WHITEPAPER
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# Wind & Handling Stabilizer – Evidence and user benefits

## Improved wind and handling noise removal for better clarity


ABSTRACT

In a recent survey with hearing aid users, about half of respondents indicated wind noise in their devices being an issue. This clearly points out the need to improve the way hearing aids process sound in windy situations.

This whitepaper presents the results of three research studies carried out on Oticon Real™, providing evidence on the new Wind & Handling Stabilizer feature. To test Oticon Real in the toughest and most controlled environment possible, we used one of the world's largest university-owned wind tunnels. A technical study found that Oticon Real 1 removed wind noise more effectively and provided more access to speech than Oticon More 1. When rated by hearing aid users, Oticon Real 1 is the only hearing aid out of three which provided benefits both in terms of loudness of wind noise and clarity of speech in windy situations. Furthermore, even though handling noise has a huge clinical impact, it is a less well-researched area. In a clinical study, we found that Oticon Real 1 significantly reduced handling noise compared to two leading competitors.





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oticon
life-changing **technology**

## RealSound Technology™ helps your clients stay sharp in the real world

RealSound Technology in Oticon Real™ is powered by the new Polaris R platform which includes new detectors for fast processing of disruptive sounds. The detectors ensure that all sound details are processed automatically and precisely to deliver the optimal sound output to the hearing aid user.

RealSound Technology has three key components (Figure 1):

1. MoreSound Intelligence™ 2.0 with the Deep Neural Network (DNN) and the new Wind & Handling Stabilizer (WHS)
2. MoreSound Amplifier™ 2.0 with the new SuddenSound Stabilizer
3. MoreSound Optimizer™

Together, these two new features, rooted in our BrainHearing™ philosophy, ensure the continued journey towards a fuller and more open listening environment – without disruptions.

The new features handle a variety of commonly reported annoyances. This was highlighted in a recent survey conducted by Oticon of 720 hearing aid users from three different countries: Annoyances range from wind noise, to the distracting sounds caused by hair and hands around the hearing aids, to all manner of sudden sounds – soft and loud – in everyday environments. In fact, seven out of ten (71%) users reported being bothered by distracting sounds daily, and more specifically, 52% of users reported noise from wind to be annoying, unpleasant, or irritating. The challenges can be even greater for first time hearing aid users who can struggle to acclimatise to amplification of sudden sounds. As a result, gain is often reduced to increase comfort. Some clients may even reject hearing aids altogether due to such annoyances. The reported issues from hearing aid users are also recognised by hearing care professionals. Almost nine out of ten (88%) have first-hand experience with clients complaining of a negative experience with their hearing aids due to disruptive sound issues.

### MoreSound Intelligence 2.0

MoreSound Intelligence 2.0 (MSI 2.0) provides clear contrast and balance for all relevant sounds. The new addition to this feature – Wind & Handling Stabilizer – introduces the world's first wind and handling noise prevention system in a hearing aid. The system ensures that less wind and handling noise enter the sound processing. Any residual wind noise entering the system is rapidly suppressed by this new and innovative technique. The result is optimised audibility of other relevant sounds. WHS also provides a cleaner signal for the remaining part of MSI 2.0 - including the DNN - to work on, which enables improved output.

### MoreSound Amplifier 2.0

MoreSound Amplifier™ 2.0 (MSA 2.0) receives optimised sound input from MSI 2.0 and uses that to provide precise and balanced sound amplification. With the addition of SuddenSound Stabilizer, amplification of sudden sounds is controlled, ensuring they are audible and available, but no longer annoying, distracting, and uncomfortable. Correct and sufficient amplification can be applied in

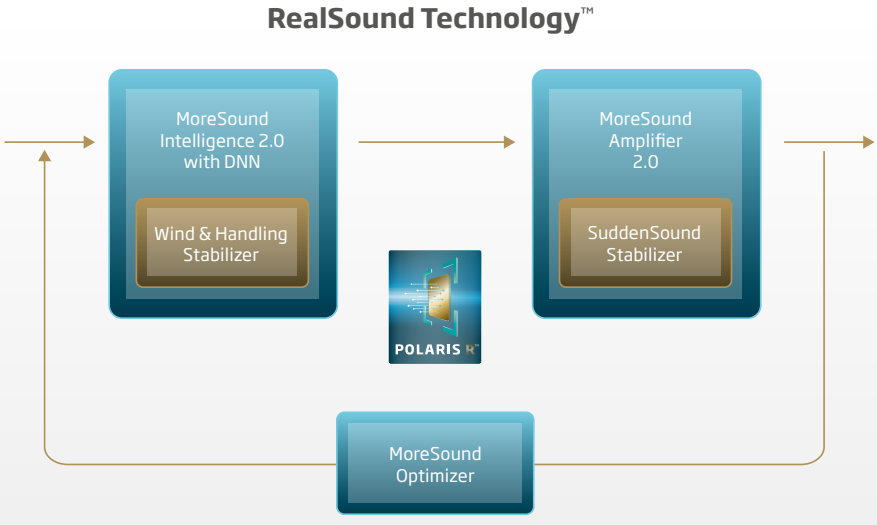


*Figure 1. The processing flow with the three components of RealSound Technology.*

the first fitting – even for first-time users – without risking overamplification of the sudden louder sounds.

**MoreSound Optimizer**
MoreSound Optimizer (MSO) supports the entire processing flow by constantly monitoring the signal for any feedback build up. In case this happens, MSO quickly applies a breaker signal in the relevant frequencies to break the feedback path.

**RealSound Technology**
Upgrading to MSI 2.0 and MSA 2.0 takes our hearing aids to the next level in the journey to expand the sound scene and make all sounds available to people with hearing loss. We call this RealSound Technology. Our RealSound Technology expands the range of sound environments in which the hearing aid can work optimally and ensures a clearer, more balanced sound quality for your clients. Oticon Real provides the technology for users to stay sharp in the real world.

This paper will take a closer look at the technology and evidence behind WHS in Oticon Real 1. For more information on SuddenSound Stabilizer see Santurette, Brændgaard, Wang, & Sun (2023).

## Processing wind and handling noise

Wind blowing across hearing aid microphones or fingers, glasses, hair, or facemasks touching the hearing aid microphone create turbulence around the microphone openings and uncorrelated noise in the hearing aid. This unwanted noise needs to be handled by algorithms in the hearing aid to provide comfort and access to speech for the hearing aid user. Previously, this has been handled by reducing gain in the channels where wind noise was detected – primarily in the low frequencies – providing comfort for the user, but also attenuating other relevant sounds (Ricketts, Bentler, & Mueller, 2019). WHS is the first part of the processing in MSI 2.0. With this, WHS immediately detects and prevents wind and handling noise from entering the remaining part of the sound processing scheme.

The process starts with a new detector which monitors the presence of uncorrelated noise created by wind or handling. The detection is done individually in each hearing aid microphone to determine which microphone is receiving the most noise. In an uncorrelated noise signal each data point is independent of all others. This means there is no correlation between signal points. In other words, one signal point cannot be predicted based on the previous signal point. WHS monitors for changes in the presence of wind and handling noise 500 times/second, as the detector is constantly active. The attenuation for wind and handling noise is dynamic, meaning it is only active when wind or handling noise is detected.

Blowing wind creates turbulence which is detected as it moves across the hearing aid microphone. This turbulence causes unacceptable noise in the hearing aid, similar to blowing air across a handheld microphone. For all situations, other than direct wind and handling, the system uses both microphones across the whole range of frequencies. Preserving a two-microphone input signal enables the system to optimise the Spatial Balancer and Neural Noise Suppression (DNN) processes (the remaining processes in MSI 2.0 - for more info see Brændgaard, 2020) by providing a spatially separatable signal. When wind is detected, shutting down one microphone momentarily is preferred. The microphone receiving less noise is prioritised and the microphone with more turbulence is deactivated. The new system shuts down one microphone in both the time and frequency domains as needed, while simultaneously ensuring that the dual-microphone input signal is retained as much of the time and in as many frequency channels as possible. At very low wind speeds (1-2 m/s), WHS can handle the uncorrelated noise while maintaining two active microphones. WHS works in 24 frequency channels and is optimised for wind coming from the front. The remaining wind and handling noise in the open microphone is efficiently removed by a modulation-based noise reduction system.

**Wind & Handling Stabilizer compared to traditional technology**
The number of frequencies compromised by the wind and handling noise depends on the wind speed.

- Wind speeds less than 3 m/s only affect the low frequencies up to around 1500 Hz
- Wind speeds at 3-5 m/s increase the effect on mid frequencies up to around 3500 Hz
- Wind speeds from 5 m/s and above will affect all frequencies

For frequencies not compromised by wind or handling noise the DNN performs as intended in those time/frequency tiles.

Traditional wind noise management systems are efficient at attenuating wind noise in the low frequencies

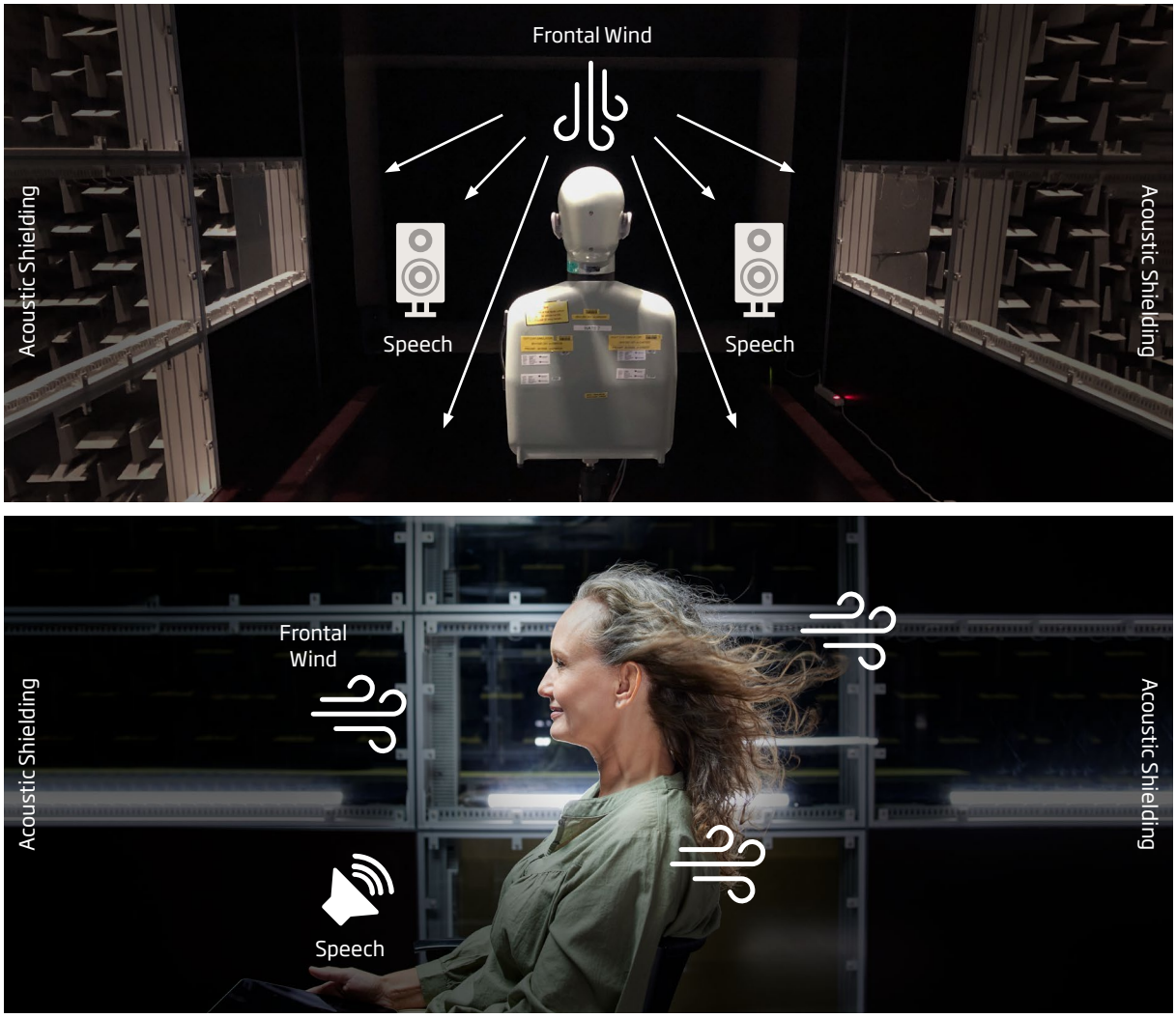


*Figure 2: Experimental setup in the Poul la Cour wind tunnel. Top: Picture of the test section during technical investigations. The test section is embedded in an acoustically shielded room. Bottom: Test setup for the clinical investigation, with a test participant sitting in the centre of the test section.*

up to around 1500 Hz which ensures comfort for the user. However, an additional advantage of WHS is the precise and efficient attenuation of wind noise in frequencies above 1500 Hz, which is significantly improved compared to previous wind management systems (see later in this paper).

The attenuation of wind and handling noise varies in accordance with the varying fluctuations around the microphones created by different wind speeds.

The most attenuation (up to 30 dB) is applied in the frequencies up to around 1500 Hz like previous wind noise management systems. Now, with WHS we can also apply more than 20 dB attenuation for mid and high frequencies. This is more than double the attenuation previously possible in the mid and high frequencies.

The maximum attenuation is applied at wind speeds above 9-10 m/s to promote comfort.

## A wind tunnel investigation

To investigate the benefits of WHS and its performance at realistic wind speeds, two research studies were conducted in one of the largest university-owned wind tunnels in the world, the Poul la Cour Tunnel at the Technical University of Denmark (PLCT, 2022). The first study investigated the technical performance of Oticon Real, while the second focused on the perceived benefits of the Oticon Real hearing aid on a group of people with hearing loss.

Poul la Cour Tunnel provides a unique acoustical environment, in the sense that the test section is embodied in an anechoic chamber, thus absorbing the noise reflected within the test section. The tunnel is of the closed-return type (NASA, 2021) and allows a high control of the wind flow with a turbulence intensity lower than 0.1% (PLCT, 2022). Additionally, sound reducing material ensures that the mechanical noise from the fan is not audible in the test section at the tested wind speeds. By using such a highly controlled acoustically treated wind tunnel, we could make sure that the recordings from the hearing aids accurately reflected the wind noise created by the turbulence around the device microphones at natural wind speeds and were not contaminated by other noise sources.

## Technical performance of Oticon Real

### Wind noise attenuation in Oticon Real

For the technical investigations, a pair of Oticon Real 1 and a pair of Oticon More™ 1 hearing aids were adjusted to a mild-to-moderate hearing loss according to an N2 standard audiogram (Bisgaard et al., 2010) with all advanced features set to the default prescription. In Oticon More, the Wind Noise Management (WNM) feature was activated. Oticon Real was tested with both WHS turned on and off to assess the effectiveness of the new feature.

A head-and-torso-simulator (HATS) wearing hearing aids was placed in the center of the wind tunnel facing upstream (Figure 2, top panel), typically one of the most challenging situations as frontal wind produces much louder wind noise than side wind (Dillon et al., 1999). The hearing aid output was recorded at the end of the HATS ear canals at moderate wind speed (5-7 m/s, corresponding to wind force 4 on the Beaufort scale) and in stronger wind (9-10.5 m/s, corresponding to wind force 5 on the Beaufort scale). In the following, "moderate wind" thus in other terms refers to wind speeds between 18 and 25 km/h (11 to 16 mph) that are very common when walking outdoors, when wind makes small branches move in trees and raises dust and loose paper from the ground. "Stronger wind" refers to wind speeds between 32 and 38 km/h (20 to 23 mph) that are more common when engaging in an activity such as biking or when wind is strong enough to move large branches and water on lakes and rivers. The selected wind speeds reflected the range of average wind speeds observed many places around the world (Global Wind Atlas, 2022).

### Wind & Handling Stabilizer on vs. off

To quantify the wind noise attenuation provided by WHS in Oticon Real, the recorded wind noise level when WHS was activated (WHS on) was compared to the wind noise level when WHS was deactivated (WHS off). Figure 3 shows the calculated wind noise attenuation (i.e., the difference in wind noise level between WHS off and WHS on) as a function of frequency for moderate (light

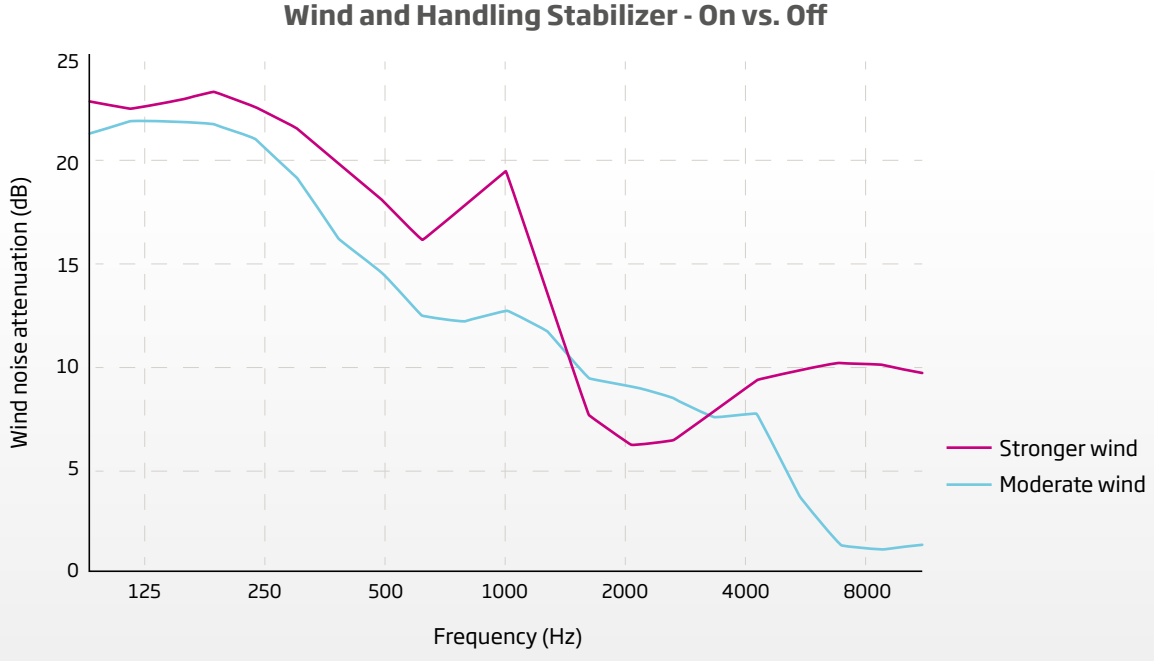


*Figure 3: Wind noise attenuation provided by Wind & Handling Stabilizer in Oticon Real as a function of frequency (one-third octave bands), as measured in a wind tunnel at moderate and stronger realistic wind speeds.*

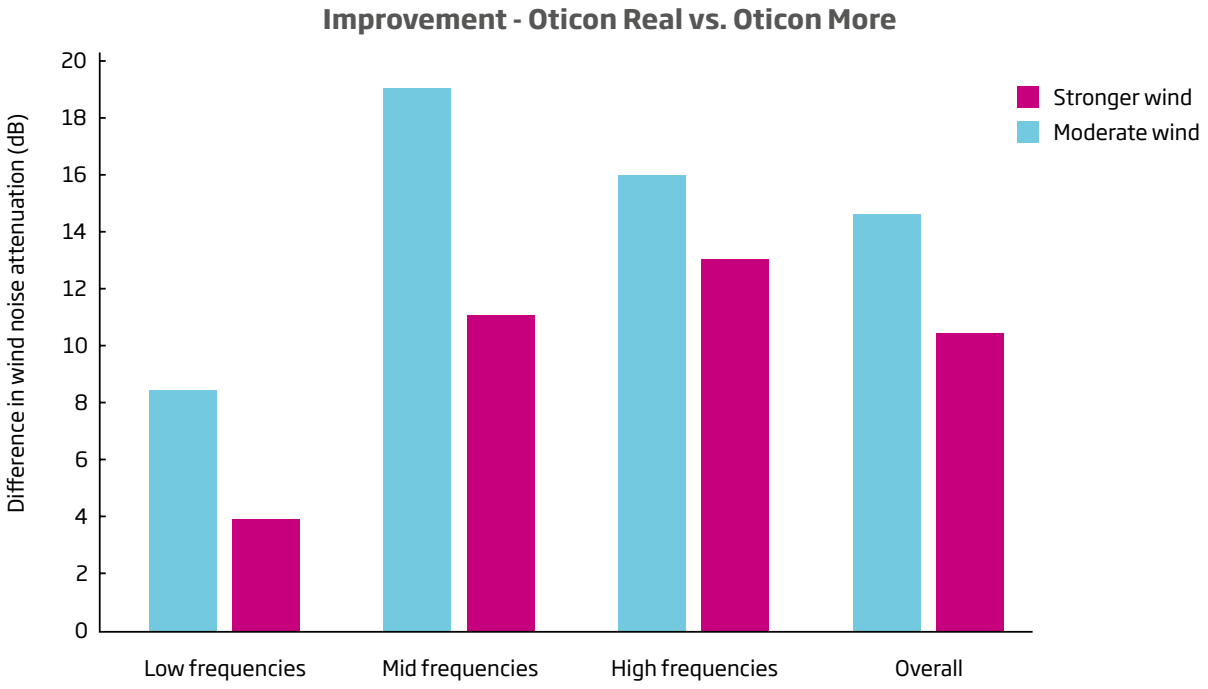


*Figure 4: Additional wind noise attenuation provided by Oticon Real compared to Oticon More in three frequency regions and overall (broadband attenuation), as measured in a wind tunnel at moderate and stronger realistic wind speeds.*

blue curve) and stronger (magenta curve) wind speeds. The strongest wind noise attenuation – up to 23 dB – was found at low frequencies, where the wind noise energy is most prominent (Korhonen, 2021; Dillon et al., 1999). More attenuation from WHS was observed at high frequencies in stronger wind than in moderate wind, consistent with the fact that the frequency content of wind noise typically moves towards higher frequencies at higher wind speeds (Chung et al., 2009). In another sound studio test setup, using a wind machine that produced a less controlled wind flow with more gusty wind, attenuations of up to 24 dB at mid frequencies and 27 dB at low frequencies were measured at moderate wind speeds, and attenuations of up to 24 dB at high frequencies were measured at stronger wind speeds.

**Comparing Oticon Real to legacy product**

Comparing the wind noise levels in Oticon Real and in Oticon More makes it possible to estimate the improvement in wind noise attenuation from the previous generation of Oticon products. Figure 4 illustrates this difference at low (0-1.5 kHz), mid (1.5-5 kHz), and high (5-10 kHz) frequencies, as well as the overall broadband attenuation. Oticon Real was found to remove wind noise more effectively than Oticon More in all frequency regions. The largest improvements occurred at mid and high frequencies, which contain important speech cues such as vowel formants at mid frequencies and consonants at high frequencies (French & Steinberg, 1947). Removing wind noise in those regions is crucial to prevent speech details from being masked. At moderate wind speeds, improvements of up to 19 dB were measured in the wind-tunnel setup described above. Similar improvements of up to 20 dB were also measured in a sound studio test setup using a wind machine. This illustrates that Oticon Real clearly outperforms Oticon More across the whole frequency range at wind speeds that are most realistic to happen in everyday situations for hearing aid users. This superior performance is due to WHS in Oticon Real cleaning up the input signal so that the DNN in MSI 2.0 gets a better input to work on. This provides a clearer total output sound from MSI 2.0, further optimized by the action of the SuddenSound Stabilizer in MSA 2.0, which may additionally catch sudden wind noise bursts and attenuate their peaks (Santurette et al., 2023).

**Access to speech in the presence of wind**

In another series of measurements in the wind tunnel, the ability of Oticon Real to preserve access to speech in the presence of wind was investigated. The test setup

was identical to the one described above, with the addition of one loudspeaker for playing the speech signals (Figure 2, top). A loudspeaker was placed on the floor close to the sides of the wind tunnel's test section in order not to disturb the wind stream. The speech level was calibrated to 80 dB SPL to reflect the fact that a person talking in a windy situation typically raises their voice. Recordings of speech in wind were obtained from the HATS microphones at moderate wind speeds for Oticon Real 1 with WHS on and Oticon More 1 with WNM on. For each condition, sixty-four recordings were obtained, so that the signal-to-noise ratio (SNR) at the output of the hearing aids could be estimated by means of an averaging method adapted from the phase-inversion technique of Hagerman & Olofsson (2004).

The results showed that the output SNR for the hearing aid on the same side as the speech was higher by 4.3 dB in Oticon Real than in Oticon More, indicating that Oticon Real provides better access to speech in the presence of wind. Moreover, a calculation of the short-time objective intelligibility (STOI, Taal et al., 2011) from the obtained speech-in-wind recordings showed that the STOI metric was higher for Oticon Real than for Oticon More, indicating a better preservation of speech details by Oticon Real.

## Clinical performance - Oticon Real outperforms two leading competitors

Imagine you are walking on a beach with your friend. It's a moderately windy day, and you are having a pleasant conversation. For users of hearing aids, this listening situation can be challenging. In fact, we have found that when walking outside with a friend, 41% of hearing aid users experience wind noise as a negative phenomenon.

In this situation, you want your hearing aid to solve two problems. You want to get rid of the loud, uncomfortable wind noise, and you want to engage in the conversation with your friend, responding to a clear speech signal. Our latest research study has shown that Oticon Real addresses both problems, by providing less loudness and more clarity in windy situations in comparison to two leading competitor hearing aids. The study was conducted on hearing aid users, demonstrating that a true user benefit is achieved with the use of Oticon Real compared to competitor hearing aids.

### Method

The aim of the study was to measure and compare the perceived loudness of the wind noise level as well as the clarity of speech in Oticon Real and two top competitor hearing aids.

The study included 12 experienced hearing aid users with an average age of 70.6 years (range: 54-88 years) with mild to moderately severe symmetrical hearing loss. Due to failure to complete training runs in the task, two participants were excluded from the data analysis.

### Setup

To test Oticon Real in the toughest and most controlled environment possible, the study was conducted in the Poul la Cour Tunnel at an average wind speed of 6 m/s, corresponding to the moderate wind conditions in the technical study described above. A speech signal consisting of Danish audiobook clips was presented at 65 dB SPL, creating a very complex listening environment. While listening to running speech, the participants were asked to rate the loudness of the wind noise in the hearing aids as well as the clarity of the speech signal. They entered their ratings on a 0-10 numeric scale with decimal intervals, using a portable tablet.

The participants were blindly fitted with four pairs of hearing aids: Oticon Alta (worn during training and acting as an anchor expected to lead to high loudness and low clarity), Oticon Real 1, Competitor 1, and Competitor 2. All hearing aids were the latest premium miniRITE styles. Default settings were prescribed in terms of acoustics, speaker level, gain, and for all advanced features such as noise reduction. If per default turned off, the wind noise reduction feature in the hearing aids was turned on.

### Improved loudness of wind and speech clarity

#### Less loudness of wind noise

*"On a scale from 0 to 10 which number best reflects the loudness of the hearing aids' generated wind noise? 10 means highest loudness level."*

On this question, a low score means the hearing aid performs well. As illustrated in Figure 5 (left panel), Oticon Real is rated to have the lowest median wind noise loudness (40%). This means that overall, the wind

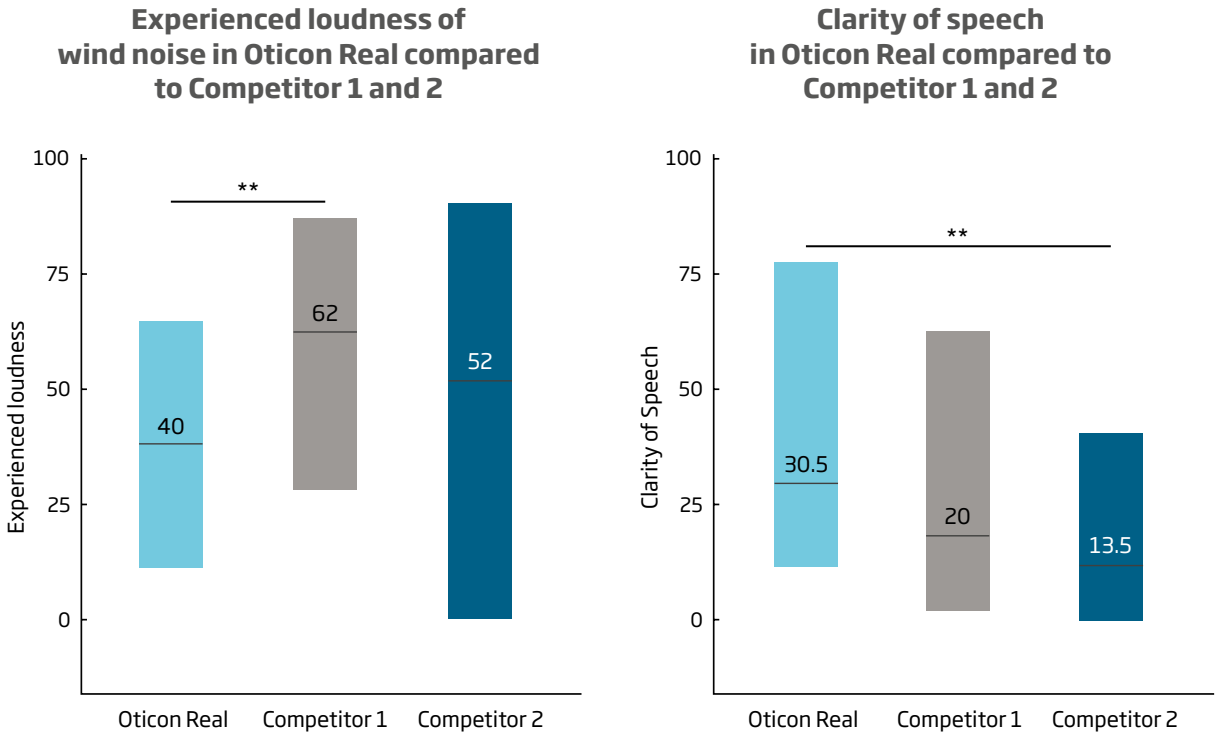


*Figure 5. Perceived wind noise level (left panel) and clarity of speech (right panel) for Oticon Real and two premium competitor hearing aids. The vertical bars show the range of ratings across participants and the horizontal line within each bar indicates the median. ** p < 0.05.*

noise experienced in Oticon Real was 22 percent points lower than Competitor 1 (median: 62%), and 12 percent points lower than Competitor 2 (median: 52%). Moreover, the wind noise loudness was statistically significantly lower for Oticon Real than for Competitor 1 ($p = 0.021$).

For a fair comparison between hearing aids, the test participants were fitted with the default speaker level. For Competitor 2, this included fitting a speaker where the microphones are situated in the ear canal, providing more shielding from the wind. The difference in microphone placement between Oticon Real and Competitor 2 is presumably what causes a smaller difference between the two hearing aids. Despite this, Oticon Real performed at least equally well as Competitor 2, demonstrating the efficiency of WHS technology when compared to a hearing aid that uses physical shielding from the wind. In comparison to the same competitor, the variability of the loudness ratings, as demonstrated by the size of the vertical bars in Figure 5 (left), was also lower for Oticon Real, demonstrating greater consistency of performance.

**Better speech clarity**

*"On a scale from 0 to 10 which number best reflects how clear the speech is? Clarity means how distinct the speech sounds are. 10 means most clear."*

On this question, a high score means that the hearing aid performs well. We found that participants rated Oticon Real to have the highest overall speech clarity (median: 30.5%), which is 10.5 percent points higher than Competitor 1 (median: 20%) and 17 percent points higher than Competitor 2 (median: 13.5%). See Figure 5, right panel. Moreover, the speech clarity was statistically significantly higher for Oticon Real than for Competitor 2 ($p = 0.021$). The test required a high level of concentration for the participants, as they were exposed to very low signal-to-noise ratios and a constant flow of wind in an unfamiliar environment. A rated speech clarity of 30.5% thus shows that Oticon Real supports hearing aid users' access to clear speech – even in the toughest environments.

### Clinical benefits for the user and hearing care professional

#### Hearing aid user benefits

You are back on the beach with your friend, wearing your hearing aids. A traditional hearing aid would handle this situation by simply turning down gain in an attempt to provide comfort. However, turning down gain will close you off from the full sound scene, reduce your access to speech, and leave you with a less enjoyable conversation. With Oticon Real, hearing aid users no longer have to compromise speech clarity for comfort. It is the only hearing aid of the three which provides both.

It is a well-known clinical experience that some hearing aid users do not wear their hearing aids outside without realising how much valuable information they miss out on - like the short messages from their tennis partner on the court. However, with Oticon Real, reduced loudness of wind noise will provide a listening experience where the unwanted noise no longer overshadows the wanted sounds, providing access to all relevant sounds, including speech. This will support hearing aid users to stay connected to their surroundings and not miss any relevant information. It may even encourage them to always wear their hearing aids outside.

#### Hearing care professional benefits

We have all met the golfer, the tennis player, the hiker, or the grandparent who likes to take their grandkids to the playground and have experience with their complaints about wind noise. In fact, in a recent survey we found that 68% out of 201 hearing care professionals report that clients sometimes or more often experience wind noise as a negative phenomenon when wearing hearing aids. Hearing care professionals want to help their clients, but are often left to say, "you will have to get used to it" or "try to focus on the speech instead of the wind noise". With Oticon Real, hearing care professionals are no longer bound to this worn-out phrase. They can confidently fit Oticon Real to all users – both those who are very active outside, and those who would like to enjoy a conversation on the beach – as it will protect all users from overly loud wind noise.

In our survey, we found that 78% of the hearing care professionals report that being able to control the wind noise reduction system is an important aspect of choosing what hearing aid to fit. As for WHS in Oticon Real, the feature is per default on, and it is recommended to keep the settings this way. However, when fitting Oticon Real using the 2023 update of Oticon Genie 2, it is now possible to turn WHS off by selecting *Automatics* under *More tools*.

## Evidence on handling noise - Oticon Real vs. top competitors

#### Background

Handling noise is a challenge that has not been widely explored and is therefore not commonly acknowledged in audiological investigation. What is handling noise and why is it important to consider for hearing aid users?

Handling noise includes various forms of noise that are produced when hearing aids are being manipulated. The severity of the handling noise can depend greatly on microphone location, signal processing algorithms, and the frequency at which a user touches their hearing aids. For example, due to the position at which behind-the-ear hearing aids sit and the location of their microphones, this style of hearing aid is the most susceptible to handling noise. This, as opposed to an in-the-canal style hearing aid, which is less likely to experience bothersome noise produced by handling, as it is shielded by the outer ear.

Handling noise can be caused by a variety of actions such as brushing hair, putting on and taking off glasses, changing hearing aid volume and/or programs, etc. These actions occur in the daily life of the hearing aid user and can become more bothersome with the addition of items such as glasses, hats, masks, etc. In fact, an additional internal survey of 766 users and pre-users (persons with hearing loss) in USA, France, and Germany in 2022, revealed that 93% of hearing aid users wear eyeglasses on a daily basis. Further, 44% of users expressed they experience bothersome handling noise when removing, inserting, and adjusting their hearing aids. Therefore, demonstrating that handling noise is almost unavoidable in a user's day. So, what can be done to help overcome this challenge?

#### Method

The answer is found with the introduction of WHS in Oticon Real. To investigate the power of the new feature, a clinical study comparing Oticon Real to two leading competitors was completed. In order to cover handling

more widely, two conditions were tested. The first condition mimicked the handling movement of hair, by placing a wig on a HATS and lightly brushing the hair back from the face. The second condition involved brushing of microphones, which is an action that hearing aid users unintentionally perform daily, when removing, inserting, and adjusting their hearing aids manually.

To measure performance, the HATS was positioned in an acoustically optimised sound studio. It was fitted with Oticon Real 1 and the same two leading competitors hearing aids as described above using the prescribed acoustics. To ensure a fair comparison, all hearing aids were set to the respective manufacturer's default settings for a standard N3 audiogram (Bisgaard et al., 2010). The test leader completed all handling movements as naturally and consistently as possible. Additionally, to overcome the inconsistent nature of handling, each condition comprised of 12 handling audio events that were measured over 2 trials.

Audio events were then broken down individually, and the mean and standard deviation from the repeated handling situation was calculated across the dB SPL values of all handling audio events. The output values were normally distributed according to the Shapiro-Wilk test, hence two-tailed paired t-tests were performed to analyse the difference between: (1) Oticon Real vs. Competitor 1 and (2) Oticon Real vs. Competitor 2.

**Results**

The mean hearing aid output in dB SPL for all hearing aids for both conditions is plotted in Figure 6. Results revealed that there was a statistically significant difference between Oticon Real and both competitors, for the two conditions tested. Condition 1 results showed Oticon Real had a 59 dB SPL overall average output, while Competitor 1 and 2 produced average outputs of 68 dB SPL and 64 dB SPL respectively. This demonstrates that for condition 1, Oticon Real delivers 5-9 dB less handling noise than competitors. Similarly, for condition 2, Oticon Real had a 60 dB SPL overall average output, while Competitor 1 had an overall average output of 74 dB SPL and Competitor 2 had an overall average output of 79 dB SPL. This shows that Oticon Real provides 14-19 dB less handling noise than competitors in condition 2.

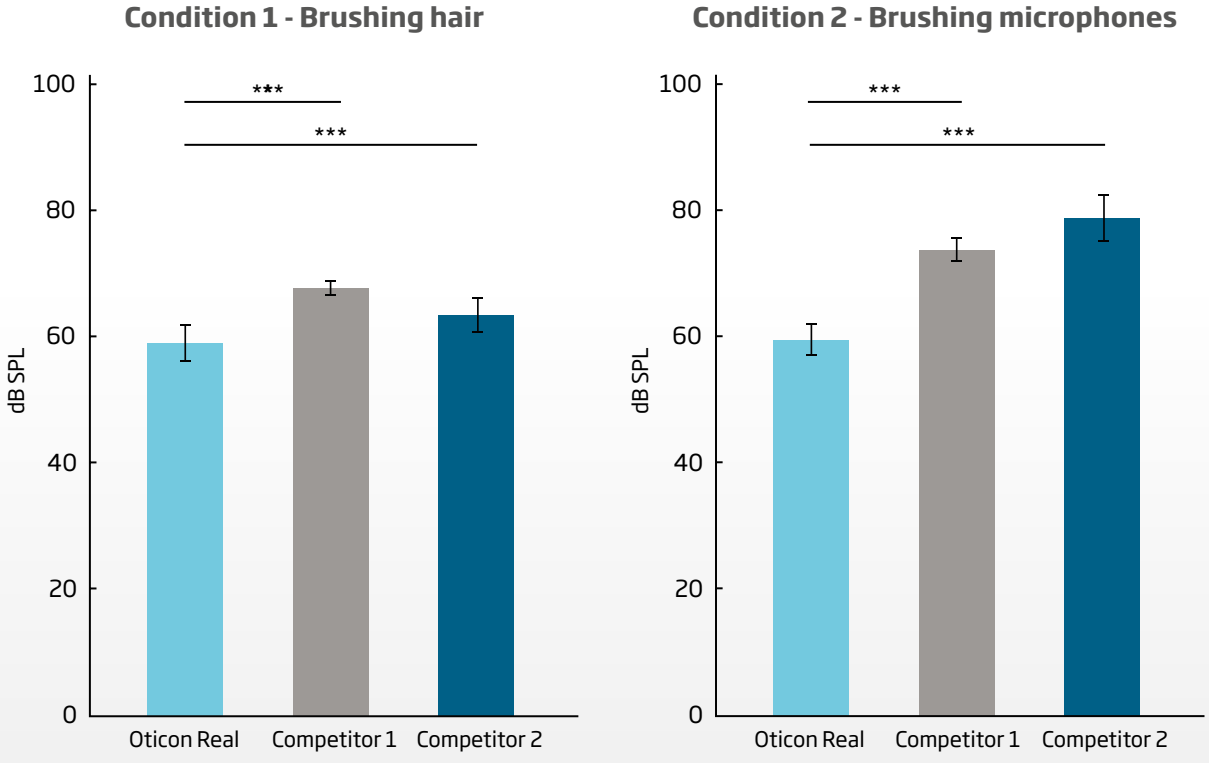


*Figure 6. Results comparing the recorded sound level of all handling audio events for Oticon Real and two competitor hearing aids for the two conditions - left panel brushing hair and right panel brushing microphones. *** $p < 0.0001$.*

With these findings, we believe that users will experience less distraction and further comfort in their daily lives with Oticon Real.

## Summary

This white paper describes Wind & Handling Stabilizer in Oticon Real, a feature that is proven to provide both technical and clinical benefits. In terms of technical benefits, Oticon Real 1 was found to remove wind noise more effectively than Oticon More 1 in all frequency regions, and furthermore provide better access to speech than Oticon More in the presence of wind.

When rated by hearing aid users, Oticon Real 1 is the only hearing aid out of three which provides benefits both in terms of loudness of wind noise and clarity of speech in windy situations, with significantly less loudness than Competitor 1 and significantly more speech clarity than Competitor 2.

Handling noise in hearing aids is not well-researched, although many hearing aids users experience it. In a clinical investigation, we found that Oticon Real 1 significantly reduces handling noise, with competitors being up to 19 dB louder.

Oticon Real 1 is proven to protect users from unwanted, disruptive sound, helping them stay sharp in the real world.

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