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Selecting and Fitting Devices for Tinnitus Management Recorded April 12, 2023

Presenter: Jennifer Martin, AuD



- [Christy] It's my pleasure to introduce Dr. Jennifer Martin. She's gonna be presenting to us: Selecting and Fitting Ear-Level Devices for Tinnitus and Sound Intolerance Management. If you'd like to learn a little bit more about Dr. Martin, you can read about her bio on the Course Registration page. And at this time, Dr. Martin, I'll hand the mic over to you.

- Wonderful. Thank you so much. I just really appreciate being here. It's lovely to be a part of this and to get to share this information with everybody. I just am recently going through a change. I've been teaching master students in Singapore for the last 10 years, and it's just been the most wonderful experience. And I just recently moved to Portugal, so this is just such a wonderful way to start off our new life here in Portugal, just both personally and with audiology. So let's go ahead and get started. Okay, so just some standard disclosures here that you can take a look at. And the learning outcomes. All right, so when we talk about tinnitus management, one of the cool things about tinnitus is it has so many facets, right?

So there's so many aspects to it. We've got the education and the counseling part where we really get to talk with people and explain things. There's the stress reduction and relaxation part because we all know that tinnitus patients come with depression and anxiety, and all kinds of things that we need to work on that component. And then of course, there's the whole therapeutic sound part, which is what we're really gonna focus on today. So, the thing I like to point out first is that there's a lot of definitions floating out there about therapeutic sound. And I just wanted to throw a few up here 'cause you can just see, everyone says it in a little bit different way, but basically, we're just using sound to somehow affect the tinnitus, right?

So, whether it's the perception or the reaction to the tinnitus, we'll talk more about that in a moment. But really, the thing that is most striking to me, is that it's really this very broad area. Okay, so essentially, we're trying to use sound, whether it's amplified



sound through a hearing aid or sound sent through just headphones, or sound sent through hearing aids, so you're getting both amplification and additional sound. We're really striving for habituation, both to the perception of tinnitus, but I would argue more importantly, to the reaction to tinnitus. So I don't like to pigeonhole sound therapy too much. I don't like to say, oh, it's a particular device, or it's a particular method. I always tell my students, it's a big umbrella and there's a lot of things that live under the umbrella.

But today, when we're talking about using sound, it's really kind of that big category and it's gonna use similar guidelines, but it doesn't really matter what specifically you choose as long as you're sticking with those guidelines. Okay so, we all know lots of ways to deliver sound, right? We can do it through a speaker, we can do it through headphones. There's pillows that have speakers, there's ear-level devices. A lot of that choice depends on if there's hearing loss or not hearing loss. But to keep everything simple, today we're gonna focus on ear-level devices and how we can program those a bit differently for tinnitus and for sound intolerance. Okay, guidelines. I used to call these rules and then I thought, eh, that's a little too strict.

Like there's not hard set rules. They're more like guidelines that help me to guide my patient through the process. And these are mine, so I don't think that these are universal or that everybody has to use these. This is what I use to give patients kind of a framework of thinking so that instead of just having everything be so nebulous, we'll pick a sound that's good for you, What does that mean? Okay so, my three guidelines are that whatever sound we use shouldn't be bothersome to the patient. They already have a bothersome sound, that's their tinnitus. So we don't want the therapy sound to be bothersome. Now, what's interesting is that I used to use the word pleasant, that the sound should be pleasant.



I don't say that anymore 'cause actually, I've learned that a lot of sounds we use are neutral, like the sound of an air conditioner. I don't find that necessarily lovely or joyful, it's an air conditioner and it's just sort of neutral in the background, but it could help with my tinnitus. So now, I've changed that to just the sound shouldn't be bothersome. The next guideline is that it shouldn't interfere with communication or concentration, or basically whatever I'm trying to do in the moment. So the nice thing is, that kind of opens it up that we can have different sounds for different occasions. If I'm just cooking, I may want music, but if I'm working on a lecture, music may be too distracting.

So, the other thing you'll notice is that the volume of the sound will affect both one and two, so that's why we specifically say a low-level sound. I have a lot of patients who will turn on a sound, let's say it's rainfall, and they'll say, oh gosh, this is terrible. It's bothersome. First thing I say is, let's turn it down a little bit, right? Or they say, oh, this really interferes with my ability to talk with you. Great, let's turn it down first before we make those first two judgments. So setting a low-level volume is always the first thing I do. And then of course, the one that I think is quite important is we're somehow using that sound to reduce the brain's ability to focus or zone in on the tinnitus, okay?

And that doesn't always mean that we have to cover the tinnitus, that doesn't mean we even have to affect the perception and make it softer, it just means it has to be doing something that is allowing the patient to not focus so much on that sound. And that can look very different. Okay so, these are kind of the general guidelines, whether we're using amplified sound, whether we're using imported sounds, it's all gonna stay the same. Okay. Yeah, let's talk a little bit about the purpose of these different sounds before we dive into the devices and the programming aspect. You'll see that I have cited Jim Henry et al. He is at the Portland VA, and he has developed, he and his colleagues, a program called Progressive Tinnitus Management.



And I like teaching it to my students because it's a lovely program that people just starting in tinnitus, it's easy for them to understand and do, and all the information is online for free, so it's a lovely program. And so, you'll see that my subcategories here are their names for these different kinds of sounds, depending on what we're trying to do. So if we wanna use a sound to provide a sense of relief just from the stress, it's not even doing anything to the perception of the tinnitus, just listening to that sound makes the patient just feel better. That's what they would call a soothing sound, okay? If we are offering passive diversion from the tinnitus, so it's physically kind of interfering with the ability to perceive the tinnitus, but just in a passive way, that's what they would call a background sound.

And then, an active diversion where you're actively engaging the brain away from the tinnitus would be what they would call an interesting sound, okay? And then within each of those categories, there's different types of sounds you can use. So there's environmental sounds, whether it's naturally in the environment or you're playing a recorded sound of an environmental sound. There's music, of course, and there's speech. So within each of those categories, we have different options. And this really just gives us lots of flexibility. So for example, let's say ocean, right? So for a particular person, ocean could be considered a soothing sound 'cause they find it comfortable and relaxing and just listening to it makes life better. And it's an environmental sound, so that could be a combination for them.

For other people, let's say an interesting sound might be a podcast. So that would be speech, and that helps divert their attention from their tinnitus. Now, music is an interesting one because I find that it depends on if you're just a normal person like me or you're a musician. Musicians are special and they don't view music as a soothing sound. They don't view music as a background sound. It is an interesting sound, it is active, it is something that they are analyzing all the time, whereas for me, it's just sort of there, it's in the background. I may dance around a little bit. So you have to think



about not just your own categories for these sounds, but how your patient might be interpreting these different types of therapeutic sounds.

Okay, and then we have lots of ways of delivering them, right? We have what I'll call sound generators, we have hearing aids, and we have combination units. And I'm gonna explain all of these here. So sound generators are ear-level devices that often look like a hearing aid, but they have no amplification. Some have multiple sound options, some are programmable. They come in a variety of styles, and they tend to, at least in the United States, be less expensive than hearing aids. Now, I use these a lot when I was at the clinic I worked for in Portland, Oregon, but when I moved to Singapore, the government doesn't use these medically, they don't allow the import of these.

So suddenly, I had to figure out, okay, so if I have a patient who wants to just deliver sound, but they want something that's portable, that's not gonna have cords, those kinds of things, and this was before we had so many great wireless options, I often would have to use hearing aids as just a sound delivery system. So, sound generators are not available everywhere, but they certainly can be, so that can be one option. Hearing aids, of course, we're all familiar with, and we know that we can use them in a variety of ways. We can use just the amplifier to bring up the sounds that they need, and we also have a lot of wireless options for sound streaming and all kinds of things.

And then, this is the interesting one. So, I'm gonna date myself a little bit. I just had a birthday, and I'm getting quite old. When I was first starting off, we actually had units called combination units. It was a combination of a hearing aid amplifier and a sound generator, and it looked usually like a BTE. And you could do just the amplification, you could just do the sound generator, or you could do both. So in that way, it was brilliant. The difficulty was that you had to choose, am I gonna fit a hearing aid only or am I



gonna fit a combination unit? And the hearing aids didn't have the streaming capabilities, so they were just hearing aids.

And the combination units had very, very outdated amplifiers, so they usually were not the best technology for the hearing loss. So it was a really difficult decision, okay? Now, these days, we all know that most hearing aids are going to have built-in sounds and or be able to stream in sounds for tinnitus. So, we don't have this conundrum anymore necessarily of choosing one or the other. We can fit a hearing aid knowing it has all these additional capabilities. So in the talk today, when I talk about a combination unit, keep in mind I'm just talking about using a hearing aid in the capacity of having access to both the amplifier and the additional sound for sound therapy, okay?

So I just wanted to explain that so it makes sense. Okay, so let's think about, what are the benefits of amplification when we're dealing with a tinnitus patient? Obviously, if we're improving their ability to hear and we're just bringing in more sound, we're enriching their sound environment, we're gonna probably provide background sounds they haven't been hearing very well. And it could be that air conditioner, it could be music in the background, it could be voices. And so, if those additional sounds just create a comforting background, if all it does is just relieve some of the stress of that tinnitus signal, great. That could be one of our goals. It can actually affect the tinnitus loudness as well.

So the having that background of sound could cause the tinnitus to not seem like it's poking out so much, so it's not quite so vibrant in the midst of that background sound. We also know that if we are relieving the hearing loss, we're making it easier to hear, then there's less stress. People are less tired at the end of the day. When they're less tired, they're probably gonna be able to fight off their tinnitus a little bit better. So, even just giving them good amplification just for the hearing and communication aspect can



be very helpful. And then of course, stimulating the auditory system. We all know that what we don't use, we're gonna lose. So we want to continue to stimulate the nervous system, continue to keep those connections active, and that's going to be good for the outcome of the tinnitus in the long run.

Okay, so now we have to think about, now, we get into the fun stuff, thinking about the device type, what would we fit? So going back to the old days again, when we had to choose, and this was a hard decision, it always made me so nervous. When we had to choose between a hearing aid and a combination unit, there was this great paper by McNeil et al that said, okay, great, if we have relatively normal hearing in the low frequencies, or maybe just a mild hearing loss, it's highly likely you can fit a hearing aid and just the amplification you're providing in the mids and highs is going to be enough to help reduce the tinnitus perception.

But the worst the hearing gets in the low frequencies, you might need additional sound to create that same thing. Again, nowadays, we don't have to necessarily worry about that, but we always wanna be thinking a few steps ahead. First of all, in our office, trying amplification only, added sound only if they don't have a hearing loss, and then the combination of both and allowing them to determine what they like, but also just keeping in mind the capabilities we want the hearing aid to be able to have down the road. So what kinds of onboard sounds does it have? How good is the streaming capability with this particular hearing aid? And then we can just turn off and on those features as we need them.

So I think we're in a beautiful age of technology where it's making our tinnitus life much, much easier. Okay, so typically, when we look at our device style, we are going to focus on open whenever we can. So most of us know, those of us who have tinnitus, and I have lovely crickets that live in my head all the time. If I plug my ears, my crickets are much louder, okay? Because I'm blocking out the sound from the environment that



could be reducing my tinnitus. So if I'm gonna use a device, my first inclination is I wanna keep the ear canals open. So normally, that's gonna be a slim tube BTE, a receiver in the canal, something like that.

And the nice thing is, we have domes so we can just trade off different domes at very low cost and determine what's the best combination for that patient of open, but closed enough to prevent feedback and things like that. If we just can't, if the hearing loss is just too great or we're getting feedback issues, and of course, we're just going to try to do the most open fit that we can, even if we can't call it open. And we'll talk in a bit about how that's where feedback control systems come in really handy when we're trying to do this. Okay, another question is, this has been an argument over time, monaural versus binaural. If I have hearing loss in both ears, but tinnitus in one ear, do I fit for both or do I fit for one?

And I would say that most people agree these days that fit for the hearing loss, okay? Fit for the hearing loss first. Don't worry about if the tinnitus is only on one side because honestly, the way that our ears and our brain are built, we've got neural connections going straight up, we've got neural connections crossing, we've got a lot of different pathways going on. And so, the more input we can give, the better. And if we're creating auditory balance, if we have a more normal function, then we expect to avoid some of the pitfalls that we can sometimes create if we're just amplifying one side. So fit for the hearing loss and then we're gonna adjust for the tinnitus if it's only in one ear.

Okay now, this is a really interesting concept that I really like that was brought up in a paper by Grant Searchfield in New Zealand. So, he talked about prosthetic fitting of hearing aids versus therapeutic fitting of hearing aids. So it's a really, really interesting concept. When we first become audiologists and we're fitting for hearing loss, we're fitting prosthetically. We are missing a sense, we're missing our hearing, we're trying to



add that back in. Just like if we were missing a leg, we put on a prosthetic leg, right? So, we're fitting the hearing aid to replace the lost hearing, and that is how we're trained. And that is where all of the research and development of hearing aids goes into.

They're gonna focus on audibility, they're gonna focus on speech clarity. They should, that makes sense if we're trying to improve communication, and they're also gonna use all those great fancy features to enhance speech and noise, whether that's enhancing speech, reducing noise, or both. However, tinnitus often requires us to fit therapeutically where our goals are different. And I used to apologize when I would go to big conferences and talk about this stuff to all the manufacturers because I'd say, all of that research and development that you go through to get the hearing aids super quiet, the circuits are so quiet now, and the speech enhancement and the noise reduction is so much better than when I started 25 odd years ago, but I'm gonna mess that up now.

I'm gonna go in and I'm gonna, what I call, dirty up your circuit because I want the hearing aid to be noisier. I want the hearing aid to be providing some level of noise for the tinnitus part. So, that's really what we're gonna focus on today is these changes that we are making to the programming to allow us to hopefully have a more positive effect on the tinnitus perception. And the nice thing is that you can flow fluidly back and forth between prosthetic and therapeutic. If your patient is having more problem with tinnitus, now you can do therapeutic, but as it becomes more of a hearing problem, you can go towards prosthetic. So it's not really a choice between one or the other.

We can have this fluid exchange back and forth. Okay, so how do we choose which one we're gonna use? And I call this Method 1 and Method 2, it's just kind of random names I gave to it. So in general, this is what I've seen. Method 1 would be determining



what's the bigger problem. Is this person more bothered by the tinnitus? Are they more bothered by the hearing loss? And then fitting accordingly based on that. So if it's the hearing loss, you're gonna fit for the hearing loss and the patient's communication needs. Any benefit we get to the tinnitus from doing that, fantastic. That's great, right? But it's the secondary goal. If they tell you that tinnitus is their bigger problem, then we're going to fit more therapeutically.

We're gonna go primarily for tinnitus relief, okay? Any improved communication they have is now the secondary goal. And again, like I said, we can move back and forth between those. There are a lot of ways of determining this. Again, the Progressive Tinnitus Management program has a lovely worksheet called the Tinnitus and Hearing Survey. And it has questions, four questions, I believe, about hearing, four about tinnitus, and one about sound intolerance. And the ones about hearing are only about hearing, has nothing to do with tinnitus. The ones about tinnitus are only about tinnitus. So you can see based on the score, which is the bigger concern for the patient. The other way of doing it is just asking, right?

So if I have a patient who has all three problems, I say great, rank those problems for me. Which is the most bothersome for you? So that I kind of know how to prioritize what I'm doing. The other cool thing is, is that we can have one program that's more suitable for the hearing loss. It can be more prosthetic. You can have another program that is more suitable for the tinnitus. It's more therapeutic. So, you don't have to pigeonhole yourself into one program either. You can be pretty flexible. Okay, the second method is what the Progressive Tinnitus Management program talks about, which is just always fitting for the hearing loss first. The reason they say this is that it's a progressive, in the name, right?

Progressive Tinnitus Management, it's a progressive program. So, you're starting with just the low-hanging fruit. You're triaging, you're making sure there's no medical



problems, you're dealing with any hearing loss that exists first, whatever tinnitus is left over, they move to the next level, move to the next level, right? Knowing that most people are gonna drop out of the program pretty early on because we know that the majority of patients are going to get relief from their tinnitus by just a well-fit hearing aid. If we're doing our job, they're gonna do pretty well. It's a much smaller number of people who are gonna need the entire program. So they say great, fit for the hearing loss first, but keep in mind all of those features that you may want in the hearing aid, make sure those are there in case you need those later on.

So again, if you fit for the hearing loss and they're not getting enough benefit for the tinnitus, you can start making some of these changes that we're gonna talk about. All right, now we're gonna talk about these changes and this is the exciting part for me. Now, I wanna let you know that for each of these topics or strategies, I'm gonna be showing you some screenshots of programming from manufacturer programming screens. And I don't have any special relationship with these four manufacturers. There's nothing magic about it except that I emailed every manufacturer I work with and just said, hey, would you be willing to have your screenshots in my talk, because I think that it's easy for me to just tell you guys, oh, go in and do this, really simple, but where do I find this in the circuitry?

In a particular hearing aid, where can I disable this function? Where can I enact this function? So, this is just to give you a taste of where you can find some of these features, okay? So let's start with feedback reduction. We talked about how with tinnitus, we're gonna almost always try to go as open as possible. And this is a tough one for some of my students or new trainees to understand 'cause they're so used to really looking at the low-frequency hearing, and with tinnitus, I'm just a lot bolder. And then I rely on my feedback system more, okay? Because again, I'm trying to keep that ear canal open. So, think about your different products that you sell, your different



devices, which are the ones that have the feedback reduction systems that you really like and that you've learned to depend on?

Do they have multiple styles of feedback reduction within the same device that you know that if one's not working, the other one's gonna kick in, things like that. So a lot of times, we'll have certain features that we like about certain makes and models, and if feedback reduction is one of them, that can be asset in these cases. So just to give you a quick idea, this is the Signia screen, I believe, and they have feedback cancellation. Now, this may seem really silly, like why am I showing you these things? Because they all named them something different. So, it sometimes has a magical special name, and I laugh with our manufacturers about that. Like what are they gonna call it today?

This one's easy, feedback cancellation. And you can see that some features in certain hearing aids are gonna be an on/off situation. Some are gonna have gradations. So I'm never implying that when I say, you may need to use more feedback control, you don't have to automatically go in and just crank it all the way up to maximum. If you're not getting feedback, fantastic, that's great. Don't worry about it. But if you are getting feedback, maybe you turn it on a little bit, maybe you activate it fully. So, none of these suggestions I'm making, they don't all have to happen at the same time and they don't all have to be an on or off situation, it can be a gradation as well.

Whatever works for the patient. Here, we have ReSound, and they call theirs DFS Ultra III. So, not as straightforward as feedback reduction. Oticon, they've got it under their feedback management, and you can see they have three different settings. And then with Widex, they have an adjustment with quite a few settings across there from less risk of feedback all the way up to we want maximum gain, okay? All right, so the next one, disabling the internal noise reduction, or what we call the expansion circuit, right? So expansion was really developed to allow hearing aids to have lower compression



thresholds or compression knee points, but not be so noisy internally, and also for that very, very soft, soft, soft gain in the environment, not have that be bothersome.

So before we had these great circuits, I remember patients would say like, when I'm sitting in my office and nobody is speaking to me, I hear like low-level sounds. I hear my computer hum, like it's super loud, and things like that. And that was just, they were just getting too much super soft gain or they could hear the circuit actually working, hear the circuit noise. So expansion is fantastic when we're trying to make the hearing aid quieter for communication. But if we want it to be messy, if we want it to be dirty, if we wanna create some background sound so that the patient kind of has a built-in sound generator in a way, you could think of it, then we might wanna turn that down or turn it off, okay?

So it's important for us to know in each of our products where to do this. So in the ReSound product, ReSound is nice 'cause they have kind of their features all on one page, so it's under the expansion circuit. So in this case, they call it what it is so it's easy to find, and they have four different settings that we can choose from. For the Oticon, it's a silencer control. So again, I'm not sure that I would've necessarily thought to call it that, so it's good to know where to find these things, and this appears to be an on/off situation. In the Widex, we've got the soft level noise reduction. And I believe if I had clicked on that before I took the the screenshot, it will bring up all your different options for you.

Right now, it's at maximum reduction. Okay, the third idea that we can use if we're still not getting enough, and these are not in a particular order. So it's not that you have to go in this order, but if you've tried things and it's still not giving enough relief from the tinnitus, another thing that you can try. And this now instead of the internal noise reduction is your external noise reduction, or automatic noise reduction. Sometimes it's speech enhancement, which is actually noise reduction to try to enhance speech. So,



we're all very familiar with these circuits 'cause usually, we're trying to adjust these so that our patients can understand speech and noise better, but we might not want so much noise processing if our goal is more of a therapeutic fitting.

So, if we go into Oticon, they use environments, right? So this isn't necessarily so straightforward, it's gonna be about discerning an easy environment from a difficult environment, and the difficult environment is gonna require more A and R. So, how you adjust this, you've gotta think it through in a different way than just sliding a slider for more noise reduction, less noise reduction. So, just done a little bit differently with them. With the Widex, they have it under speech and noise mode, and we can adjust it from enhancing speech all the way through basically reducing noise so much that we're not even trying to understand speech anymore, we're just trying to keep it comfortable. So we have a lot of changes we can make there.

For the Signia, it is down under the sound equalizer where we can adjust quiet and noisy, and those kinds of things. And then in the ReSound, it is the noise tracker II. So again, just figuring out where you can control these and how much you wanna change it. So it may just be kind of changing it one level at a time to see if that makes a difference for your patient. Okay, this is a tricky one, a low compression knee point. So, as much as my students hate learning about compression, we all know it's really important, right? And it can be a tricky thing for new students to understand, but we know that a lower compression knee point is going to give us more soft input gain, okay?

Which can be a double-edged sword. So to a certain extent, that can help with speech, but at some point for communication purposes, it might bring in too much low-level noise, right? So with tinnitus, because we want to have a noise floor, a lower compression knee point can be helpful. However, not everyone lets you change that. It depends on the manufacturer. So this is something that I still talk to people about, but



just know that your product may not give you the option of doing this. You may only be able to adjust your compression ratio, not your compression knee point. So let's just take a look here. This is Widex, okay? So you can see that you can adjust your compression ratios by proxy when you change your gain at each input level, but it doesn't let you adjust separately where that compression starts, your knee points.

Now, I've had this discussion with Widex years ago and they said, well no, Jennifer, of course not, because our product has always been built on having a low compression knee point. We don't want people messing that up. We know what sounds good, we don't want someone like yourself, so I get that. I get that if their whole platform is built on a particular compression knee point, I understand why they might not want us to change that. It's just good to know which products allow you to do that. The Signia product does allow you to change that. They have two knee points in this particular device, and you can actually change the knee points individually for that.

With the ReSound, this particular one does not. You affect your compression ratios by changing your gain for the different input levels. And I believe it is the same way for the Oticon. So you can see, of the four random ones that I chose, one of them allows us to do it, the other three do not. So, it's not a big deal if you can't, it's just something you might wanna think about. Okay, omnidirectional versus directional. So, we're so used to fitting directionally because again, we're trying to control noise, we're trying to keep sound that's not important behind us or to the sides from interfering with what we're hearing in the front. And again, in tinnitus, we may not want that, we may want more of a noise floor.

So sometimes, you might wanna think about if you're in an automatically changing directional mode, do you want that or do you wanna just freeze it in omnidirectional? Also, some of the directional can get very, very directional. So are we cutting out too much other sound? And that's just something that you can play with a little bit. And



again, have different programs. If you feel like for communication, it's better this way, but for tinnitus, it's better this way, you can set different programs for that. In the Signia, it's here under microphone modes. And so, you can see they give you a nice graphic of what you're changing when you click on the different modes. For ReSound, it's under the little top left pull-down menu here.

You can have a 360 all around, you can have soft switching where it's gonna change, it can be in omni all the time, so you can make those choices. For Oticon, it is under directionality settings, which is at the bottom. And I was kind of laughing with my rep for this company and just saying, hey, it's sort of hidden. And she's a previous student of mine, so I'm like, it's kind of hidden at the bottom. So sometimes, when you're searching your screen for these things, they can just be a little difficult to find. And then for the Widex, it's under the microphone mode, and you can see we've got lots of choices for that as well. So again, not all of these are gonna work for each patient, but this hopefully gives you an arsenal of things to try.

The last thing we'll talk about is the fitting protocol. There was a really interesting article that Grant Searchfield did, that looked at what was preferred by patients. Was it DSL or was it NAL? And I apologize, I always was taught to say NAL. In Singapore, they say nal, so I apologize if I'm saying it wrong, but an NAL target versus a DSL. And they fit a bunch of people and they looked at preferences. And what was interesting was, most people, the majority of people, preferred an NAL target for communication. So if they wanted to focus on speech and speech understanding, they liked the NAL. If they were focusing on tinnitus relief, they preferred the DSL. And those of you who are familiar with these prescription formulas, you can understand why with the differences in gain and things like that.

So, one thing we can think about, again, if we go back to, what is the primary concern? If the primary concern is hearing loss, then maybe we start with an NAL target and see



how that goes. If the primary concern is the tinnitus, maybe we start with a DSL and see how that goes. The beautiful thing is that this is so changeable in the moment, right? I used to feel like once I committed to a target, I had to stick with it forever whether the patient liked it or not, it's like a marriage or something. And then I realized, hey, it's a click of a button. Now, the only thing we have to keep in mind is that of course, if we're changing our whole fitting strategy, we're gonna have to repeat our probe microphone measurements.

And I am a big proponent of verifying fittings for tinnitus, just like you would for anything else, because we don't know what's getting into the actual hearing mechanism. We're just kind of making guesses from our computer screens until we verify that with something. So just keep in mind, of course, that if you switch that, you're gonna have to rerun your probe microphone. But most companies now offer really a whole lot of options for you to choose from. So you can pick all kinds of different things. But again, kind of thinking about, what's the primary goal for my patient? Here we've got for Oticon, you'll see the first one is the VAC+ so that's their proprietary. Now hopefully, I'm not gonna offend any manufacturers, I'm not a huge proponent of proprietary fitting strategies for tinnitus patients, and I'll tell you why.

I'm not saying they're not good. I'm just saying that first of all, they're difficult to verify because we don't have the normative data for those, but also, they tend to be structured for instant acceptance. So typically, we're gonna have a little less gain and usually, if we're trying to manage tinnitus, a little more gain is good, okay? So anecdotally, I find that my patients will get more tinnitus relief if I'm using a DSL or an NAL than if I'm using a proprietary fitting, okay? So just keep that in mind. But certainly, if you're using that fitting strategy and it's working for your patients, that's great. Okay, in the Widex, we see that they have a couple of DSL and an NAL.



And then for the Signia as well, okay? All right so, hopefully that's clear on the different things that we can try, and I'm sorry it's not more formulaic or black and white, like try this first, if this doesn't work, try this. It's really about trying things and seeing what works for your patient, but going into it with kind of an understanding of what you're trying to do and how the circuit might help you do that. Now, if we switch for a moment to sound intolerance, because anyone who sees tinnitus patients knows that a lot of times, this is gonna be part of the package, and it's kind of a frightening thing to have to deal with.

Most people who see you about this are already very much on edge. There's certain tests they don't want you to do because it's very frightening for them. And so, a lot of times, we may have to deal with this first before we can even get to the tinnitus, but that's kind of our first choice. So our first choice is, are we gonna do just a sound generator so that we're going to get them used to more and more sound input over time so that we can increase that dynamic range, basically like physiotherapy for the brain, right? Or do we need to think about hearing aid or hearing aid with additional sound? Okay, so a combination unit.

So, first thing is, do they have hearing loss? If they do not, then you may be fine with just a sound generator. Of course, you can also use headphones and things like that, but we're focusing on ear-level devices today, so sound generators. However, if you begin fitting them and then maybe they're borderline normal, maybe they're at 20, 25 thresholds, and you put in that sound and it's great, except that now they're having trouble hearing soft voices, maybe they do need a little amplification just to overcome the additional kind of hearing loss that's being caused by the sound that you're putting in. And then, can you deal with both at the same time by doing that or do you really have to desensitize the system first and expand that dynamic range before you can even deal with therapeutic sound for the tinnitus?



So just some things to think about when you're trying to choose devices. We also need to think about this whole occlusion versus venting issue again because it's gonna kind of be the exact opposite of tinnitus. Tinnitus, everything is open. I would argue that for sound intolerance, you're usually gonna start with complete occlusion and then you're going to work away from occlusion over time. So, if we fully occlude the fitting, we achieve a few things. First of all, you do get some passive reduction of those sounds that have been offending the person. And keep in mind that most people with sound intolerance have also developed a level of phonophobia. So if they've been driven crazy by certain sounds for a long enough period of time, they become fearful of those sounds.

So kind of like a little bit of an earplug. However, you never wanna plug without adding sound in. So of course, we're gonna use the hearing aid circuit or the sound generator to stimulate at the same time that we're plugging, so that's very, very important. But if we have an occluded fit, we're gonna have control over how that sound is being managed by the amplifier. So we all know that if we can do all the crazy stuff inside the hearing aid we want, but if we fit with an open fit, half of those things aren't even working because a bunch of the sound is getting through to the eardrum through the open ear canal. It's not even going through the circuit.

So by occluding, we're forcing the sound to go through the microphone, go through the amplifier, and then to the eardrum, okay? So, if you have set some of these settings we're gonna talk about in a moment, if you have done all your due diligence on doing that, you're much more guaranteed those things are gonna be working if you're using an occluded fit. And by doing both of those things, you can encourage the patient that they have control, okay? Yes, we're gonna be putting sound into your ears, but you have control. We're blocking out the offensive sounds and we're heavily controlling the sounds that are getting into your ears. So you don't need to worry, we're going to manage that for you.



And I think just that emotional sense of, okay, Jennifer's got this under control, she's not gonna let wild sounds just come into my ear unattended. She's controlling all of this. And then, as their sound intolerance improves, you can open up that fitting and get more and more natural sound in, because of course, at the end of the day, we want them to be able to hear natural sound and or amplified sound and not have a problem with it. Okay, some of the programming modifications that I like to make. First of all, again, if we can lower our compression knee point, but use a higher than normal compression ratio, that usually can be quite effective. So we're giving more emphasis to soft input gain, but boy, as that input gets louder, it's just really clamping down, the compression is really taking care of what's coming in.

It's not gonna let it get too loud. And a lot of us forget, after we fit hearing aids for so many years, that an amplifier can also be a limiter. So we can actually assign negative gain. And we've seen this in our probe microphone measurement sometimes, that sometimes, we end up creating negative gain. So, I like to explain that to my patient that hey, I'm gonna use this circuit both to amplify the soft sounds that we wanna hear, but maybe not amplify all certain sounds or maybe de-amplify certain sounds, right? So again, having that control over the situation. And then, as their sound intolerance improves, of course we're gonna back off those compression ratios because we know it can affect speech intelligibility, right?

So, we're gonna open that up as their dynamic range improves. And then, the other thing I like to do is pay attention to MPOs. And this is something that my students forget even exist. They're always like, oh yeah, we can control those. So, the interesting thing about MPOs is that I think they can be very, very important for, again, creating that sense of, Jennifer's not gonna let things get too loud for me. But if I'm really gonna set them appropriately, I need to have LDL values, and that can be a difficult thing to



test in some of these patients. So I never rush into doing LDL testing on the first visit. I build that rapport with the patient first.

If I am going to do it, I do a lot of counseling first, a lot of education about why I am doing it, why it's important. And I try not to do it until I feel that they're comfortable and ready for that. But having those LDLs is really, really important if I determine that the MPOs are a problem and that I need to reduce that ceiling of what the hearing aid can put out. Now, one thing you have to keep in mind is that we're measuring those typically in HL, but some manufacturers only have their MPOs reported in SPL. I'm gonna show you an example of one where you can switch back and forth, which is nice, but if you do have to convert, there's just this very simple table that you can convert the different frequencies so that you make sure that you're comparing apples to apples and that you're adjusting correctly.

But you can see with the Widex circuit here over on the right-hand side of the red box, that they allow you to switch back and forth between HL and SPL. So that just makes it a lot easier and you don't have to go through those calculations. There's an example in the SPL. But just something to keep in mind. Okay, so I'm sure at this point, people have a lot of questions and I'm excited to get to those at the end 'cause I think that really is the very, very best part. But I hate that we can't all be together today and that I can't see your faces and see how you're understanding this. So I thought we could do just a couple of very simple case studies and because of the Slido that we're gonna be using, they're not super complicated, but I wanna do at least get some feedback from you guys to kind of see where your thought process is at this point.

So case study number one, you have a patient with bilateral high-pitched tinnitus, looking pretty much like something noise induced, and they report that their primary concern is the tinnitus at this point. They have some issue with high-pitched voices when they're in a noisy environment, but really, the hearing is not the primary concern,



it's more the tinnitus. And you're interested in trying some hearing aids to see if you can give tinnitus relief, but then who knows? Maybe you'll get some communication benefit as well. What type of device, hearing strategy, and dome would you most likely choose for this patient? So again, there may not be an absolute black and white correct answer, wrong answer. I wanna see more what you guys would choose.

So would you choose just a sound generator so no amplification and you're gonna do a semi-open dome. So a little bit occluding, okay? Are you gonna go with the hearing aid so you can provide some amplification. You're gonna do an NAL-NL2 and you're gonna do a double dome, you're gonna go full occlusion, okay? Or are you gonna try a combination unit, again, meaning that you're gonna add additional sound in or have the capability, excuse me, have the capability of adding additional sound in later with a DSL-v5 with an open dome. Okay, now again, I was gonna reiterate, nothing about this is black and white, so please don't think that I'm telling you what to do, but clearly, you have absorbed the information in the way that I hoped you would, right?

Yes, you can use a sound generator if you decide, 'cause I see that number going up. You absolutely can try just a sound generator first and no amplification, and I would probably still do an open dome, but you know, again, it depends on what you're trying to do. I would probably do a device that allowed me to have the amplification for the high frequencies and the ability later on to add some sound in if I need that, so that would be the combination unit. I would probably start with a DSL-v5 because that's our primary concern is the tinnitus, and I would do an open dome. But again, every situation is different. So I just like to see that you guys are thinking your way through this, that you're considering your options.

And the nice thing is that we can try it on the patient and see if we're lucky enough to have demo devices and see what they experience. Sometimes my guess is not great and they like something different. Okay, great, so thank you for doing that. Number



two, okay, now we have a patient, or you have a patient, with sound intolerance, and kind of what we would consider normal-ish, right at the bottom of normal hearing across all the frequencies. So you have already fit them and you decided to do receiver in the canal hearing aids. Okay, so you decided to have the option of amplification. I don't know why. Maybe you're like me and you're in Singapore and that's all you have.

You don't have other options. You did double domes for maximum occlusion 'cause you wanna control everything that's going in, but you didn't do amplification, okay? So you're not amplifying right now 'cause you look at the thresholds and you say, they're essentially normal, right? You're using pink noise at a comfortable level that the patient chose in your office. And then, of course, the volume control allows them to increase that at least probably 3 to 6dB as they progress. And then you didn't test their LDLs because they were just still really nervous at the time. And you said, that's okay, we can worry about that later, okay? And you're not using amplification right now, so not a big deal.

All right, they come back in a month and they say that, boy, I really like this pink noise, it's very comforting. I've been able to increase the volume a couple of steps. so maybe a few dB. However, when I'm using that sound, and because of the occluding domes, I'm having some difficulty hearing soft conversations, okay? And then, occasionally, even though for the most part it's pretty good and they feel under control, occasionally, a loud sound will still cause them some discomfort. Okay, so their examples were traffic horns, their children screaming or an ambulance siren. So these are are certainly loud sounds, but they're kind of getting through the devices. So, this is just a word cloud.

What adjustments would you like to make? Wonderful. And clearly, the big one here is amplification, right? So, you got it. You got my very first one. The first thing I would try would be to give them a little bit of amplification to just overcome the fact that now that



we're putting sound in and we're blocking their hearing off, they're struggling a little bit with speech. Now, I would certainly focus on soft gain, okay? So the whispers, the soft talkers, stuff like that, I'd probably give little to no gain for the moderate sounds and certainly, the loud inputs may even be reduced gain, so negative gain, okay? But that's very important. Now, the reason I wouldn't go to an open dome yet, and I understand why you guys are saying that, is that, hey, if we open it up a bit, then they're not going to have that problem.

Now, it is possible that if their condition is not that severe, you might be able to do that. If they're doing well now with the pink noise, you might be able to just not do amplification, go straight to a more open dome, let more sound in, but they're still able to increase their pink noise. That may work great. But where my thinking was going was, hey, let's still control everything coming in, but let's give a little amplification for the soft sounds. Bunch of you mentioned measuring LDLs now, right? Now we can explain it to 'em, they can understand what we're trying to do, and then we can use those LDLs to adjust the MPO values. And my guess would be, because of the hearing loss, my guess would be that we're gonna maybe have to, not just the hearing loss, excuse me, but also the sounds that they reported as problematic, you're probably going to be adjusting the high frequencies more.

That's just a guess. And then, what you might also wanna consider is that because they've already increased their volume on the pink noise a little bit, see where they're at in that range. You might actually wanna bump up their base, their default level, so that now they have more that they can increase. And then eventually, you could even change that from a pink noise to more of a white noise, something a little harsher that's going to drive the system a little harder, okay? So you guys did great. You got all of my suggestions. And again, I just like to see that you're thinking about it, you're using that information. A lot of you may already be doing these things in clinic, but I think it's just



good to, instead of panicking when these people bring back problems, just having some things that you can try.

Okay, so the key points I'd just like to remember about this population, and I know you guys already know this, is just that each tinnitus patient is so unique and they just require us to be very flexible, right? So, I consider those of us who do tinnitus, we're kind of the out-of-the-box thinkers. And whenever people look at my fittings, they probably are like, what on earth is she doing with this? So, we just have to be a bit more flexible. We have to make sure that the devices we're fitting, no matter what they are, are meeting the individual needs for the hearing, the tinnitus, and the comfort, the sound intolerance. So we've got a lot of targets that we're trying to hit at one time.

I do still really, really firmly believe that probe microphone measurements are really important whenever possible. Now obviously, double checking your MPOs could be a little hard on a sound intolerance patient, that may have to come later. So as we're adjusting the MPOs inside, we are guessing at that sometimes, but at least measuring your soft gain, hopefully you can get your moderate gain. You may have to wait to get your loud gain later, but anything that we can verify I think is good. Multidisciplinary care is always best, I think we all know that. So the nice thing is, we don't have to work in a single file line. We can be working on all of this with our patients while they're also seeing a psychologist, or a psychiatrist, or an ENT doctor, or whoever they need to see to be managing some of the other issues as well.

And then, I always tell my friends and colleagues and students this, that you know what? I really would love more people who focus on hearing aids to know how to fit hearing aids for tinnitus and sound intolerance. But a lot of my friends tell me, Jennifer, you're crazy. I don't necessarily want to do tinnitus management. That's okay. You can still try some of these things, and if at some point, you just feel like you're outta your league, you can punt it to someone crazy like me who really enjoys this kind of stuff.



But I think there's so many, many patients that just following some of these simple rules can really make your normal hearing aid fitting just a whole lot better for their tinnitus in that moment.

And then, who knows? Their tinnitus may improve so much that you can go back to fitting them like a normal hearing aid patient at some point. So, I really appreciate everyone listening, and I really appreciate people who are willing to try some of these crazy things. And here's some references in case you wanna read up on any of these things I've mentioned. And I just very, very much appreciate your time, so thank you so much for being here today. Okay, and I think we have some time for questions. Can you say if and how you might adapt your fitting for someone with PTSD and auditory hypervigilance? So, first of all with PTSD, that is actually one of the big components that the Progressive Tinnitus Management program addresses.

So if you see a lot of PTSD patients, I would really encourage you to go in and read some of their literature because of course, being at the VA, they see a lot of patients with PTSD. So everything that we're doing has to have an additional level of caution, and concern, and care, right? Because any of these changes that we're making could set off an emotional reaction that we're not expecting. So I would say that your process is going to be slower, especially for sound intolerance. Your changes that you're making, your increases, your desensitization over time is gonna be much, much slower. So, I think that with this group of people, hopefully, you are doing your part, but also you have a psychologist on board who's working with you at the same time or with the patient at the same time to make sure that we're addressing the hypervigilance, addressing the PTSD issues so that that doesn't fall completely on you to do that.

Do patients complain of own voice concerns when they are more occluded for sound tolerance issues, even without amplification? Great question. Spot on. Yes, they can. Typically, if I am managing somebody for sound intolerance, they are so bothered by



the sound intolerance, the stuff coming from the outside, the sound of their own voice is minimal to them. That's the least of their worries. So as long as I'm educating them on why that's happening, it's not a permanent change. As soon as we can graduate into a more open dome, then things will improve. Usually, it's not a big deal, okay? But you're right, it absolutely will probably be a conversation in your counseling part with them. Can you review fitting musicians with tinnitus again?

Okay, when you're thinking about therapeutic sound, think about, is that really going to be, if you wanna do a soothing sound, is it gonna be soothing for them to listen to music or is that too much work? Also, think about your hearing aid circuit. I have just naturally noticed over time that certain makes and models seem to appeal to musicians more. And I don't wanna name names, any of you are welcome to contact me offline, we can talk about that. But you might see over time that you're like, hey, this particular circuit just seems to be accepted by musicians. And sometimes, it's the circuits that actually mess with the amplification the least, so they don't over process.

They keep the purity of the sound, kind of like an LP versus a CD, right? So definitely are some specific concerns for musicians. And I think also you need to be open to having them bring their instruments in. Okay, have you heard of music ear syndrome? If so, what do you recommend for patients who have it? Yes, we have been lucky enough to see patients with this situation. And I think that the biggest thing that I recommend is figuring out, first of all, what's happening. So I know, especially in Singapore, I would just get people sent to me with auditory hallucinations, they're hearing things. And the first thing we'd have to figure out is, is it a psychotic episode because I shouldn't be dealing with that, right?

Or is it some kind of music ear syndrome, something less harmful, that is usually some sort of memory loop, right? It's an auditory memory loop that just gets sort of stuck in the system. Now sometimes, the reason it can get stuck in the system is that this is



kind of an early sign of some cognitive changes. So sometimes, when we send these people for cognitive testing, we find out we've got some early dementia going on or things like that. So, I'll use a lot of the same strategies. I'll use sounds to help stimulate their brain in a different direction away from the sound that they're hearing. We'll sometimes use, if we do think it's something more cognitively based, we'll use multimodal inputs.

So we have them listen to sound with visual stimuli and with writing things, or you know, like, gosh, what are some of the examples? We'll have husbands and wives sit at two opposing computers with the same image, and the wife has to explain to the husband, like, describe a picture without telling him what it is. And then he has to try to guess what the picture is. And then, doing crosswords online, but discussing it. Like anything that we can do where they're using vision and audition and even tactile information to try to stimulate as many sensory inputs as we can, we found, over time, can be helpful. But as far as the actual sound that you're putting in, you're still gonna follow kind of those basic rules.

And occasionally, you'll have people who, once you explain what you think is happening, they'll say, oh yeah, you know, I kind of like my music. It's not a bad song and it's kind of my friend now. And once you realize it's not a medical condition causing it, that it's just a memory loop that is being triggered, they may not even want to deal with it. One patient I had said that it wouldn't bother her so much except it was a country song and she hated country music, so otherwise, she would've just ignored it. So, I think you just have to work a little harder to get to the bottom of what you think is happening and then it will become more clear how to follow up on that.

Wow, you guys must see really interesting patients. This is great. Do you formally assess tinnitus patients before tinnitus management and fitting to determine how successful they will be with devices versus maybe psychology therapy without



devices? We do a pretty thorough assessment as far as lots of questionnaires. They're usually, in Singapore, they were usually coming to us already having had a medical evaluation. And if we felt that things were missed, we would send them back. In Portland, we had our own physician, so that was fantastic 'cause we could just simultaneously do the medical and the audiological part. And we used to do the loudness matching, the pitch matching, the minimum masking levels, all of that. We had already decided in Portland that that information, although interesting, didn't always drive how we manage the patient, so when we moved to Singapore and our time was really, really cut down, that was one aspect that I decided to let go of.

But we had tons of questionnaires, which some people, kind of turn up their nose at. But for us, the history is everything. So really, really determining the history. And part of that includes psychological screeners. So we use the Hospital Anxiety and Depression Survey, the HADS, and we use the TFI, Tinnitus Functional Index, for the tinnitus severity aspect. And I would honestly say that most of the time, we are managing in multiple directions at the same time. So I rarely say, oh, I'm gonna fit hearing aids, then we'll send to psychology or vice versa. We're usually doing those things all at the same time because we really feel like the more aspects you work on together, the faster the patient's gonna get better.

Now, there are gonna be exceptions to that. If they're suicidal, clearly they're gonna go deal with that first and then come back to me. Or if they have a major medical problem that's causing all this, we're gonna deal with that first. But I appreciate your question because sometimes it's hard to figure out, what do I focus on? And I would say, focus on what you do best and then farm them out for all of the other things, but don't be afraid to do it simultaneously. Thank you so much for having me. I really am so excited that people out there wanna learn about this stuff, so thank you to everyone who came today.

