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Optimizing Starkey Technology for Music Listening: Every Note Matters

Presenter: Keeley Layfield, AuD

Foreign.

Hello and good afternoon. Thank you for joining me. My name is Dr. KeeleyLayfield and we're going to talk about how to optimize Omega AI hearing aids specifically for music listening. So before we get started, if you do have any questions, feel free to throw them in the Q and A. I may not be able to get to them throughout the talk, but I will try to make sure that they're all answered before we wrap. And there is a PDF handout of today's presentation posted in the chat, so you do have that resource for you as well.

And today's course will be good for one ceu, so you will have to pass the course code after completing today's lesson. But again, it is good for one CEU hour if you have a paid audiology online membership.

Here is a list of the risk and benefits associated with this course. And again, this will be posted in the handout, so I'm not going to spend too much time on that. But if you would like to review, check the handout.

And before we get too deep in the contents, I do want to go over the learning outcomes. So after today's session you will be able to describe the different frequency response that's associated with common musical instruments. You'll be able to discuss how additive compression is being used by Starkey specifically for our music processing. And lastly, you'll be able to discuss how streaming can be controlled via the My Starkey app.

So like I said, My name is Dr. KeeleyLayfield and I'm one of the trainers at Starkey. I am not a musician, but I am a music lover and I did work with a fair amount of musicians when I was in clinic myself. So this is something that I am very passionate about because I feel like music is something that everybody deserves to have the best sound quality for and to kick us off. I really love starting with this quote as music is the universal language of mankind because music is meaningful to so many people for so

many different reasons. Reasons you know, it's linked to personal well being, to social bonding, to your emotional expression.

And music can play a significant role in relaxation, encouragement, celebration, or even in your determination. Now, music and taste in music is as unique as each patient. The power that music holds over people is universally understood. And so even if we don't all speak the same language, we we all understand music.

So there are a couple of core elements to music and that is rhythm, which is that movement and that pattern. Melody is the tune or the sequence of notes. Harmony is the combination of sounds and form is the structure of that composition. And then timbre is the quality or character of a musical sound. All of these layered together build music.

So when it comes to, you know, hearing aids and hearing aid wearing, you may kind of ask yourselves, or, you know, patients may come to you and say, well, which of these sounds are most difficult for the hearing aids to process? So is it speech in a noisy environment.

Or is it rock music specifically?

Or are your patients more of that smooth piano type listeners?

Or maybe, like me, you had patients who were in a choir.

So many people assume that speech and noise is the most complex environment for hearing aids to process. But music can often create very unique challenges because hearing aids are primarily optimized for speech processing. And that's because hearing aid programming, you have different signals of interest. And so they're primarily designed for amplification and clarification of speech. But as

we're very, very familiar with, speech and music are very different kinds of signals and they can be important or equally important to your patients.

So with speech, the average conversational level is around 65dB SPL and you can kind of have peaks and valleys of around 15 decibels from there. Very rarely is speech exceeding 90dB conversationally. Now this isn't talking about like big venues, but just having a one on one conversation with someone else. Now music, on the other hand, has a much larger dynamic range. That range can be from 20 decibels all the way up to 120 decibels.

And it can often hit the musician's ears between that 85-100 DB SPL. For a music listener, distance from that source will affect the SPL and what they're getting at the ear canal, but it can still be pretty loud. Think about going to a concert or something like that. And spectrograms provide a three dimensional visual representation of an acoustic signal. You can see along the x axis is timing and along the y axis is frequency.

And intensity is represented by color. So those lower intensities are going to be more those blues and greens with the higher intensities more on that red into the color spectrum. So here it's easily, very visually, to see the difference between speech and music. But it may be not quite as easy to identify the differences between speech and noise and music. So this is where precise sound classification can be essential for accurate signal processing.

And it's really no surprise that traditional approaches to amplifying music have failed because again, music and speech signals are very different from each other. The average level of speech is softer than it is for music. And the intensity, the frequency, the temporal envelopes of music are highly variable. Music is not nearly as predictable as speech. So I really like to show this slide because it can kind of help you visualize how different speech and music signals are, again, looking at that frequency and intensity breakdown.

So, with Starkey's improved sound classification, the analysis of incoming sounds is extremely fast and automatic. As you would expect, each signal is analyzed in the area seen here in order to determine proper sound classification. The attributes specifically used in music classification are the ones that I've just populated in gray. Now, based on the outcome of both feature extraction and analysis, the proper sound classification occurs, and then the optimal signal adaptation is implemented. The system is dynamic and designed to keep up with the pace of a person's normal daily living.

It is extremely important for sound classification to be extremely accurate. I've already mentioned that, but why is that so important? Because sound classification leads to signal adaptation, which delivers optimal sound quality. So Starkey's environmental management can handle multiple environments simultaneously, and it allows us to deliver our most sophisticated and accurate classification and automatic adaptation system to date. By using artificial intelligence to help in sound classification, we're able to analyze and adapt the environment every 6 milliseconds in every single channel of the hearing aid to really build a layered approach to sound quality, which leads to higher patient satisfaction with the sound quality of their hearing aids.

Now, Starkey hearing aids are designed to use what is called additive compression technology. And so this is using a fast and a slow compressor simultaneously. And this is designed to optimize both speech and music signals. Now, given the differences between the two speakers, speech and music should be treated differently to ensure optimal audibility and sound quality. So when a patient enacts a dedicated music processing, we're able to introduce a completely separate compression strategy to ensure the best sound quality specifically for music.

Now, I'm not going to spend a whole bunch of time on our speech programming and our speech processing today, because, again, the. The point of today's course is music programming. But for our speech programming, when you're using speech compression, we have dedicated knee points and

dedicated compression ratios specifically designed for speech signals. So again, it's that fast and that slow compressor running in tandem. Those adaptive features and how they're set are going to be based off of speech characteristics.

Now, with our dedicated music program, much like what we do with speech, we have specific and dedicated knee points and compression ratios, but they're specifically built for music. And we're going to use slow compression alone. We're going to disable that fast compressor, regardless of which one you're in though. Expansion has been completely separated from the compression architecture and the hearing aids have a broader frequency response response. So this leads to better perceptual outcomes for patients in a lower noise floor.

So now that we've discussed some very basic about music processing and we've discussed how speech and music differ when we're looking at more in depth programming considerations, you know, there's certain things that we need to know and we need to understand about the foundation of music. And a big part of that is terminology. You know, how are your patients going to talk to you about certain things? So when discussing music with patients and musicians, there are common phrases that they may use or common terms. Tones and octaves are very common terminologies used within the music world.

Tones are a steady state sound that is characterized by its pitch duration, its intensity and its timbre. If the interval between two tones reaches a one to two ratio, then that's referred to as an octave. The higher tone of a two tones is perceived twice as high than the lower one. I'm sure you all know what a tone is though from pure tone testing on an audiogram. But vocalists or musicians will often use bass, tenor, alto to describe their vocal ranges.

Bass tend to be more lower in frequency. Tenors are going to be in those more mid ranges and then altos are in those higher frequency ranges. Now this is one of my favorite things to use when I was in

the clinic programming, and this is in that PDF handout. So when it comes to music, both the frequency and the dynamic range is highly variable. I've already said that.

But what's really cool about this chart is it takes common musical instruments that compose music regularly and shows you the average music frequencies associated with them. So if you have a musician as a patient, this chart can really come in handy when programming so that you can optimize the patient's frequency response of their hearing aids for their instrument of choice. So for example, if you have a vocalist and maybe you see that vocal range for on average is around 90 to up to 16,000 Hz depending on their singing style. So if you know, maybe your female singer tends to be on that alto range, we may look at more of that 3,000 and upper range for programming. So this is just a really cool starting point.

Now estat 2.0 is our proprietary fitting formula in Starkey's aids specifically for speech. And so this was designed to, you know, improve the sound quality of speech for patients. It reduced the competition of background noise. We wanted to bring more gain for soft speech. But again, all of this doesn't necessarily matter when it comes to music processing.

And so when it comes to, you know, music listening, E stat 2.0 is a great option for speech focused programming. But what do we want to give our patients when they're trying to specifically listen to music? And that is where our dedicated music fitting formula comes into play. And so this was specifically designed for music listening and it was designed to keep loud music loud, soft music audible and give a great sound quality regardless of the genre, the instrument, is it vocalized music, acoustic music? You know, regardless of that, we want to give a good music experience for the listener.

And so you can give your patients access to this dedicated music processing by setting it up as a program. And you can do this either through the Quick fit or the fine tuning screens within the Profit software. And I'll show you what those controls look like in just a second. When selected, this fitting

rationale will change from E Stat to music and you will see that the Quick fit in the fine tuning screens change to reflect optimizing compression and fitting rationales specifically for our music processing. Our music fitting rationale is unique to Starkey and it's something that we built from the ground up.

We wanted to focus on audibility, music loudness and sound quality so that we can provide a peak listening experience for the wearer. So our goals of our music prescription formula were a couple of different ones. We wanted to restore overall loudness of loud music using flat linear insertion gain. And we also wanted to restore the audibility of soft music with shaped compressive gain according to the hearing loss for those low levels. Now, the individual variability of desired sound is usually greater for music than it is for speech.

And early research when we were developing this found that patients liked the ability to be able to turn music up louder than they traditionally would for speech. We also needed a bit more of a high frequency emphasis when compared to speech programming. Now, time constants and compression thresholds and compression ratios were needed to be optimized specifically for music so that soft music is audible and receives signal processing for the patient's hearing loss. Acoustic transparency was also a goal in restoring both loudness and audibility to give patients the impression that they were listening to music like they would without their hearing devices in use. Now, based on the common problems seen with our goals for music processing, our music formula is designed to use multi channel expansion and compression output and it provides expansion in those ultra low frequencies, linear Gains for both soft sounds and for high input.

And then we're using compression in the mid frequencies. So to reiterate, by using shaped gain according to the hearing loss, acoustic transparency is achieved by restoring desired loudness at high input levels with flat linear insertion gain that mimics the unaided ear, the input dynamic range is up to 118dB SPL. To allow loud music to be processed without input saturation, we also implemented unique

compression knee points and compression ratios to allow that soft music to be audible and amplified for the hearing aid wearer. So the end result of all of this is a natural music listening experience. Now, it's important to note that fitting and evaluating the music program is completely subjective because there's no objective measures in place for evaluating a hearing device fitting for music.

So it's very important to base your adjustments on patient feedback.

Sorry, I got a scratch in my throat. It's also worth considering that the individual preferences and variability between patients is likely going to be a lot higher when you're programming specifically for music than it will be when dealing with speech signals.

And you can give your patient multiple music programs within their aids. So for example, maybe they sing in their church choir, but they also enjoy listening to jazz records in the evenings. Both of those scenarios, the patients may want to engage their music program, but their own personal preferences they may have want those to sound very different from each other. And so again, you can give them multiple music programs. We wanted to make sure that programming music was in line with how musicians and music lovers tended to address their sound quality concerns.

And so when we get into the quick fit and fine tuning screens, you'll see there's some different controls there. So the quick fit controls within preference profile adjust larger frequency bands, while the fine tuning controls allow you to make those more targeted and specific frequency adjustments. Regardless of how you're making those adjustments, either from quick fit or fine tuning, one click equals a 2dB step. Now, for our case studies, I'm going to be showing adjustments made within the fine tuning screen to show that more detailed approach. But I will say that when I worked with musicians clinically, I was able to do a large majority of my adjusting on the quick fit screen.

I just like to show you all the details. Now, I also personally tend to be a little bit more conservative in my adjustments for music and for musicians just due to the dynamic sound quality of music. So many different components of music build and layer together or build off of each other. So I found that doing a small adjustment can go a really long way. A lot of the times now, it doesn't matter where you're at in the world. Everyone thinks about his music in kind of that bass mid and treble.

And so that's why we have these controls within profit for that dedicated music program. And so here you can see the quick fit screen. If you want to go into that fine tuning screen again, this is where you still see that bass mid and treble breakdown. But you can expand your frequency ranges out and you can also adjust for the loud and the soft input levels. So this is where having that musical instrument frequency chart could be really helpful so that you kind of know which frequencies to come in and target.

I also want to note that while we do have multiple modes of directionality within Omega AI devices, when you're in the music program, it defaults to omnidirectional. This in combination with no noise reduction or linear compression and a low feedback sensitivity, allows for that incoming audio signal to be treated more like an analog signal so that we can maintain the integrity of the music in the event of entrainment occurring. You do have the option to completely disable the feedback canceller, but again, that subtle is the default state when you're in the music programming. Subtle adaptation, sorry, all noise management algorithms are disabled when you're within the dedicated music program. Consonant, brightness, wind and machine algorithms are turned off.

So again, no fast compression, no wind and machine. You are able to make adjustments to quiet and directionality, but you shouldn't need to, as their default settings are specifically optimized for music listening. But you do have some control on the sound manager screen, now completely separate from our dedicated music programming. I do also want to talk about our dedicated streaming configuration.

So with Omega AI devices, when streaming happens, the hearing aids are going to swap into a configuration with sound quality specific for audio streaming.

And so this allows for separate streaming frequency responses and controls and does not affect the personal program, restaurant program, anything else that you may have set up for your patient. So you can adjust the new streaming configuration in a couple of different ways through the Profit software, and I'll show you what that looks like in just a second. And your patient can also adjust their streaming controls and their streaming sound quality through my Starkey and I'll show you what that looks like as well. So on that fly out menu of Profit, you should see audio streaming and coming into that will bring you to the audio streaming controls. So again, anytime a stream is initiated, whether it's for a phone call, audiobook, podcast, music streaming from their TV streamer, connecting to AuraCast Broadcast, whatever it may be.

When that stream is initiated, the hearing aids swap into the streaming configuration and you can make programming adjustments to that based off of patient feedback. You've got both quick fit and fine tuning controls here. You also have the ability to stream target match. So maybe you've made a whole bunch of changes, the patient's overwhelmed, and they're like, I just don't like any of this. Can we start over?

Cool. Don't go, hit undo 1,000 times, hit string, target match, and come right back to the default. You have a lot of control here, which I think is really cool. Maybe your patient's not in the office though, and they want to make some controls while they're actively streaming. Well, when that happens, the hearing aids swap again into that audio streaming configuration.

And now all of the controls on the home screen of My Starkey are dedicated to their streaming audio. So here they can make minor changes just to streaming volume or the hearing aid mic volume through those slider bars at the bottom. But if they hit that adjust sound button, it's going to open up their EQ controls. And this is where they can adjust their bass, their mid, and their treble independently. And

they have a plus or minus 5db range that they can then enact for a more robust streaming experience.

What's really cool is you also, I didn't show you, but on the accessory screen within Profit, where you have those streaming defaults of bass boost, treble boost, and overall boost, those are cumulative or summative with what the patient's done within My Starkey. So maybe you've turned on bass boost. As you can see with that purple curve, it's boosting those low frequencies, and then the patient has more of a bass boost. They can get a lot of oomph or a lot of power in those low frequencies. You can control and enable these boost or these streaming configurations through the accessory screen on Profit, your patients can do it from the audio streaming settings within My Starkey, which is under my hearing.

So lots of controls on both sides of the line.

Now, not all patients have the same music listening needs. We have casual music listeners, and those are going to have very different programming needs from someone who is a true full musician. So you need to understand a little bit more about what each type of listener is looking for so that you can best understand what program they need and how do we configure that program to match their needs. And so, you know, again, there's a lot of different types of music listeners, ones We've all probably encountered in the last five years are our constant streamers. Streaming has become such a huge part of the hearing aid wearing experience.

But you still have, I would say my mom falls in that like casual listener stage. Her and my dad love to listen to music when they're on their road trips. They are crazy people and they drive from Louisiana to Alaska so they're listening to music in their car, but that's really about it. They're not listening to it much. Other places.

You have someone like me who's a music lover where I'm going to concerts anytime I can. I love finding live music venues. I'm always getting a new vinyl to test out at the house. But I'm not a

musician. I just appreciate it and enjoy listening to it.

Then we have, you know, your casual musicians who may perform regularly in like a garage band or they're in their church choir, something like that, or those professional touring stadium musicians. And so those, you know, are going to have requirements for extremely accurate sound reproduction. For the purposes of the rest of the talk, when we're talking about programming, I'm not going to be talking about professional musicians because that is just such a unique type of programming and processing. I'm going to focus more on the other types of music listeners.

And I've mentioned this before, but you know, there are fundamental components and terminology of music and we know the different instruments used to, to create them, but there are a million different types of genres. And that is, you know, what is the strategy used to identify a music piece that is, you know, belonging to a shared tradition or a shared set of conventions. So knowing instruments and knowing genre can again, kind of take you back to that music frequency chart and help you know, what to do with programming. So it's probably no surprise to any of us that musicians' hearings can be affected by the music they play, whether the professional or the, you know, more I forgot, casual musician. That is the word I was looking for.

But, and again, this is probably no surprise either. Rock music tends to have a higher intensity than classical music both in rehearsal and in performance. Now, classical musicians do tend to have a higher occurrence of asymmetrical hearing loss. Rock musicians tend to have a higher occurrence of hearing loss overall. I thought that was an interesting stat when I was doing research for this talk.

We're also able to see that music can help with different types of auditory processing. But do people rank the ability to listen to music or engage with music as an important factor to themselves? So Cohen and colleagues studied the importance of music in seniors. And so they evaluated two groups of subjects, the young old, which was 69 to 77, and the old old, which was 78 to 100. I did not come up

with those categories.

That was what they were in the study. But they found that people even well into the old, old stage considered music important or very important to their lives. And so you can see here a ranking on a zero to five scale, with five being very important, that the majority of study participants ranked music importance to them in that four or five range.

And we all know that hearing loss impacts the enjoyment of music. Leaks and colleagues found that half of their survey respondents listened to music at least daily. And almost 30% reported that their hearing loss affected their enjoyment of music. So they found that hearing loss impacted the loudness of music by making it either too loud or too soft or compromised melody recognition or influenced the understanding of words and resulted in multiple volume changes.

And in 2019, ear and hearing sent out a questionnaire to adult hearing aid users that got 111 responses. Of those responses, 51 participants had a mild loss, 42 had a moderate to moderately severe, and 18 had a severe or worse loss. Now, overall, there were some significant differences noted, but predominantly between the mild and severe groups. But there were fewer differences between the mild and moderate groups. The respondents with the greater level of hearing loss reported a greater reduction in terms of music appreciation.

And it was also observed for the severe group that the more severe the hearing loss, the greater their preference for lower pitched instrument. And I thought that was really cool as well, just because, you know, as they tend to lose the highs, giving that kind of that robustness and that fullness becomes very important for them.

So just based off of, you know, what we've learned about music so far, we know music is important to a lot of people. We know their hearing loss can impact their enjoyment of music. And we know that music

and speech signals are very different from each other. And so, you know, a lot of that is what led us to developing our dedicated music processing at Starkey. So I've kind of given you the basics of what is our dedicated music programming, why we developed it, the research that kind of led us there, how we developed it.

But that doesn't necessarily mean anything if you can't put it into practice. So I want to look at a few specific patient examples that can help you program for the various patients that you may see in your clinic and how you can customize their music program or their hearing aid programming specifically for their level of music enjoyment. So the first patient that I want to talk about today is Susan. Susan is 54. She plays piano, both for fun, but she also teaches piano to both children and to adults.

And she enjoys going to a local jazz bar where she enjoys listening to live music. And as you can see, she's got a mild to moderate sensorineural hearing loss bilaterally. So since Susan is mostly working with pianos, it's helpful to know that pianos range in frequency anywhere from 27Hz all the way up to 4186Hz. And so we've got a pretty big range to play with there. You can also use the fundamental frequencies of the piano's keys in hertz.

So for example, that a four key has a frequency of around 440 hertz and a five key, which is one octave active, higher than a four. It has twice the frequency at 880 hertz. Now you can see all the different frequencies associated with the different keys on the piano. But knowing the different notes that your patient tends to play can kind of help you drive towards hearing aid programming for future adjustments. So when Susan comes back for her follow up appointment, she's reporting that the upper keys on the piano are coming in a little bit closer, crispy or a little bit tinny.

And she's also reporting that those mid keys seem a little flat. So with Susan's complaints, you're interested in programming, you're kind of in an interesting position from programming. So typically with complaints of flatness, this could be an overall gain issue or a gain issue specifically in those mids and

highs. But based on her complaint of those upper key sounding crispy, I'm inclined to think it's more in that mids and I don't want to overdrive those highs again since she's already reporting some tininess or some sharpness there. So for this complaint, I'm going to kind of come at things from an equalization standpoint.

Boosting those mids can bring a little bit more life to the music. And just slightly dropping the highs can hopefully round off the some of that sharpness that she's experiencing. So after discussion with Susan and knowing kind of that upper end of frequencies on a piano, I want to just slightly drop the highs that are relevant to her to take that crispy edge off. So looking at that 3,000 to 4,200 hertz, I'm going to take it down by two clicks or roughly 4 dB. I don't want to drop these too much because again, she's already complaining of some Flatness, but I want to take that sharpness off if I can, for that flatness.

Sound quality report, I want to be a little bit more aggressive with my adjustments because again, I'm trying to go for a little bit more of that balancing act. So looking at that 1400 to 27 Hz range, I'm going to go four clicks or eight decibels. This is going to equate to key 69 to 80 on the piano, and it's hopefully going to bring that more full sound quality that she's looking for when she's playing. So that's what I ended up doing for Susan.

Our next patient that we're going to see is Chandler, and he is 36 and he is a data specialist. And he works in your stereotypical office type setting. And he does have the ability to stream during work hours. And so he does like to do that through his hearing aids so that he can kind of reduce all of the competing background noise in the office, you know, hearing other people on their phones and whatnot. So he is a very big streamer, and you can see his hearing loss is that more mild to moderately severe sensory neural.

So when he comes in, he's reporting that he's having a hard time hearing his podcast while working. And if he's streaming music, he doesn't necessarily love the sound quality of it. He says it just feels a

little weak in his opinion. So for him, I'm going to look at streaming controls both within profit, and then remind him of what he can use through my Starkey. And so we talked about the audio streaming a second ago, but I didn't talk about demo streaming.

And so this is really cool because I can actually have Chandler stream the podcast that he's playing or stream the music that he doesn't love the sound quality of. And I can make live adjustments based off of his report of like, it just was a little weak or a little flat. I focus more on my lows because I feel like with streaming, that low frequency is really what gives you that kind of like or that power. So that's what I used for him on that demo stream. And I was again having him listening to it while I'm actively programming, which I think is really cool.

And then just as a reminder, you know, when he's streaming, whether it's a phone call, a podcast music or whatever, the hearing aids move into that streaming sound quality. And I'm going to remind him that he can go into that, adjust sound and make some EQ changes in the moment. What is really cool about these EQ controls is they're what's called a sticky preference, which means if he bumps up the bass to decibels, it remembers that every time. So he shouldn't have to do that every single time he wants to start streaming. It's just.

It remembers that setting and applies it once he begins streaming again. So those are what we did for Chandler, and now he's very happy with his streaming at work.

And then our last patient that I want to talk about is Brian, and he is 42 years old, and he's a baritone vocalist in the local choir. So he also sings at local events, such as karaoke nights or other more casual events. But what's really cool is he's in the Saint Loft Choir, which is a very big deal. And so this is, you know, something that is very, very important to him. And he's got that mild to sloping.

Sorry, mild sloping to severe sensorineural hearing.

So because Brian is a baritone singer, baritones fall between a tenor and a bass. And as you can see here, baritones, they're not quite as low as a true bass, but they don't quite go into that high range that tenors hit. And so they kind of tend to fall within that 2000-3600 Hertz and that G2 to G4 range when singing. And so he's reporting that he is struggling to hear the other singers on either side of him. And he's also noticing that when he himself sings, he feels like there's a lack of robustness to the sound quality of the music.

So the lack of robustness could be stemming from some low frequency specifically, or it could be stemming from a lack of overall volume. Now, with Brian's specific complaints, I want to start by increasing the lows to try and bring that robustness back that he's looking for. And I want to target his complaints of not hearing the singers around him by looking at those specific frequencies that I know baritone ranges fall between.

And so for those low frequency adjustments, I'm looking at that 150 to 1100 hertz. And I turned these frequencies up two clicks, or a total of 4 dB. Lower frequency signals require more power because their waveforms are larger, but increasing them too much can lead to increased vibrations and increased resonance within the signal. So I do want to give him a more full sound quality that he's seeking, but I don't want to overpower the rest of his music listening experience. Experience.

So, again, here I'm starting with a very conservative adjustment and just doing that for DV tone.

Now, in order to help Brian hear the singers on either side of him and the choir, I want to specifically again target those ranges that the baritone singers fall within. And so if you remember from earlier, Those are around 2000-36. So those are the specific frequencies I'm adjusting within profit. I did also do these only two clicks or four decibels, because after talking with Brian, he could hear them, but they were just a little bit softer than what he would like. And so he was having a hard time kind of keeping his

pacing and keeping his rhythm.

So by making them just a little bit louder, Brian should be able to hear them a bit more clearly and be able to stay on key with the singers around him. Again, I don't want to do too much and over modulate the signal for him. So that's what I did for Brian.

Now, to wrap us up today, I do want to talk about a few clinical considerations or some office optimizations that you could do if you frequently work with music listeners or musicians within your office. And this is a very simple one to start us out with. But having external speakers or some type of ability to play different sound sources for the patient to test out can really help you with fine tuning or with troubleshooting, especially if your patient's complaint is with listening to records, to CDs or to other types of recorded music. Your computer speakers are fine, but to me they just don't have as good of a range. And so I'm not saying you have to go and invest \$1,000, but just a small little external speaker can really go a long way in programming for these patients.

And then digital streaming services are also a really great option for playing specific songs, specific audio clips, specific genres. Again for those troubleshooting purposes. I personally love YouTube because you can find so many different musical instrument clips, But I've also used Spotify with patience. I don't love Pandora because I don't get to like pick the song that I want to listen to, but that is a me biased full disclosure there. But I've used again both YouTube and Spotify pretty often with, you know, trying to get the sound quality of the music that that specific artist or that specific genre that the patient's looking to enjoy.

The media player Within Profit is a really cool little source as well. We have a few different music sources already built in there, but if you go up to preferences, you can actually add other clips. Fairly easy to this. So if there's a specific, you know, clip that you like to use for programming. And you're like, I don't feel like finding the CD every time.

Just add it to the audio file setting in the media player and then you can access it through profit anytime. So I do like to mention that because it is kind of a hidden gem in the software, especially if you don't have, you know, a CD player in your office or any type of external way of playing music.

Now, my personal favorite way of optimizing the office or programming specifically for music was just have the patient bring their instrument. I loved hearing my patients play their instrument of choice while doing live programming. It was really fun for all of us involved. And it can help you get that sound quality exactly the way that they're looking for pretty quickly. I had a patient very similar to Brian, who was a choirist, just in his church choir, but it was him and his son.

And a lot of times he's like, I can't hear my son. And we had tried some adjustments. Well, he was kind of, I don't want to say misrepresenting, but he wasn't very good at explaining what key his son sang in. So it turned out I was adjusting the wrong frequencies a lot. So I actually had him and his son both come in together and they put on a little impromptu concert in my ENT clinic while I'm making adjustments.

And he would do like this or like this for up and down. And it was a really fun day and I was able to nail it. And then they were able to go back to church and he didn't come back very much after that. So when in doubt, just have them bring it with them. And again, this is one of my favorite ways of programming for musicians.

Now, I've mentioned this before, but it bears repeating. Programming for music is highly individualized. This goes for patient preference of what the sound quality is or what they are playing or listening to. Another consideration is violins and other instruments that are played similarly are played by holding the instrument up to one shoulder or one side of the body. So in these instances, patients may need individualized volume controls.

So if you fit your patient with something where they can't have different controls on each side, that may be incredibly frustrating for them. So I love to fit the ric RT style or something with a rocker switch. And for these patients, maybe I disable the ear to ear volume control and I allow them to adjust the volume independently to keep things balanced when they're in that music playing mode. The other really cool thing is you can do this same thing through My Starkey. So maybe you didn't fit them with a Ric RT and they need to rely on the app to use those controls.

You can split out the right and the left and they can use individualized ear volume control within My Starkey to achieve the same thing. So a couple of different ways to come at it.

Now to wrap us up, I want to leave you with some of the top fitting considerations for your music loving patients. Our dedicated music program is for live or recorded music. It is not designated or designed for streaming music and it is not designed for speech. If your patient is wanting to prioritize music within their environment, give them a music program and teach them how to swap into it. No two patients will perceive music the same way.

So individualizing your programming based on your patient preference is key for both musicians and for your patients that just generally love listening to music. So I have said that a lot throughout the talk, but it is something that I will continue to repeat. The variability of programming for music is very high from patient to patient. This is kind of a funny anecdotal story, but me and my husband, we both like the same types of music. We have a lot of the same favorite bands.

Again, we go to concerts together. Our EQ controls on Spotify are very different. So much so that I'm not allowed to hook up my phone in his car or his phone in my car because of how much our sound quality preferences difference. And that's we're just two people. So again, you're going to see some variability across your patients.

Don't let that scare you. That is normal with music processing and it just goes back to preference.

I love this quote by Samuel Butler because I think it sums up everything that I've said today pretty well. You know, life and music both have certain rules and fundamentals to follow, but ultimately the composition is a very personal thing. Shifting our thought process to hearing aid programming, we know a lot of the rules and a lot of the fundamentals, programming specifically for speech signals. But when you're looking at music processing and hearing aids, we want to account for all of the styles and the genres of music within our processing so that we can give patients back the sound quality they are looking for.

And I did say, you know, our music programming is, or our music program is for live music. It's basically just for anything that isn't streamed. So I did not do a very good job of clarifying that earlier on in the talk and for that I apologize. But just that dedicated music program is for when patients are not trying to stream music through the hearing aids. So and it is a great tool to have in your back pocket.

Now, I know I've given you a lot of information today and so I want you to feel like you don't have to remember all the details because there are several support materials that you can find. So we've got a quick tip specifically on our music programming. We also have quick tips on our streaming programming as well, if you want to go into the science a little bit more than what I did today. We've also got our white paper on the music program or how it was designed specifically for music listening. And we also got some other support materials and like researching posters and stuff like that.

All of this and more can be found on starkeypro.com and so feel free to reach out to your sales rep, reach out to Starkey customer your service. If you're having any problems locating any of these, if you just go up to that search in the top type in music, it should find you what you're looking for fairly, fairly easily.

So I want to thank you guys for giving me some time today. I see there are some questions in the chat, so let me open that up real quick. Is there a recommended validation measure like REM but for the music formula? So no, there are no objective like real ear targets for music. You could use your real ear system to kind of go into that live speech mapping, turn the targets off and just see, you know, how loud things are being perceived at the level of the eardrum through the hearing aids, just to make sure you're not like over amplifying.

But we don't have specific targets for music processing. So that's why I said the programming is going to be so highly variable because we don't have objectives to fall back on. So we have to rely on subjective reporting from the patient itself.

Let's see, when using the demo streaming, what input is the audio coming from patient's phone or our computer? So that is actually an excellent question. And it's going to depend on what they are demo streaming. So the one that I have most commonly used it with is the patients reporting when they're streaming music from their cell phone. It's too soft.

So I have them start streaming something from their phone and then that's what is streaming. But you can really do this from anything. You can do it on a, a phone call, you can do an audiobook music. If you have a TV streamer in your office and maybe they, you know, are complaining about that at home. You could have it paired to that and then demo stream through the TV streamer.

If you have an ORACAST broadcast in your office, you can use that. So there's a lot of different ways to use demo stream. And then the last question I see is on the EQ and my Starkey, are the DB adjustments one to one DB wise?

I'm not sure if you're asking is it in a 1dB step? If that is the question, yes, it's a 1dB step with a plus or minus 5dB range, so 10dB total. And then if you're asking is it a 1 to 1 ratio of like does base in my Starkey equate to base within profit? Yes, that is true. So whatever the frequency range for base is within profit, that is what the base range of my Starkey is as well.

So not quite sure which answer you're looking for, so hopefully both will suffice. And then the answer oh, sorry, I missed the answer to the REM question. There are no targets for measuring on real ear. There's no objective music targets. So I do recommend if you are using REM with your musician patients, you can just make sure you're not over amplifying based off of speech targets.

But we don't have hard and fast like targets to rely on to make sure like you're hitting the right lows or hitting the right mids, if that makes sense. Sense. So I do tend to just turn the targets off and see what's going on at the level of the ear canal in that instance. So. And it looks like that was all the questions.

So I thank you guys. If there's anything else that y' all think of, don't hesitate to reach out. And thank you. I hope you all have a great rest of your day.