

WIDEX ALLURE™ AI RIC WITH CLARITY BOOST

# SPEECH INTELLIGIBILITY BENEFITS IN HIGHLY REALISTIC SOUND ENVIRONMENTS

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**Widex Allure AI RIC aims to deliver the best of both worlds: natural hearing for everyday use when using the Universal program and superior speech clarity when activating the Clarity Boost program in noisy sound environments. The goal of this study was to evaluate the user benefits of Widex Allure AI RIC in listening situations that closely resemble the real world. Thirty hearing-aid users participated in a speech-in-noise test in the laboratory, where a highly realistic 3D sound field was reproduced. Significantly better speech intelligibility was achieved with the Clarity Boost program than with the Universal program when speech was coming from either the front or side. Additionally, significantly better speech intelligibility was achieved with both Clarity Boost and Universal programs than with another leading manufacturer with AI-based denoising. These results confirm and further strengthen the superior speech clarity achieved with Clarity Boost in noisy sound environments that closely mimic real-world situations.**

## Key findings

- Allure AI RIC with Clarity Boost significantly improves speech understanding over Universal in highly realistic sound environments when speech is coming either from the front or side.
- Allure AI RIC with Clarity Boost achieves, on average, 9.6% better speech intelligibility than another leading manufacturer with AI-based denoising when speech is coming from the front in realistic sound environments.

## Introduction

### **Combining natural sound with excellent speech understanding**

Guided by a clear sound philosophy of delivering the most natural sound experience, Widex hearing aids aim to provide the wearer with a natural balance between the target signal and the background sounds. Clinical studies have been performed both in the laboratory (Balling et al., 2025b) and in real life (Balling et al., 2025a), providing evidence that Widex Allure offers a comfortable balance of focus and awareness for a better speech-in-noise experience. This natural listening experience is also reflected in a strong preference for the superior sound quality of Widex Allure among leading manufacturers (Balling et al., 2025c). Interestingly, a recent study (Picou et al., 2026) showed that hearing aid sound quality was significantly and positively correlated with ratings of mood in hearing aid users. These results suggest that hearing aids delivering good sound quality can play an important role in users' general well-being.

Importantly, however, natural sound does not have to come at the expense of speech-in-noise performance. In a recent study simulating realistic conversations in background noise, Widex Allure achieved superior speech-in-noise performance, outperforming three manufactures with AI-based denoising while showing comparable performance

to the fourth manufacturer (Korhonen et al., 2026). The combination of superior sound quality and excellent speech-in-noise performance was also confirmed by users wearing Widex Allure in real life. In a survey of 270 Allure wearers, 95% of users expressing an opinion reported improved speech understanding in noise in real-life situations, and 97% reported that the sound is natural and clear (WidexPress 61, 2026).

### **Greater speech clarity via the Clarity Boost program**

With the Widex Allure platform as a foundation, delivering a natural listening experience with clear speech for everyday use, the Allure AI RIC adds an Artificial Intelligence (AI) co-processor to achieve even greater speech clarity and comfort (Slugocki et al., 2026). Users can activate the AI co-processor on demand via the Clarity Boost program, whenever they may need additional speech clarity in noise. This is because at Widex, we believe that AI technology should work in partnership with the wearer. In this way, Widex Allure AI RIC aims to deliver the best of both words: natural hearing for everyday use when using the default Universal program and superior speech clarity when activating the Clarity Boost AI-program in noisy sound environments.

The deep-neural network (DNN) in Clarity Boost deploys

## Clinical implications

Widex Allure AI RIC with Clarity Boost empowers users with the option of enhancing speech understanding in noise when speech is presented from either the front or side.

a novel AI architecture specifically built for audio signals. The DNN is placed directly on the signal path (Bianchi et al., 2026), effectively and efficiently processing audio end-to-end with a delay within the threshold for acceptable sound quality (Dillon, 2012). The result is that Clarity Boost achieves the highest average signal-to-noise ratio (SNR) at the output of the hearing aid compared to four other premium hearing aids with AI-based denoising (Bianchi et al., 2026). Moreover, thanks to the innovative DNN training approach, this superior denoising performance comes hand in hand with preserving what is important to human perception, such as environmental awareness and natural sound quality, in line with the Widex Sound Philosophy.

### Evidence from realistic sound environments

Guided by the goal of supporting users in real life, the training of the DNN in Clarity Boost was deliberately focused on ensuring robust performance across a wide range of real-world listening situations. In line with this, clinical studies evaluating speech-in-noise performance with Clarity Boost were also designed to ensure a high level of realism to reflect listening situations and acoustic conditions commonly experienced in users' everyday life. A first study (Slugocki et al., 2026) was conducted to simulate a conversation in noise, either with a speaker positioned in front of the participant or with two alternating speakers positioned at the sides of the participant. A busy cafeteria background noise was reproduced over eight loudspeakers in the horizontal plane. The results of the study showed that speech-in-noise performance was 20.5% better with Clarity Boost than Universal, for target speech presented from the sides (Slugocki et al., 2026). While speech-in-noise performance was on par between Clarity Boost and Universal for target speech presented from the front, users rated Clarity Boost as less effortful and more comfortable than Universal in realistic sound environments, independent of target direction.

In this study, we expand on the results of Slugocki et al. (2026) to assess speech-in-noise performance with Widex Allure AI RIC in highly realistic sound environments, against one other manufacturer that applies AI-based denoising and claims a focus on natural sound. The goal of this study was to take realism a level further. Using Ambisonic reproduction with 45 loudspeakers placed in a 3D array around the participant (Figure 2), the acoustic details of the sound scene were reproduced with much higher precision, including reverberation. In this way, it was possible to effectively reproduce a 3D sound field in all its acoustic details and cues. To further increase realism, the target speech consisted of natural sentences from the Danish Sentence Test (DAST, Kressner et al., 2023, 2026), which were embedded in the sound scene. The aim of the study was to evaluate speech-in-noise performance with the Clarity Boost program relative to both the Universal program and the other manufacturer during a one-to-one conversation with a speaker positioned either in front of the participant or to the right side. The hypothesis was that a higher level of realism, both in the reproduction of the sound scene and in the speech material, would allow us to better understand the user benefits of Clarity Boost in listening situations that closely resemble the real world.

## Methods

### Participants

Thirty participants (10 females, 20 males) with mild to moderately severe symmetrical sensorineural hearing loss (pure tone average, PTA4 = 48.4 dB HL, standard deviation = 11.7 dB HL, range = 26.3-67.5 dB HL) were included in the study. The mean age was 72.6 years (standard deviation = 10.2 years, range = 56-85 years). All participants were experienced hearing aid users with more than one year of experience.

The sample size was determined based on an a priori power analysis using the effect sizes of pilot data. The power analysis determined that a sample size of 29 test participants would power the study at > 80% to detect a significant difference between Clarity Boost and Universal for speech from the front.

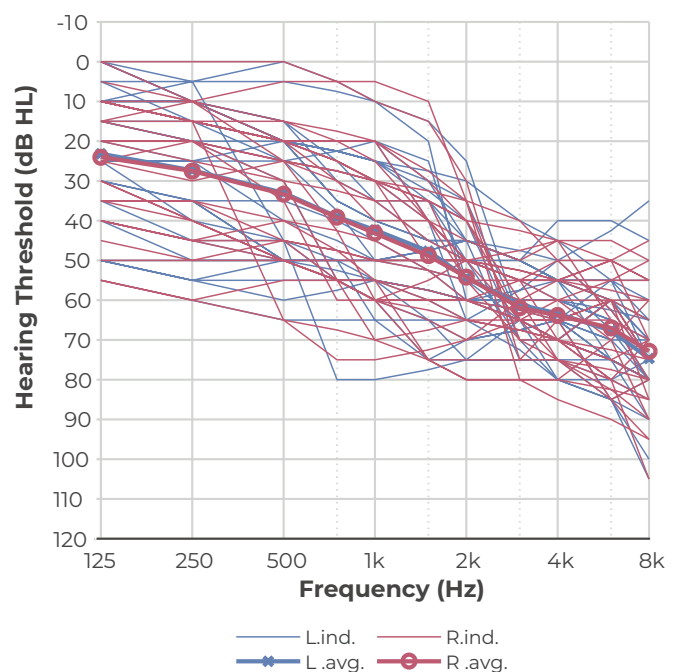


Figure 1. Individual (thin lines) and average (thick lines) air conduction thresholds of the thirty participants included in the study.

### Hearing aid fittings

Participants were all fitted bilaterally with Widex Allure AI receiver-in-canal (RIC) hearing aids as well as with hearing aids from another manufacturer with AI-based denoising. The study aids were programmed for each participant's hearing loss according to the relevant proprietary fitting formula and coupled using power domes. Feedback tests were conducted for all fittings prior to testing.

The Allure AI RIC aids were configured with two programs, the first was the default Widex Universal program and the second was the new Clarity Boost program. The Universal program features a high-definition adaptive beamformer (HD Locator) and a noise reduction system (Speech Enhancer Pro) that uses the Speech Intelligibility Index (SII) to reduce noise while preserving speech (Herrlin et al., 2025). The Clarity Boost program features a broadband beamformer and a DNN-

based noise reduction system powered by a dedicated AI co-processor (Bianchi et al, 2026). The hearing aid from the other manufacturer was tested in their speech-in-noise program, which activates AI-based denoising.

### Test setup and procedure

The speech-in-noise test was performed in the Spatial Audio Laboratory (shown in Fig. 2), which consists of a 3D loudspeaker array with 45 loudspeakers placed on 4 rings. A recording of a busy university food court during lunch, taken from the ARTE database (Weisser et al., 2019), was used as the background sound scene. The sound scene was rendered to the loudspeaker array using mixed-order Ambisonics. The speech material consisted of natural sentences (5-14 words per sentence, male speaker, average duration of 4 s) from the Danish Sentence Test (DAST, Kressner et al., 2023, 2026). The sentences were processed using the specific spatial impulse response of the sound scene to acoustically embed the speech in the background scene.

After two training lists (20 sentences per list), a third list (20 sentences) was run adaptively to assess the individual speech reception threshold to achieve 50% correct (SRT50) with the Universal program for speech coming from the front. The test was then performed at two fixed SNR conditions, namely at the individually obtained SRT50 (very challenging condition), as well as at SRT50+3 dB SNR (challenging but more manageable condition). The target speech was presented either from 0° (speech from the front) or +90° (speech from the right side), with one list (20 sentences) for each target angle. Before the start of each sentence, an acoustic cue (1 kHz pure tone of 100 ms in duration) was played from the front loudspeaker to alert the participants of the incoming target sentence. After the end of the sentence, the participants were instructed to repeat the sentence. The percentage of correctly repeated words was reported (word score).



Figure 2. Picture of the Spatial Audio Lab where the speech intelligibility test was performed.

The participants performed the test with three hearing-aid conditions, namely Widex Allure AI RIC in the Universal program, Widex Allure AI RIC in the Clarity Boost program, and one other manufacturer with AI-based denoising. Due to a programming issue, one participant in the speech front condition and one participant in the speech side condition did not perform the test with the other manufacturer. Additionally, one participant did not participate in the second visit (speech side). Overall, this resulted in N=29 for the speech side condition with Widex Allure AI RIC (Universal, Clarity Boost), N=28 for the speech side condition with the other manufacturer, N=30 for the speech front condition with Widex Allure AI RIC (Universal, Clarity Boost), and N= 29 for the speech front condition with the other manufacturer.

The study consisted of two visits, each of approximately 1.5-2 hours in duration. In each visit, all six conditions for one target speech angle were measured (three hearing aid conditions, two SNR conditions). The order of conditions was randomized and balanced across participants.

### Statistical analysis

The four combinations of SNR and target speech angle constituting the four test conditions were analyzed separately. For each test condition, one-sided Fisher permutation tests were performed for all pairs of hearing aids (three tests in total) to assess the within-subject differences in word recognition scores. Due to the nature of the Fisher permutation test, no correction was done for multiple comparisons.

### Results

On average, the SRT50 obtained with the Universal program during the initial adaptive speech-in-noise procedure was 0.08 dB for frontal targets (standard deviation = 3.65 dB, range from -5.2 dB to 9.2 dB). Following the adaptive procedure, speech understanding was evaluated at a fixed SNR, corresponding to the individually obtained SRT50 (very challenging condition), as well as to the individual SRT50+3 dB SNR (challenging but more manageable condition). The percentage of correctly repeated words is shown in Figure 3 for the two levels of demand imposed by the listening environment (SRT50: top panels; SRT50+3 dB SNR: bottom panels).

When participants were in a very challenging listening environment (SRT50; Fig. 3 top panels), speech understanding was significantly better with the Clarity Boost program than with the Universal program for speech targets from the side (Clarity Boost benefit = 8.6 percentage points;  $p = 0.003$ ). When speech was presented from the front, participants achieved, on average, similar speech intelligibility with Clarity Boost and Universal (Universal: 58.0%; Clarity Boost: 58.7%). The obtained speech intelligibility performance at SRT50 was closer to 60% than 50%, likely due to the nature of testing at a fixed SNR, which often leads to a procedural advantage relative to adaptive testing. Additionally, participants obtained a significant advantage in speech understanding with Clarity Boost over another manufacturer, for speech targets presented either from the front (Clarity Boost benefit = 9.6 percentage points;  $p = 0.0001$ ) or side (Clarity Boost benefit = 5.2 percentage points;  $p = 0.031$ ).

When participants were in a challenging but more manageable listening environment (SRT50+3 dB SNR; Fig. 3 bottom panels), speech understanding was significantly better with the Clarity Boost program than with the Universal program, for speech targets presented either from the front (Clarity Boost benefit = 2.5 percentage points;  $p = 0.041$ ) or side (Clarity Boost benefit = 3.4 percentage points;  $p = 0.035$ ). In other words, in challenging but more manageable listening environments, participants obtained a significant advantage in speech understanding with Clarity Boost over Universal, independent of speech direction. Moreover, a significant advantage in speech understanding was obtained with Clarity Boost over the other manufacturer, for speech targets presented from the front (Clarity Boost benefit = 9.6 percentage points;  $p < 0.0001$ ).

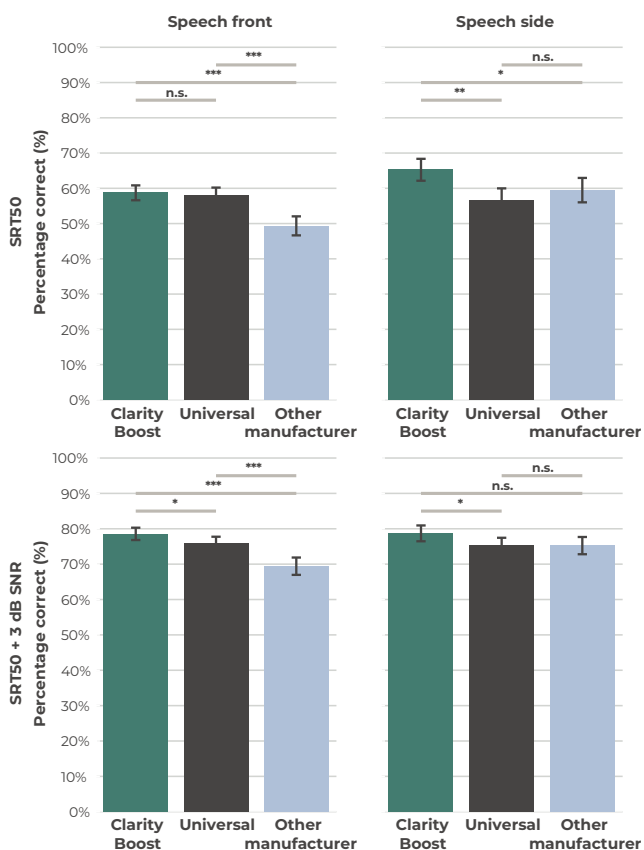
Importantly, a significant speech intelligibility advantage was also obtained with the Universal program relative to the other manufacturer for speech targets presented from the front, for both the very challenging listening condition (SRT50: Universal benefit = 9.2 percentage points;  $p = 0.001$ ) and the more manageable listening condition (SRT50 + 3 dB SNR: Universal benefit = 7.0 percentage points;  $p = 0.0001$ ).

## Discussion

The ultimate goal of hearing aid features is to support users in the real world. When evaluating user benefits with new hearing aid features, laboratory studies should be designed to reflect acoustic environments that are as realistic and relevant to users as possible. This is exactly what this study was designed for. Using Ambisonic rendering to reproduce a 3D sound field with high accuracy, it was possible to evaluate speech intelligibility benefits that are closely related to real word performance. To achieve an even higher level of realism, the DAST speech material was used (Kressner et al., 2023), which consists of natural sentences of longer duration than sentences from traditional speech corpora, e.g., matrix tests (Wagener et al., 1999) or Hearing-In-Noise Test (HINT, Nilsson et al., 1994). The DAST sentences were embedded in the actual sound scene for a fully immersive listening experience simulating a conversation with one interlocutor, either positioned in front of the hearing aid user or to the right side.

In such a highly realistic sound scene, the results showed a significant improvement in speech understanding when using the Clarity Boost program over the Universal program. In a very challenging listening environment reproducing a sound scene where participants were around their individual threshold for 50% intelligibility, a significant improvement in speech understanding was obtained with Clarity Boost over Universal for speech presented from the side. This result confirms and further strengthens the findings of Slugocki et al. (2026). The findings of Slugocki et al. (2026) indicated a speech intelligibility advantage of 20.5% for side targets obtained with Clarity Boost over Universal in very challenging listening environments, simulated with eight loudspeakers in the horizontal plane without Ambisonic reproduction. By reproducing a full 3D sound field with high realism, this study not only confirmed the significant (albeit numerically smaller) advantage in speech intelligibility with Clarity Boost for side targets but also revealed a significant speech intelligibility advantage of Clarity Boost for frontal targets. The frontal advantage was obtained in challenging but more manageable sound environments reproducing a sound scene where participants were 3 dB above their individual threshold for 50% intelligibility (on average, resulting in 78.6% correct speech understanding with Clarity Boost). Hence, in environments where participants are less likely to give up and withdraw, Clarity Boost provided a speech intelligibility advantage for speech located either at the front or side of the listener. The benefit for Clarity Boost over Universal was independent of the degree of hearing loss, suggesting that mild, moderate, and moderately severe losses would similarly benefit from AI-based denoising offered via the Clarity Boost program.

This study also showed a competitive advantage for Allure AI RIC over another manufacturer using AI-based denoising and claiming a natural sound experience. Listening to speech in noise with both Clarity Boost and Universal programs resulted in significantly better speech understanding than with the other manufacturer. Whether in very challenging or more manageable listening environments, hearing aid users obtained a speech intelligibility benefit between



**Figure 3.** Mean speech-in-noise performance for Widex Allure AI RIC (Clarity Boost: green; Universal: gray) and another manufacturer (light blue), for two fixed SNR conditions (SRT50: top panels; SRT50+3 dB SNR: bottom panels) and two target speech directions (speech front at 0°: left panels; speech side at +90°: right panels). Error bars indicate standard error of the mean. Asterisks indicate a significant difference between conditions: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ . Non-significant differences are indicated with "n.s."

approximately 7 and 10 percentage points over the other manufacturer when listening to a frontal interlocutor. These results corroborate earlier findings of the superiority of Widex Allure Universal with its natural sound processing over three manufactures with AI-based denoising (Korhonen et al., 2026). The findings of the current study confirm the superiority of the natural processing used in Widex Allure AI RIC (Universal) for speech-in-noise performance while also proving evidence of the superiority of Widex Allure AI RIC with Clarity Boost, achieving even greater speech clarity in a variety of noisy sound environments.

### Conclusion

By reproducing a highly realistic sound scene in the laboratory, the user benefits of Clarity Boost could be evaluated in environments that are as realistic and relevant to users as possible. Speech understanding significantly improved when using the Clarity Boost program for speech targets coming from either the front or side of the user, providing further evidence for the enhancement in speech clarity when activating the Clarity Boost program in noisy sound environments.

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