Life sounds brilliant.

Signia Nx Proven Benefits

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Introduction

Our goal at Signia has always been to allow our patients to live their lives to the fullest despite hearing loss. Therefore, we develop hearing solutions designed to ease and facilitate communication in a variety of listening situations. Signia Nx is one of the most advanced platforms offering many industry-first features with clinically proven benefits. Some features, such as Own Voice Processing (OVP), are completely new with the Nx platform, while many other tried and true Signia features, introduced on previous platforms, have been carried forward, validated, and improved upon.

One area where Signia has consistently excelled is harnessing wireless technology to directly benefit our patients. Signia was the first hearing aid manufacturer to introduce a near field magnetic induction (NFMI) wireless system, which allowed hearing aids to synchronize user controls and aspects of signal processing. In 2012, the development and commercialization of NFMI technology in hearing aids was affirmed when the three chief researchers involved in the development won the prestigious Deutscher Zukunftspreis (German Future Prize). Today, the signal processing applications relying on a NFMI link have expanded so that Signia arguably offers the most comprehensive and advanced application of NFMI technology in hearing aids. Now, we call this NFMI link Ultra HD e2e. It is the key wireless technology behind features such as Spatial SpeechFocus, binaural eWindScreen, binaural OneMic Directionality, and Narrow Directionality.[1] Signia was also the first company to introduce wireless inductive charging technology to improve wearer usability.

The following summary describes several of our advanced features and corresponding studies that demonstrate clinically proven benefit to patients.

Own Voice Processing

OVP is a groundbreaking new technology which significantly improves the wearer's perception of own voice. By processing the wearer's speech independently from other sounds, Nx ensures that the former sounds natural without compromising the audibility of the latter. The benefits of OVP have been consistently proven in a number of independent clinical studies. Here are some of the study findings.

In the first clinical study we conducted with OVP, results showed that without OVP activated, 20 of the 42 subjects (48%) were dissatisfied with the sound quality of their own voice. After applying Own Voice Processing to the "unsatisfied group," 75% experienced a noticeable improvement. [2] In other words, by offering OVP the total number of subjects satisfied with their own voice improved from the initial 52% to 88%.

Another study revealed that OVP provides a substantial improvement in own-voice satisfaction, and that this improvement is present for different fitting formulas, and for different ear-canal couplings (i.e. open vs. closed).[3] Specifically, with OVP-Off, 10 of the 21 participants (48%) were not satisfied with their own voice (e.g., rating below 4 on a satisfaction scale of 1-7 where 1 is completely dissatisfied, 4 is satisfied, and 7 is completely satisfied). With OVP-On, 80% were now satisfied (rating above 4), resulting in a total group satisfaction of 90%. Moreover, when the satisfaction with OVP is compared to alternative solutions from competitive products, a significant OVP advantage was clearly demonstrated–to the extent that own-voice satisfaction with OVP using a closed fitting is equal or superior to other products using an open fitting.

This study, conducted at the University of Northern Colorado, covered a number of aspects of OVP. It showed that OVP improved the percentage of first-time hearing aid wearers, who rated the sound quality of their own voice positively, from 29% to 86%.[4] That's an incredible 57% improvement in own-voice satisfaction and acceptance at the initial fitting! The study also showed that clinicians can obtain a similar level of own-voice naturalness with closed fittings regardless if they use the NAL-NL2 or the Nx-fit prescriptive algorithm.

In a study conducted at the University of Arkansas at Little Rock, when new users were fitted with Own Voice Processing, self-reported communication increased in 75 of the 96 communication settings (78%), as reported on the COSI (Client Oriented Scale of Improvement). [5] Only 4 of the 32 participants did not report increased communication in at least 1 of the 3 situations selected.

Rechargeability

Placing a premium on wearer convenience, Signia has been known as the pioneer and benchmark for energy efficiency and rechargeable hearing solutions. Since the launch of Centra Active and the first eCharger in 2006, Signia has offered a large rechargeable portfolio. It also introduced the first inductively charged lithium-ion rechargeable hearing aid with Cellion in 2016. Since then, a variety of rechargeable options have become available on the market, but lithium-ion rechargeable solutions are still the most user-friendly and effective solution. Heuermann & Herbig [6] offer an informative summary of the variety of hearing aid battery solutions available along with their advantages and disadvantages. In 2016, Signia introduced the world's first RIC hearing instrument featuring lithium-ion inductive rechargeable batteries, which, in the most power-draining use case, can power the hearing aid for more than a day.

Pure Charge&Go Nx was the first fully featured hearing aid which includes own-voice processing, direct streaming, and lithium-ion rechargeability. The appeal of Pure Charge&Go Nx is that every available technology is combined to make the wearer's ownership and listening experience as convenient and natural-sounding as possible. The lithium-ion battery uses contactless charging which makes daily use easier and more reliable than ever before.[7] Most importantly, Pure Charge&Go Nx is competitively small – barely larger than a conventional 312-sized receiver-in-canal hearing aid.

To test the appeal of Pure Charge&Go Nx against two leading competitor hearing aids, a study was conducted in the United States in April 2018, which was administered as an online survey to a hundred participants. [8] Pure Charge&Go Nx was the preferred hearing aid in all parts of the study: a comparison of rechargeable hearing aids featuring direct streaming, a comparison of lithium-ion rechargeable hearing aids, and a comparison of all devices which included photos showing size and design. In all parts, Pure Charge&Go Nx consistently obtained a positive Net Promoter Score (NPS), whereas two out of three of the competitor products failed to obtain a positive NPS. In the comparison of rechargeable devices featuring direct streaming, Pure Charge&Go Nx offered the most positive match to wearers' needs among the hearing aids compared. In part three, where product size and visual design was included in the comparison, Pure Charge&Go Nx remained the preferred device among the majority of participants.

Motion Charge&Go Nx debuted following the success of Pure Charge&Go Nx, extending all the advantages of the later to an even wider range of patients who prefer a behind-the-ear style instrument.

Styletto redefines what a hearing aid should look like. Its unique form factor is made possible because Signia reimagined, yet again, what a hearing aid battery could be. The innovative pin-shaped lithium-ion rechargeable battery defines the hearing aid's slim, aesthetically pleasing look. Because Styletto looks nothing like a traditional hearing aid, it has been shown to attract potential new wearers who would otherwise have not considered hearing aids.[9] For even more convenient handling, the Styletto charging case provides four days of wearer autonomy, free from electrical plugs or cables. The special lithium-ion case offers three separate portable charges before it needs to be recharged itself. This makes it one of the most efficient charging options available to hearing aid wearers.

Better than normal hearing

The NFMI technology, which today we call Ultra HD e2e, made the first generation of our binaural directional microphone system possible with the binax platform in 2014. Over the years, this microphone system has been improved upon with successive platforms. But the groundbreaking claim of its star feature Narrow Directionality: better than normal hearing performance in challenging noisy environments, remains unchallenged and unrivaled to this day.

Narrow Directionality is an advanced binaural beamforming algorithm which uses binaural wireless audio exchange technology to effectively solve the age-old "cocktail party effect."[10] One of the first clinical studies showed that with this technology, sentence recognition in surrounding background noise for individuals with mild-to-moderate hearing loss was significantly superior compared to individuals with normal hearing. Between the two sites where this study was conducted, Narrow Directionality provided an advantage of 2 to nearly 3 dB SRT (Speech Recognition Threshold) enough to be noticeable in many real-world situations.[11, 12]

While the first studies on Narrow Directionality were conducted with RIC instruments, this technology lends its benefit to other hearing aid form factors as well. In a later study using custom products, Narrow Directionality was shown to be as effective as the RIC form factor.[13,14] For those with more severe hearing loss, another study indicated that when using the Signia beamforming technology, similar speech recognition benefit can be achieved as those reported in previous studies with individuals with mild to moderate hearing loss. [15]

More recently, Narrow Directionality was evaluated at a study conducted at the University of Iowa, and again it was found to provide the same benefit for speech.[16] Taking one step further, it was shown that not only can Narrow Directionality improve speech intelligibility, it can reduce listening effort in different listening conditions, as measured by EEG.[17, 18]

Meanwhile, work by Harvey Dillon and his colleagues at the National Acoustics Laboratory (NAL) in Australia also corroborated previous studies of Narrow Directionality. Findings revealed that hearing-impaired participants with moderate hearing loss matched the intelligibility performance of a group of age-matched near-normal hearers. The range of effort incurred in listening for the hearing-impaired participants also matched that of the age-matched, near-normal hearing group. The authors also concluded that listeners with mild hearing loss using the same technology (and a fully occluding ear fitting) may outperform (near-) normal-hearing listeners in difficult listening situations.[19]

Nx improvements to Narrow Directionality as well as the entire binaural microphone system includes improved spatial perception. This way, while wearers are still able to take full advantages of the proven Narrow Directionality benefit in noisy situations, spatial

awareness of their surrounding environment can still be maintained. Combined with direct streaming as well as the unique Own Voice Detection, Nx is the only platform which offers these patient benefits in the same hearing aid.[7]

Signia technology is consistently proven to provide outstanding benefit to patients. In areas of sound quality, usability, and speech intelligibility, Nx features improve initial acceptance and long-term satisfaction.

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Rebecca is a Clinical Education Specialist for Sivantos USA. Since 2008, she has been responsible for various aspects of scientific marketing, both globally and specific to the US market. Prior to joining Sivantos (then Siemens Audiology Solutions) in 2008, she worked as a clinical audiologist in northern Virginia. Rebecca received her doctorate in Audiology from Gallaudet University in Washington DC.

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[1] For more information about these features and clinical validation studies conducted with them, visit www.signa-library.com.

[2] Høydal EH. A new own voice processing system for optimizing communication. *Hearing Review*. 2017;24(11):20-22.

[3] Powers T, Froehlich M, Branda E, Weber J. Clinical study shows significant benefit of own voice processing. *Hearing Review*. 2018;25(2):30-34.

[4] Froehlich M, Powers T, Branda E, Weber, J. Perception of own voice wearing hearing aids: why "natural" is the new normal. *AudiologyOnline*. 2018; Article 22822. Retrieved from www.audiologyonline.com.

[5] Powers TA, Davis B, Apel D, Amlani AM. Own voice processing has people talking more. *Hearing Review.* 2018;25(7):42-45.

[6] Heuermann H, Herbig, R. Hearing Aid batteries: The past, present and future. *AudiologyOnline*. 2016; Article 18176. Retrieved from http://www.audiologyonline.com.

[7] Jacobs A. *The art of designing Pure Charge&Go Nx*. Signia Product Backgrounder. 2016. Retrieved from: https://www.signia-library.com/scientific_marketing/art-designing-pure-chargego-nx/

[8] Jacobs A. *What's the Preferred Rechargeable Hearing Aid With Direct Streaming?* Signia Product Backgrounder. 2018. Retrieved from: https://www.signia-library.com/scientific_marketing/preferred_rechargeable_hearing_aid/

[9] Hakvoort C, Burton P. *Increasing Style, Reducing Stigma: The Styletto Solution.* Signia Product Backgrounder. 2018. Retrieved from: https://www.signia-library.com/scientific_marketing/styletto_solution/

[10] Kamkar-Parsi H, Fischer E, Aubreville M. New binaural strategies for enhanced hearing. *Hearing Review*. 2014;21(10):42-45.

[11] Powers, T. & Froehlich, M. Clinical Results with a New Wireless Binaural Directional Hearing System. *Hearing Review*. 2014;21(11): 32-34.

[12] Froehlich M, Freels K, Powers T. Speech recognition benefit obtained from binaural beamforming hearing aids: comparison to omnidirectional and individuals with normal hearing. *AudiologyOnline*. 2015; Article 14338. Retrieved from http://www.audiologyonline.com

[13] Herbig, R, Froehlich, M. Binaural Beamforming: The Natural Evolution. *Hearing Review.* 2015;22(5):24.

[14] Froehlich M, Powers TA. Improving Speech Recognition in Noise Using Binaural Beamforming in ITC and CIC Hearing Aids. *Hearing Review.* 2015;22(12):22.

[15] Powers T, Littmann V. Benefits of Binaural Beamforming for Individuals with Severe Hearing Loss. *Hearing Review.* 2016;23(5):28.

[16] Littmann V, Wu YH, Froehlich M, Powers TA. Multi-center evidence of reduced listening effort using new hearing aid technology. *Hearing Review.* 2017;24(2):32-34.

[17] Littmann V, Froehlich M, Beilin J, Branda E, Schaefer PJ. Clinical Studies Show Advanced Hearing Aid Technology Reduces Listening Effort. *Hearing Review.* 2016;23(4):36

[18] Herbig R, Froehlich, M. Reducing listening effort via primax hearing technology. *AudiologyOnline.* 2016; Article 17275. Retrieved from www.audiologyonline.com

[19] Mejia J, Carter L, Dillon H, Littman V. Listening Effort, Speech Intelligibility, and Narrow Directionality. *Hearing Review.* 2017;24(1):22.