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## Oticon Opn S, Proven to Support the Brain

Recorded: June 26, 2020

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AudiologyOnline.com Course # 34779

Partner: Oticon

- [Dianne] Thank you, Kimberley. I'm very excited to be here with you today. My name is Dianne Senay and I have been a trainer, an education and training specialist with Oticon for the last 15 years. So I'm very excited to have this opportunity to talk with you today. Currently, in addition to the experience as a trainer, I have been transitioning to a position where I will have the opportunity to help create our training content for courses like this and other CEU courses and training for our staff. So that's very exciting. But in my heart I probably will always be a trainer because I very much enjoy talking about the research and development in our products and what they can do for your patients. So let's get started. These are our learning objectives for today's course. We want to make sure that you're able to list the product families on the current Oticon platform. What's our current offering for you and your patients.

That you'll be able to describe the technological innovations that enable what we call the open sound experience and the unique benefits of the BrainHearing technologies. And that you'll be able to discuss the evidence documenting the benefits of the BrainHearing technology. So as I said I've been here for the last 15 years with Oticon and prior to that I spent many years in the clinic serving patients and I think anyone who starts to fit hearing instruments really does want to have the same goal that you see on the screen. That we would love to have a world where hearing loss is not a limiting factor for our patients. And so when we approach what we're doing and have, for the last many, many years that we focused on really innovative technology, not that everything hasn't been innovative along the way. But I would say really some very large game-changers have happened in the last 10 years. If you know Oticon you probably know our history but if you're newer to us or don't know a lot about Oticon's legacy in research and development, we are the oldest hearing instrument manufacturer in the world. Started in 1904 by a gentleman named Hans Demant whose wife was hearing impaired. And to me that's a huge legacy that at our roots we started out as a company who focused on the person with hearing loss and making their life better. Because the title of this course is Opn S-Proven to Support the Brain, we are gonna

look at that legacy of research and those key technologies and how they are supporting the way the brain makes sense of sound. I think a little bit about our research and development and our research center is important. The picture you see here is of our research center called Eriksholm and this is outside of Copenhagen in Denmark. We are a Danish company and it is a separate research facility called Eriksholm Research Center. If you go to the website you'll see pictures of an old castle, it was a property with an old castle on it. And this is a shot of the newest training classroom that is there at Eriksholm and there are all kinds of researchers there that are audiologists, engineers, hearing scientists, sociologists, anthropologists and they're doing all kinds of research about the effects, the implications of sensory neural hearing loss, the patient experience and then researching technological innovations that we may not see for eight to 10 years in a commercially available product.

And so those innovations, more innovations that we're gonna talk about today, really were researched here at Eriksholm for many years before they became commercially available. This research center was established in 1977 so it was the first independent research center in the industry and it continues to be independent. So the people that are actually developing the products and bringing things to market, are in a separate location in Copenhagen and this facility is a pure research facility looking at not only what we could do but really what should we do to make sure that we provide the most innovative technology to make the experience for the person with hearing loss better. And try to bring them as close to the experience that normal hearing people have in the real world. So you may see this logo from time to time now on many of our pieces of literature or some of our presentations. So we are innovators, I believe in technology but we are all about people. As I mentioned, at our core we were started by a gentleman, the company was started by a gentleman whose wife was hearing impaired and so we do want to focus on that experience and the effects of sensory neural hearing loss on that individual patient. But we wanna challenge convention and look for innovative ways to do that better so that we're looking for opportunity to focus on how

we can give the brain a better signal so that it can do what it was designed to do. But our technology is life-changing in the sense that we are working hard on your behalf to develop those technologies, but you're the one that actually changes a life. When a hearing care professional chooses to recommend and fit our technology in your capable hands, you're the one that changes that individual patient's life. You've probably seen a lot of the blue brains around on our literature or if you've looked at anything or you fit our products, you see this term BrainHearing. And you see that many years ago, quite a few years ago now we did trademark that term. I think if you asked most of us that have experienced fitting hearing instruments we would all say of course, it's important that we think about brain health. We're all very aware of the correlation to untreated hearing loss with other health problems and hearing really is a healthcare issue. I talked to my patients about brain health and the implications of what's happening to the brain. In terms of the way we view that term, when we think about what we're developing, excuse me, we start with looking at the capabilities of the brain and what we know about it and then what can we do with those technologies to support the way the brain makes sense of sound.

So being aware of what the brain needs and then actually developing that technology to support the way the brain operates and makes sense of sound. We all know we're never gonna change that peripheral hearing loss. We're never gonna make their hearing normal again but what we can do is make sure that whatever we do with the signal will give the brain good clean information so that it can make sense of it. So we continue to learn more and more about what the brain needs and how it makes sense of that sound. And so we utilize that information and you're gonna see some of our newer research here in this presentation that allowed us to say that we are supporting the brain. You also probably see these kinds of logos on our literature. So Oticon BrainHearing Technology. I hail from the Midwest, from Missouri, the Show-Me state, is where I grew up and I look at that and I'm a little bit cynical and that looks like a really great marketing term to me. But what it really means is that we've taken these

technologies and we really have done the hard work to research them before they are put in a product and then to continue to research that they are doing what we say they are doing. And so that's why we're using that logo, Oticon BrainHearing Technologies. The BrainHearing term, the pictures you see that reference the brain are counseling literature that we have with these images in them and descriptions actually resonate very much with consumers. They're extremely interested today in brain health and hearing about the benefits rather than all the technical descriptions. We all need to know that and because audiology is evidence-based and should be, we should be good consumers of the literature, understanding all of that and then being able to put it in benefit terms for our patients I think, is very important. We have challenged convention. I think you see in some of the more recent developments of the way we're addressing the noise problem. We really do try to look at things differently and then research that and show that it has benefit for your patients. There's a huge difference between what all we could do today and really what we should do to provide better benefits every time we come out with new product families and options for you and your patients.

Platforms, I think play an important role as well. So when you look at a manufacturer's product offerings today you wanna know what platform they're on. We led the way in our wireless platforms in naming them and this is today's current Oticon platform. It's called the Velox S Platform. We continue to develop our own platforms from the ground up so we can plan and know what we're gonna do with all that processing capability. I have other slides and every manufacturer probably shows platform slides. I could talk to you about MOPS and Mbps and processing speed and all of that but I think what you really wanna know is what does Oticon do with that processing capability. And the fact that we do develop our own platform allows us to plan for everything. We're not buying a platform off the shelf and then trying to add our technology to it. So when you plan for it you can choose how you're gonna use your processing capability, you can decide what you're gonna do with that in terms of the

technology and the products you're gonna put on it. We also use two types of wireless technology on our platform today and have for a number of years and we use near-field magnetic induction for many of the audiological features and then we use Bluetooth low energy for the benefits of connecting to other devices. So those are both built into the platform. The Velox S Platform did give us increased processing speed. So over our previous Velox Platform and of course you would hope that that happens and I'm sure it does with every manufacturer, when you move to the next newest platform, you get more processing speed. So when we moved to this current Velox S Platform what did we do with it? Well, we got about 30 times more processing capability than our previous platform and so there was an opportunity to do very detailed measurements of the sound loop where you see here on the slide 56 000 measurements per second. So we took the bulk of that new processing capability and added a feature called OpenSound Optimizer and that's one of the ones I'm gonna talk about today. And that is actually a feedback prevention system but it ended up having some additional benefits that you're gonna see and see some of the research that we did on that. And then the other thing that we utilized that for was to actually you need to, if you're gonna do lithium ion rechargeability you need to optimize that for that in your platform.

So the Velox S Platform was where we did optimize and introduce lithium ion rechargeability and we have that in several of the product families that are on the Velox S Platform today. The other nice thing too is that this platform, everything that's currently on it, all the products are about 18 months old or less. Some were just, we did have a family that was just recently introduced that I'll show you quickly at the end today. So platforms do play an important role. So let's look at the three areas that we're gonna talk about today and the research to support that title Opn S-Proven to Support the Brain. So the first one that I wanna just talk quickly about is Speech Guard. So if you've known Oticon for some time, you know that technology has been around for several platforms and several product families. And Speech Guard is our

adaptive compression system. So if all goes well here I'm gonna show you a couple of videos to just illustrate what this system was designed to do. So when you learned about compression in a hearing instrument, wide dynamic range compression which is all the systems are today, but they typically are either faster acting or slower acting and both of those have benefits and limitations. So a faster acting, so I'm gonna, let's see if I click on this video. Kimberley, make sure I do this correctly, there we go. And I'm gonna start it. So a faster acting compression system will do fairly well in a quiet environment but you'll see that it's attempting, it's constantly going into compression to bring everything into the range. So when you move into a noisier environment, a more background noise environment, then that system will actually puff up the softer periods of speech and so it starts to sound a little bit scratchy and noisy in a more complex environment. Slow acting compression is actually the opposite. It'll be a little bit kinder to speech and background noise but if you have to deal with a sound like a slamming door, dishes dropping in a restaurant, something like that then you can have a dropout when the system deals with that before it can come back up to full gain. Speech Guard is actually an adaptive compression system and so what it does is it uses both a slow and a fast time window.

So it's actually got the capability to do both. So it's gonna bring that speech detail into their dynamic range and it's going to deal with any sudden sounds in the environment and come back up to full gain very quickly. And so the advantage of that is that, do I just click back on the slide, Kimberly? There we go, thank you. So the advantage of that for your patient is that it's gonna maintain more of the details of the speech envelope instead of squeezing it or having dropouts. And it's gonna add to the natural sound quality. So one thing you'll see of technologies like this that have come along, were introduced and then have come along from each new platform, is that it was originally called Speech Guard. Then it was called Speech Guard E and now you see it's called Speech Guard LX. So that's the delineation that improvements have been made to it and it got better as it was moved to each subsequent platform. This was a

technology that was researched at Eriksholm for many years, so if you go to the Eriksholm website and you click on the history button, it's a really interesting progression of hearing instrument technology as you go down the line and you'll see a description of how many years that Speech Guard was actually researched there before it was introduced. You also can find independent research on this technology. So if you are familiar with Andrea Pittman's work in Arizona, she actually did a research study on Speech Guard and she did it with both children and adults and she describes her study very eloquently. We do have videos from back then of when she did this research study, and then she published it in 2014 in the "Journal of the American Academy of Audiologists". So if that's a reference anyone would be interested in please let me know. And now we're gonna move on to the more significant technology that came out when we introduced the product Opn back in 2016. And I think as you look at the body of research that we've developed for OpenSound Navigator and the most recent research, is where you're gonna see why we called this course Opn S-Proven to Support the Brain. So this truly was a game-changer in the way we addressed the noise problem.

So when patients come to see you they really do talk about the places that are difficult for them as noisy places, right. Whether it's a family situation, social gathering, many people who are still working today who are getting hearing instruments. Even patients who live in long-term care go to the noisiest place in the facility three times a day in the dining room. And you can see from this illustration here it becomes very difficult. You've got noise all around and a lot of the background noise is speech babble. And maybe you've got music, maybe you've got waiters and waitresses. You've got all the people around the table. And really the traditional way we had always approached this kind of situation was to look at that situation and then use directionality to focus the attention and improve the signal to noise ratio, mostly for the person in front of you. So you needed to be looking at that person then the hearing instrument would go into directionality and then it was gonna add some noise reduction for comfort. But if you

look at this scenario, even though he might be able to hear the person across from him that he's looking at a little bit better, there's actually noise right behind them. You see the music, you got the waiter walking by. And then you've got all this other noise going on. And then what happens if that waiter at the end of the table moves down to him? Is he even gonna know that they're there? So the traditional approach was what had been around for many years. But we had these new ideas and we felt like there was a better way to address the situation. And instead of moving towards what we could do with those traditional approaches, we moved more in the direction of something very unique and that's where OpenSound Navigator came from. So it's actually a three-step system that analyzes the environment. So it actually uses the directional microphones in a different way to look at the environment all around and one microphone's gonna take that 360 analysis.

The other one's gonna do what's called reverse cardioid, so think of a heart. And it's gonna gather information from that perspective and then a hundred times a second it's gonna update this analysis in terms of frequency response, clearly defined speech, noise, specific noise, diffuse noise and then at the same time, once it completes that roadmap, you've got the balance step which is where the adaptive directional polar plots would be created and the noise removal that's like a diffuse filter, to remove the noise even between sounds. And so when you've got this detailed roadmap and those two systems operate together with the same roadmap and they operate moment to moment, you can actually manage that environment much better and constantly update it better than the traditional approach. And the traditional approach of looking at the environment, going into directionality, adding noise reduction, is very slow. So this visual kind of helps you see that so a traditional system, it's gonna be a little bit different across manufacturers but it could be anywhere from about two to seven seconds for the whole thing to kick in. And then you see that OpenSound Navigator, you can barely see the bar. So the illustration is to show you that it is operating moment to moment. And so what that does, the benefit for the patient is really to be

able to give your patient more access to those clearly defined voices around them and preserve it and that background noise not feel overwhelming. And now the gentleman at the center of our illustration there can choose where to focus his attention instead of the hearing instrument making that choice for him. And then finally the last one is what we added when Opn S came out, which is called OpenSound Optimizer. And I'm gonna show you a little bit of information on that one but I wanna show you a quick video here that was done by Don Schum our vice-president of audiology. And so what I want you to focus on in this video is what he talks about in terms of the benefits. He's gonna give a quick description but if you've seen it before focus on what he talks about in the benefits. And then that's gonna be important when we look at the research on that.

- In the hearing aid world, acoustic feedback is just a fact of life. At least we used to think so. We developed OpenSound Optimizer to prove it doesn't have to be that way. If you run into feedback during a fitting you have to make a compromise. Perhaps it means that the patient just has to deal with feedback from time to time. Or perhaps it means that you can't provide the sort of gain you would like to in the mid to high frequencies. Or perhaps it means you need to provide a more closed fitting than either you or the patient would prefer. If feedback becomes a persistent problem, the patient can become frustrated. And it could even lead to the point where the patient decides just simply not to use the hearing aids anymore at all. OpenSound Optimizer was built on the power of the Velox S Platform. And we've leveraged the power and speed of that platform to be able to not be bound by conventional thinking. Traditional approaches to feedback cancellation may be too slow to stop feedback before it becomes audible. But with OpenSound Optimizer we monitor the signal 56 000 times per second in 28 channels. If it detects that feedback is beginning to build up, it puts a small break in a narrow frequency window to stop feedback before it even has a chance to start. And all of that happens in less than a tenth of a second. That break pattern will then be repeated as often as necessary until the threat of feedback has

passed. And that break is so subtle that the brain may not notice. And what is the effect? Well the effect is up to six dB more usable gain. And with six dB more gain to work with that means you have to make less compromises. The patient can go throughout the course of the day confident that they're not going to have to deal with feedback. We developed OpenSound Optimizer to approach the feedback problem using a new way of thinking. To better protect the hard work that you put in, to create a good fitting for your patients.

- [Dianne] All right, there we go. So as you saw he described it as a feedback prevention system and he used this illustration. And I think what's really fascinating about this edition when we went from Opn to Opn S, the benefits, we came to a new platform so we have the benefits there. OpenSound Navigator, we had all the research supporting it that I'm gonna show you. But now we also added a prevention system that allowed us to use that new processing capability to add these tiny breaker signals that you see. So think of like a picket fence on a beach, that it's inserting them very quickly and very narrowly to break down that build up, and so what's gonna end up happening, the benefit for your patient, is that it does reduce that risk but it provides up to about six dB more usable gain, gives you more headroom. It allows you to make some choices in some of those fittings that maybe you might have felt like you had to close down a little more in the past to get what you needed in terms of audibility. But the bigger group that it made a difference for was providing a more stable signal throughout the day and that really is a larger group of your patients and because of that more stable signal it allowed all these other key features that were in Opn and now we brought over to Opn S, to operate even better in the new product on the Velox S Platform. So let's take a look at some of that research and how we have built the body of evidence and then how that historical evidence then is built on from the newest evidence that you see in supporting the way the brain makes sense of sound. So let's start at the beginning, so you may remember back when Opn was introduced on the Velox Platform, you saw lots of literature from Oticon that talked about the paradigm

shift. To us it really truly was a paradigm shift because we were moving away from the traditional way of approaching the noise problem to something new called OpenSound Navigator. And it really is innovative, it's also heavily patented and has had a lot of research in the development of it and then ongoing research so that the claims that we have for it really truly are supported. As you probably know today, you must do all the hard work for any of the claims that you have and you publish about your hearing instruments. You have to prove that before you can publish claims about any product today. So this actually represents several studies. So what I wanna focus on though is where we started first. So you may know about an objective test called pupillometry. And what was fascinating to me back when we first introduced Opn and the OpenSound Navigator was we took a well known objective test, so there's lots of literature out there about pupillometry, the dilation of the pupil in the eye, being a test for measuring cognitive load. And so what happens is the harder your brain has to work, the larger your pupil gets when you're doing that cognitive work. And of course we all know that someone with sensory neural hearing loss is gonna have to work harder.

So what we did in those initial studies to get those percentages you see there were we used pupillometry and we actually compared our premium product at the time called Alta2 Pro and that used traditional adaptive directionality and a traditional noise reduction system and we compared that to Opn and OpenSound Navigator. So that OpenSound Navigator was the main technology that was different so we were comparing to our difference there. And so what we found was that the pupillometry showed a 20% reduction in the cognitive load. So we could reduce listening effort by 20%. But there were actually two other components to that study too. So that if you reduce the load on the brain you can actually, you don't have to work as hard to understand what's going on around you. So that was a hearing and noise test. It was the Danish version 'cause this was completed in Denmark. And that's where we got the 30% better speech understanding and so now if you don't have to work as hard and

you can understand better, then it makes sense. You can actually recall information. So that's where the third number of the 20% better memory recall came from and that was a fairly complex task too where they had to listen to these statements within a noise background and then repeat the last word ongoing in these sentences. So it wasn't an easy task. So that's where we got those first numbers and we used that objective measure to show that we did reduce the cognitive load on the brain. So after that you'll see later on there's a second study there on the right. So I remember after all of that was published and people were fitting our Opn product then the next question that came from people was, okay, well that's all well and good. I can appreciate that you compared that to your previous premium product. But some other manufacturers continue on with traditional directionality and others are starting to take a more narrowed approach to taking that beam of directionality and making it narrower. Have you compared to that?

So in my time with Oticon that had never really been something that we did. We really felt like our obligation to you and comparing apples to apples, was always to look at our last best and compare to what we did differently and show what the benefits were. But this time we did actually do a study comparing to traditional directionality and narrow beam-forming directionality and to OpenSound Navigator. And so what was interesting about that study was we actually looked at it from two perspectives, so it was the speaker in front and then two additional speakers at a 45 degree angle. So for the speaker in front, OpenSound Navigator was on par with the narrow beam forming and it was better than traditional directionality. I thought that was pretty impressive that it would be on par with the narrow beam forming because that would be the whole purpose of narrowing that beam would be to get that speaker in front a little bit better. So it was on par with that, better than traditional. But when you look at the two other speakers at a 45 degree angle, then OpenSound Navigator outperformed both in terms of improving the signal to noise ratio. So the benefit to your patient is another way of showing that truly you are able to access those other conversations and it does stand

the test of true research and comparison to other ways of doing it that it will provide better access to those conversations and improve the signal to noise ratio. So after we did that we did those initial pupillometry studies, the speech and noise, the recall, in that same timeframe our researchers also decided to take a look at normal hearing peers. So we've got a white paper you've probably seen, or if you're interested in it, that was closing another gap. So of course we know there's a lot of work to be done to bring that experience of the hearing-impaired person closer to normal hearing but they wanted to take a look at that. So this takes, I'll take you through this real quickly. This takes you through that original pupillometry data so we have the OpenSound Navigator off and on. So we looked at the pupillometry data with OpenSound Navigator on, we were able to reduce that cognitive load down to five dB more complex environment. And then the speech and noise which is that SNR 50 test where you have to get that 50% correct with the signal to noise ratio where you're getting that 50% correct score, we actually were able to move people down again five dB. So you had the objective measure and the speech and noise measure.

So the researchers decided to take a group of normal hearing peers and do that same task and see what happened. And so what was interesting is what you see is that with the OpenSound Navigator on they were in line with their normal hearing peers on that task. So we had moved them down in terms of their ability to do better in more complex environments, similar to what a group of normal hearing people could do. And then the final one, in addition to all those research studies we do to support what we're doing before we introduce something, the claims and the ongoing research after it's introduced, when Opn S came out we did research studies and looked at that difference that OpenSound Optimizer would make. The role of the extra headroom, the six dB and the stability of the signal. But from time to time we also do validation studies and sometimes you'll see those published and sometimes you won't. In this case we did publish this one and I thought it was a value because we always do the pure research but those subjective measures and understanding what characteristics

are important to them and what they value in the performance of their hearing instrument, I think is important for us to know as providers. And so we actually did a validation study that compared Opn to Opn S. And if we took a look at all the key features you would see that Speech Guard was in both, OpenSound Navigator is in both. Other key features that we haven't talked about today are in there. But the one significant difference was the OpenSound Optimizer. And so what they did was took a group of very happy Opn users and did this validation comparison to what did they think about Opn S compared to Opn. And so they're asked a lot of different questions and so you see here that it showed, the validation study showed that 96% preferred Opn S over Opn. And a lot of them it was they're somewhat better and then you had a fairly significant group that thought it was much better. But again, for me, that's all well and good that looks like a great marketing story but what does that really mean? This was more significant to me. What was it?

So we described it as a prevention system that had been added. But remember when I said focus on the benefits, the two characteristics that the participants said were better was their speech understanding with Opn S and the overall sound quality. Very few of them talked about feedback and rechargeability continues to be an important factor to patients. But the way they were understanding in complex environments and the overall sound quality were most important to them. And so everything does get better when you move forward but we also felt that that stability of the system for the larger group of your patients, really does make a difference. So I think if you get asked by someone, I've been wearing Opn, would Opn S really be better? We do have good data to show that they would experience a difference. And then finally just real quickly for our pediatric patients. We do research separate for children and I think it's important, whether you serve children or not, I think knowing that we look at children and their needs differently are very important. And so we did Boys Town Research Hospital in the research center in Omaha, Nebraska did do a research study, focused on OpenSound Navigator and the benefits for children. And I think what's important

about that is when I talked about how OpenSound Navigator works and the fact that you can choose to move your attention where you want it to, you think about a child. One of the things that children do is they don't always look at their communication partners. And if you look at the standards for hearing instruments and the best practices for fitting children, it's been very conservative in terms of using directionality. But we can show with OpenSound Navigator that this can preserve the speech around them and allow them to choose where to attend to and they're gonna be able to absorb that information, hear their communication partners whether they're looking at them or not and interact with their teacher and their classmates or out on the playground or wherever children happen to go. And then finally I wanna show you the newest research and this I think is very exciting because as we continue to learn more about the brain then I think we can do more with our technology to support the way the brain operates. So this has to do with new EEG research, an innovative strategy that was developed and this study was done in partnership with our researchers there at Eriksholm. So it uses a new EEG method developed by leading independent hearing researchers. So one of the benefits of studying the brain by use of EEG, electroencephalography, woo that's a big word isn't it, is it's non-invasive. And so we can look at what's going on without using invasive techniques. So the purpose of this study really was to look at selective intention and see if we could track that speech signal as it was processed in the brain. So rather than me tell you a lot about that what I'm gonna do is show you a quick video here because it actually goes through the study much better than I could do it justice and shows you what we did with this method.

- [Narrator] At Oticon, we are always looking for ways to understand more about hearing loss and the brain. With a new EEG test method we can actually see how sounds are represented inside the brain. For people with hearing loss, situations like these are very difficult. And it only gets harder when people are talking at the same time. This is because hearing loss degrades a person's ability to perform selective

attention. Selective attention is our brain's natural ability to organize and prioritize sounds. It enables us to focus, suppress noise and switch our attention when necessary. And poor selective attention can radically affect our social lives.

- For the first time in the industry we can measure selective attention by using a groundbreaking EEG test. This new test mimics the restaurant situation. It was designed specifically to gain deeper insight into the biggest challenge faced by people with hearing loss. Namely following conversations in a noisy environment.

- [Narrator] The loudspeakers in front represent two people talking at the same time. While four loudspeakers behind create babble noise. The test person has to focus on one of the speakers in front and ignore the other while suppressing the babble noise. Meanwhile an EEG cap records the brain's activity in response to the speech and noise. Afterwards the test person answers questions to check if they understood what was said. In this way we can test two hearing aids against each other or assess a specific hearing aid feature. To analyze the recordings we separate the auditory EEG data. The waves recorded in the brain, follow the envelope of the speech. This means we can compare the EEG signals with the envelope of the actual acoustic signal from the loudspeakers. A computer algorithm sums and averages the data into the three different sound sources. The speaker in focus, the ignored speaker and the babble noise. It then calculates the correlation between the EEG data and each sound source. The strength of the EEG signals is displayed as a bar chart to give us an image of how well the test persons can organize the sounds. This allows us to see how well the brain has amplified the speaker in focus, ignored the other speaker and reduced the babble noise. When speech stands out clearly it's easier to understand the person in focus. And easier to distinguish other people's voices. This makes it easier to switch attention so people are more in control. They can follow the conversations they choose and actively take part in life again.

- This test has been developed by independent research institutions with Eriksholm as a leading partner. And it goes above and beyond what we have seen in the industry before. It doesn't just measure the brain activity. It creates an image of how sounds are represented and processed by the brain. It further more shows how the brain performs selective attention. Where previous tests only had one person talking, this test really challenges the brain with a demanding conversation where two people talk at the same time.

- [Narrator] We are always working on new research to take brain hearing to even greater heights. It's a journey of constant discovery. To liberate people from hearing loss takes insights into how the brain works. And how people live their lives.

- [Dianne] All right. So hopefully that gave you a good picture of what we did with this research. So one of the things I did in the handout was I left a few of the images here for you that are the key pieces of information that you saw in that video, just so you would have some of the images of how we were using the EEG signal to then track the speech signal within the brain and how the brain does selective attention. So that's why I kept these in here for you so that you would have all of these images. But what I wanna focus on here is the results of that research. So without OpenSound Navigator you can see even though the brain could, did have a clear representation of the focus speaker, the other two, the secondary speaker and the babble were very hard to distinguish. So the focus speaker was there but everything else was kind of jumbled. But with OpenSound Navigator what we were able to show was that even the focus speaker was a lot more distinct and the secondary speaker was 95% more distinct and there was a 50% reduction in the background babble. So we could show that the brain, we did support the brain's natural ability in selective attention. To me that's very important information that I can also use to discuss the benefit with my patient. So all of this research then allows me to put it in more consumer-friendly language that when I'm questioned, does Oticon really do the hard work and the research? Why do you

recommend these products? Well, it really does help the brain focus. We've been able to reduce that cognitive load. It helps organize the sounds better so you can choose which speaker you wanna focus on and then you're better able to push the background noise out of the way. So I think finding words that work for you and are consumer friendly are really important. Let's use our last few minutes here to just take a look quickly at the product families and the implications of all of the research in Opn S. So that was the product family that we were highlighting here in this course. So all of the research was focused on Opn in the original Velox Platform and then carrying over into additional research with Opn S. So this is a very broad product family with several styles. We can address mild to severe hearing loss, whether it be receiver in the ear or a BTE and we have rechargeability. We also have a cross-transmitter that uses that OpenSound Navigator technology to clean up the signal before it transmits it over. And this product family comes in three performance levels, one, two and three, and you'll see those technologies will be a little bit different in each, in the way they're placed or how they're implemented in each performance level, so that there truly are differences. While we didn't talk about some of these others we did talk about pediatrics and the OpenSound Navigator.

So Opn Play is our main pediatric focused product family that covers that same broad range of hearing losses and of course we focus on the needs of children and families with our pediatric product families. You see Speech Guard, OpenSound Navigator and OpenSound Optimizer in this product family and of course we have the fun colors for the children too. We do serve the needs of people with severe to profound hearing loss. This is our super power family called Xceed and there are actually two here in a super power and an ultra power. So one has a 13 battery, the other one's got a 675 and those features are available there and we do research into the needs of people with severe to profound hearing loss. And so we've got research studies with Xceed, looking at OpenSound Navigator and the benefits for people with severe to profound hearing loss. And of course we have the pediatric family so Xceed Play does serve our

children. And then the newest product family, we did introduce an essential category product family a few weeks ago called Ruby. And we do use traditional systems in this essential category. But you'll see there are all the styles available. There's actually a standard BTE and a more powerful BTE in this family. And a cross-transmitter is available in this product family as well. So that was the newest one. I'll just give you a couple of highlights about it. So this, we introduced the Ruby, what is it, it's June now. You start to lose track of time and weeks here when you're home quite a bit. But we did introduce this a few weeks ago and sound quality is a parameter that is very important to consumers. And for us this really is the best sound quality device we've ever introduced in the essential category. But we've got a lot of other benefits by bringing this over to the Velox S Platform. We do offer now that lithium ion rechargeability option in our essential product.

You have all of the connectivity options and like I said, the cross-transmitter works with these products as well. So how can I really use all of this information and the research you talked about to benefit my practice and my patients? And I think it depends on who you're serving, where you're at and what you need to accomplish. I think first and foremost, as a hearing care provider, I hope it gives you confidence that Oticon does the hard work to develop its technologies and then continues, as we develop new things, to document the benefits, document that our products and our technologies do what we say they're doing and that you can relay that to your patients. Why do you recommend Oticon products? Well, they do their research. They have for a long time. They continue to build on what they've learned. They're interested in continuing to learn about the needs of people with hearing loss and how the brain makes sense of sound and then they develop their technologies and products to support that. That's why I recommend them. So I think there are really key things that you can do with that information to give your patients and their families the confidence that when you partner with us that we've done the hard work you need to change a life and bring our technology to life for that individual patient, so that we bring their experience with

hearing instruments as close as we can to the experience those of us have with normal hearing. So thank you all. I think, I'm watching the clock here to make sure I stay right on time. I haven't seen any questions pop up in the question pod but if anybody does have any questions I'm happy to answer those. Make sure you download the PDF if you're interested. The one slide you'll see at the end there where it shows all the products, that was a slide that builds. So I apologize, those are gonna look jumbled, they're on top of each other. Certainly your Oticon account manager or if you call into customer service, can direct you to other literature. You can go on our website to find information about all of those or we're happy to forward to you any of the white papers or studies that I talked about today. So thank you again for taking time out of your busy day to spend an hour with me and I hope you enjoy the rest of your day. And the weekend, it's Friday!