WHITE PAPER

Signia Multi-adaptive Xperience outperforms key competitors in group conversation in noise

Understanding speech in noisy group conversations remains one of the greatest challenges for people with hearing loss. This study, conducted at Hörzentrum Oldenburg in Germany, compared the conversational performance of Signia Multi-adaptive Xperience (MaX) with the performance of Signia Integrated Xperience (IX) and two leading premium competitor hearing aids featuring DNN-based noise reduction. Thirty experienced hearing aid wearers were tested in a realistic multi-talker conversation scenario with interfering speech and background noise. Signia MaX delivered the best performance, achieving significantly lower (better) speech reception thresholds than all comparator hearing aids. The benefit was highly consistent across participants, with 97% of them showing their best speech understanding performance with Signia MaX. The results demonstrate that Signia MaX with Acoustic Intelligence™, which controls the new AI-driven RealTime Conversation Enhancement^{AI}, provides substantial speech understanding benefits and supports more effective communication in challenging noisy social environments. The results show that the combination of multi-stream processing and system-level intelligence significantly outperforms competitor hearing aids with AI co-processors in noisy group conversations.

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Take-away messages

- In a modified version of the standardized OLSA speech-in-noise test, simulating a group conversation, 29 out of 30 participants (97%) showed their best performance with Signia MaX, compared to Signia IX and two key competitors.
- The mean speech reception threshold (SRT80) for Signia MaX was 1.0 dB lower (better) than the mean SRT80 for Signia IX and 1.5 dB and 2.8 dB lower than the mean SRT80 for the two key competitors.
- The observed performance benefits demonstrate the positive effects of Acoustic Intelligence and the AI-steered signal processing offered by Signia MaX.
- The results suggest that Signia MaX wearers will experience improved conversational performance when being in noisy group conversations, allowing them to participate and contribute more effectively.

Introduction

The introduction of the Signia Multi-adaptive Xperience (MaX) platform represents a significant development in hearing aid signal processing, leveraging advanced artificial intelligence (AI) based on multiple deep neural networks (DNNs) to provide a much higher degree of personalization and speech clarity.

While many current AI applications in hearing aids focus primarily on noise management, Signia MaX applies AI at system level by the introduction of a much more holistic approach where the scope of the AI application is much broader, controlling the sound processing at all times and in all types of listening situations.

The Signia MaX hearing aids are designed to address one of the most challenging listening situations encountered by people with (and without) hearing loss, as confirmed by the recent MarkeTrak 2025 survey (Picou, 2025): Group conversations in noisy environments. The new platform is built on the foundation laid out by the Signia Integrated Xperience (IX) platform, which introduced RealTime Conversation Enhancement (RTCE) as a unique way to continuously analyze a conversation situation and track and enhance the conversation partners in real time (Jensen et al., 2023). However, by adding the power of AI via the introduction of Acoustic Intelligence – where four DNNs work together to optimize four key sound-processing technologies implemented on the MaX platform – a major improvement in both technical and wearer performance is enabled.

A more detailed description of the Signia MaX platform, Acoustic Intelligence and the four key technologies steered by AI is provided by Jensen et al. (2026). That paper also presents the results from technical measurements showing substantial signal-to-noise ratio (SNR) improvements provided by Signia MaX in a simulated group conversation in noise, both compared to its predecessor (Signia IX) and compared to hearing aids from key competitors. In this white paper, we will focus on the perceptual benefits provided by Signia MaX and Acoustic Intelligence in group conversations in noise. We will investigate whether the SNR improvements shown by Jensen et al. (2026) translate into improved speech understanding.

In particular, we will explore the effects of one of the four key processing technologies, RealTime Conversation Enhancement^{AI} (RTCE^{AI}), which is a new AI-driven version of the technology known from the previous Signia IX platform – but now offering stronger impact and improved performance due to Acoustic Intelligence.

Controlled by Acoustic Intelligence, RTCE^{AI} is able to provide an even more precise analysis of a conversation scenario, and the ability to focus on and enhance the conversation partners is further improved (see Jensen et al. (2026) for more details). This is clearly demonstrated by the mentioned SNR measurements.

The three other features controlled by Acoustic Intelligence include Own Voice Processing^{AI}, Ambient Scene Adaptation^{AI}, and Dynamic Noise Control^{AI} (see Jensen et al. (2026) for detailed descriptions). All of these features make important contributions to different dimensions of the overall wearer experience in communication situations, but they do not provide the same direct impact on making conversation partners stand out in background noise – which is the effect we explore in this paper – as RTCE^{AI}.

We will present a study designed to investigate some of the most important perceptual benefits offered by MaX. The main research question was: How does the conversational performance offered by Signia MaX compare to the performance of the Signia IX platform and the performance of two key competitors with AI-based noise reduction when tested in a simulated noisy group conversation in the lab?

Methods

The study was carried out by Hörzentrum Oldenburg, Germany. The study was approved by the medical ethics committee of the University of Oldenburg, and all participants signed an informed consent form before entering the study.

Participants

To determine the appropriate number of participants, an a priori statistical power analysis was performed using G*Power 3.1.9.7. The analysis showed that including 29 participants would allow detection of a 1 dB difference in the speech reception threshold (SRT) measured with the applied modified German OLSA speech test (see description below). The analysis assumed a significance level of 5%, a statistical power of 90%,

and a standard deviation of 1.6 dB on the individual SRT differences (based on data from previous use of a similar test).

Accordingly, 30 participants were recruited for the study. The 30 participants included 15 females and 15 males. Their mean age was 71 years (range: 28-84 years; standard deviation: 12 years), and they all had a sensorineural hearing loss, mainly in the moderate-to-moderately-severe range. The mean audiogram is shown in Figure 1.

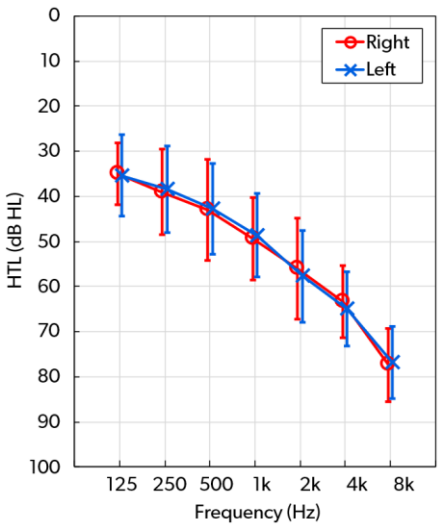

Figure 1. Mean audiogram for the left and right ear of the 30 participants. Error bars indicate ± one standard deviation.

All participants were experienced hearing aid wearers, and they were wearers of a variety of different hearing aid brands in their daily life.

Hearing aids

All participants were fitted bilaterally with four different receiver-in-canal (RIC) hearing aids:

- Signia Pure C&G T MaX 7
- Signia Pure C&G T 7IX
- Two premium RIC hearing aids at the highest available price points from two main competitors (referred to as Brand A and Brand B)

Both the Brand A and B hearing aids offer AI co-processors with DNN-based noise reduction. At the time of measurement, they represented the most recent premium RIC hearing aids offered by the respective manufacturers.

All hearing aids were fitted according to the proprietary fitting rationales recommended for experienced wearers by the respective manufacturers' fitting software (Connexx 10 for Signia). Fine-tuning was not carried out, so testing was done with the gain setting prescribed by the manufacturer. All fittings were done with closed couplings using power domes/sleeves.

To make sure the DNN-based noise reduction was active in the two competitor hearing aids and thereby avoid any uncertainty about when and whether it would kick in, it was decided to carry out the speech-in-noise testing using the dedicated manual speech-in-noise programs offered by the respective manufacturers, in which the DNN noise reduction would be forced to be active. Accordingly, all four pairs of hearing aids were fitted with a second program designed for optimal speech-in-noise performance. For the two Signia hearing aids, this meant that the "Noisy Environment" program was added as the second program and used for the testing. The programs were used in their prescribed setting with all processing channels enabled, but with frequency compression/lowering features deactivated. All other features were in their default setting. The volume controls on the hearing aids were disabled to avoid unintended changes during testing.

Conversation test

To test the ability to understand speech in a realistic dynamic group conversation in noise where different conversation partners speak, the test setup with 16 loudspeakers shown in Figure 2 was established in a meeting/conference room.

Two loudspeakers (shown as red symbols) were placed 1.03 m from the participant at azimuth angles 0° and 330°. They were used to simulate two conversation partners taking turns speaking in a group conversation by presenting test sentences alternating between the two loudspeakers.

The remaining 14 loudspeakers (shown as gray or white symbols) were placed 1.60 m from the participant, covering azimuth angles between 22.5° and 315° at 22.5° separation, and they were used to create the background noise scenario. The four gray loudspeakers presented recordings of babble speech to simulate nearby disturbing talkers not involved in the conversation (and thus, acting as disturbing noise). The level of the babble signals from the left and right side, respectively, was 67 dB(A). To simulate a realistic ambient sound environment, all 16 loudspeakers

presented background noise recorded in a cafeteria. The total level of the ambient noise was 55 dB(A). The total noise level (including both interfering babble and ambient noise) was 70 dB(A). The level of the noise was kept constant during the test.

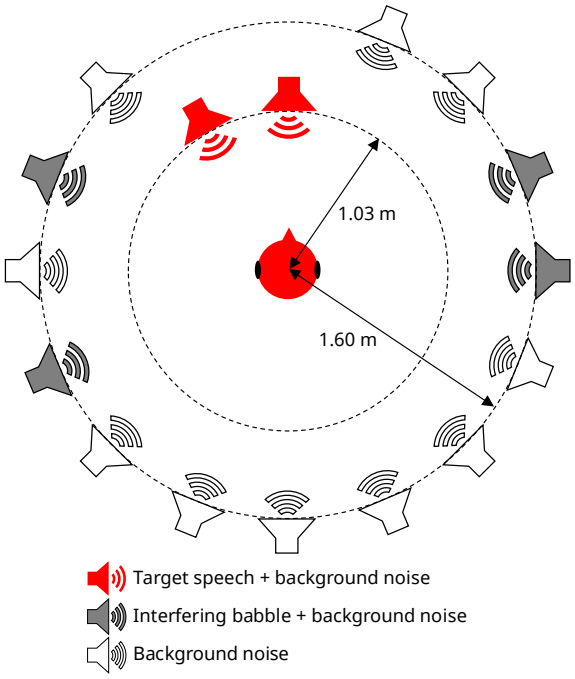

Figure 2. Loudspeaker setup used to simulate a group conversation scenario. The participant was seated in the center of the setup, and target speech sentences were presented alternately from the two red loudspeakers, interfering speech babble was presented from the four gray loudspeakers, while ambient cafeteria noise was presented from all 16 loudspeakers.

The participants' ability to understand speech in the conversation scenario was assessed using a modified version of the standardized German Oldenburger Satztest (OLSA; Wagener et al., 1999). The target speech was the German OLSA sentences presented alternating from the two target loudspeakers. A leading sentence was presented prior to each test sentence to cue the participant.

During the test, the participant was asked to face the front loudspeaker at 0° and keep their head and body still. The task of the participant was to repeat each test sentence verbally. An experimenter scored the number of correctly repeated words, and depending on this number, the level of the next sentence was determined according to an adaptive procedure targeting the signal-to-noise ratio (SNR) where 80% of the words could be repeated correctly. This SNR is the outcome measure of the test and is referred to as the speech reception threshold for 80% correct (SRT80).

An interleaved procedure was used where separate adaptive tracks were followed for the front and the lateral target. The result of the test was calculated as the average SRT80 across both target locations. Each test run included 40 sentences (20 from each direction).

Prior to the actual test, a training run was conducted to familiarize the participant with the test procedure. The training was conducted with the first hearing aids to be worn in the actual test. The test order of the four hearing aids was counterbalanced across the participants.

Results

The observed mean SRT80 across the 30 participants is shown in the bar graph in Figure 3 for each of the four hearing aids. Please note that better performance is associated with a lower SRT80.

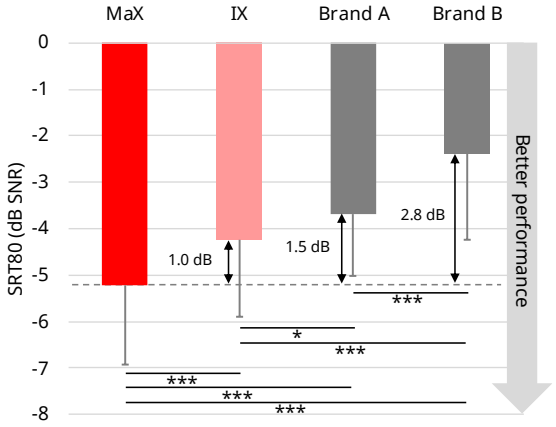

*Figure 3. Mean SRT across 30 participants for the four hearing aids. The error bars indicate one standard deviation. * p < .05, *** p < .001.*

Figure 3 shows a substantially better SRT80 performance of Signia MaX. The mean SRT80 observed for MaX was −5.2 dB, while it was −4.2 dB for Signia IX. With observed mean SRT80 values for Brand A and Brand B of −3.7 dB and −2.4 dB, respectively, none of the competitors matched the performance of IX. Compared to MaX, the two competitors trailed by 1.5 dB and 2.8 dB, respectively.

The SRT80 data were analyzed using a mixed model ANOVA with SRT80 as the dependent variable, *Hearing Aid* as a fixed effect, and

Participant as a random effect. The analysis showed a highly significant effect of Hearing Aid, $F(3, 87) = 77.9$, $p < .001$. A Tukey HSD post-hoc test showed that all pairwise differences between the four test hearing aids were statistically significant (as indicated in Figure 3). The difference between IX and Brand A was significant at $p < .05$, while all other pairwise differences were significant at $p < .001$. Thus, the difference between Signia MaX and Signia IX as well as the pairwise differences between Signia MaX and the two competitor hearing aids were all highly significant. It is also worth noting that the performance with Signia IX was significantly better than the performance with both competitors.

Besides analyzing the mean differences in SRT80, we also looked at the individual variation in the benefit provided by Signia MaX. For each of the three comparator hearing aids (i.e., Signia IX, Brand A and Brand B), Figure 4 shows the individual SRT80 values for the comparator hearing aids plotted as a function of the corresponding SRT80 for Signia MaX. Thus, the plot includes 90 data points (30 subjects x 3 comparators), of which some are highly overlapping. It should be noted that data points above the diagonal indicate cases where performance with Signia MaX was better (as indicated by a lower SRT80) than the comparator, while data points below the diagonal indicate better performance of the comparator. Accordingly, data points on the diagonal indicate similar performance of Signia MaX and the comparator.

The data plotted in Figure 4 show a rather noticeable and consistent trend. All but two data points are above the diagonal, i.e. showing better performance with Signia MaX.

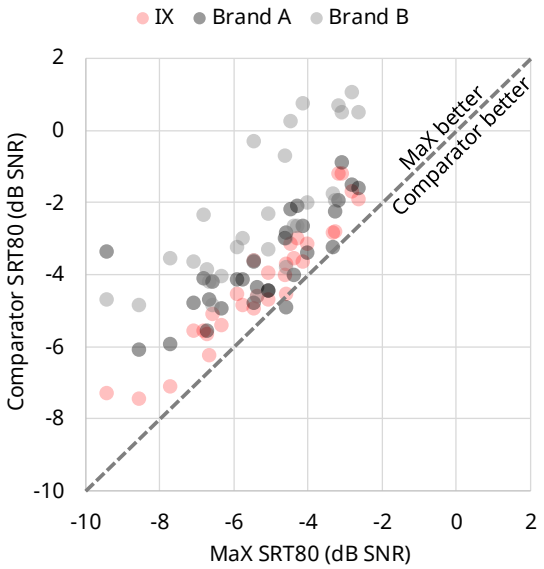

Figure 4. Individual SRT80 values measured for each of the three comparator hearing aids (Signia IX, Brand A, Brand B) plotted as function of the SRT80 measured for Signia MaX. Data points above the diagonal indicate better performance (lower SRT80) with MaX.

For one participant, the observed SRT80 for Brand A was 0.4 dB better (lower) than the SRT80 for MaX, and the same participant provided exactly the same SRT80 for MaX and IX (i.e., with the data point being exactly on the diagonal). The remaining 29 participants (97% of the participants) showed their best performance (lowest SRT80) with MaX when comparing the four hearing aids included in the study.

In Figure 4, it is also worth noting that the Signia MaX benefits occur over the entire SNR range spanned by the individual SRT80s. Thus, the data shows no trend of MaX only providing benefits at certain SNRs. But the data points for the three comparators obviously reflect the differences in mean SRT80. The IX data points are generally closer to the diagonal, the Brand A data points are further away, while the Brand B data points show the largest distance to the diagonal, as reflected by the largest mean SRT80 difference compared to MaX.

Transforming SRT80 benefit to speech understanding benefit

To be able to discuss the impact of a difference in SRT80, it may be helpful to transform the observed SRT80 differences into differences in speech understanding (indicated as percent correct). To make such a transformation, several

assumptions must be made. While, in practice, the assumptions are unlikely to be fully satisfied, the transformation may give a qualified idea about what impact on speech understanding the SRT80 difference will have.

The transformation is based on knowledge of (and assumptions about) the relationship between SNR and speech (word) understanding in the given test. This relationship is described by a performance-intensity (P-I) function (psychometric function).

The first assumption is that the shape of P-I function (averaged across participants) is the same for the different hearing aids tested. Thus, it is assumed that the P-I functions only differ by a parallel displacement, which represents the difference in SRT80. This is illustrated by the red and gray curves shown in the ideal example in Figure 5, representing the P-I functions for two different hearing aids, where the horizontal distance between the two curves is ΔSRT80 at all levels of speech understanding. The measured values of SRT80 for the two hearing aids are shown by the dots and the associated vertical dotted lines.

The second assumption is that each P-I function can be considered linear within the SNR range around its steepest part. As illustrated in the example in Figure 5, this is normally (approximately) fulfilled for speech understanding levels in the 20-80% range, but not below and above that range (shown as shaded areas in the figure). The transformation will be valid in the SNR range where both functions can be considered linear.

The third assumption is that we know the slope of the P-I function for the given test. If so, as illustrated in Figure 5, we can calculate the difference in speech understanding (ΔSU) as the slope of the P-I function (in %/dB) multiplied by ΔSRT80. Thus, in the figure, the horizontal arrow indicates the SRT80 improvement (i.e., reduction of SRT80) provided by the red hearing aids, while the vertical arrow indicates the corresponding improvement in speech understanding (ΔSU). This benefit will approximately be the same across the mentioned valid SNR range.

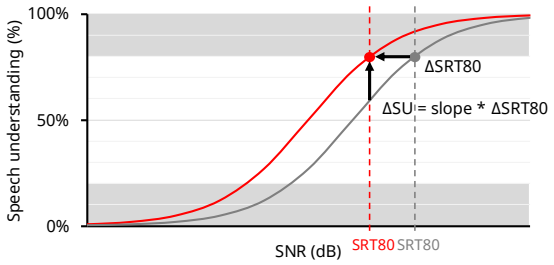

Figure 5. Ideal example of how the observed ΔSRT80 can be transformed into a difference in speech understanding (ΔSU) between two hearing aids in the SNR range where both P-I functions (shown in red and gray) are approximately linear, assuming that the two functions are parallel and that the slope is known.

By applying the slope value of 16 %/dB for the OLSA test (for speech-shaped masking noise), which was published by Wagener & Brand (2005), the 1.0 dB SRT80 benefit provided by Signia MaX compared to Signia IX transforms into a speech understanding improvement of 16% (percentage points). Thus, at the SNR where MaX provides 80% speech understanding (SRT80), the speech understanding with IX can be estimated to be 64%.

In the same way, the SRT80 benefits of 1.5 dB and 2.8 dB versus the two competitors transform into speech-understanding improvements of 24% and 45%, respectively. Accordingly, when MaX provides 80% speech understanding, the two competitors provide 56% and 35% speech understanding. With these values being within the 20-80% range, the assumption about linearity is also expected to hold true in these cases.

Discussion

The results from this study clearly show the speech understanding benefits provided by Signia MaX in a challenging group conversation in a noisy environment including both competing talkers and ambient noise. The results showed a significant mean SRT80 benefit of 1.0 dB compared to Signia IX, and when compared to the two competitors with DNN-based noise reduction, the mean benefits were 1.5 dB and 2.8 dB, respectively. All three pairwise differences were highly significant. As explained above, the 1.0 dB SRT80 benefit compared to Signia IX corresponds to a speech understanding benefit of 16% (percentage points), while the SRT80 benefits compared to the competitors correspond to speech understanding benefits of 24% and 45%, respectively.

While there is some uncertainty associated with these estimated values of the resulting speech-understanding benefits (in percentage points), the uncertainty does not challenge the overall conclusion that Signia MaX offers a substantial benefit in speech understanding in the simulated group conversation in noise, compared to all three comparator hearing aids.

While laboratory based, the test scenario incorporated key elements characteristic of real group conversations, including changing talker locations, competing speech, and ambient environmental sounds. Consequently, the listening demands imposed by the setup are considered representative of many everyday social environments reported as challenging by many hearing-aid wearers.

The results are consistent with the improved conversational AI-driven processing enabled by Acoustic Intelligence. In particular, the RTCE^{AI} technology – with its improved analysis of the conversational scene and new processing designed to improve the contrast between conversation partners and surrounding noise – is likely a major contributor to the improved performance. This becomes evident in direct comparison with Signia IX, which offers the predecessor version of RTCE without AI support.

A main reason for the improved speech-understanding performance is that MaX provides a larger SNR improvement on the output side of the hearing aid. This has been demonstrated in a technical study in which MaX was compared to the three comparator hearing aids included in this study and two additional competitor hearing aids (Jensen et al., 2026). The results of the present study document that the observed technical SNR improvements translate into human-performance (speech-understanding) benefits. However, it should be noted that a 1:1 connection between technical SNR benefit and perceptual SRT80 benefit cannot be automatically assumed, which means we cannot estimate human performance based on technical SNR measurements only, but the technical measurements can provide some useful guidelines of what level of human performance to expect.

Besides the pronounced mean SRT80 benefits provided by MaX, a noticeable observation is the very consistent individual benefit observed across the participants. While there was a natural variation in the individual SRT80 benefit, it was notable that the benefit of MaX (i.e., a lower SRT80) was observed for 29 of the 30 participants (97%). It is also interesting to notice that the benefit is observed over the entire range of test SNRs. Due to the nature of the adaptive OLSA test, the participants were tested at different SNRs, but there were no SNR ranges where MaX did not provide a benefit. If linear regression lines are fitted to the data points for the three comparator hearing aids in Figure 4, the slopes of the Signia IX and Brand B lines are very close to 1, indicating no effect of SNR. The fitted Brand A line is shallower with a slope below 1, indicating a larger MaX benefit at the lower SNRs. However, this trend is mainly driven by one data point (from the participant performing at the lowest SNR). If this participant is removed, the slope of the regression line gets close to 1, indicating little or no effect of SNR.

In parallel with this study, another study investigating the conversational performance of Signia MaX was conducted at ORCA Labs in Chicago. In terms of overall purpose and research question, the two studies were quite similar. The ORCA study also compared Signia MaX to Signia IX and two key competitors in a noisy group conversation scenario established in the lab. However, the study used a different test method with a different loudspeaker setup and different speech and noise materials (see Korhonen et al. (2026) for details). Each participant was tested at a fixed SNR that was determined individually as the SNR where 75% of the words in the test sentences could be understood while wearing Signia MaX. However, while the study methods differed from each other, the results in the ORCA study showed a highly similar pattern of results as observed in the present study. The highest mean speech understanding score was observed for Signia MaX, followed by Signia IX and with the two competitor hearing aids showing the lowest mean scores. The difference between Signia MaX and the comparator hearing aids was significant both when comparing to Signia IX ($p < .05$) and to each of the competitors (both $p < .001$).

The fact that two studies – carried out at different sites, in different languages, with different participant samples, and using different test methods – found similar patterns of results when investigating the speech understanding performance obviously strengthens the evidence

supporting the conclusion that Signia MaX provides a real wearer benefit in group conversations in noise.

Since a fixed individually determined SNR was used across test hearing aids in the ORCA study, it was possible to conduct a meaningful subjective assessment of listening effort, listening comfort and the time participants would tolerate spending in the (challenging) test environment. For all three domains, Signia MaX received the best mean ratings (i.e., lowest effort, highest comfort, and longest tolerable time), showing that the benefit in speech understanding was accompanied by benefits in other domains that are expected to impact the overall conversational experience.

In the short term, the benefits observed in this study as well as in the mentioned ORCA study are of course crucial for wearers being in challenging group conversations where Signia MaX is likely to improve their listening experience and ability to contribute to the conversation. In the longer term, such benefits are likely to positively impact the Signia MaX wearers' desire to seek out such challenging situations instead of avoiding them, allowing them to confidently live the life they want, and ultimately increase their quality of life.

Summary

The study at Hörzentrum Oldenburg reported in this paper evaluated the conversational speech understanding performance of Signia Multi-adaptive Xperience (MaX) in a realistic laboratory simulation of a noisy group conversation involving multiple talkers.

The results showed a pronounced and highly statistically significant advantage for Signia MaX, which achieved the best mean speech reception threshold (SRT80) at −5.2 dB SNR, outperforming Signia IX by 1.0 dB and two key competitor hearing aids with DNN-based noise reduction by 1.5 dB and 2.8 dB. The SRT80 differences can be estimated to correspond to speech-understanding improvements of approximately 16% to 45%. Importantly and notably, 29 of the 30 participants (97%) achieved their best individual performance with MaX, indicating that the benefit was highly consistent across listeners with different individual levels of performance.

The findings suggest that the SNR improvements driven by Acoustic Intelligence and RealTime Conversation Enhancement^{AI} translate into speech understanding benefits in challenging group conversations. Together with converging evidence from another study using a different methodology, the results support the conclusion that Signia MaX with system-level intelligence delivers superior conversational performance and can help wearers communicate more effectively and confidently in noisy social environments.

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