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Neuro Sound Technology: Breaking the Sound Barrier

Presenter: Amanda Wolfe, AuD, CCC-A

Hello everyone. My name is Doctor Amanda Wolfe and I'm really excited to spend some time with you today to discuss Starkey's latest innovation in sound quality. Neuro Sound technology before we get started, I do want to answer a few frequently asked questions for today's webinar. Please use the q and a feature for any of your questions and I will address those at the end of the course today. We also have the course handout available for download under the Resources tab.

And lastly, you are eligible for 1 hour of CEU credit for joining me today. So after today's webinar, please go to your pending courses to take the required exam. And as always, if you need technical support, please use the contact information on this screen for assistance.

Here are the learning outcomes for today. At the end of today's course, you will be able to discuss the patient benefits of Genesis AI and neurosound technology features list at least two improvements in noise reduction implementation on our latest products and list the new streaming sound options available within the fitting software or mobile app.

Starkey has never wavered from providing exceptional service and creating groundbreaking technology, and we know that innovation moves fast, which is why we're at the forefront. We keep pushing forward to provide world first features and the best products that strive to set the industry standard.

I have personally been at Starkey for about 13 years now, so I've seen a lot of product launches and I have to say that our our launch of Genesis AI in 2023 really hit the nail on the head when it comes to our best sound quality yet. Building our products from the ground up has really allowed us to achieve the industry's most advanced processor technology that provides more power than we've ever had before with less battery consumption. As a result, we have the industry's longest lasting rechargeable battery in a ripped device. But our industry bests don't stop there. We also have the industry's

smallest rechargeable rick with a sensor, best dynamic range and smallest custom product.

Sound quality really is king when it comes to that initial patient first impression of a hearing aid. The best sound quality has to be accompanied by a device that meets the demands of everyday life. Hearing aids that look good, are durable and more importantly, feel comfortable for that all day wear. With the initial release of Genesis AI hearing aids, Starkey brought together our most powerful and innovative platform to date. With this launch, we are leveraging the groundbreaking innovation of Genesis AI and introducing a new non wireless custom product family, the Starkey Signature series.

This also features neurosound technology and really is anchored by the industry's first custom rechargeable CIC.

The foundation of both Genesis AI and Starkey signature series is the Starkey neural processor, the true brain of the hearing aid. Starkey's neural processor is the industry's most advanced processor technology. So let's get into the details.

The processor is basically smarter, faster, and more powerful than we've ever had before. And it's because of this power that this processor will be able to effortlessly support Starkey product development five plus years out, really allowing us to put more and more complex algorithms in our hearing aids as we continue to innovate. Also with our faster processing, your patients will get to where they need to be faster, really, in any environment, truly optimizing patient comfort and clarity. And as you know, sound quality is really job number one for Starkey. It always has been and always will be.

Starkey's neurosound technology doubles down on speech intelligibility and comfort. Some of the main goals for our neurosound technology is to reduce patient listening

effort, provide the lowest noise floor possible, and to provide better comfort and clarity when in challenging environments, both with our normal hearing aid sound processing, as well as with additional improvements when the patient is utilizing edge mode. Plus, neurosound technology delivers over 80 million adjustments every hour. That's over 22,000 adjustments every second. With the ability for faster processing, our hearing aids can adapt more quickly to the environment, meaning patients will get to where they need to be faster while also experiencing natural and transparent sound quality in any environment they come across during their day to day life.

And a lot of that is due to our additive compression system, which was really motivated by the way the human auditory system processes sound and how we want to compensate for the loss of inner and outer hair cells. Our latest products use two independent compressors whose gains are added together, hence the name additive compressor. The key driver behind this compression system was really to leverage the benefits of two compressors, that each process sound differently, with a goal to achieve better perceptual outcomes. As you all know, outer and inner hair cells do very different things, and both are paramount to our ability to hear. The outer hair cells are nonlinear amplifiers that provide that frequency selectivity on the basilar membrane.

And because of that, they have to be very fast acting. And your inner hair cells transform acoustic signals into neural patterns. They're really the main neural output of the cochlea. Now, since the two types of hair cells do very different things, it seems natural to provide two different types of compression to compensate as best we can for their loss.

But how do we do that with a compression system? Well, we want really fast, frequency specific compensation for outer hair cell loss, and if we're trying to compensate for inner hair cell loss, we want to amplify the sound, but we want to do it with a slow moving compressor to really keep speech within the patient's residual

dynamic range. Our solution is utilizing our additive compressor, featuring both a fast compressor and a slow compressor. Both compressors operate differently and therefore provide different benefits to the listener. Fast compressors generally provide better audibility for soft consonants because they react quickly to sudden input changes, and slow compressors are generally preferred for overall subjective sound quality.

Now, since they both have their own strengths and weaknesses as standalone compression systems, utilizing both compressors together allows us to take advantage of the strengths of each system and really mitigate the weaknesses to maximize the potential of increased audibility, intelligibility, and comfort within the fitting software. The consonant brightness feature on the sound manager screen controls the fast compressor and the additive compression architecture. For the 24 technology tier, you are able to adjust the strength setting of the fast compressor. Consonant brightness has three strength settings, minimum, moderate, which is the default setting, and maximum. Increasing the strength of consonant brightness provides more emphasis for soft consonants, and decreasing the strength will provide less emphasis for the lower tiers of technology.

You will not be able to adjust the strength settings of the feature, but rather you will now be able to turn it off and on.

Professionals should consider adjusting the consonant brightness feature if a patient perceives and is unable to accept fluctuations in hearing aid volume that may occur, for example, when a transient sound occurs in the presence of a steady state background noise. In this scenario, the fast compressor responds to that transient sound by quickly turning down the hearing aid gain, and the patient notices it return to original levels following that transient event. Fast compressor gain adaptations may be particularly noticeable if there is a greater degree of hearing loss and more gain is being used,

resulting in a wider range of perceptual loudness. Some patients have used the term pumping to describe this, or a whooshing sound. If volume fluctuations are reported, the patient, of course, should be counseled on what the hearing aid is doing.

If they are unable to accept those occasional gain adaptations, a different consonant brightness setting should be tried or the feature should be turned off. Our additive compressor certainly improves the overall sound quality of the hearing aids, but that, coupled with a 20 decibels improvement in the circuit's dynamic range, including the highest input saturation level in the industry of 118 decibels and the lower noise floor patients will experience optimal sound quality in every environment. Having a lower noise floor means your patients with normal or near normal hearing will not hear the circuit noise of the hearing aids, resulting in a more natural listening experience. But what does that higher input saturation level mean for your patient? Well, if we all think back to our schooling and we envision a traditional sine wave, if a hearing aid has a low input saturation level and a signal comes into the hearing aid that is higher, we get peak clipping.

So think of that, a buzz cutter going and cutting off the peaks of that sine wave. That leads to a perceptually distorted signal that is just starting to get processed by the rest of the hearing aid, which ultimately leads to a distorted hearing aid output. If the input is distorted, the output will be distorted as well. However, if we are able to tolerate a higher input without distortion, the incoming signal before processing doesn't get peak clipped. So when we process the signal, we're working from a cleaner input.

For those of you that have been familiar with Starkey for a while, know that our proprietary fitting formula is estate. With the development of Genesis AI and its compression system, it seemed logical at the time to really update estate to complement this new compression architecture. So with the additive compressor, we

introduced Estat 2.0, our next generation fitting formula, which is exclusive to profit the fitting software for Genesis AI and signature series.

Both Genesis AI and signature series utilize the additive compressor. Also, all products, when connected to profit, will default to estate 2.0. The value of proprietary formulas is their ability to optimize fittings and deliver sound quality with consideration for the manufacturer's approach to signal processing. So what's so special about estate 2.0? ESAT 2.0 provides patients with a great initial acceptance of a starkey hearing aid by optimizing the signal based on our approach to signal processing, utilizing ESAT 2.0 will emphasize audibility for speech understanding in every environment.

It's also designed to minimize what we call event hearing aid interactions to ensure the best sound processing for the patient, regardless of the style of hearing aid or the size of vet. We use the feedback cancellation initialization stimulus to measure how much acoustic leakage is occurring in the patient's ear, and we compensate for that leakage, allowing for more accurate fitting targets and frequency response. So what does all this mean when it comes to patient outcomes? Well, during one of the initial clinical validation trials, we tested word recognition ability in a quiet laboratory environment on 30 experienced hearing aid users. Really with a range of hearing losses fit with Genesis AI, RIC 24 hearing aids, and with RIC hearing aids from a recent previous technology, they were fit as equivalently as possible, of course.

And of course everything was randomized. The results showed that, on average, the research participants scored 10% higher when they were wearing Genesis AI hearing aids compared to when they were wearing previous technology. Now, I think most of you here with me today would agree that a 10% improvement in speech intelligibility for someone with hearing loss is huge. So having this data really let us know. We were on the right track with our development of ESAT 2.0 and our new compression system.

And while improved speech intelligibility is of course our goal, with new hearing aids, we know sound quality is key with patients and professionals. So we did a head to head comparison again with Genesis AI versus our previous technology. But for this one, we actually used normal hearing research participants. Why? Because we know oftentimes it's you, the professional, who is the first person to listen to hearing aids before fitting them to your patients.

So we were interested in seeing if we have normal hearing participants do a head to head comparison between Genesis AI and our previous technology. Which one would they prefer? So we enlisted 30 participants who were not accustomed to hearing listening to hearing aids listened to recordings of speech and quiet, and speech and noise under headphones. We had sound samples that were recorded using rick hearing aids, two different audiograms, and a different signal to noise ratios. The participants were asked to listen, of course, and then rate the sound quality preference of each recording.

And of course, they were blinded to what they were listening to when listening to speech and quiet. Listeners rated Genesis AI sound quality higher than previous technology 93% of the time and 84% of the time when listening to speech and noise. These results told us again that we really hit the nail on the head with sound quality.

So now that we've covered the high level foundation of neurosound technology, I did want to touch on some other improvements that definitely play a role in sound quality and your patient's overall experience with our latest hearing needs. Starting off with our feedback canceler for years, Starkey has had one of the most robust feedback cancellation systems in the industry. Know that we are still utilizing the feedback canceller algorithm that has served you and your patients so well, but we have changed the logic for setting the defaults and the default names in profit. For those of you familiar with our previous technology, if the probability for feedback was high with

that particular patient, we defaulted to our most aggressive feedback cancellation system, called high sensitivity. That's again the more aggressive feedback canceller setting.

If we thought the probability for feedback was low based on your patient's audiogram, we set the default to low, the less aggressive feedback cancer setting. We are doing essentially the same thing with our latest products based on the audiogram. If the recommended acoustic options for your patient is an open fit or a large vent, your patient likely has less hearing loss, requiring less gain and thus there is probability less probability for feedback. These patients will have a feedback cancellation setting of subtle which has the same underlying mechanics as low sensitivity in previous technology. On the other hand, if the recommended acoustic option based on the audiogram is an occluded fit or event smaller than large, your patient likely has more hearing loss, more gain and a higher probability for feedback.

So those fittings will default the patient to strong which is the same underlying mechanics as the previous high sensitivity. Keep in mind the setting that will be used is based off the recommended acoustic option in profit and as always, if you want to change settings, we do allow you that flexibility within the fitting software.

We also have additional feedback cancellation options that are available to you in cases of potential feedback. Ideally after you initialize the feedback canceler, which we always recommend you do at the first fitting, you should see healthy gain margins that point south like you see here for both the right and left hearing aid. This tells you that you have a lot of gain to play with before there is potential for feedback. However, if you ever see these gold bars, that means in these specific channels there is potential for feedback. You have some options that will make taking care of this really quick and easy.

One of the options is to select apply right there under auto gain adjust. This will provide a minor gain adjustment in the channels with feedback potential. If you find you have more feedback potential in the mid frequencies, consider applying what we call mid frequency management and the applicable programs by selecting settings next to auto adjust. Performing one or both of these actions will put your patient well on their way to a feedback free hearing aid experience. And lastly, you can always go into your profit preferences and select apply auto gain adjust to eliminate feedback under the automatic functions area.

What this will do is it will automatically apply a gain adjustment if there is potential for feedback after initialization so you don't have to do it manually.

What's also found on the feedback canceler screen is what I was talking about earlier with the improved vent modeling and that is this optimized acoustic model. Now, prior to the launch of Genesis AI, every time you selected open, occluded or event option in the fitting software. The software would estimate the vent effect or vent model and the hearing aid frequency response you would see on the fitting graphs based on population averages. Perfit now uses the feedback cancellation initialization measurement to determine if an update to the hearing aid frequency response is recommended based on the measurement, looking at how much energy is actually leaking from the ear, with the goal to provide even more accurate fittings and better perceptual outcomes. So optimize acoustic model improves the accuracy of the fitting by replacing an estimated vent model with a measured vent model per patient.

Let's take a closer look. So, as you're running the feedback canceler, we again are measuring the amount of leakage from the ear canal and seeing if that correlates with what acoustics we recommended based on your patient's audiogram. Open, occluded or vented fitting if we find that there is a discrepancy, you will get a pop up stating that the vent model has been updated and we will ask you if you want to match the hearing

aid frequency response to this updated model. So I'll give you an example. Say profit recommended an open earbud fitting based on your patient's audiogram, and that in turn is what you fit.

However, your patient has a narrow ear canal so that open earbud may in fact be more occluding acoustically. Profit is going to then measure a more occluded fitting and adjust the targets accordingly to be more accurate. Since open was the recommended setting for your patient's audiogram, profit will prompt you saying the vet model has been updated, but will ask you if you also want to match up the hearing aid frequency response to that new target. You have two options, yes or no. If you select no, gain will not change, but profit changes your targets to account for the new vet modeling.

Therefore, in the profit software, it will look like your frequency response and your targets don't match. And I know this is a dramatic example, but it is an example. Just know that your targets and your response will not match. Probably won't look this dramatic. So you may want to select no if you have already adjusted gain away from displayed targets for patient preference before you actually ran the feedback canceler.

It's important to note that if you best fit at any time or target match the hearing aids, the gain will change to match that new target modeling. So just keep that in mind. If you select yes, however, that's your new best fit. The gain will change to match the new target modeling. So selecting yes will really give you the most accurate fitting.

So that is our recommendation if you ever see this prompt.

Now, to reiterate, optimize acoustic model runs alongside feedback canceller initialization and uses live measurements to estimate acoustic coupling characteristics with the hearing aid or receiver in place in the ear. This allows for more accurate, individualized predictions of relay responses and gain calculations by profit, ultimately

helping speed up hearing aid fittings so you can focus on patient counseling. Excuse me. So, other than the base sound quality improvements we've made, we have greatly improved our noise reduction system as well, making it smarter, faster, and more accurate. We have improved the accuracy of our environmental sound classification system by training it with a larger and more diverse database of sounds.

If the hearing aids are more accurate in classifying what is going on in the environment, how they adapt to that environment will also be more accurate. And thanks to the processing ability of our latest chip, the hearing aids are faster at adapting to noise than ever before, helping to achieve comfort and noise more quickly and improve the overall listening experience. And we know that hearing soft speech in noisy environments can be particularly challenging, with the environmental noise often masking what is being said. So we've optimized our noise reduction algorithm to improve the preservation of soft speech in those challenging environments. And last but not least, we have achieved an impressive 40% reduction in noise floor compared to previous technology, which is our lowest noise floor to date.

So what is the net effect of all of this? Combined, we've done a very impressive job of setting up your patients for success in those environments that are so hard to communicate in and stay engaged with family and friends, and we have data to support this. Again, during our clinical validation study, we tested speech understanding and noise on 43 hearing impaired research participants in various test conditions unaided, noise reduction off and in omni mode, noise reduction on and in omni mode, and then our default setting of noise reduction on in our adaptive directional mode setting. Excuse me, everyone was fit with Genesis AI hearing aids appropriate for their hearing loss and were tested in a sound booth set up to simulate a noisy restaurant. Participants then completed a word recognition and noise tasks in each randomized condition.

So, to ordinate you to this data, the y axis, the vertical axis, is the percent correct speech understanding, and each condition is represented by a different color. So as we go left to right, adding in more noise reduction and directionality, we expect performance to improve. So the higher the box plot on the chart, the actual results show just that and demonstrated an improvement in speech understanding and noise for all aided conditions over unaided. Additionally, the participants perform the best with our default settings, a 30% increase in their speech understanding and noise performance over their unaided performance.

We also tested research participants using the quicksim to determine the s and r loss, or signal to noise ratio loss both when unaided and when wearing genesis AI. The term SNR loss refers to the increased signal to noise ratio required by hearing impaired listeners to understand speech and noise relative to that required by normal hearing listeners. The quicksim test provides an estimate of SNR loss by presenting a list of six IEEE sentences, each with five target words at snrs, decreasing in five decibels steps from 25 to zero. Two lists were presented in each randomized condition, unaided and aided with Genesis AI, and the participants were asked to repeat the sentences. The quicksand provides an interpretation guide that assigns ranges of estimated SNR loss.

So what you see on the y axis on the left to degrees of SNR loss, what you see on the y axis on the right the average hearing loss for the test group was a mild sloping to moderately severe sensorineural hearing loss. To align you with this graph, looking at the y axis, zero means they don't have a lot of SNR loss, so they do pretty well relative to how a normal hearing individual would do. As we go up the graph and SNR loss increases, that means they would have more and more difficulty in noise. So looking at this, we see there's a wide range of performance for people unaided. Some people performed pretty well and others had a lot of difficulty in noise.

Individuals who are categorized in the normal group do pretty good in noise. Those in the mild SNR loss category struggle a bit but can manage, and those in the moderate group start to really have a difficult time. And then lastly, the severe group of people are those individuals who walk into a noisy restaurant and walk right back out to find somewhere else to go. They are just lost in noise. Now, looking at the results while we see an improvement as we go from unaided to aided, look at those people with a severe snr loss with genesis AI, it's now put them into a more manageable mild category.

And actually we see that these data suggest that based on the averages, the aidan improvement in estimated SNR loss increases with greater degrees of unaided SNR loss. In other words, these results suggest that those participants that may need assistance the most, they have the poorest unaided SNR loss tend to benefit the most from Genesis AI hearing aids. So overall, we really put Genesis AI through the paces when it came to hearing and noise testing, and the results demonstrated that it truly outperformed. Comprised of our additive compression systems, wide dynamic range, and supported by our proprietary fitting formula and accurate environmental sound classification system. This is truly our best sound quality yet, and capitalizing on all of our sound quality and noise reduction improvements is Edge mode plus Edge mode Plus is Starkey's second generation intelligent on demand feature that enables instant, powerful speech audibility and noise management adjustments when patients need it most.

Edge mode plus gives patients the ability to automatically select when they need more help, eliminating the need for manual programs in some instances.

Really one of our most popular features ever, Edge mode Plus uses artificial intelligence to take a snapshot of the environment the patient is in, then instantly optimizes sound quality to that place and time for either clear speech or improved

listening comfort. And with patient driven controls in the mobile app, we really put the power in the patient's hands by allowing them to change edge mode plus settings to either further enhance speech or reduce noise for the top two technology tiers. For those wanting other ways to activate edge mode plus, it also is available as a short press or double tap user control, and can also be programmed as a favorite feature for the remote control 2.0. Excuse me. It is important to know that edge mode plus can apply even more aggressive changes to gain directionality and noise reduction than what the professional can do in the fitting software or what patients can do in the mobile app.

In current products, if a patient engages edge mode plus in one environment and then moves to another environment, maybe they go from a noisy restaurant to drive home in their car, for example. They may want to actually turn edge mode plus off and then turn it back on again as they get going in their car. So then it takes a fresh adaptation of their car. If they were to just leave it on, then the hearing aids and edge mode plus would be still set to that restaurant environment that they just left. So let's take a closer look.

Edge mode plus, when activated by the hearing aid user, prompts the hearing aid to classify the current acoustic environment and then apply additional specialized settings to noise reduction, directional microphone, and gain over and above those supplied by traditional hearing aid processing. These specialized setting changes are specific to that listener's current environment. The unique adaptation is then fixed with those optimal settings for that specific environment. Because of this, again, it's recommended as you change environments or as your patient changes environments, to turn off edge mode plus and then turn it on again to provide a different adaptation. Since the launch of Edge mode Plus, both patients and professionals alike have asked for it to be automatic so patients wouldn't have to remember to disengage and reengage as they go about their day.

Well, I'm thrilled to say that we listened. And now Edge mode Plus is automatic exclusively for the Genesis AI 24 technology with a firmware update previously fit, Genesis AI devices will need a firmware update with the latest profit version to benefit from automatic Edge mode Plus. Of course, any new hearing aids being ordered will come with the new firmware already. So as a reminder, Edge mode Plus as a feature is available on the top three tiers 24, 20, and 16. Automatic edge mode plus, excuse me, is on the 24 level of Genesis AI only.

So what does automatic mean when it comes to automatic edge mode plus? Well, now when the user turns on edge mode plus, the feature will continue to scan, adapt, and optimize as the wearer changes environments or as the environment they're in changes. Automatic Edge mode Plus has really been the feature that professionals and patients have been asking for. It will provide smooth and seamless transitions as patients go about their day, move from environment to environment. The only thing patients will know is that they're hearing in challenging situations more clearly and comfortably than ever.

So, taking a closer look again, the patient will activate edge mode plus, and they can leave it on now as they change environments. So in the previous example I gave about going from a noisy restaurant to a car with what I call static version of Edge mode Plus, it's recommended to turn the edge mode off and then turn it back on as they change environments. Now, with automatic edge mode plus, the patient can turn it on and leave it on as they move from the restaurant to their car or any other environment throughout their day, as that feature will continue to scan, adapt, and optimize sound quality and comfort as they're moving across environments.

And we also have Edge mode Plus controls in our mobile app. My Starkey exclusive to Genesis AI hearing aids. With Genesis AI 24 or 20 technology levels, patients can

select their what we call listening intent, enhance speech, or reduce noise to further personalize their edge mode plus setting. When hearing aid algorithm developers are working on hearing aid features such as noise reduction algorithms and classifications, they really have to think about what to do to satisfy the majority of patients who want to hear in a given environment. Think of it as they focus on making, say, 90% of the people happy 90% of the time.

This is because these classifiers or algorithms have to make assumptions about what the listener wants to hear. Our patients are still human, after all, and even the best predictions will miss sometimes. It's also the case that even assuming identical conditions. As you know, some patients just struggle more and need assistance, more assistance than others. So this ability for the hearing aid user to choose their listening intent truly optimizes the hearing aid feature for their preferred outcome.

Once the edge mode plus icon is tapped, as you see there on the home screen, patients will see a screen that says best sound, enhance speech, and reduce noise.

Best sound is the default setting of edge mode plus and is what edge mode plus thinks are the best settings for that environment. However, if they want to hear people more clearly, they might select enhanced speed speech, or if they want more comfort and noise, they might select reduce noise. They can also go a step further and select adjust sound manually there at the bottom, which will open up an equalizer where they can adjust bass mids and treble plus. They can now save these edge mode plus settings as a custom program for future use. So if we think about the evolution of hearing aids, when patients first had the ability to manually switch between omnidirectional and directional microphones to where we are today with machine learning and artificial intelligence, we've certainly come a long way.

So let's look at some data that demonstrate the benefit of using these patient driven controls, in this case, the enhanced speech mode. Now, one goal of edge mode plus was to improve user outcomes like speech understanding and listening effort in the most difficult listening scenarios, while also adjusting for the user's listening intent. This particular study assessed whether the edge mode plus enhanced speech setting improves listener speech recognition and noise. So we took twelve experienced hearing aid users wearing starkey Genesis AI 24 ripped devices. They had audio metrically appropriate occluded earbuds or ear molds.

In general, participants had sloping mild to moderately severe hearing losses, and their average age was about 71 years years old. For this experiment, they were asked to repeat sentences presented in the context of real life recordings of restaurant noise. This noise was unique in that it included several noisy distractions that would be typical in a restaurant setting, people talking in the background, radio music playing, clattering dishes. The target speech was always presented from the loudspeaker directly in front of the participant, while the noise was presented from the surrounding seven speakers. The restaurant noise was presented at 60 decibels, and the level of the target speech was actually individualized for each participant.

Specifically, speech was presented at the level needed for that participant to achieve approximately 70% correct speech recognition while listening in the restaurant noise with default hearing aid settings. This level was chosen to ensure that the task was neither too easy nor too difficult. A brief pretest was administered to determine each participant's specific target level. The target speech was a list of IEEE sentences spoken by a female speaker. After each sentence, participants repeated what they heard, and they were scored on the number of keywords reported back correctly.

They performed this task twice, once with default hearing aid settings and edge mode plus disabled, and once with edge mode plus enhanced speech enabled. And of

course, the order of testing was randomized and the participants were blinded to which condition they were in. What we found was in the default hearing aid setting condition, participants on average recognized 62.6% of speech in that restaurant noise, but when Edge mode plus enhanced speech was enabled, speech recognition improved by 10.7 percentage points to 73.3%, which was a statistically significant improvement. Thus, enabling edge mode plus with enhanced speech enabled allowed participants to understand significantly more speech in that realistic, noisy background.

Here are the tech tier differences for Edge mode Plus as displayed in my Starkey Edge mode Plus with automatic adaptation is exclusive to Genesis AI 24. The user also has access to additional patient driven controls, and then with the Genesis AI 20, they also have access to those edge mode plus patient driven controls. When we go down to the 16 tier, they still have access to edge mode plus within the app, but no further adjustments are available other than turning it off and on.

And finally, for your patients who don't use the app or don't want to use it all the time on all three tier top tiers of technology, Edge mode Plus can be activated via the favorite button on the Starling remote control, allowing users yet another simple way to access the many benefits of Edge mode Plus. So I really think this is a great addition for your patients who either use the app or don't use the app, or maybe want a more discreet way of activating edge mode plus rather than having to take their phone out or use ear level controls. So, as a reminder, while the Edge mode plus extra capabilities or those patient driven controls are available on the top two tiers, the feature itself is available on the top three tiers.

Another great enhancement to our Genesis AI products is the addition of a new feature called motion based optimization. With our most recent firmware update, we released motion based optimization, or I call it MBo, utilizing the embedded sensors within Genesis AI hearing aids. This feature optimizes sound quality and situational awareness

while working in two ways. The first way it works is improving situational awareness exclusive to the 24 and 20 technology tiers. When activity based motion is detected, like walking or running, the microphones will switch to omnidirectional to ensure more awareness of the patient's surrounding and the best listening experience.

The other way motion based optimization works is by optimizing feedback reduction capabilities when small movements are detected that may result in hearing aid chirping. So this piece is exclusive to the 24 level of technology. So when motion based optimization detects those small movements, such as chewing, putting on glasses or a hat, movements that often cause hearing aid chirping or squeals, the hearing aid will automatically switch to the strong feedback cancel adaptation setting, the more aggressive one, for as long as that motion is detected, reducing the risk of those feedback chirps or squeals and really promoting an optimal hearing aid experience.

Motion based optimization defaults on for the top two technology tiers. However, if patients either notice and object to the switching or directional mode changes, the professional may turn the feature off via the sound manager screen. Keep in mind, in doing so, this would turn off that feature for all programs.

We tested the effectiveness of motion based optimization a few ways. For the first test, patients listen to target sounds as seen on the horizontal axis, the x axis. These sounds were a plate, knocking, birds, speech saying order up, excuse me, and now boarding. And they listened in a variety of background noises, a food court, dinner party, and a train station. Important to note that the target signals were played from behind the listener.

So the participants then controlled the level of those target sounds in the background noise and increased the level until they were just audible, both with motion based

optimization off. So when the hearing was kind of doing its own thing, maybe probably in directional mode, and then when motion based optimization was on in that omni mode, kind of simulating them moving. So what we did was we took the signal to noise ratio with the feature off and subtracted that with the feature on, and that difference is on the y axis. So a higher difference score means that participants performed better with motion based optimization on than off because they didn't have to have the target signal be as loud to be just audible. So in a nutshell, when the feature is on, they performed better when in that omni mode, detecting that target signal from behind them.

And the stars on the chart there indicate the conditions where we found a statistically significant difference.

The next evaluation focused on measuring the added stable gain of the hearing aids when in the subtle feedback cancel adaptation setting versus the strong feedback cancellation setting. So we measured added stable gain when the hearing aids were set to subtle adaptation and then strong adaptation. And we did that by increasing gain in each setting until we were able to get feedback to occur. In doing so, we found there was 10% more added stable gain using strong adaptation than subtle. Again, just reemphasizing the fact that within that strong adaptation setting, feedback will be better managed.

So when it automatically turns on, when motion is when those small movements are detected, that will set your patients up for a cleaner listening experience, not experiencing those chirps and squeals.

The third evaluation focused on benefits to perception of wind noise when motion based optimization is active or in omni mode. So what we did was we recorded the amount of wind noise being basically processed by the hearing aid on a key marikina

we did this test in omni mode and in directional mode. And what we basically found was that in omni mode, wind was picked up less by the hearing aid than when in directional mode, that turbulence over the microphones was less. So in turn, your patient's perception of wind noise would be less when in omni mode because that wind is only going over one microphone. So really a lot of benefits to your patients here.

When they start to move and that device goes into omni mode, wind noise benefits, feedback benefits, as well as that situational awareness.

Since the initial launch of Genesis AI, it truly remains our most validated product family to date, we've worked tirelessly to provide the best hearing aid experience for your patients, but we know that while general hearing aid quality is of course of the utmost importance, I would be remiss if I did a whole talk on sound quality improvements without mentioning streaming, as I know a lot of more and more patients are kind of coming out of the woodwork that actually enjoy streaming or are interested in streaming either from their smart devices or wireless accessories. So I wanted to briefly review the wireless accessories we have available to you from our Starling accessory line, from remote mic options to tv streamers. Really, these do set your patients up for success to confidently connect to their favorite media devices and really dial up the overall performance of their hearing aids. As always, our accessories are able to be paired both within the fitting software and without the fitting software.

And whether your patient is streaming from our wireless accessories or through their smart device, streaming with Genesis AI is now done in whatever program the patient is in at the time they start a stream. So we don't have a specific streaming program. You and your patients can further customize the streaming frequency response from within profit as well through the MyStarkey mobile app. We do have some streaming sound options available in the accessories screen in profit, as you see here. So you can

add in for each accessory or for that phone section, a treble boost, a bass boost, or an overall boost you see under that phone section we have an iPhone drop down specific for your Android users.

You would use that left box that you see there highlighted here. Equalize just means that's the default program. And again, you can add a high frequency boost, a low frequency boost or an overall boost here, another recent update we released is adding a streaming equalizer in the Misharchi app. So now when your patients are streaming, that edge mode plus button actually becomes adjust sound. And clicking adjust sound gives patients additional sound customization options specific to streaming.

So really, this new ability provides the flexibility of adding even more gain on the fly when streaming any audio, which is really nice.

The gain from the equalizer controls is complementary to any previously enabled boost controls I just discussed. So on the right, you can see the typical gain configuration for base boost, treble boost, and overall boost. Equalizer controls can provide an additional plus or minus five decibels for that robust and strong streaming experience. And again, the changes here that would be in addition to what you have set up.

Another improvement we made with Genesis AI is increasingly streaming distance range from 30ft to 42ft. So this is a great improvement because even before Genesis AI, I thought our streaming range was impressive. But now, giving your patients more flexibility to walk around and still hear audio from their phone or their tv streamer, for example, is really a great improvement.

All right, so now to kind of cap things off, I did want to touch a little bit on phone use that's not really related to smartphones. I think some of you probably still have patients out there who use landline phones and who may benefit from the use of telecoils and

phone use or those loop systems. So all relate to that sound quality experience. And I wanted to share what we have for you with our Genesis AI products.

So telecoils, although they're an old technology, they just work. So I wanted to really provide you a realistic example of what improvements people can experience using a telecoil, particularly in a loop environment, as we have here in the Minneapolis airport. So we went to the Minneapolis airport and recorded those overhead speakers making an announcement using the hearing aids only. And I'll play it here.

Did anybody pick up what was being said? I didn't. So let's listen again. Now, dialed into that loop system within the airport in order to prevent someone from placing dangerous items in your baggage, do not leave your bags unattended, and do not accept items from unknown persons to carry on to the aircraft. So really clear and easy to hear, right?

So I really wanted to include this in the presentation because again, I know telecoils are old technology. A lot of people kind of push them off to the side anymore, but they work. So I wanted to share with you some quick data that we obtained with speech intelligibility ratings using these different phone methods. So speakerphone, bluetooth, we have our auto phone in the software, auto phone both monorail and Binaural as well as our auto coil, both monaural and binaural. Now all of this data really looks the same.

I really wanted to bring this up though, because I wanted to not discount the use of an actual phone program within our profit software. And really, no matter what you choose, as the data shows here, your patients will experience better speech understanding using those phone programs, whether that be streaming with their smartphone or using a more traditional phone program with their landline phone. So really we see an immense benefit to including telecoil options within our hearing technology and we continue to offer it in a variety of products within our product

portfolio such as the Genesis AI RIC RT and the Genesis AI ITeR, as well as that Starling remote microphone, plus for telecoil usage that has its own built in telecoil.

So with these enhancements to Genesis AI and the addition of Starkey signature series, we continue to drive to deliver the most intuitive, convenient and patient driven hearing products in the industry and continue to be the best partner for hearing professionals around the globe. To take a deeper dive into all things Starkey, I encourage you to register for more audiology online courses. Here's just a snapshot of what we have to share with you, and of course, stay tuned for more courses to be added as we make our way through the year.

For helpful resources on starkey products, please visit starkeypro.com to view all of our quick tips, read our research based white papers that review in detail some of our most important research written by the great minds who lead those work efforts. And as always, if you would like more one on one training with our products or software, please contact your sales rep to help set up a time with an education and training audiologist such as myself in your area. Thank you and have a great rest of your day. I do see some questions that have popped up, so let me take the last few minutes here and answer these brandon, I am so sorry. What is the sample size in that study?

I don't know what study you are referring to, but typically our sample sizes I used to be in research here at starkey are no smaller than ten people and as you saw, as I talked about studies throughout today. We included a sizable amount of people in our research, so I apologize. I missed what study you were exactly referring to, but again, it would have been no less than ten. I do see a question. How does the user turn edge mode plus off?

There are a few ways. On the top tier of technology, you can activate the user controls. Either a short press user control or a double tap user control. Within the profit software. That is how that patient would turn edge mode plus on and off.

So it is a manual activation and deactivation. Of course, for those top three technology tiers, it is available to tap on the home screen of the app as well, or use that favorite button or the star button within that remote control 2.0 how does the user halt automatic changes? So I'm assuming. So the question was, how does the user halt automatic changes if they're at a concert and the environment changes at the end of each performance? So if I'm assuming you're talking about automatic edge mode, there is a way within profit in the user control screen.

Under additional configurations, you can turn automatic edge mode plus off. Your patient would still have access to edge mode plus, but it would be now the static version of Edge mode Plus, and that automatic adaptation would be turned off. That said, the hearing aid is smart enough to know it's not going to be changing like crazy. It does conservatively make changes. It has to be confident, in other words, to be sure that you're actually in a different physical environment before it will make a new adaptation.

The details of that, of course, are proprietary, but just know that the hearing aid will not be constantly fluctuating if they're in that same environment, such as a concert. All right, so I think those are all of the questions. I again want to thank everyone for your time and attention today. And again, I hope you all have a great rest of your day. Thank you so much.

Bye.