# Hyperacusis and My "Misophobia"

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- [Christy] At this time, it is my pleasure to introduce our presenter, Dr. Richard Tyler. He's gonna present to us on a topic of hyperacusis. Dr. Tyler is currently a professor in both the Department of Otolaryngology Head and Neck Surgery and in the Department of Communication Sciences and Disorders at the University of Iowa. His scientific work includes quantification of tinnitus, as well as the development of different treatments. Dr. Tyler has served on committees from the National Science Foundation, the World Health Organization, as well as the American Academy of Otolaryngology and the Veteran's Administration. Welcome back, Dr. Tyler, and at this time, I'll hand the mic over to you.

- [Richard] Thank you. I'm glad to be here and hope I can be helpful. I'm gonna start off just saying it's a good thing that so many people are now interested in hyperacusis. We have a great opportunity to help a lot of our patients, that in the past have not been helped usually. And because the field is changing so much, helping other patients and letting the world know that you are interested in helping patients with hyperacusis will be good for the patients, 'cause you'll be able to help them and hopefully good for you as you expand your practice. So, I also want to acknowledge that Ann Perreau from Augustana College has also helped in the updating of the hyperacusis activities treatment and I appreciate that. So, we're going to review today a number of different aspects of hyperacusis, including the different sounds that can be a problem and provoke the way that I like to classify this, as having experiences in distress with the loudness of sounds, avoiding different situations, being afraid of going places and actually experiencing pain for moderately intense sounds. In addition to the counseling strategies here, the application for hearing aids has a great potential and also sound therapy. Also, a lot of patients will come in and use hearing protection and that might also be used in some situations to help some of these patients at least a temporary way. We have developed what we call hyperacusis activities treatment to interact with the patient in a formal fashion, in a systematic way it can be adapted for other patients, including a group session, which I will go into as well. So, again, I'm glad that you're all interested and it's a great potential for the field. So, hyperacusis are reactions to

moderately loud sounds that are perceived as being too loud or being annoying, create fear and some people avoid going places because of their fear, or they are experiencing pain from moderately loud sounds, which can be very, very distressing. There's lots of different surveys and lots of different varieties of ways of asking these questions. And so, the actual effect on the general population is not terribly clear, but we know it's widespread, it's invisible and we do see a lot of patients come in with hearing loss and tinnitus that also have hyperacusis. So we know it's out there and we know that our patients can benefit from our help. So there are lots of other terms that have been used or that are currently being used and there'll probably be new terms next month as well. The term hyperacusis has been used for about 70 or 80 years, but people also come up with new clever terms to try and attract attention in my opinion. These terms include select sound sensitivity, hypersensitivity, misophonia, exaggerated sound response, decreased sound tolerance, phonophobia. And all these different terms that are floating around, I think is a bad thing for the profession, it's confusing for the patients.

Sometimes we have a patient that will say, "Well, I don't have hyperacusis, "I have decreased sound tolerance." Or we get a phone call from other health care professionals saying, "What's phonophobia? "I've never heard of that before." And I think it's gonna be helpful if we stick with a simple term that's been used for a long time, hyperacusis, that has been used and documented for over 75 years and is pretty straightforward in terms of what it means. So, we choose a simple term with a clear distinct definition and please avoid temptations, for everyone, to make up new terms as we go along. This, I believe, is helpful to our patients, audiologists, other healthcare professionals we interact with and the general public. We want them to be aware of what the consequences are and how we as professionals can help people with hyperacusis. So, different types of hyperacusis, loudness, annoyance, fear and pain. So the people that have loudness hyperacusis experience moderately loud sounds as being way too loud, annoyance hyperacusis is people that find moderately intense sounds as being annoyance. Fear hyperacusis is people that become afraid of sounds

because they know they're gonna experience them and pain is when people actually experience pain. These things are not mutually exclusive, they're just different ways of understanding and documenting and appreciating the different ways that people can experience these things. So, it's important to have a broad perspective and try and help the patients understand what the different symptoms are with people with hyperacusis. So this is a description of the relationship between the intensity of a sound shown on the x axis and the loudness of a sound on a scale from zero to 100, so these are arbitrary scales. Normally the line depicted by A is the relationship between stimulus level and the loudness of the sound. And so, we've defined this as zero on this axis being thresholds for normal listeners and 100 being uncomfortably loud sounds for normal listeners, that's A. So B is when somebody has a hearing loss, in this example, a 40 dB hearing loss, and they have loudness recruitment. So as you increase the level of the sound, the loudness increases rapidly and their perception of the uncomfortable loudness level is also at 100 on this scale, the same as it is for a normal hearing individual and we call that loudness recruitment.

Somebody who has loudness hyperacusis often also has a hearing loss, in this example, about 20 dB, and their perception of loudness increases even faster than somebody with recruitment. In their perception of loudness, their maximum loudness occurs, even at lower loudness intensity levels. In this example, 60 dB above threshold. So that's the definition of loudness hyperacusis. Hypersensitivity, which we never mentioned or measure, is people that have normal hearing thresholds less than zero dB, but there's no evidence to suggest that they actually have hearing thresholds that are loudness recruitment or loudness hyperacusis, more often than somebody with a hearing loss. If I said hearing loss usually occurs with hyperacusis and with loudness hyperacusis and with loudness recruitment. So pain hyperacusis, we don't see as often, but it is a little more challenging and I just have a few definitions here from a few patients to share, some of the disastrous notes that these patients have. These are example of patients who share their pain hyperacusis as being like a dull ache or a wound. "The sound of putting on clothing "feels lightly blowing in an open wound. "My

ears feel raw and vulnerable to sound "as if they were an open wound." "Setting a coffee mug on a wooden table "feels like a thumb pressing hard on a broken bone "deep in the ear." "Walking on gravel feels as if "I'm pressing the gravel into my wounded ears." So these are just examples, real examples, of individuals that have pain hyperacusis that I've grouped as an example of describing their hyperacusis as having a dull ache or a wound. There are many different categories one could come up with for pain hyperacusis, but this gives you a general idea of how some everyday sounds can be very, very distressing for these people with pain hyperacusis. Indeed there are individual groups online that have formed pain hyperacusis clubs and groups that try and help each other, but these pain hyperacusis people are very, very desperate and I'll talk more about that as we go through this. So, the mechanisms.

So I'm just gonna say at this point, that no one knows for sure, just like tinnitus. We talk about it as if there's one thing, but there's probably many different subtypes of hyperacusis and many, many different mechanisms. There's lots of people doing brain imaging and scans and trying to understand what the different mechanisms might be with hyperacusis. But at this point, the simple answer is we simply do not know. I will go into, later, some potential mechanisms and some things we share with the patient because it's often helpful to have some suggestions to talk to the patient about. But basically, we really don't know what the mechanisms, again, plural, what the mechanisms are contributing to hyperacusis. The different causes are somewhat documented, so I often like to make the distinction between noise, continuous noise exposure and impulsive noise exposure. But noise is probably the most common cause of hyperacusis. These are descriptions the patients make, and so, they're not always clear that they're actually related to the cause, like the aging process, but it might be Meniere's disease. It's also interesting that a lot of them feel like that it's caused by anxiety or depression. Though, again, that might be resulting from their hyperacusis. Sudden hearing loss is another common thing that patients actually report as consistent with the onset of their hyperacusis. There are lots of medications that result in hyperacusis and tinnitus. And as I often tell the tinnitus patients and

hyperacusis patients, that when people are taking two medications, the interactions between those medications are not always clear and the pharmaceutical companies are not required to document and explore what kinds of side effects interactions between medications can't take. And again, lots of other causes and individual causes that might relate to hyperacusis. So in some early work we were doing on tinnitus, we noted that the loudness discomfort levels on some of these tinnitus patients were very, very low, 60 or 70 dB HL and this occurred in several of our tinnitus patients. And so, it does appear that there is a link, in many patients, between tinnitus and hyperacusis, and this suggests that at least in some subtypes of hyperacusis, there is a common mechanism involved. And what that might mean is that there is a mechanism, something going on that produces both the hyperacusis and the tinnitus at the same time, and this might indeed result in the hyperacusis and tinnitus, and so, it's interesting to explore this. And of course, people working on animal models can try and explore this to develop their animal models.

But it's also true that there are a lot of people that have hyperacusis without tinnitus and a lot of people that have tinnitus without hyperacusis, and again, hyperacusis without tinnitus, so it's complicated. There's lots of different surveys, and again, I'm not quite sure that the surveys are clear. There's quite a broad range in the results, but it does clearly show that patients with tinnitus often have hyperacusis and maybe up to 40%, probably less than that. There are patients that have hyperacusis and if you ask them, a large number of them actually also have tinnitus. So, again, an overlap at least in some of these patients that result in the hyperacusis and tinnitus being linked in a lot of these patients. This is something we asked our patients that had hyperacusis and we asked them if they had hyperacusis, if they had tinnitus and it turns out that most of them, in our case, you know, over 90% of them said they also had tinnitus. And again, with the surveys, it depends how you ask the questions and what the context are. So, lots of different issues. We also ask patients if they had anybody in their family had hyperacusis and it turns out that much to my surprise, some of the patients said indeed, there is other people in my family that also report that they have hyperacusis

as well. It was a surprise to me. It seems like it's unlikely that there's a genetic basis for hyperacusis and unlikely for tinnitus also. It is worth noting, of course, that there are many families that both members or several members of the family work in a noisy factory, and therefore, they likely have... Likely have shared exposure to noise, which could cause. But there are also, again, hyperacusis is a little different, so there are some syndromes that go along with this, that result in this, and so, there might very well be some experiences where hyperacusis in some cases is passed along with one to the other. The other interest, one of the amazing things, is that there are... Some patients have told us that they have hyperacusis in only one ear and that really shocked me when I first heard that.

So we actually did a little survey and much to my surprise, we indeed found that although most patients, of course, have the hyperacusis in both ears, there are some patients that hear hyperacusis in one ear and that completely shocked me and I really didn't understand how that could be the case. One of the questions, you know, so there must be something going on in one ear that's not happening in the other ear and I saw one question is, you know, maybe one of the symptoms of superior canal dehiscence has been identified as causing hyperacusis in some patients, and so, that could be a reason. But for the most part, it's just a real shock that some of these patients, to me, have the hyperacusis in only one ear. But again, there might be something that is affecting the auditory system and not in the cochlea or that side of the brain that's not affecting the other side of the brain. So that's a peripheral source in some ways, compared to the brain reorganizing and relaying the sound to other system. The other interesting things about this hyperacusis is the relationship to other sensory systems. We often heard patients complaining, not just about sound but other things, so we did a survey and asked them about, for example, their relationship with smells, and so, 118 of them out of this sample size of over 300 said that smells aren't a problem. But many patients said that in addition to their hyperacusis, they were bothered by cigarette smoke, cleaning solvents, pesticides, car exhaust, paint fumes and a variety of different things. So it's a bit of a surprise that it's not just about sound

in some patients, it can be affected in lots of other ways as well. Indeed, there are patients who said some foods, sour foods, pepper, spices, these things affected their smells. Their effect on their tastes were also affective and related to their overreaction to the hyperacusis related to sound. So the measurement of hyperacusis, we don't do this for every single patient, but it is important to appreciate that it can be done. And for some of the patients, knowing that it can be measured actually helps them in the counseling framework. Some of the patients will say, well, and this goes for tinnitus as well as hyperacusis, "You mean you can measure this? "I'm not making this up, this is real?" And so, that often helps patients when you can help them show that this is something real, they don't have a mental illness and it can be measured. So we usually measure loudness discomfort levels by increasing the level of a tone until the person says its loudness is discomforting and that can be a real dangerous thing for patients with hyperacusis.

And so, we actually do this with pure tones, but also instruct the patient beforehand that we're gonna proceed from a very low level and increase the level very slowly and ask the person after they hear our tone to assign a number from zero to 100, where zero is the softest tone they could imagine and 100 is uncomfortably loud. But we're never gonna present anything over 80%. We're gonna start off at very low levels and gradually increase it five dB at a time and as soon as you say it's at 80% loudness, we'll stop right there. Now in some patients with severe hyperacusis, then you could stop at 70 or even 60% instead of 80%. But you don't have to find the loudness discomfort level as you might do in most patients without hyperacusis to help set the hearing aid, for example, but you can document that their loudness discomfort levels at 80%, for example, is at 60 dB HL at certain frequencies. So this is a way of measuring these loudness discomfort levels. They are also questionnaires and I'm not gonna go into this a whole lot at this point, but there are, now, probably at least 20 different hyperacusis questionnaires and they'll probably be a couple more next year. I think that my approach is to keep it simple and clinic and I'll just show you some of the simple questionnaires we use and just talk about some general ones. This is one that

we first developed with tinnitus patients and have adopted for hyperacusis patients. It is useful because we let the patient tell us what they think is important. We might develop a very clever questionnaire but miss some important things that the patient feels is very helpful to them. So, in this case, we have them make a list of what is important to them. What problems do you experience as a result of your hyperacusis? And we can send them to this questionnaire electronically, before they come into the visit in our clinic or we can have a paper copy that we can hand to them when they're in the waiting room. And this is an opportunity for them to think about what's happening and an opportunity for them to share with us what's important for them.

And so, the example we give here is I just don't go into restaurants anymore, so there's an avoidance type thing, and a fear. The sound of dishes clanging is the worst, so now we know what specific sounds that this person is bothered by as a starting point. As I mentioned, lots of hyperacusis questionnaires and several more. We're not gonna recommend anyone in particular. The ones we use are available online, which I'll talk about later, just on our department line we use clinically, many different versions of these available. Some that we use in some situations is this example, which of the following sounds or events are often too loud for you? And so, these covers and things that we found are commonly reported by patients, including babies crying, crowds, dishes being stacked in the kitchen, dogs, music, of course. A lot of people with experience in listening to loud music over the years or being or performing in a rock band come into the clinic with hearing loss, tinnitus and hyperacusis and that's often got in the way of their life. Restaurants, sporting events, whistles going off, so these are all common things that they have reported that these sounds are way too loud. We also look at how that's affected their life. And so, in this context, which of these sounds has meant that they avoid going places because of these different sounds? And these are the same sounds we've recorded in the previous questionnaire. But again, gives some idea of how these patients have been affected by their hyperacusis. We also wanna know specifically which makes their tinnitus, their hyperacusis worse. Dogs barking, large crowd, loud voices, sharp noises, which we'll come to again, whistles

and sirens. We also actually want to be in a better position to help them cope with this, and so, we wanna know are there some situations where your tinnitus is not so bothersome? And this could be an important starting point for the counseling strategies that we'll get into later. So, is your hyperacusis better when you're in a quiet environment? When you're feeling relaxed in general? After you've had a good night's sleep? When you're in the background of using a low level sound and you don't notice your hyperacusis? That actually could lead the way to providing sound therapy for these patients. Getting involved in different activities and I'm gonna talk also about stress reduction exercises to help people cope with their tinnitus. So it's important to get a general feel for what situations they don't notice their hyperacusis in and they are feeling better about things. And the gain, that's gonna provide a stepping stone into the counseling strategies.

So these are situations where their tinnitus has been bothersome in terms of their loudness, annoyance and fear. So these are the results we've got from these patients. So you can see crying, lawn mower, dogs, restaurants, dishes. These categories here are all pretty common and one of the things that I've noted over the years is that these are generally sounds with a rapid onset time. And also things that the patient doesn't have any control over and I think those are two important factors that often lead to a distress in these hyperacusis patients. One survey done many years ago, consistent with our comments we just made, loud music, horns going off, a door slamming, the sink. I often hear people talking about the kitchen and dishes going on, of course police sirens. Patients often talk about restaurant noise and they fear going to restaurants. So these are all reports that other people have noted in this hyperacusis group. Interestingly, people come in often who have experiences playing in bands or even in orchestras, and in this survey, we show people experienced tinnitus after these rehearsals, but also some experience hyperacusis, in this case, quite often, after being exposed to noise after playing in a band, so that can be common as well. So, it's really important. We're all different, we all react in different ways and we need to understand these individual differences as a stepping stone for understanding how we can help

these patients. So we ask them if they've had any treatment, and of course, many of the patients come in, they've tried dietary supplements, they've been on medications. Some of them have told us they'd been to psychologist or a psychiatrist. Some of them have tried the wearable sound generators before. So these patients have often been a lot more active and aggressive in searching for treatments than our tinnitus patients. And knowing what they've already tried is, and again, an important first step here. It's important to know also that how they've dealt with this and how long they've had it for and is it staying the same? Is it getting better or worse? And much to my surprise, compared to our tinnitus patients, most of the hyperacusis patients say it's not getting better. In fact, most of them actually say it's actually getting worse.

So this is a surprise compared to tinnitus patients where we have shown that for most tinnitus patients, the reactions that they have are worse in the first six to nine months. And I tell the tinnitus patients that's a normal reaction that something has happened to you, you hear a sound that nobody else hears. Is it my fault? It's not fair. Is it ever gonna go away? Do I have to live with this forever? So those initial reactions are reasonable. And then after the first six to nine months, the tinnitus patients often say, okay, well, everybody in life has challenges, and you know, maybe I'm just gonna have to deal with this as best I can. So the tinnitus patients tend to, not everybody of course, but tend to react differently and cope better after the first six to nine months. That doesn't happen in the hyperacusis patient. The hyperacusis patients, it seems like they're less easy to adapt to hyperacusis and maybe it gets worse over time. I don't know if it's a bias but it certainly is true that these hyperacusis patients, in the first, in this case, 20 years, some of these patients, their hyperacusis ratings are very, very high and it doesn't decrease as the duration of the hyperacusis increases, and this is exactly opposite to what I've seen in our tinnitus patients. So these hyperacusis patients are not coping over time, the same way that the tinnitus patients are. And a lot of the patients come into the clinic wearing hearing protection, and so, this shows that more than half of patients with hyperacusis have actually tried hearing protection and we'll talk about how that can actually get in the way and also can be helpful in different

patients. I mentioned that we ask the patients if anything makes it worse and some patients say no, but most of the patients here by the far part, far grade, most patients actually say the sharp noises and whistles, loud noises, dog barking. So a lot of unpredictable rapid onset times make their tinnitus worse. Again, when we asked them about what makes it better, so this is important because we wanna be able to use this information in our counseling and maybe to suggest things that they haven't tried before. Well, of course, removing themselves from the noise is what most of them try and do but it's also worthwhile to note that if they're feeling relaxed and they've had a good sleep, if they can play soft music, which is a good starting point, again, to using sound therapy, stress reduction exercises. So in our hyperacusis activities treatment, we'll talk about this a little bit more about how that can be used. Again, some of them have been to counseling, reading, distracting themselves. Interestingly, some of them have said that taking medications and supplements make them better, although there's no good evidence to support that,

Again, everybody's different, and so, we tend to group all these hyperacusis patients the same. But clearly some do report that having some experience with medication and things can be very, very helpful for them. So, now we'll go on to the foremost things that we do in our clinic that we refer to as hyperacusis activities treatment. So, I'll say that I have a group session about once a month with tinnitus and hyperacusis patients. We have a brochure that we send out, and usually, patients have to pay for this, they can bring in a partner at no extra cost. In the brochure, they can Use phone counseling, they can have individual sessions, but we try and encourage people to start off with our group session. It's usually about 10 to 12, 15 people and we go through and have these slides, there are pictures that we use to go through this. And following the group session, if that's what they choose, it's up to them, they can go through the individual session. The individual sessions we have in our hyperacusis activities treatment, divided up into four groups based on thoughts and emotions, hearing, sleep and concentration. We usually break this up into four different sessions with about two weeks in between, they have homework, they practice in the clinic and

they go home, they come back in two weeks and we go over their homework and then start the next session. Although everybody's different and we can move around if they don't have any problems sleeping, we can ignore those sessions if they... If they prefer, we can do, if they live far away, for example, we can actually do all four sessions in an hour, if needed. So we can work this into different sessions. The advantage of having a picture-based system is that it helps me organize things, although I can shift them around if necessary, it makes it easier for me to remember all the things that I wanna say in the individual counseling sessions, it also is easier for the patient to follow the different concepts that we're using. So we like to use our hyperacusis activities treatment pictures and these are all available online in our department's website, you can download for free. For the sake of time, I'm just gonna show a few of these here to give you an idea of the kinds of things that we work with. So to begin with, it is important to interact and connect to the patient.

So instead of me thinking that I know everything about hyperacusis and I'm the expert clinician, I wanna start off being a good listener, I wanna know what they have experienced with their hyperacusis. How long they've had it for? I can ask them did they hear it in one or both ears? I wanna be a listener. Are there any sounds that are too loud? Are some sounds annoying? Are you afraid of going places because of some of the sounds? Are some of the sounds painful? So I wanna hear the patient out and see what they're going through. I wanna know if there are times during the day when they're particularly bothered and I want to know what there are times when they're not bothered. What do they do? And this, again, can be a stepping stone for understanding them and understanding what kind of treatments they need because not one thing is gonna work for everybody, we have to gear the treatments to the individual challenges they've had. I wanna know if there are episodes that are triggered and how long those episodes last for. So I'm looking for the individual challenges here that people have and the different ways that I can help and focus on what might be the way to move forward with this. So I'll go over the audiograms with them and I'll go over pictures of the ear, they probably have had this but sometimes I'm surprised that some

of them really don't know very much about how the ear works. So I will review briefly the outer ear and the middle ear and then I'll talk about the central nervous system and the hearing nerve, how it's connected, and talk about the cochlea and the basilar membrane, and again, just showing you some of the slides here. We wanna make this real and make sure we connect with the patient. We talk about the outer hair cells and we talk about the nerves that code information and have this activity on the nerves that is sent up to the brain and that activity is a function of actually how we hear. So it's important to show the patient and to help them understand how the auditory system works. So we note that there is spontaneous activity and I talk about these little action potential, sometimes I say it's kind of like a flashlight going on and off. And the purpose of going through these things is to make them see that, in fact, they are experiencing something that is real, they're not making this up.

So for soft sound, there's low levels of activity, as the intensity of the sound goes up, our activity increases even more, and because you have hyperacusis, the activity on some of these nerve fibers increases quite rapidly. And so, your experience in moderately loud sounds can be the same as somebody with normal hearing and how their brain is activated, to loud sounds. Another way that I try and explain this to patients is that because you have a hearing loss, your brain is actually amplifying, you're searching, your brain is searching for activity and what that means is that there's some extra activity going on in your brain and that's what's the cause of your hyperacusis. So this is of course somewhat theoretical in a simplification of things, but it's a way of connecting to the patient and showing the patient that they're not making this up, they don't have a mental disorder, there is something going on in their auditory system, something going on in their brain that is making them hear moderately loud sounds as too loud. And this is a... For many, many patients, this is somewhat of a comforting example of how they're not making this up. Another thing we talk about in our review of these hyperacusis activities treatment as a way to encourage them to use sound therapy is the analogy with sunburn. So for some people, when they're exposed to sun, they get sunburned and that's an overreaction of their skin. If you protect

yourself from the sun, in this case, by wearing a coat, then that doesn't really help you when you do decide to go in the sun, you still expose yourself to the sun and your skin's not used to it and you get sunburned. However, if you start off using gradual exposure with suntan lotion and go through that gradually and limit the activity and limit the activity and allow your skin to adjust to that gradually, then it may very well be that you can get a nice suntan if that's your goal. And the analogy with low levels of sound is that you might actually be able to equip your brain to cope with the intense sounds and loud sounds and different sounds even if they're not loud by a gradual exposure to those sounds and that's part of our sound therapy strategy. So, back to the slides that we use in general, different causes of hyperacusis, head injuries, car accidents, for example, noise exposure, the common one. What do you think caused your hyperacusis? The different reactions people have, emotions, hearing and communication, sleep and concentration. What is your experience? What kind of problems has hyperacusis caused for you? There are options to help you with your hyperacusis, counseling.

We're gonna provide hyperacusis activities treatment. You can also benefit from earplugs, at least sometimes you can benefit from earplugs with hyperacusis. There're lots of sound therapies now available that can help some patients with hyperacusis. We're gonna go over some potential relaxation exercises that can help everybody. There are medications that don't cure the hyperacusis, but can be helpful in the short term. And it turns out that much to our surprise that if the hearing aids are fit properly, although they can amplify sounds, they can also, when fit appropriately, help patients with hyperacusis. So hearing protection, earplugs are good to reduce noise exposure and important for everybody to wear in noisy environments when cutting the lawn and vacuuming the house. And so, for patients with hyperacusis, it's okay to use earplugs in some environments. And sometimes we recommend musicians ear plugs, which of course are not as effective in the high frequency regions, but reduce things at all frequencies at the same amount which might help them with speech communication better than traditional earplugs. But keep in mind, the earplugs are gonna reduce the

level of sounds and they could get in the way of communication and cause their own difficulties. And the use of earplugs does not let your brain get used to hearing these normally loud sounds, so we have to be somewhat cautious in letting you use earplugs all the time, that's not treating your hyperacusis. So we'll talk about how that can be used in some situations a minute. So lots of patients actually say that they can benefit from sound therapy, and sound therapy can be used, a lot of you actually use low-level sounds in the background and let your brain get used to those moderately loud sounds. And of course, there are wearable devices now that a lot of patients are using, not just the sound pillows and sound generators, there are apps that can connect with your, compute with your phones and wearable devices to help patients with hyperacusis, and now, I'll show you some data supporting this as well. So not everybody is the same, not everybody benefits from this, but a lot of patients do benefit from sound therapy.

For the sound therapy, we like to start off with a very low level of sound and then gradually, gradually over time, sometimes several weeks, sometimes several months, increase that noise level so your brain adapts to it. An example here, and this is an example of how we use cognitive behavior therapy, there's a dog barking, it's not your dog, you don't like dogs. You turn on a low-level fan in the background, you keep yourself busy at work, and eventually, both the sound and the dog actually blend into the background. An example of sound therapy, gradually. We also explained in the clinic and how patients do some of this from homework, everybody's different, progressive muscle relaxation. So they will learn to intentionally make some of their muscles more tensed, and then gradually reduce that tension over a few minutes and that can be helpful and I'll demonstrate that in a minute. So, for example, what I often demonstrate to patients, again, in the clinic, is that okay, start off with... Clenching your... Clenching your fist and then slowly, slowly release that. So, for example, here's something that you can all do, start off with your, open up your hand and slowly, slowly make a fist and tense that fist for 15 seconds. And then gradually, gradually focus on that muscle tension, and gradually, gradually release your arm, release your muscles

and breathe deeply and focus on your muscles. And during that experience, you're not focusing on your hyperacusis, you're not focusing on the stress and tension in your life, you're focusing on something else. And people do this in clinics for mindfulness and meditation and all kinds of different things. We're all different, different people can benefit from these things in different ways. They don't work for everybody but it's important to give people some options. Another option is deep breathing exercises. So, again, you can sometimes close your eyes, breathe deeply and focus on your breathing, not focusing on anything else in your life. One of the things I like to do when I'm under stress is visual imagery. So focusing on something, usually closing your eyes and imagining you're on a beach in Jamaica. Think about the sand that you're touching with your feet. Listen to those waves, smell the water in the surf, relaxing and focusing on that. And when you're focusing on that, and again, patients can do this over half an hour, over five minutes, people can do it at home, they can even do it in their office, but it gives them something to do instead of being overwhelmed and feeling helpless.

We're all different, so these things don't work for everybody. But there are some things that the patients can do to make their tinnitus, make their hyperacusis less of a problem for them, and so, this is an example. I share this in the group session, as well as in individual counseling sessions, but I make the case that indeed there is no pill that has been shown to reliably eliminate hyperacusis. There is, in general, speaking and that's almost all cases that we see in the clinic. There are effective drugs for sleep and anxiety and depression but there are no pills or no surgery anybody can do for your hyperacusis and I say that twice to patients. One of the nice things about us as audiologists helping these patients is there are some good sound therapies that now can be done, and this is actually shown to be effective in lots of different ways to strategify this. So the four different things I'll go over is the sound therapy developed initially by Jonathan Hazell and Jackie Sheldrake in United Kingdom based on their strategy that they referred to as reducing the central gain. Jack Vernon had a strategy he used and noted this in his book, he referred to as desensitization for hyperacusis. The strategies we developed will share in our tinnitus, hyperacusis treatments and

clever strategies developed by Carol Sammeth and strategies and colleagues on the use of hearing aid adjustments which might sound a bit bizarre but indeed has been shown and is very clever in helping these hyperacusis patients. So the first strategy by Hazell was based on this model that they had that hyperacusis was a result of this hair cell loss and brain reducing this input and needing to amplify and that was the cause of the hyperacusis. So they suggested bilateral noise generators and a continuous exposure of low-level noise. Craig Formby and his colleagues have followed up on this and published many different articles supporting this. So first of all, I'll note that Craig measured in a lot of patients the loudness discomfort levels, and as we know, typically the loudness discomfort levels are around 100 dB HL for most of our patients. There's some patients can tolerate more than that, there are a few patients that, he said 5% of the patients even do not report hyperacusis are between 80 and 90 dB HL, but most of the patients are around 100, most of our normal hearing people are around 100 dB.

So the normal coating of loudness, and some of these are from our hyperacusis activity treatment slides, depends on the activity of normal nerve fibers. And as we increase the level of sound, we increase the number of nerve fibers that respond to this, and also, more nerve fibers with similar best frequencies. So this is an example of how the activity on different nerve fibers increases as we increase the level. So that's known in normal hearing individuals, in the normal activity on nerve fibers. One theory, then, in hyperacusis is we might have a hearing loss but as we increase the level of a sound, the activity on these nerve fibers increases more rapidly than it does in the normal ear. And therefore, at lower levels of intensity, in example, 800 dB HL, our brain is already reacting to this high level activity and we're hearing hyperacusis. So that's the strategies suggested by Hazell and he said the way to deal with that, then, is to provide low-level background sound and that low-level background sound will prevent the brain from needing to search, and so, the strategy then is to use these low-level sound generators. And this was validated by Craig Formby and there's several articles they have now, they provide low-level just broadband noise. And they noted that for even normal show an increase in their loudness discomfort level but patients with

hyperacusis show an increase in their loud discomfort level. So this is one patient, this is their hearing thresholds in the right ear. And these are their loudness discomfort levels with the filled symbols when they came in with their loudness hyperacusis. So the strategy then was to provide them with binaural noise generators that they listened to over several months and they then measured their loudness discomfort levels and showed how that increased their loudness discomfort levels by listening to broadband noise through hearing aid type devices over several months. And this individual shows that their loudness discomfort levels became normal over this period of a year and a half. So, evidence that loudness discomfort levels can be improved. So Jack Vernon suggested using pink noise, about two hours a day at home, when and just gradually increase the level and increase the duration, he suggested when this is done at home. So we took this and because patients often said that, okay, you're going to listen to noise at home. And because they had specific sounds, we actually recorded the sounds for them or they can record their own sounds and they can then play these sounds back at a low peaceful level where they're in control of it, listen to it for 10 minutes or 20 minutes, and gradually over several weeks increase the level and increase the duration they are listening to and then gradually move that into realistic situations.

So I use the example of progressive exposure so they could listen to, for example, dishes. They could be in control of dishes that they clang together themselves in the living room when it's quiet and then move to the kitchen and then have someone else they trust listening to control the dishes and then working into realistic listening situations as progression using actual sounds that bother them. Hearing aid adjustments. So hearing aids can be reduced in their application to reduce the output and they might have hearing aids already that are too high. They also might have reaction times on the automatic gain controls that are too slow. So adjusting those factors might be an advantage. It's also possible to reduce the maximum output of the hearing aids and that could be a good thing at least in the short term but of course it's gonna reduce their ability to hear the wide dynamic range of speech and show that in

the long-term, it's not a desirable output. So the output could be increased gradually over time. The one that I like is the strategy developed by Carol Sammeth in here colleagues. So she suggests using hearing aids with closed ear canals and those ear molds can reduce sound by about 30 dB and then reduce the maximum output of the hearing aids. Again, that might be in the long term not desirable 'cause you're limiting their exposure to sound and speech, but gradually, over several weeks or months, increase the output of the maximum output of the hearing aids and gradually make those fit to normal. So the patient is controlling the output of the hearing aids because they now have closed ear canals reducing the sound and the hearing aid is now actually controlling the sound they're exposed to, so this is actually very clever.

So in summary for this session, the kinds of symptoms that patients are exposed to include loudness, avoidance, fear and pain. and they're all different and there's some overlap and these are just the symptoms. We have the pictures available to you online referred to as hyperacusis activities treatment. There are some good sound therapies that are available, including just using a low-level continuous broadband sound like noise produced by sound generators, low levels and then gradually, over several weeks and several months, increase that. We actually use copies of the individual sounds because almost all of these patients can describe to you specific disturb sounds that are a problem for them. And so, we then copy those sounds, they can play the sounds from their phone or from other devices, and gradually, move those to longer durations, higher intensities and realistic situations so they get used to those individual sounds. And then finally, the hearing aid strategies with closed ear canals reducing the maximum output, and then gradually over time, increasing both. It's often hyperacusis, not always perceived with the onset of hearing loss and a lot of patients say hyperacusis is more of a challenge, some of them have different experiences and it might be helpful to work with psychologists and psychiatrists and these patients are often more trouble than tinnitus patients, and it can take them a more time to deal with than the tinnitus patients but you can help them. And so, I'm glad that you are interested, I'm glad that you are hopefully gonna give this a try, if you haven't tried

some of these things already because you can help them. The different questionnaires and tinnitus activities and hyperacusis activities treatments are all available online. You can just search the Iowa Tinnitus Clinic and you'll get to that. And I wanna just finish off by saying you have a larger number of references available together with the handouts. We have our tinnitus and hyperacusis conference every June in Iowa City where we go over this including manufacturers forms and individual patients also can come forth to that conference. And if you come, you'll get to square dance and have a barbecue and around barn.

- [Christy] Thank you, Dr. Tyler, for such an excellent resource for us clinicians. I know that your last closing statement was we can help these patients, and I really do believe that equipped with this webinar and this course that many of our members and our clinicians will feel more confident going forward in treating patients and working with patients with hyperacusis. Thank you everyone for tuning in to listening to Dr. Tyler. Have a great day.