# Oticon Real: Audiological Innovations

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Presenter: Virginia Ramachandran, AuD, PhD

- [Virginia] Okay. Hello, my name is Virginia Ramachandran. I am Head of Audiology at Oticon. And today, I'm going to be talking about Oticon Real and the audiological innovations in our new product. Prior to beginning, I do have some disclosures. I do work for Oticon and receive a salary. I also have some financial interests with Plural Publishing as an author and editor and as an adjunct assistant professor at Wayne State University. And I am also serving currently as President of the American Academy of Audiology. And because of that, I do also need to provide a disclaimer that the opinions and assertions presented are the private views of the presenter and Oticon, and not to be construed as official or necessarily reflecting the views of the American Academy of Audiology.

The learning objectives for this course include being able to describe the components of Oticon's RealSound Technology features, being able to explain the patient benefits of effective management of wind and handling noise via Oticon Real, and being able to explain the patient benefits of effective management of sudden sounds via Oticon Real. So to start off, one of the things that we as audiologists have always had to struggle with is the trade off between optimal comfort and optimal clarity. We know that there's a challenge in a lot of cases that when we try to maximize one or the other, that oftentimes a trade off occurs, predominantly in the area of gain. Where if we try to maximize comfort, we might in some cases have to reduce gain, thereby reducing clarity.

And in trying not to do that, a lot of times we'll first try with penciling for the patient. So you have a patient that comes in and you fit them with amplification and they experience a lot of new sounds around them that they haven't heard in sometime perhaps, and they might make comments about it. And as an audiologist, I know that I've frequently said something along the lines of the following, "Don't worry, that's normal, you'll get used to it." And some patients do get used to it. Some patients wear the devices long enough and have enough consistency that their brain really does

acclimate to those sounds. Unfortunately, there are some patients who in fact do not get used to it.

And in a lot of those cases, the hearing aids end up in the drawer because they simply can't, the sounds are too objectionable for them to be able to manage effectively in order to acclimate. And so it's important that we address these types of issues for patients and do so in a way that doesn't sacrifice the clarity that we're looking for. 'Cause of course, if you want hearing aids to be effective, there are two conditions that must be met. They need to be both fit well and worn consistently. So we need to give the patients the benefits of having that optimal amplification, but we need to do it in a way that allows them to be comfortable enough in order to wear those hearing aids consistently to benefit from that amplification.

And the way that we do that is by finding that balance to promote both optimal comfort and optimal clarity. And that's easier said than done. In a lot of cases, we've seen technologies in recent years becoming more and more sophisticated at choosing one or the other, sometimes in rapid succession, and maybe even more intelligently promoting one over the other. But it's very, very difficult to overcome what we have historically viewed as a trade off. It requires a lot of really evolved out of the box thinking in order to try to understand how can we do both. But that really is our goal at Oticon overall and is something that we've really made great strides with with the new product Oticon Real.

Now, in addition to great ideas, you also need the equipment to make it work. And with the Polaris R platform, we actually have the tools in place in order to make this lack of compromise a reality. And we've got that onboard Deep Neural Network to clean up the sound signal, requires a lot of processing ability and also optimized for battery life. But we also needed some new detectors add on to what had been the Polaris platform. So with these new detectors on the Polaris R platform, in addition to the really powerful

processing capability, we can move forward and try to not have to make that compromise anymore. The culmination of all of the technologies that I'm gonna be talking about is something that we think about with RealSound Technology and the tagline here being, "Helping users stay sharp in the real world."

And that's the idea, is that the real world is loud, it's noisy, you should have access to all of those sounds. They provide context and so on. Those sounds become noise when the brain can't make good use of them, when they become annoying in some way. But other than that, they're just sounds, sounds that can give meaning, sounds that can give texture to life. And really what we in the best of worlds want to do is to keep those sounds as sound and stop them from turning into noise because they're disruptive or a challenge in some way. And that's really what we're looking for with these technologies. Now, there's three major components of this RealSound Technology.

There's MoreSound Intelligence 2.0, which is where we clean up the sound signal. Then it goes on for processing to MoreSound Amplifier 2.0 where the sound is amplified intelligently. And then we use MoreSound Optimizer to maintain that cleaned up gain and do so in a way that prevents feedback while providing those auditory queues so that we're not having to give up anything. So we end up having these three major components that facilitate excellent patient outcomes. With MoreSound Intelligence, that name probably sounds familiar if you had fit an Oticon More in the past. MoreSound Intelligence is in its 2.0 version because it has a new feature that helps optimize the input to the Deep Neural Network. That new feature is called the Wind & Handling Stabilizer.

So I'm gonna get into that in a little bit. And then MoreSound Amplifier is also a name that's probably familiar to you if you've, again, fit an Oticon More in the past. MoreSound Amplifier is now in its 2.0 version with the addition of the SuddenSound

Stabilizer. So I'm gonna be talking about that in a little bit as well. So those are the two features that have allowed for upgrades to MSI and MSA, and they are designed to address four key pain points for listeners, which are things that we have been able to address from a clarity point of view, but we want to optimize the comfort as well. Those four things are wind noise, handling noise, and handling noise is what we refer to, anything that's really touching the microphone.

And so people have patient complaints about that a lot, whether it's hair or glasses or a mask, sort of anything that touches the microphones and creates that objectionable noise, we consider that to be handling noise. And then with the SuddenSound Stabilizer, we can address sudden sounds, transient sounds, both sudden loud sounds and sudden soft sounds. Now, historically, transient noise management has been effective in many kinds of instruments at handling loud sounds, but not really addressing sudden soft sounds. And we'll talk about what those might be and why your patients might object to them as well. So diving into Sound Intelligence 2.0 with the Wind & Handling Stabilizer, what exactly is the new feature doing? I'm not gonna get too much into how MoreSound Intelligence works per se with the Deep Neural Network, you've probably seen that in the past.

If not, please don't hesitate to look at some of our previous recordings where we get into MoreSound Intelligence and the Deep Neural Network and how that helps to clean up the sound scenes effectively. Or of course, reach out to your account manager for that. But with the addition of the Wind & Handling Stabilizer, what we're able to do is to minimize the amount of noise that's introduced to the system to begin with. So that Wind & Handling Stabilizer, what it's doing is the signal is brought into the microphones, the microphones capture that signal and digitize the input, and then it is analyzed by the system. And then it goes on for additional processing in terms of the spatial clarity processing and the neural clarity processing.

But with the Wind & Handling Stabilizer, what we wanna do is reduce the amount of noise coming into the system before it has to get cleaned up. So in order to do that, the system actually analyzes the input, the two microphones, after it's digitized during that scan and analyze process. When the input to the two microphones is correlated, is related in some way mathematically, that's usually because there's a signal of interest out there, something like speech or music for example. But when the signal between the two microphones is decorrelated, it means that it's random, it's not related in any way. Random noise tends to happen when there is wind or when there's a noise made by, again, things touching the microphones, from that handling noise.

So the system is able to do a correlation between the input to the two microphones. If it decides that the signal is correlated between those microphones, it leaves it alone and lets the information pass through. However, if signal is decorrelated, it is not correlated between those two microphones indicating that it may be wind or handling noise, the system disregards the input from the louder microphone. So it doesn't turn off the microphone per se, but it reduces that negative noise coming in by throwing out the information that it got from the one microphone. And in doing that, it introduces much less noise to the system and thereby optimizes how the DNN can then continue to clean up the sound signal because it doesn't have as much to clean up.

So I kind of think about this says the car that's going through a car wash and there are oftentimes people at the front end of the car wash who take a big brush and wipe off the car and scrub off some of the really difficult stuff to get off the car at the beginning. That's how I think about the Wind & Handling Stabilizer. It's getting all that big junk off the car at the front end so then when it goes through the car wash, it's much more effective. So that's how I kind of think about the Wind & Handling Stabilizer in relation to the rest of MSI with the the Deep Neural Network, it allows it to be more effective and efficient.

Now, what's really cool about this is that when it does disregard that input from the microphone, from the louder microphone, it only does it in a frequency specific manner. So if there is are frequency bands where there is signal of interest presence and it is not overwhelmed by that random wind noise or handling noise, it preserves the two microphone input in those frequency bands so that the system can benefit from the additional analysis that's made from those directional microphones. So you're very selective in how the Wind & Handling Stabilizer is applied. The other thing that's really cool about it is that it operates across the entire frequency range of the instrument. Typically, wind noise management happens in the lowest frequencies, up to 1,500 hertz, and that is fined for low frequency, or sorry, for low wind speeds, but when you get into higher speeds, you start to affect the higher frequency bands.

And so by operating across the entire frequency range of the hearing aid, we can address a greater number of challenging situations for our patients. So it's a very selective and precise strategy for how we're handling wind and handling noise. In Genie 2, under the automatics tab, you can find access to the Wind & Handling Stabilizer. It will default to on, but if for any reason you ever wanted to turn it off, you could come in here to do it. Personally, if you happen to have the devices in your office and wanna listen to the effect of it, I would recommend going in and trying those two settings. It's quite remarkable, especially for the handling noise. You know, it's probably not windy in your office, but the handling noise you can try out as well while the hearing aids are hooked up to the device, or to the software.

So if you wanted to to try it out on and off, you can go in there and and do that to listen to the effect. Of course, we needed to document that there are benefits to the Wind & Handling Stabilizer. And so we did two types of measurements. One is a technical measurement for access to speech and then another was a competitor test to look at patient perspectives relative to both loudness of speech and clarity of speech. The test setup was done in a, oh, excuse me, a acoustically treated wind tunnel. And so this is a

tunnel that's, a wind tunnel that's in Denmark, very large wind tunnel, but what's really interesting is that it's acoustically treated so that the wind turbines don't generate noise in and of themselves or that noise is not in the location.

And so the noise that is generated within the hearing aids is related solely to the wind itself and not to the ambient noise around the listener. And what we wanted to do first was to look at access to the speech. In order to do that we used head and torso mannequin, hats, and we used the Oticon Real with the Wind & Handling Stabilizer, both on and off, to look at that effect. We also looked at the effect of Oticon Real versus Oticon More so we can look at improvements compared to the previous generation. In setting up the methods for this study, we used a standard N2 hearing loss, which you can see here on the audiogram. And again, Oticon Real Wind & Handling Stabilizer on and off, and then also compared to Oticon More.

The head and torso simulator was fit with the hearing aids facing the wind and the hearing aid output was measured in the ear canals. And we did that with a couple of different moderate and strong wind speeds. Speech was presented with speakers coming from the front, one on each side, and the output signal-to-noise ratio was recorded in the ear canal of the mannequin. And so here, basically there is a mechanism by which we can record what was the signal-to-noise ratio of the signal that was provided by the hearing aids and really understand how effective they were at improving the signal-to-noise ratio. So when you look at the results of just a decrease in wind noise level, you can see that here on the graph what you see is the difference in wind noise level with the Wind & Handling Stabilizer on versus off, okay?

And so this is with Oticon Real and you can see in moderate wind speeds in the blue line and in higher wind speeds with the magenta line, you can see that compared to it being off where the difference would be zero, you can have a difference up around the mid 20 dBs in the lowest frequencies and you see results even at the very highest

frequencies. So this gets to that idea again of higher wind speeds having a negative impact in the highest frequencies and this feature being able to address that dilemma at those higher wind speeds at the high frequencies. In comparing Oticon Real to Oticon More, we did see improvements with the Wind & Handling Stabilizer in terms of the output signal noise ratio.

So how much of that did we get? Now, what you're seeing actually here in this graph is a difference in the wind noise attenuation between the two instruments. So it's really Oticon Real with the wind noise Wind & Handling Stabilizer on, Oticon More with the wind noise prevention on. And you can see that there's a reduction in the wind noise at the low frequencies, the mid frequencies, the high frequencies, and then there's an overall calculation across all of those frequencies, and it occurred for both moderate and strong wind speeds. I mentioned a moment ago that we were also recording the signal-to-noise ratio and compared Oticon Real compared to Oticon More resulted in a 4.3 dB improvement in signal-to-noise ratio when measured at the ear canals.

We also looked at how Oticon Real performed relative to competitors. And I wanna say that, you know, typically we don't spend a lot of time thinking about competitor technologies, but I've mentioned it here because it illustrates the point that I was making at the beginning, which is that our goal is to preserve both comfort and clarity at the same time. And I think that looking at it in this way helps to demonstrate the importance of that. So in this test set up, we had 12 experienced users, average age of 70 years with mild to moderately severe hearing loss. They listened to beaches at 65 dB in a wind speed of six meters per second and they compared Oticon Real to two major competitors.

It was a blinded test so they did not see which devices they were fit with and they were asked to rate the loudness of the wind noise as well as the clarity of speech on a scale of zero to 10. And what you can see here is the results of the, got the mean and the

spread of results for Oticon Real and then the two competitors. So when it says there, experienced loudness, what was their average rating compared to the other two? And you can see that there's a bit less in terms of the loudness there for Real. Then, they were asked about the clarity of speech, and you can see that the clarity of speech was rated higher for Oticon Real.

Now, when we measured this statistically to determine whether those differences were significant or not, what we found was that Oticon Real tested better for loudness than competitor one, okay? So it was judged as not as loud as competitor one. Competitor one was good at preserving the clarity, but it was louder in terms of the wind noise than Oticon Real. On the other hand, competitor two, which has a microphone in the ear canal to try to help with wind noise, actually performed as well as Oticon Real. So Oticon Real was able to perform as well as this instrument in terms of loudness of wind noise. However, when it came to the clarity of the device and the clarity of the speech, this instrument was not, was rated as less clear than Oticon Real.

So the point here is that we really want to make sure that we are able to provide both the comfort by a reduction of loudness and noise, and additional clarity, and Oticon Real was able to do both of those. In addition to that wind noise, we also wanted to demonstrate that improvement in handling noise. Handling noise is not something that we really see people looking at in our literature, but which is actually a little bit of a surprise given how ubiquitous this issue is for our patients. We hear about it all the time in clinical settings that patients have challenges with this. And so we want to make sure that we looked at this, and you know, how effective this strategy was for dealing with them.

So we took these same two competitors, we put the devices on the heads of the mannequin so that we could do some technical measurements, program them to a standard hearing loss, and then did some test conditions where they were brushing the

hair over the microphones or brushing the microphones with a finger. And we did 12 different trials of this for each of those conditions and compared them to those competitors. So with an actual technical measurement of how loud it was. And when the hair was being brushed and therefore was hitting the microphones in that way, we did see that there was a significant difference in the recorded output of the devices with Oticon Real being significantly quieter, as well as in the conditions where they were finger brushing up against the microphone.

So we saw a significant decrease than what you can see here is the scaled representation of the sounds that recorded with these. So the other competitor technologies were much louder than what we had with Oticon Real. So in summary, our goal with this Wind & Handling Stabilizer and MoreSound Amplifier 2.0 is to provide that, maintain that excellent signal-to-noise ratio, maintain that good speech understanding, but to do it in a way that reduces those annoying sounds and make things much more comfortable. Moving on to the next strategy here, MoreSound Amplifier 2.0. The addition, again, is what's known as the SuddenSound Stabilizer, which is designed to detect and control sudden sounds. MoreSound Amplifier uses what's called an adaptive amplification approach.

So this is something that Oticon has had for a very long time, this adaptive amplification. It combines the best of both slow and fast-acting amplification, and in doing so, creates what's called a floating linear window, meaning speech is kept as linear as possible to preserve the most natural cues possible. So it's really important that this feature preserves the benefits that we have from MoreSound Amplifier and that adaptive compression. What we've done with SuddenSound Stabilizer is to take it from its original location where we used to have transient noise management on the front end of the hearing aid, meaning that when sound came into the device, it was, had a level estimate, and if it was estimated to be loud coming in, that was reduced so that sudden sounds wouldn't enter the processing scheme.

Unfortunately, what that means is that when the hearing aid goes on and amplifies that signal, it could end up with some sounds that were now amplified after the fact and could create some discomfort or potential artifacts. So with SuddenSound Stabilizer, we were able to take advantage of the faster processing of Polaris R platform and add new sensors to the system and those sensors are placed at the end of the processing scheme, so that after the sound amplified, it is then that the system looks for those sudden sounds to be able to attenuate them if need be. Once those sudden sounds are identified, the gain reduction that occurs in order to prevent over-amplifying them is what we consider to be instantaneous, meaning at least at the speed of speech, this works quickly enough to not interrupt any of the other cycles of the speech signal so that you can maintain the clarity and audibility and all of those individual speech cues, okay?

So it works fast enough that we would, at the speed of speech at least, consider it to be instantaneous. You can see here what that effect would be when we did a recording of the SuddenSound Stabilizer off, that blue signal, versus on its highest setting, which is pink signal. And what you can see is that you have not lost any of the clarity of the signal, it's differently amplified, but all of the individual precise cues are still inherent in the signal. The good news is that you can customize SuddenSound Stabilizer in Genie 2. And this is important because different types of hearing losses and different people perceive loudness of sound differently. Some people can be very sensitive to these types of loud sounds, other people not as sensitive and they might want a more dynamic quality sound signal.

So from qualitative point of view, from a sound quality point of view, you have a lot to work with in terms of these sound preferences. You can see that in an Oticon Real 1, you have six settings, it goes from off to low, medium, high, very high, and max. The big difference here among these is what intensity level they will begin to activate at. As

far as the intensity level, I'm talking about the overall level of the signal. What will occur is that at each moment in time for each channel, the system will detect how high is the signal right now and compare that to the overall intensity of the signal that is ongoing. If that difference exceeds a certain amount, then gain reduction will occur.

And you can see that when it begins to activate at higher settings, at lower intensity levels, it's more likely that there will be a difference between those two and it'll be more likely to activate. In the bottom line there, that bottom row, you can see the maximum amount of attenuation that could occur, with low having a maximum attenuation of 10 dB and max having a maximum attenuation of 30 dB. That does not mean that it will attenuate by 30 dB every time it activates. The actual active amount of attenuation will depend on the level of the signal overall. But in the cases with the greatest amount of transient energy there, it could create an attenuation of up to 30 dB.

So that's what we're looking at here. So you can make adjustments in Genie depending on the needs of your patient. The default for Genie will be at medium and that you can make adjustments from that. The nice thing is that you don't have to worry about being too aggressive with this. We've confirmed with technical measurements that there's not a problem with being assertive with these settings. What would really end up happening is really, it's a sound quality issue for the patient. If you were to put somebody on max who really didn't have that type of sensitivity to those sudden sounds, they might find it to sound a little bit flat. If, however, you were to put it on low and somebody was sensitive to those types of sudden sounds, then that might be a bit jarring for them and you'd wanna be a bit more aggressive.

But in either case, you're not gonna negatively impact understanding. You can adjust this for comfort without sacrificing audibility. To document the benefits, we looked at some performance and benchmark data and we looked at the SuddenSound Stabilizer effect within the device and then compared it to other technologies. Again, we used

this N3 standard hearing loss, and some technical measurements on the head and torso simulator. We used a variety of sudden sounds to simulate what sudden sounds might be like in the environment and measured the hearing aid output in the ear canals. And what you see here is the amplitude of those many sudden sounds with these different SuddenSound Stabilizer settings. So this is just an example right here, what that intensity looks like for the exact same recorded signal depending on the level that you set that SuddenSound Stabilizer to.

We also compared it to other technologies, again, to competitors, as well as to Oticon More. We played those sudden sounds, the hearing aid set for that N3 hearing loss, set to an NAL-NL2 fitting. And we compared the transient noise management, the defaults for competitor one and two, and compared it to off or the maximum setting. And what you see here is the attenuation of that sudden sound for a variety of conditions. Over the left, you see how much attenuation occurred on average, the bold line, and then the distribution of those reductions for the different setting of Oticon Real, low, medium, high, very high, and max. And of course, at the max you can see that, under certain conditions, we got above 30 dB of attenuation.

Compared to Oticon More, you can see that at its default setting of medium, it was substantially, it was really on par with the middle settings for the Oticon Real. But then with Oticon Real, you have options to increase the amount of attenuation as needed for your patient. And then compared to the other two competitors where they were set to their maximum transient noise settings, you can see again at those higher levels of settings with Oticon Real, you have a greater amount of attenuation of those. So for those patients who need it, we have a great ability to be able to adjust for those sudden sounds there beyond what we've seen in the past. And then what is the impact of that attenuation on speech?

And what we're gonna see is that it's pretty minimal. So you've got speech coming from the front in the scenario, sudden sounds were also presented from that front location at plus and minus 30 degrees azimuth. And then we had babble noise coming from behind the speaker. So it was a pretty complex environment where they're listening to speech in a complex situation with sudden sounds erupting. And the hearing aids were placed on the head and torso simulator and we compared Oticon Real to Oticon More. And we compared the settings of off, medium, and for Oticon More, we could go up to high, for Oticon Real, we could go up to max. And we compared the SS, or the SII weighted output SNR.

And so what that means is how much of the speech signal would be available based upon the SNR that was provided. And what you can see here is that Oticon Real provided better access to those speech sounds than Oticon More did in both the default setting and then the maximum setting. So we saw some improvement in the clarity of speech there. We also looked at the individual subjects and what their experience was wearing these devices. So we used pupillometry, look at listening effort. Now, pupil dilation is a well-known metric for listening efforts. It's a well-known metric for all types of effort and has been used to measure effort since the 1970s. We've been using it for a number of years at Oticon to better understand the effort involved in listening.

And so what you can do is actually measure the dilation of a pupil or the size of the pupil. To the extent that that changes or becomes greater, it's indicative in many cases of greater listening effort. And so you can better understand how much effort a person is expending. And that's important because with a lot of hearing aids nowadays, you know, if you have a good enough hearing aid and you have good enough gain, you can really expect to perform at that person's 100% under most circumstances in a sound booth. So at least as far as being able to understand what the impact is on speech

understanding, you know, gain can give us a lot of what we need and you have a lot of that in most modern hearing aids.

But the important thing to us in addition to that is this idea of brain hearing. How much effort does the brain have to expend in order to get that level of performance? So you can have two situations where somebody has the exact same outcome, but in one case it may have taken much more effort to achieve that outcome. And so that's what's important to us that we understand the higher level cognitive processes because we want our patients to not just perform well, but to be able to be comfortable and successful while they're performing well. We don't want them to have to be exhausted at the end of the day because they had to expend so much effort in order to hear well.

So that's the type of thing that being able to focus on pupillometry allows us to do, is to really better understand what's happening at a higher cognitive level. So we looked at 29 participants with mild to moderate hearing loss and prescribed them with Oticon Real devices with VAC, which is the default prescription. And we used the default settings of the SuddenSound Stabilizer and then we did an on condition to those default settings and an off condition. And in this test set up, it's similar to a test set up you saw previously for the head and torso simulator, but here we have a person sitting there. So speech comes from the front, the target speech, background noise, speech babble, presented from the back, and then sudden sounds that are presented from off to the sides and the front.

And in this case an eye tracker was used to measure the dilation of pupils of these test subjects. Now for each test subject, the background noise was adjusted so they got 80% speech intelligibility. So whatever signal-to-noise ratio was required to get that. And the target speech was presented at 70 dB SPL. So we know that they had a really specific level of performance. Ae wanted to make sure that the performance was consistent and then we wanted to understand how much effort it took to get that same

level of performance. The task was to repeat two keywords and people were also due to a subjective evaluation after the fact. And whether or not the sudden sounds were present, the activation of the SuddenSound Stabilizer did not have any impact on speech understanding.

So this is really good because we did not see any negative impact from SuddenSound Stabilizer. Now, sudden sounds in and of themselves could mask some of speech and we can't prevent that from happening. But what we can do is make sure that our solution in making those sudden sounds more comfortable doesn't additionally compromise speech. And so we were very pleased to see that that did not occur. But we did see an improvement in the amount of effort that was expended, meaning less effort was expended to get the same level of performance. So what you see here is the amount of pupil dilation that occurred relative to baseline, the baseline being zero. You can see what the time scale was at the bottom.

And so over the course of five seconds, you had background noise being continuously presented. That was that background speech babble. And then you had three different conditions here. The dotted line was situation where the person responded to the speech, the target sentence, in the presence of background noise, but there were no sudden sounds present under this circumstance, okay? And so you see there that when the target sentence is presented there's an arousal stimulus where the person is listening for those keywords that they're supposed to repeat back and then you see a decrease back to the baseline that occurs, okay? So this is a normal cognitive response to them doing this listening task in a complex environment.

What you see on the blue line is how much more effort needs to be expended when the sudden sounds are present. So you can see again on the timeline at the bottom, you've got that background noise, and then you can see the listening effort starts to increase while the target sentence is being presented. But you can see that in the presence of

those sudden sounds, this task becomes much more difficult to accomplish. And so you have this much higher change from baseline, indicating much more effort being expended. The magenta line that's there is what happened, SuddenSound Stabilizer was turned on, the presence of those sudden sounds. And what you can see is that while the sudden sounds still did have an impact on the effort, that impact was reduced when the SuddenSound Stabilizer was activated.

So we could reduce the amount of sitting effort that occurred in the presence of those sudden sounds because we're able to reduce the impact of the sudden sounds, make them more comfortable, and stop them from being as intrusive to the subject who was trying to do this other cognitive listening task. Okay? So that was something that we were very excited to see is this 22% reduction in listening effort. Another thing that was done is that we asked subjects to subjectively rate their experience doing this task. And what we've found during this subjective assessment was that there was less of a tendency to give up and more reported engagement in the activity. And of course, this makes perfect sense when you think about the idea of listening effort.

Here, we've got a situation where the person is performing well, but they're not having to expend as much effort as they ordinarily would. And in doing so, that's necessarily or more likely to be the case then that they would be giving up on the task and being unengaged in the activity. And really, this is the type of thing, again, from a brain hearing perspective, what it is that we're looking for patients to have. When we think about brain hearing, one of the things that we think about is, again, is cognition and so on, but it's more important than that. It's important because it really impacts the lives of the patients that are in front of us.

We have a patient who comes in. If they've come in, there's usually something that drove them in to see us, that something has gone wrong. And in a lot of cases what's gone wrong is communication, right? They don't have a hearing problem, they have a

communication problem. And what we're typically trying to do when we're intervening with patients is to help them to stay engaged and to have good communication experiences with their communication partners. To the extent that people are not able to participate in an activity, to the extent that they have to give up because it's simply too difficult, that's where we're not meeting our patients' needs. You know, when patients used to come in when I was working in clinic, they might come in and they would say, "Well, you know, I went to this restaurant and it was really noisy, and I was struggling to hear."

You know, a lot of times what I would say is, "You know, if I was a noisy restaurant, I have normal hearing, I might struggle to hear under those circumstances as well." And that's true, I would struggle to hear under those circumstances, but I would still be engaged in the activity because I would be performing well enough for that to be the case. If we have patients who are struggling and not able to do the activity in spite of the amount of effort that they're putting out, then they're simply going to give up. And that's the follow up question that I regret in clinic, not following up that comment that a patient might make. The question isn't, do you have to work hard necessarily, that's an important question.

But when you do work hard, are you able to be successful at the task? That is the question that is really important because, you know, it might not be an easy task, but are they still able to engage in the same tasks that their friends and loved ones are able to be in? 'Cause if that's the case, then we have made a big step towards success with our patients in meeting the needs that they came to us with. So that's, so when we look at these subjective results, they are subjective, but it really is important that we see that they were engaged and able to follow through at this activity 'cause they had to do it enough times.

So not an easy task in a difficult listening situation and they were able to stay engaged, and that's what it is that we want from the patients that we're working with. So in summary, SuddenSound Stabilizer is offering better comfort in the presence of these sudden sounds, better access to speech compared to what we were using, and a 22% reduction in listening effort in the presence of sudden sounds. And what goal here is that this is getting us closer to that situation where we're benefiting our patients by causing hearing aids to be effective because they are fit well and have the ability to be fit well and provide access to the audibility that the patient needs, but also to be worn consistently because they are comfortable enough, and they are comfortable and made comfortable in a way that doesn't compromise that first point, which is that they be fit well.

They're comfortable in a way that maintains the clarity and improves the audibility. We do have a couple of technical papers and white papers that will provide more information on the details of these. So if any of this sounded interesting to you and you wanna go in and and learn more about it, there's a Wind & Handling Stabilizer Whitepaper, there's a SuddenSound Whitepaper, and there's a MoreSound intelligence Technical paper that talks about how it works altogether. And you can find that either by contacting your account manager or you could go to our website at oticon.com and there is a location where you can, as a professional, look for those supporting papers and so on. And so with that, I just want to thank you for taking the time to learn more about this.

Again, any questions that you have, please feel free to reach out to us. My email is vira@oticon.com. If you have any questions or thoughts you'd like to share, please don't hesitate to reach out, or contact us at our 800 number to talk to somebody in audiology tech support or your regional audiologist, or reach out to your account manager for more information. So thank you very much.

- [Melissa] Thank you so much for joining us today for the Oticon Real Audiological Innovations course from Dr. Virginia Ramachandran. As a reminder, handouts for today's class can be found in your AudiologyOnline account in the pending courses area, or also in your transcripts later on. If you need technical support, please contact AudiologyOnline directly after this course. You can find their information on their website. Any questions for today can be sent in to AudiologyOnline. We'd be happy to forward them on to our presenters after this class is over. And as a reminder, you can earn continuing education credits for today's class. To do so, just go into your AudiologyOnline account. You do need to be a member of their CTA program and pass the exam with an 80% or better.

Just a reminder about a few things from today's class. After this course, you should be able to describe the components of Oticon Real's RealSound Technology features, be able to explain the patient benefits of effective management of wind and handling noise via Oticon Real, and be able to explain the patient benefits of effective management of sudden sound via Oticon Real. Again, we'd like to thank you very much for joining us today. At this time, you're welcome to close out. If you have any questions about this wonderful product, please contact Oticon at any time. We know they'd love to hear from you. Thank you again and have a great day.