understanding

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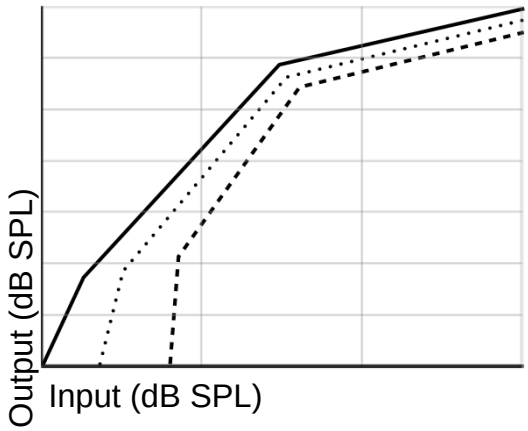
Elegant Expansion

- Hearing loss dependent
- Program dependent – especially alternative sources (i.e. t-coil, streaming)

Benefits

- Increase soft speech intelligibility*
- Reduce internal noise



* Lübeck study (2015) demonstrated a 10% improvement in soft speech intelligibility

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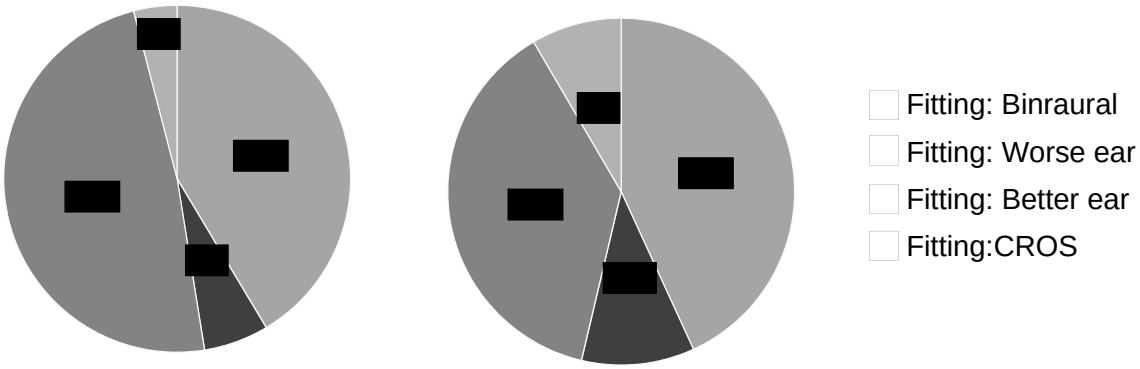
Symmetrical gain for first-time users with asymmetrical hearing loss

- New settings for asymmetrical hearing loss provide statistically more comfort for first time users



Worse ear <70 Worse ear <80

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Amplification approach for asymmetric hearing loss

People with differences between the ears or have an asymmetrical hearing loss – asymmetrical gain in each ear

For first-time users

- Discomfort (unbalanced, too loud)
- Reduced intelligibility (high amplification in worse ear can create masking in the better ear)

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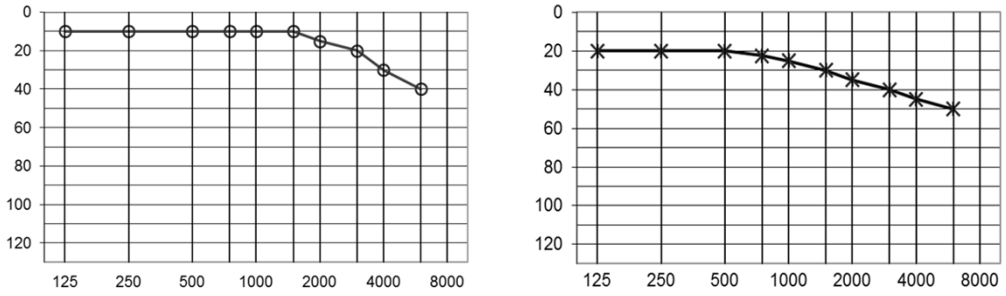
Amplification approach for asymmetric hearing loss



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Amplification approach for asymmetric hearing loss

Asymmetric gain for asymmetric hearing loss (80%-first-time users)

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Amplification approach for asymmetric hearing loss

New amplification approach for asymmetric hearing loss (80%-first time user)

- Slightly more gain for better ear; less gain for poorer ear

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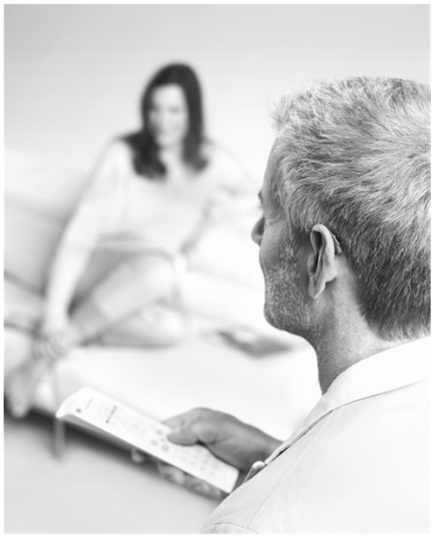
Amplification approach for asymmetric hearing loss

- More holistic approach to applying gain especially for asymmetric hearing loss
- Symmetric gain:
  – Biggest effect for first time users
  – Effect of symmetric gain is reduced as experience with amplification increases
- Benefits to this approach
  – Less potential for masking effects with larger asymmetries
  – More comfort for first time users with asymmetric hearing loss*
  – These pre-calculation improvements are automatically incorporated into the new AutoSense OS so everyone can benefit



* Sonova Israel study (2016) demonstrated statistically significant improvements in loudness comfort, shrillness, & overall preference

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Research FINDINGS

20% better speech understanding thanks to the automatic selection of the best setting for everyday listening situations.

Better speech and sound performance in everyday listening situations compared to other automatic technology.

60% improvement in speech understanding by zooming in on a single voice in a noisy environment - versus without hearing aids.

37% reduction in effort when listening to conversations in cars compared to other automatic technologies

Calm 10% improvement in soft speech understanding with our newest products.

Most natural music experience. Top rated hearing aid for music sound quality.

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Summary

Researchers at the Phonak Audiology Research Center (PARC) compared the **capabilities of AutoSense OS™** to the **automatic steering systems of two other leading hearing aid manufacturers.**

Phonak AutoSense OS consistently yielded **better speech intelligibility performance** across numerous real-world, complex and challenging listening environments when compared to competitors.

Field Study News

July 2016

Comparing objective and subjective outcomes of automatic classification systems across manufacturers

The use of automatic classification systems to categorize listening environments, and change hearing aid parameterization accordingly, has significantly increased the ability of hearing aid users to take advantage of multiple hearing aid settings without the additional effort of a manual push-button. However, the level of sophistication of these systems differs across manufacturers, with the speed, ability to categorize and number of parameters available for adaptation in the hearing aids varying widely. Phonak AutoSense OS™ has the ability to not only accurately characterize listening environments quickly, but can classify proportions and probabilities of different acoustic classes present in the environment. The Phonak Audiology Research Center (PARC) completed a research study to better understand the capabilities of AutoSense OS, in comparison to the automatic steering systems of two other leading hearing aid manufacturers. Specifically of interest was how each manufacturer's automatic classification system affected hearing aid user performance in real-world situations. The results indicate that Phonak AutoSense OS consistently yields better speech intelligibility performance across numerous real-world, complex, and challenging listening environments.

Introduction

Since automatic classification systems were first incorporated into hearing aids in the late 1990s, they have become increasingly complex in their ability to detect and adapt hearing aid parameters in accordance with the environment. The emphasis on "smart" hearing aids that adjust hearing aid programs and parameters has become a main topic in the hearing aid domain, as this type of technology reduces effort and maximizes convenience for hearing aid users.

In a scoping study by McCormack and Fortnum (2014), it was concluded that lack of perceived benefit (particularly in noise) and handling difficulties both ranked in the top three reasons reported for hearing aid disuse. It could be surmised that a reliable automatic operating system that both optimized parameters based on the given environmental situation and minimized the need for user interaction with the device would potentially remove some of these barriers. Manufacturers have implemented automatic functionalities in different ways. Some manufacturers have focused on this area of innovation adding flexibility, complexity and accuracy to their automatics, while others are restricted to the automatic manipulation of a limited number of parameters. Phonak AutoSense OS uses advanced algorithms to accurately classify, as well as blend characterizations of different acoustic environments. Specifically, AutoSense OS smoothly steers gain and sound cleaning features to provide an optimal balance between performance and sound quality. Adaptation of the signal processing occurs slowly to avoid harsh, noticeable transitions or artifacts. It also allows the device the blend multiple programs as in the complex scenes of everyday life.

A previous research study completed at PARC investigated the performance of hearing aid users in real world listening environments in manual hearing aid programs versus AutoSense OS (Rakita and Jones, 2015). That research study revealed that AutoSense OS yielded equal or better speech recognition performance than the manual program of the participants' choice. As an extension of this previous research study, it was of particular interest how the classification systems of other hearing aid manufacturers affect the ability of hearing aid users to

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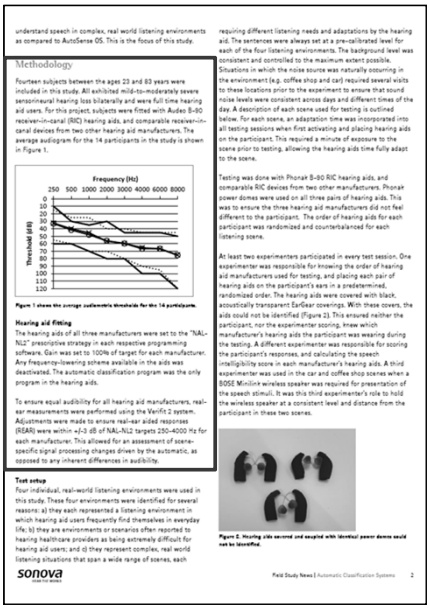
Study design - methodology

- 14 experienced hearing aid subjects (ages 23-83 years) with mild to moderately severe sensorineural hearing loss.
- Subjects were fit with Phonak Audéo B-90 RIC hearing aids and comparable RIC devices from 2 other hearing aid manufacturers
- Devices for all 3 manufacturers were set to NAL-NL2, 100% set to Target and all frequency lowering schemes were deactivated.



understand speech in complex, real world listening environments as compared to AutoSense OS. This is the focus of this study.

Methodology

Fourteen subjects between the ages 23 and 83 years were included in this study. All exhibited mild-to-moderately severe sensorineural hearing loss bilaterally and were full time hearing aid users. For this project, subjects were fitted with Audeo B-90 receiver-in-canal (RIC) hearing aids, and comparable receiver-in-canal devices from two other hearing aid manufacturers. The average audiogram for the 14 participants in the study is shown in Figure 1.

Frequency (Hz)
250 500 1000 2000 3000 4000 6000 8000
Threshold (dB)
0 10 20 30 40 50 60 70 80 90 100 110 120

Figure 1 shows the average audiometric thresholds for the 14 participants.

Hearing aid fitting

The hearing aids of all three manufacturers were set to the "NAL-NL2" prescriptive strategy in each respective programming software. Gain was set to 100% of target for each manufacturer. Any frequency-lowering scheme available in the aids was deactivated. The automatic classification program was the only program in the hearing aids.

To ensure equal audibility for all hearing aid manufacturers, real-ear measurements were performed using the Verifit 2 system. Adjustments were made to ensure real-ear aided responses (REAR) were within +/-3 dB of NAL-NL2 targets 250–4000 Hz for each manufacturer. This allowed for an assessment of scene-specific signal processing changes driven by the automatic, as opposed to any inherent differences in audibility.

Test setup

Four individual, real-world listening environments were used in this study. These four environments were identified for several reasons: a) they each represented a listening environment in which hearing aid users frequently find themselves in everyday life; b) they are environments or scenarios often reported to hearing healthcare providers as being extremely difficult for hearing aid users; and c) they represent complex, real world listening situations that span a wide range of scenes, each requiring different listening needs and adaptations by the hearing aid. The sentences were always set at a pre-calibrated level for each of the four listening environments. The background level was consistent and controlled to the maximum extent possible. Situations in which the noise source was naturally occurring in the environment (e.g. coffee shop and car) required several visits to these locations prior to the experiment to ensure that sound noise levels were consistent across days and different times of the day. A description of each scene used for testing is outlined below. For each scene, an adaptation time was incorporated into all testing sessions when first activating and placing hearing aids on the participant. This required a minute of exposure to the scene prior to testing, allowing the hearing aids time fully adapt to the scene.

Testing was done with Phonak B-90 RIC hearing aids, and comparable RIC devices from two other manufacturers. Phonak power domes were used on all three pairs of hearing aids. This was to ensure the three hearing aid manufacturers did not feel different to the participant. The order of hearing aids for each participant was randomized and counterbalanced for each listening scene.

At least two experimenters participated in every test session. One experimenter was responsible for knowing the order of hearing aid manufacturers used for testing, and placing each pair of hearing aids on the participant's ears in a predetermined, randomized order. The hearing aids were covered with black, acoustically transparent EarGear coverings. With these covers, the aids could not be identified (Figure 2). This ensured neither the participant, nor the experimenter scoring, knew which manufacturer's hearing aids the participant was wearing during the testing. A different experimenter was responsible for scoring the participant's responses, and calculating the speech intelligibility score in each manufacturer's hearing aids. A third experimenter was used in the car and coffee shop scenes when a BOSE Mini link wireless speaker was required for presentation of the speech stimuli. It was this third experimenter's role to hold the wireless speaker at a consistent level and distance from the participant in these two scenes.

Figure 2. Hearing aids covered and coupled with identical power domes could not be identified.

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Field Study News | Automatic Classification Systems 2

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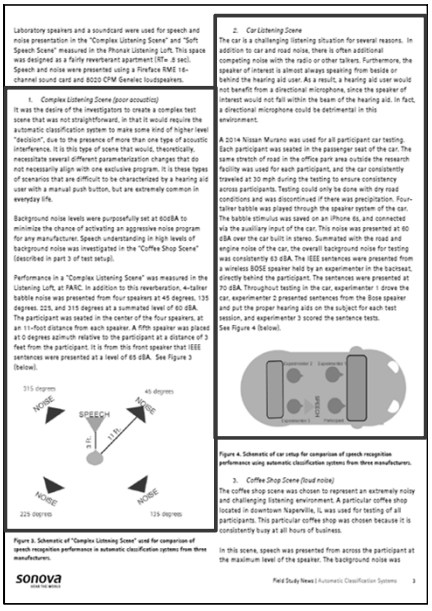
Study design – test setup

- Objective performance was measured in 4 real-world listening environments for the 3 different manufacturer devices
  - Complex Listening Scene with poor acoustics - similar to family home
  - Listening in the Car
  - Coffee Shop
  - Soft Speech Scene
- Description of the scenes are given in detail in the article.
- A video explaining the test setup can be found here: https://youtu.be/5Pmh-BuNTYQ



Laboratory speakers and a soundcard were used for speech and noise presentation in the "Complex Listening Scene" and "Soft Speech Scene" measured in the Phonak Listening Loft. This space was designed as a fairly reverberant apartment (RT= .8 sec). Speech and noise were presented using a Fireface RME 16-channel sound card and 8020 CPM Genelec loudspeakers.

1. *Complex Listening Scene (poor acoustics)*

It was the desire of the investigators to create a complex test scene that was not straightforward, in that it would require the automatic classification system to make some kind of higher level "decision", due to the presence of more than one type of acoustic interference. It is this type of scene that would, theoretically, necessitate several different parameterization changes that do not necessarily align with one exclusive program. It is these types of scenarios that are difficult to be characterized by a hearing aid user with a manual push button, but are extremely common in everyday life.

Background noise levels were purposefully set at 60dBA to minimize the chance of activating an aggressive noise program for any manufacturer. Speech understanding in high levels of background noise was investigated in the "Coffee Shop Scene" (described in part 3 of test setup).

Performance in a "Complex Listening Scene" was measured in the Listening Loft, at FAAC. In addition to this reverberation, 4-talker babble noise was presented from four speakers at 45 degrees, 135 degrees, 225, and 315 degrees at a summated level of 60 dBA. The participant was seated in the center of the four speakers, at an 11-foot distance from each speaker. A fifth speaker was placed at 0 degrees azimuth relative to the participant at a distance of 3 feet from the participant. It is from this front speaker that IEEE sentences were presented at a level of 65 dBA. See Figure 3 (below).

315 degrees
45 degrees
NOISE
SPEECH
NOISE
3 ft.
NOISE
NOISE
225 degrees
135 degrees

Figure 3. Schematic of "Complex Listening Scene" used for comparison of speech recognition performance in automatic classification systems from three manufacturers.

2. *Car Listening Scene*

The car is a challenging listening situation for several reasons. In addition to car and road noise, there is often additional competing noise with the radio or other talkers. Furthermore, the speaker of interest is almost always speaking from beside or behind the hearing aid user. As a result, a hearing aid user would not benefit from a directional microphone, since the speaker of interest would not fall within the beam of the hearing aid. In fact, a directional microphone could be detrimental in this environment.

A 2014 Nissan Murano was used for all participant car testing. Each participant was seated in the passenger seat of the car. The same stretch of road in the office park area outside the research facility was used for each participant, and the car consistently traveled at 30 mph during the testing to ensure consistency across participants. Testing could only be done with dry road conditions and was discontinued if there was precipitation. Four-talker babble was played through the speaker system of the car. The babble stimulus was saved on an iPhone 6s, and connected via the auxiliary input of the car. This noise was presented at 60 dBA over the car built in stereo. Summated with the road and engine noise of the car, the overall background noise for testing was consistently 63 dBA. The IEEE sentences were presented from a wireless BOSE speaker held by an experimenter in the backseat, directly behind the participant. The sentences were presented at 70 dBA. Throughout testing in the car, experimenter 1 drove the car, experimenter 2 presented sentences from the Bose speaker and put the proper hearing aids on the subject for each test session, and experimenter 3 scored the sentence tests. See Figure 4 (below).

Figure 4. Schematic of car setup for comparison of speech recognition performance using automatic classification systems from three manufacturers.

3. *Coffee Shop Scene (loud noise)*

The coffee shop scene was chosen to represent an extremely noisy and challenging listening environment. A particular coffee shop located in downtown Naperville, IL was used for testing of all participants. This particular coffee shop was chosen because it is consistently busy at all hours of business.

In this scene, speech was presented from across the participant at the maximum level of the speaker. The background noise was

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Field Study News | Automatic Classification Systems 3

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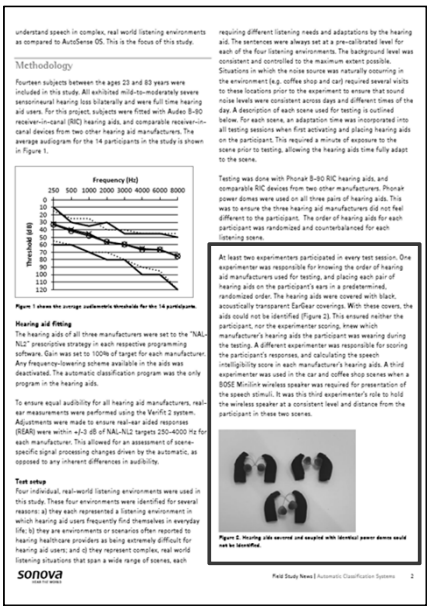
Study design – double blinded

- All results were obtained using a double-blinded approach meaning that neither the participant nor the experimenter knew which device was being tested.
- The order of device testing was randomized to eliminate bias or listener fatigue effects.
- The hearing aids were covered with acoustically transparent EarGear covers so the hearing aid manufacturer could not be determined by the participant nor the experimenter scorer.
- Similar to previous experiments from PARC, this level of detail adds significantly to the credibility of the study.



understand speech in complex, real world listening environments as compared to AutoSense OS. This is the focus of this study.

Methodology

Fourteen subjects between the ages 23 and 83 years were included in this study. All exhibited mild-to-moderately severe sensorineural hearing loss bilaterally and were full time hearing aid users. For this project, subjects were fitted with Audeo B-90 receiver-in-canal (RIC) hearing aids, and comparable receiver-in-canal devices from two other hearing aid manufacturers. The average audiogram for the 14 participants in the study is shown in Figure 1.

Frequency (Hz)

250 500 1000 2000 3000 4000 6000 8000

Threshold (dB)

Figure 1 shows the average audiometric thresholds for the 14 participants.

Hearing aid fitting

The hearing aids of all three manufacturers were set to the "NAL-NL2" prescriptive strategy in each respective programming software. Gain was set to 100% of target for each manufacturer. Any frequency-lowering scheme available in the aids was deactivated. The automatic classification program was the only program in the hearing aids.

To ensure equal audibility for all hearing aid manufacturers, real-ear measurements were performed using the Verifit 2 system. Adjustments were made to ensure real-ear aided responses (REAR) were within +/-3 dB of NAL-NL2 targets 250–4000 Hz for each manufacturer. This allowed for an assessment of scene-specific signal processing changes driven by the automatic, as opposed to any inherent differences in audibility.

Test setup

Four individual, real-world listening environments were used in this study. These four environments were identified for several reasons: a) they each represented a listening environment in which hearing aid users frequently find themselves in everyday life; b) they are environments or scenarios often reported to hearing healthcare providers as being extremely difficult for hearing aid users; and c) they represent complex, real world listening situations that span a wide range of scenes, each requiring different listening needs and adaptations by the hearing aid. The sentences were always set at a pre-calibrated level for each of the four listening environments. The background level was consistent and controlled to the maximum extent possible. Situations in which the noise source was naturally occurring in the environment (e.g. coffee shop and car) required several visits to these locations prior to the experiment to ensure that sound noise levels were consistent across days and different times of the day. A description of each scene used for testing is outlined below. For each scene, an adaptation time was incorporated into all testing sessions when first activating and placing hearing aids on the participant. This required a minute of exposure to the scene prior to testing, allowing the hearing aids time fully adapt to the scene.

Testing was done with Phonak B-90 RIC hearing aids, and comparable RIC devices from two other manufacturers. Phonak power domes were used on all three pairs of hearing aids. This was to ensure the three hearing aid manufacturers did not feel different to the participant. The order of hearing aids for each participant was randomized and counterbalanced for each listening scene.

At least two experimenters participated in every test session. One experimenter was responsible for knowing the order of hearing aid manufacturers used for testing, and placing each pair of hearing aids on the participant's ears in a predetermined, randomized order. The hearing aids were covered with black, acoustically transparent EarGear coverings. With these covers, the aids could not be identified (Figure 2). This ensured neither the participant, nor the experimenter scoring, knew which manufacturer's hearing aids the participant was wearing during the testing. A different experimenter was responsible for scoring the participant's responses, and calculating the speech intelligibility score in each manufacturer's hearing aids. A third experimenter was used in the car and coffee shop scenes when a BOSE Mini link wireless speaker was required for presentation of the speech stimuli. It was this third experimenter's role to hold the wireless speaker at a consistent level and distance from the participant in these two scenes.

Figure 2. Hearing aids covered and coupled with identical power domes could not be identified.

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Field Study News | Automatic Classification Systems 2

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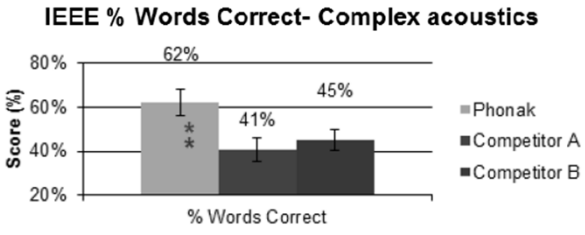
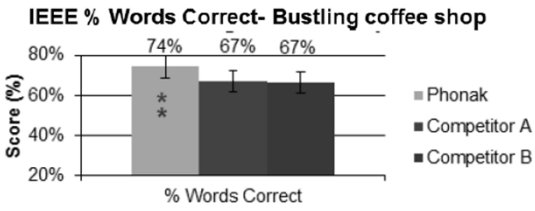
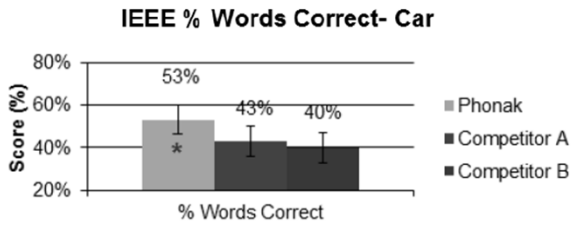
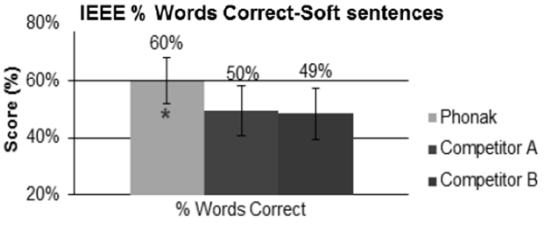
Comparing objective outcomes of automatic classification









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Subjective results

- Listeners were asked to subjectively rate perceived listening effort on a scale from 1 (no effort) to 10 (maximum effort).
- Results of the subjective data indicate a trend toward less perceived listening effort across all 4 scenes in Phonak AutoSense OS as compared to the other 2 manufacturers.

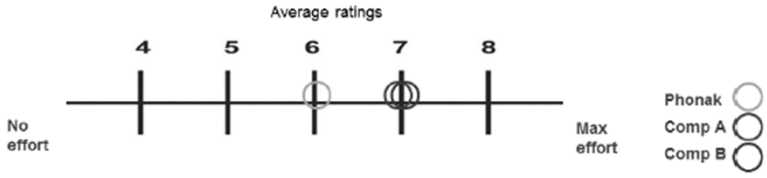

Figure 8. Average subjective rating of perceived listening effort when performing the speech recognition task in each manufacturer's automatic classification system.

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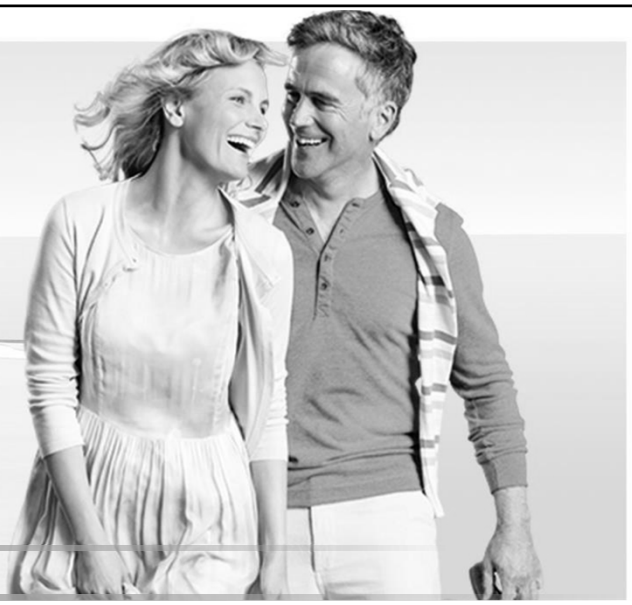
Audéo Belong™ Simplifying life

- AutoSense OS is an incredibly powerful and accurate scene classification system
- PARC Research findings:
  - performed better in AutoSense OS than their preferred manual program or “acoustically appropriate” target program
  - preferred AutoSense OS in all three listening scenes
  - Phonak AutoSense OS consistently yielded **better speech intelligibility performance** across numerous real-world, complex and challenging listening environments when compared to competitors.

PHONAK life is on

Phonak Audéo™ B-R

When you can enjoy 24 hours of hearing with one simple charge, life is on



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life is on

Introducing the first and only lithium-ion rechargeable hearing aid

What was once futuristic

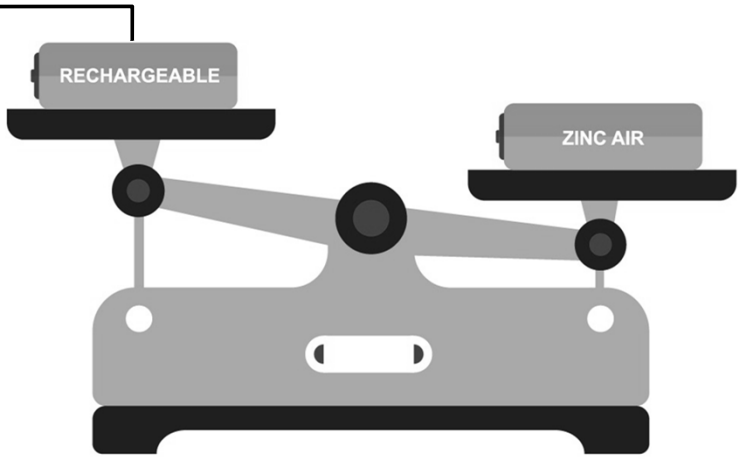
First ever rechargeable car, built in 1888

Is today part of everyday life

PHONAK life is on

Why have rechargeable hearing aids not become the standard?

- Long charging time.
- New battery required after 1 year.
- Less than 24 hours battery life
- Back-up battery option confusing for patients



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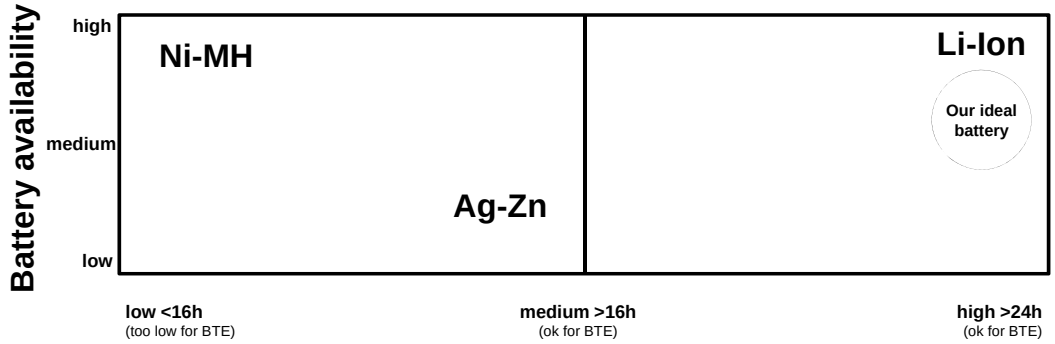
Why Lithium-ion?



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Rechargeable battery technologies and consumer benefits of Lithium-ion

	Nickel-Metal Hydride (Ni-MH)	Silver-Zinc (Ag-Zn)	Lithium-ion (Li-ion)	Consumer Benefit Phonak Audéo Belong Rechargeable
Voltage (V)	1.2	1.6	3.6	24 hours battery use
Capacity (mAh)	30	35	42	
Charge time (h)	5	6	3	3 hours for a full charge
Charging cycles	500	400	1500	Battery lifetime 4 years plus
Expected Battery lifetime (years)	1	1	4	
Self-discharge per month	<20%	<5%	1-2%	

Phonak Pioneering

PHONAK life is on

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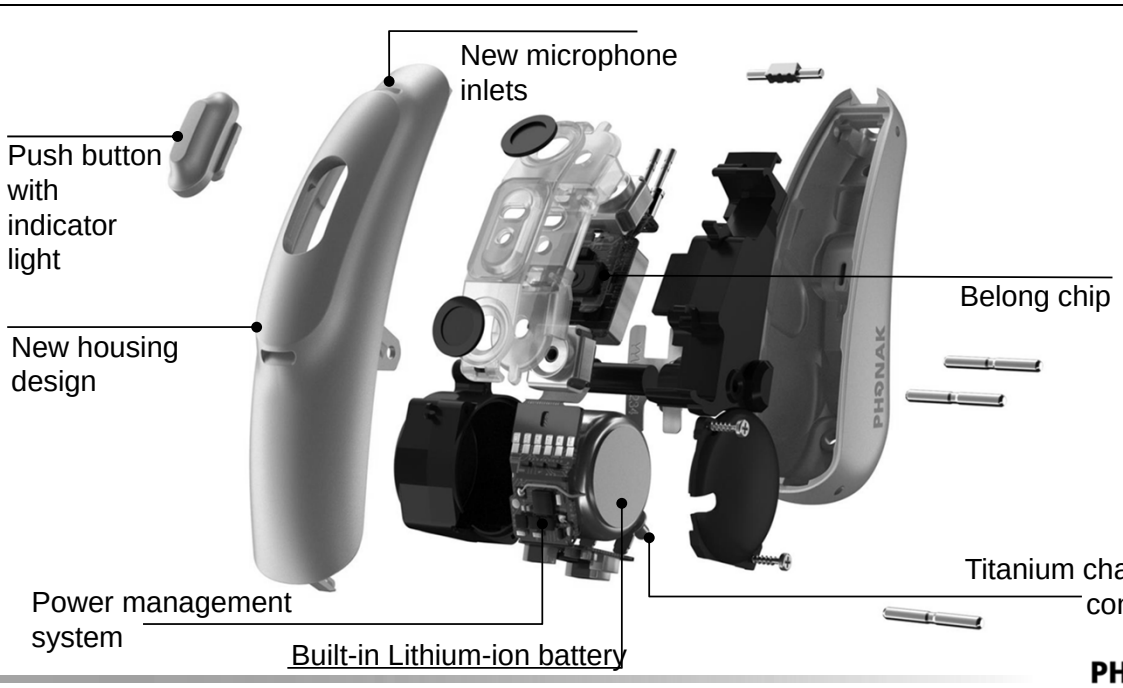
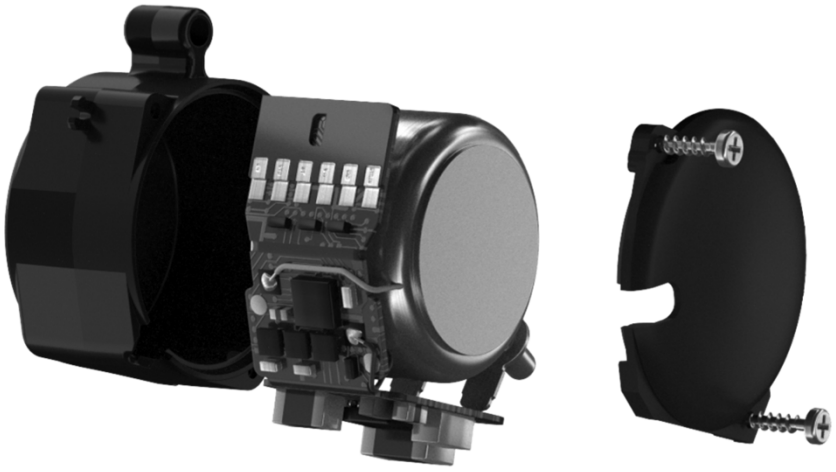
Phonak Audéo B-R:

A LOOK INSIDE



Built-in Lithium-ion battery

- Battery compartment is encapsulated to protect from moisture and dust
- Ensures battery reliability
- Increases lifetime of the hearing aid



PHONAK life is on

Power management system

- Phonak proprietary power management chip that allows Phonak hearing aids to use a Lithium-ion battery.

- Regulates the Lithium-ion voltage
- Improves battery capacity
- Maintains state of charge
- Protects the battery

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Titanium charging contacts

- Does not corrode
- Fast charging
- Smaller hearing aids

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Battery life: Hours of use

- Up to 80 minutes media streaming – 24 hours*
- 5 hours of audio/media streaming –20 hours
- 10 hours of audio/media streaming –16 hours

***Expected results when fully charged, and up to 80 minutes wireless streaming time. Please refer to www.phonakpro.com/evidence**

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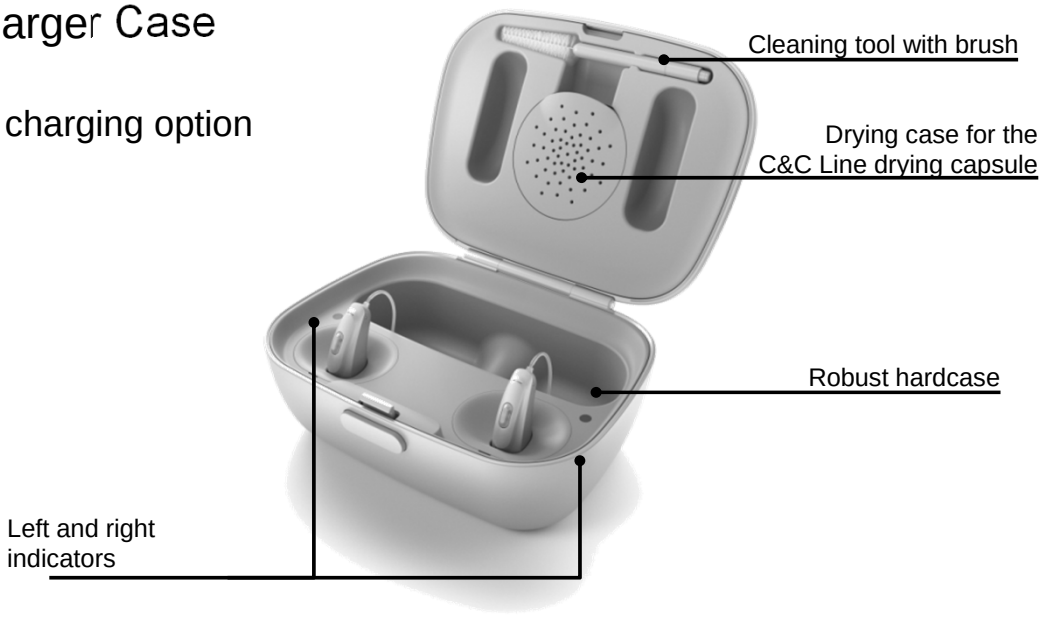
Audéo B-R charging options

Charging Time	Battery Life
3 H	24 H
90 Mins	19 H
60 min	12 H
30 min	6 H

Phonak Charger Case

- The 3-in-1 charging option



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Phonak Power Pack

- The charging on-the-go option
- 7 full day charges of Audéo B-R
- Charge hearing aids and power pack together
- Design integrated

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PHONAK life is on

Phonak Mini Charger

- Most compact charging option

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Traveling with Audéo B-R

- Clients travelling with rechargeable hearing aids cannot place Lithium-ion batteries in their checked luggage and must follow the rules of the airline with regards to this.
- They can wear their hearing aids or have them in their carry on bag on the plane
- Rules and regulations on the handling of Lithium-ion on planes are bring updated

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Things to Remember

Phonak Audéo™ B-R

- Phonak Target™ 5.0 fitting software is required to fit these devices, and can be downloaded within your existing Target software
- If you require a hard copy, please contact Phonak Customer Service

- Devices are sent to you in "sleep" mode
- To "wake" the devices, simply insert into a charger for 2 seconds
- Devices are shipped with a partial charge. We recommend charging prior to fitting

- iCube II is required to program these devices
- Be sure to turn the devices on (long press of the push button, the LED light will blink 1x) before connecting to iCube II

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Audéo B-R
Simplifying life

Offer a rechargeable hearing aid that lasts a whole day

Patient benefit:

No more hassle obtaining and changing hearing aid batteries and 24 hours of use per day

Provider benefit:

No need to spend time on battery instruction within fitting appointments

PHONAK life is on

Simply rechargeable

- Breakthrough Lithium-ion battery technology that is minimized into a hearing aid
- 24 hours* of continuous hearing
- Quickest charging, longest lasting hearing aid ever
- Charge on-the-go

***Expected results when fully charged, and up to 80 minutes wireless streaming time. Please refer to www.phonakpro.com/evidence**

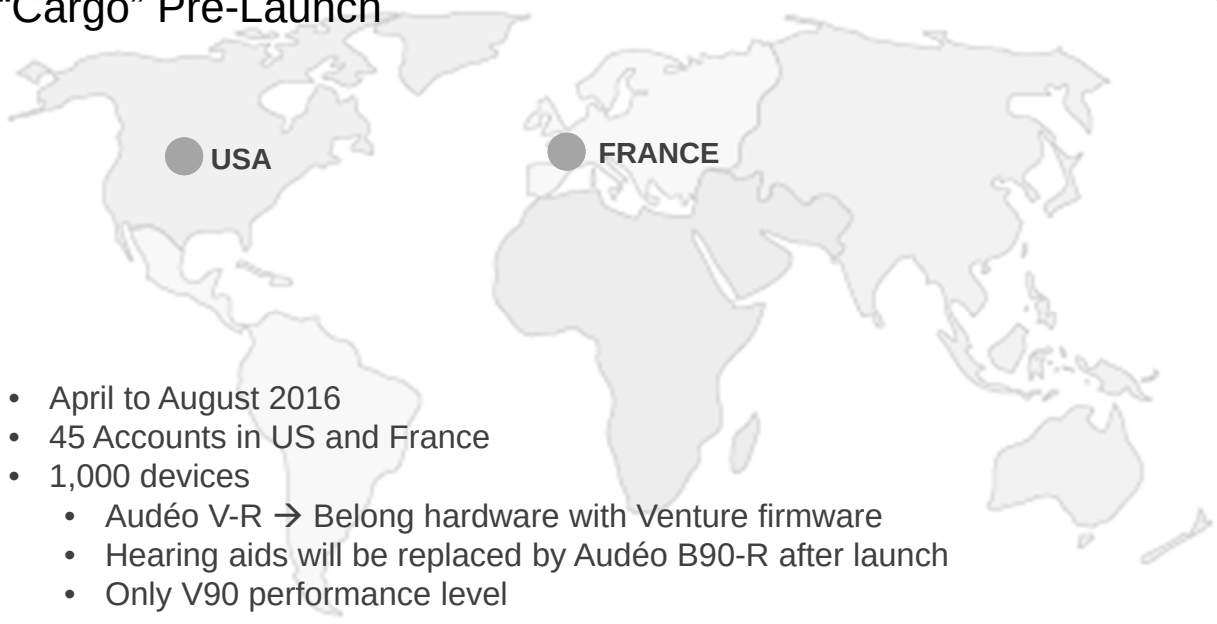
PHONAK life is on

PHONAK life is on

Phonak Rechargeable Pre-Launch

Simplifying life

“Cargo” Pre-Launch



- April to August 2016
- 45 Accounts in US and France
- 1,000 devices
  - Audéo V-R → Belong hardware with Venture firmware
  - Hearing aids will be replaced by Audéo B90-R after launch
  - Only V90 performance level

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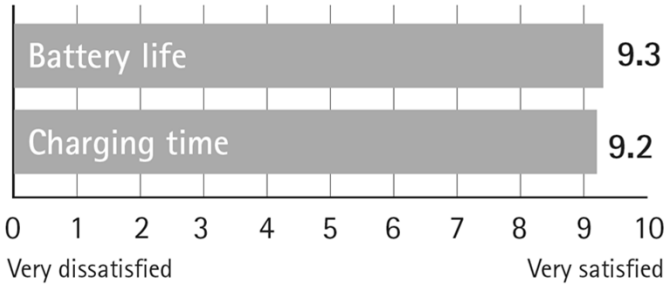
1 Cargo INSIGHTS

SATISFACTION

How satisfied are you with the following….



Total: N=173

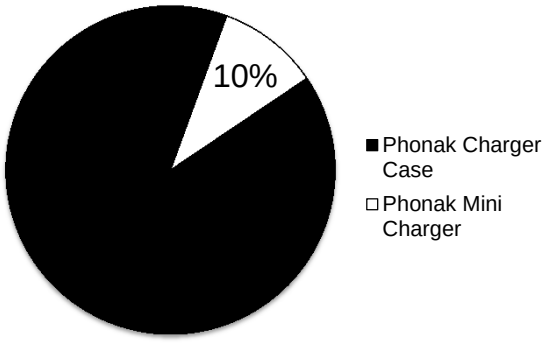
Source: Phonak Cargo Pre_Launch Internal Summary Report

PHONAK life is on

PHONAK life is on

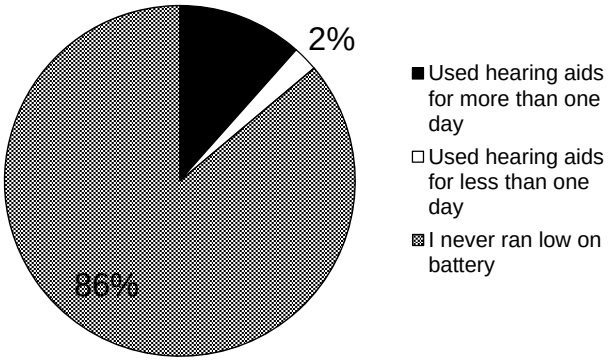
Charger preferences and experiences

Which charger do you prefer from a usability perspective?



Total: N=51 (USA only)

If you ever ran low on battery, when did it happen?



Total: N=152

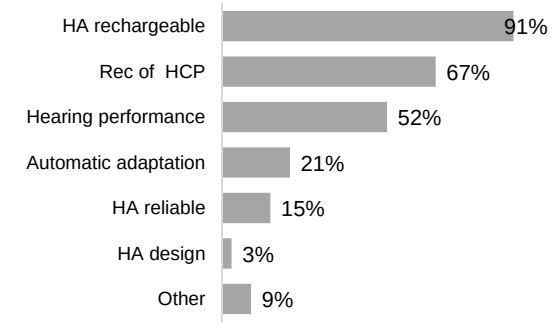
Source: Phonak Cargo Pre_Launch Internal Summary Report

PHONAK life is on

2 Cargo INSIGHTS

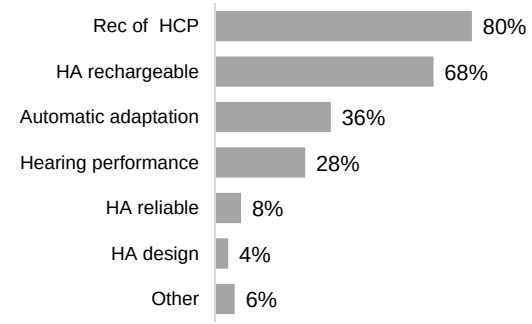
MOTIVATION to purchase

Providers…



Total: N=33

Patient…



Total: N=51

Source: Phonak Cargo Pre_Launch Internal Summary Report

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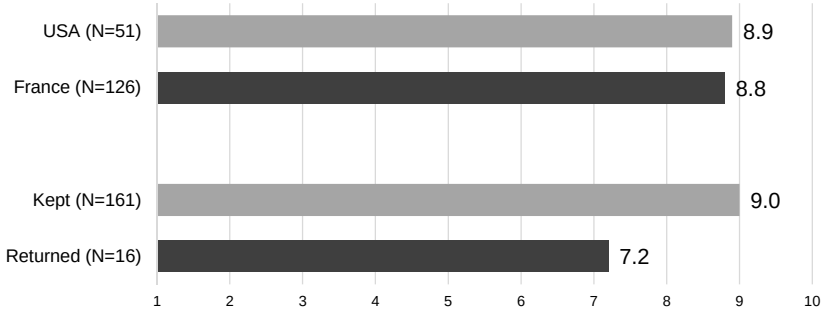
PHONAK life is on

3 Cargo INSIGHTS

Patient willingness to **RECOMMEND** rechargeable



Source: Phonak Cargo Pre_Launch Internal Summary Report

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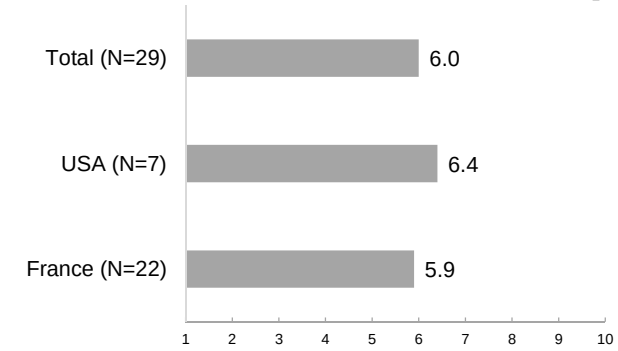
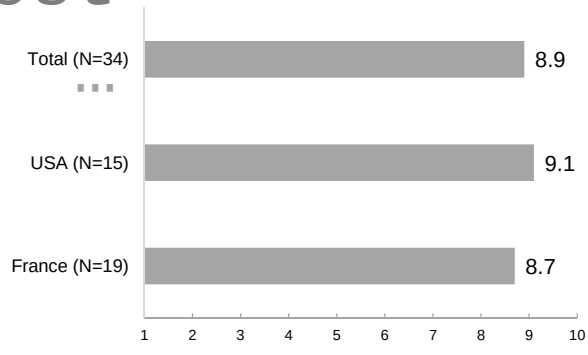
Provider willingness to **RECOMMEND** rechargeable

Pre…



Post



Source: Phonak Cargo Pre_Launch Internal Summary Report

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9 out of 10 HCPs would recommend Phonak Audéo lithium-ion battery technology[4]

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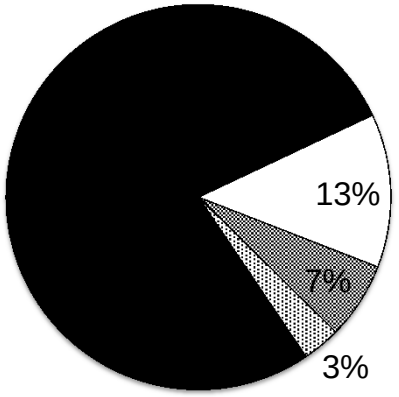
4 Cargo INSIGHTS

Provider **COMPETITIVE** comparison

Compared to rechargeable hearing aids from other manufacturers which you are familiar with, how would you rate the Phonak Rechargeable?



Total: N=31

Source: Phonak Cargo Pre_Launch Internal Summary Report

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Phonak Target 5.0 – New features

1. Benefit demonstration
2. Pre-calculation improvements including:
   – Expansion fading to off
   – Amplification approach for asymmetric HL
3. Receiver check

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Benefit demonstration

While home trials with hearing aids or in office demonstration provide insights into the potential benefits to the user, there are several drawbacks:

- Need to have devices available
- The fitter must spend time to program and counsel on the use and care
- Not applicable for significant other

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Top 10 reasons to purchase a hearing aid

HA: Hearing Aid
HL: Hearing Loss

Recognize HL worse	**69**
Spouse or relative	**53**
Safety concern	**21**
Audiologist	**20**
ENT	**18**
Insurance coverage HA	**17**
Price of HA	**14**
Media (print, TV, radio)	**13**
Family doctor	**12**
Received free HA	**11**

MarkeTrak VIII: The Key Influencing Factors in Hearing Aid Purchase Intent; March 1, 2012

PHONAK life is on

There is growing recognition among audiologists of the importance of promoting partnership with family members during the hearing rehabilitation process.

Am J Audiol. 2015 Dec 1;24(4):536-48.
Meyer C, Scarinci N, Ryan B, Hickson L

While family members currently have minimal participation in audiology appointments, they display a strong interest in being involved and sharing their experiences of the client's hearing impairment.

Int J Audiol. 2015 Feb;54(2):70-6.
Ekberg K, Meyer C, Scarini N, Grenness C, Hickson L]

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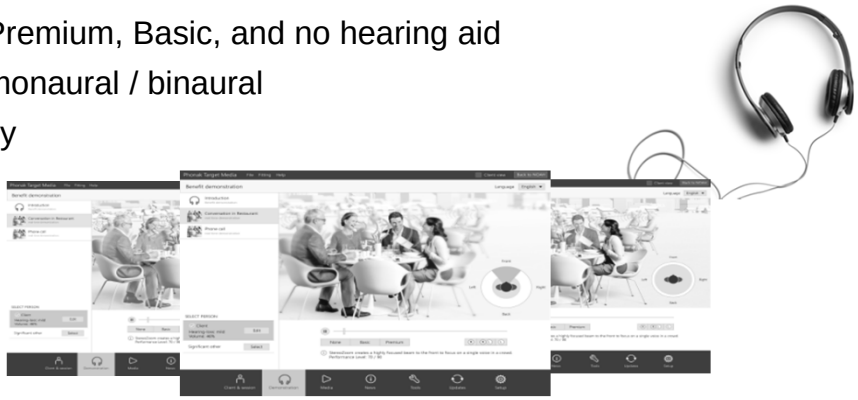
Benefit demonstration

Counseling tool for preliminary talks with new clients and significant others.

- Comparison of Premium, Basic, and no hearing aid
- Comparison of monaural / binaural
- Headphones only



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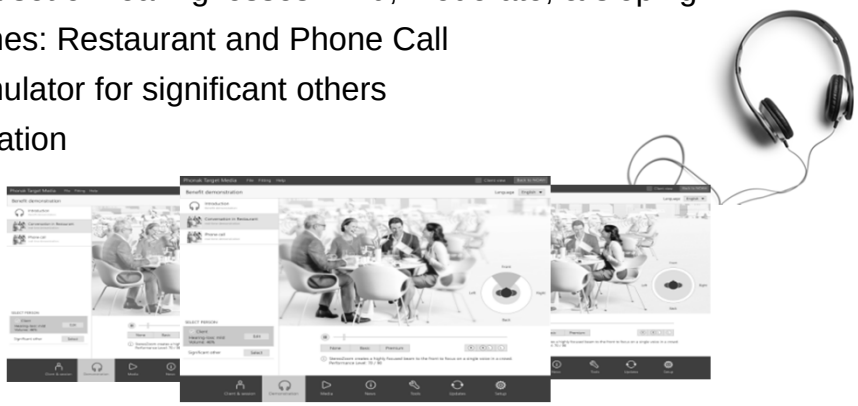
Benefit demonstration

- Recordings through real hearing aids
- Recordings for a set of hearing losses: mild, moderate, & sloping
- 2 important scenes: Restaurant and Phone Call
- Hearing loss simulator for significant others
- Integrated calibration



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Benefit demonstration

- Select **[Demonstration]** to start
- Hand a set of headphones to the person
- Select the person **[client]** or **[significant other]**

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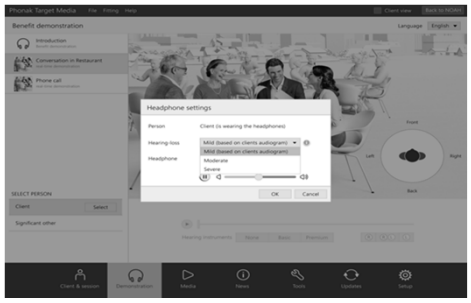
Benefit demonstration

- Press the play icon
- Adjust the headphone settings to a
- comfortable level
- Select an alternative hearing loss level (if desired)



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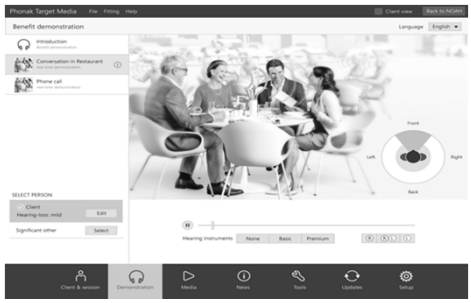
Benefit demonstration

- Select a scene to demonstrate
- Select between **[none]**, **[basic]** & **[premium]** to demonstrate the benefits



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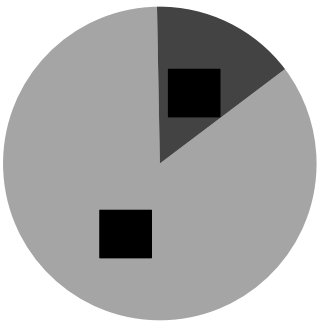
Receiver check

15% of the attached receiver do not match the receiver stored in the fitting data.

A wrong receiver negatively impacts sound quality and performance.



Correct
Wrong

Internal repair statistics, in percent

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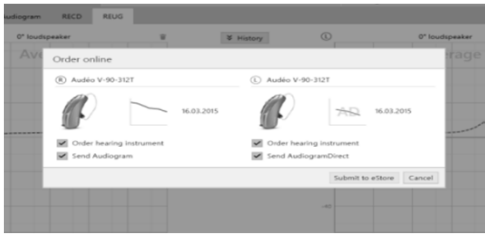
Receiver check



New functionality:

- Read out receiver characteristics
- Information given if there is a mismatch between the receiver attached and what has been selected in the software

Benefits:

- Crosscheck of the receiver attached against to what is selected in fitting software is quick and easy
- Ensures no mismatch of acoustic parameters for best sound quality
- Saves time trouble shooting during the fitting session

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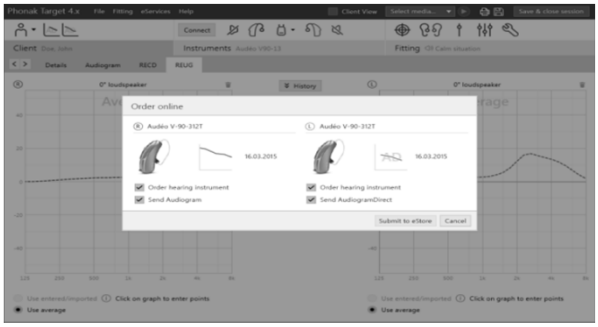
Phonak Store connection



Start orders out of Phonak Target

The following data will be transferred to the Phonak Store

- Patient identification and Patient record number
- The selected hearing aids with the article number
- The audiogram (AC, BC, and UCL)

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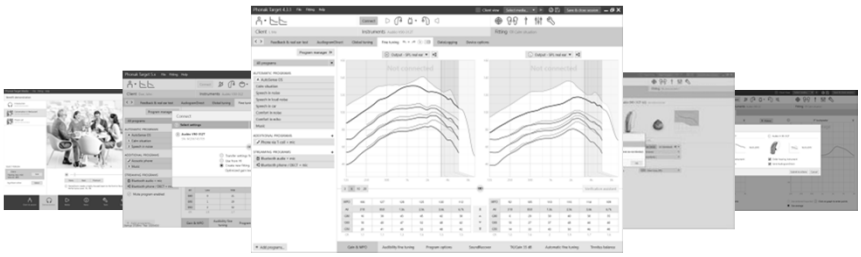
Phonak Target 5.0 – Simply the best

- Benefit demonstration
- Experience level selection
- Pre-calculation improvements including:
  - –Expansion fading to off
  - –Amplification approach for asymmetric HL
- Receiver check
- Audiogram Direct - Pulsed tones
- Assign program toggle to long push
- Lyric display options: gain and output curves
- Runtime intelligence
- Polyphonic beeps
- eStore connection



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Audéo Belong™
Simplifying life

Comprehensive Marketing
- Generate leads for participating providers
- Expand reach and create/awareness
- Increase % of people who seek a solution

Audéo B-R Rechargeable:
- 24 hours of hearing with one simple charge
- Quickest charging, longest lasting rechargeable hearing aid ever

AutoSense OS
- Accurately and precisely adapts to provide a seamless listening experience
- No manual adjustments
- Unmatched hearing performance in everyday listening situations

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Thank You

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