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Beyond the Audiogram: Assessment and Treatment Challenges in Veterans with Self-Perceived Listening Difficulties, in partnership with University of Pittsburgh

Presenter: David Jedlicka, AuD

Thank you for joining us for today's webinar Beyond the Assessment and Treatment Challenges in Veterans with Self Perceived Listening Difficulties, in partnership with the University of Pittsburgh, I'm excited to introduce our presenter, Dr. David Jedlicka. David Jedlicka, Aud, is an advanced practice audiologist at the Pittsburgh VA Healthcare System specializing in auditory Processing Disorder assessment and treatment. Dr. Jedlicka also specializes in amplification diagnostics, osseointegrated devices, vestibular assessment, and tinnitus. In addition to his role at the Pittsburgh VA, Dr. Jedlicka is an adjunct faculty member at the University of Pittsburgh's Doctor of Audiology program. He is currently a PhD student at the University of Pittsburgh with a focus on self perceived hearing difficulties despite normal audiometric configurations.

Dr. Jedlicka is a former president of the association of VA Audiologists, former American Academy of Audiologists, Early Career Audiologist Award winner, and is a current member of multiple professional organizations. If you'd like to learn more about our presenter, additional information is available on the course registration page. Welcome. We're so happy to have you with us today Dr. Jedlicka. At this time I'll pass the mic over to you.

Thank you Erica. Pleasure to be back on Audiology online. I'd like to thank everybody for this invitation. The work that we'll be talking about today is actually the culmination of several projects focusing on the same topic related to my clinical interests at the Pittsburgh VA as well as my interests with my PhD that I'm working on and hopefully will be done with in a year or so. We're going to get through just some of the disclosures.

You can read all of this if you are interested to know more about my disclosures, limitations and risks. Hopefully the biggest risk will be that I don't bore you to sleep during the course. We'll see what happens. So for our learning outcomes, this is something I do want to talk about just because I think this is the one of the more important things that from the end of today's session, hoping that you'll get a

better idea of the clinical measures that are most effective in identifying individuals with self perceived listening difficulties will refer to that group as SPLD. I want to talk about the expected differences in outcomes between veterans fit with hearing aids for the purposes of hearing loss versus those fit as a treatment for SPLD and to explain the differences in our most commonly occurring comorbidities between these two groups.

Now, some of you attending might not be VA audiologists, but that's okay because I do think that there is a lot of overlap in the population that we see from the veteran side versus on the commercial side. So there I'm hoping will be some great what I usually will say Monday morning takeaways, but in this case that will probably be the next day takeaway depending on whenever you're attending or watching this webinar. As a VA employee, I do need to say that the views, thoughts and opinions in this presentation are solely mine and do not represent the official policy, position, or endorsement of the U.S. government or the Department of Veterans Affairs. So today's focus When I became interested in this population Back when I was an audiology extern in 2009, we started to see many veterans from the Iraq and Afghanistan wars that were coming back reporting severe hearing difficulties, specifically on the Hearing Handicap Inventory for Adults. But when we would do our standard audiological test battery, they didn't I they didn't have any type of deficit.

The hearing fell within categorization of being normal and word understanding and quiet was great. So we started defining this population as our auditory processing disorder population, which has now been kind of revamped into our SPLD group. And we wanted to really follow the evidence to provide the best treatment for these individuals. So we started looking at what research was available. So we're going to talk about proposed test batteries that we felt were well researched and could be incorporated for our specific population.

And then I want to talk about, towards the end, the two research projects that I completed along with my lab that will take a deeper dive into what are the actual measures and treatment options that we have available for the population at this time. So for self perceived listening difficulties, whether you're in the VA system or outside of the VA system, about 10% of patients seeking audiological care for perceived hearing difficulties specifically in background noise won't have any measurable hearing loss. And this term or this phenomenon was first identified as being what was called selective diacusis. There have been other terms along the way, such as King Kopetsky syndrome, idiopathic discriminatory dysfunction, obscure auditory dysfunction which was more common in the 90s, just generally auditory processing disorder and more recently we've been calling that hidden hearing loss or cochlear synaptopathy. And now our group is adding another one to the to the research base calling it self perceived listening difficulties simply because I think if we call it something like auditory processing disorders, that's doing a disservice because these individuals don't always necessarily have a traditional auditory processing disorder and cochlear synaptopathy has been used as a kind of a newer term of the catch all.

But again, I think that's relating to a very specific type of issue that's causing the difficulties. And I think self perceived listening difficulties is a much better catch all term because it's just identifying why these individuals are coming to see us as clinicians. Interestingly enough, we've been interested in this population for over 30 years now. When Gabby Saunders started talking about this specific group and luckily her and her colleagues developed a test battery. And I feel like for the very first proposed test battery, this is pretty good because she incorporated four different types of measures and it wasn't just related to hearing tests.

So she proposed that we should start with just a general, what she called obscure auditory dysfunction interview. You use the Institute of Hearing Research questionnaire as well as a pseudo free field speech and noise test. This way you're getting an idea of what the patient's main complaints are. You

can see what areas that they're having the most difficulty in. And if they are reporting difficulty hearing in noise, it makes sense to do speech and noise testing.

Right. She also included some psychoacoustic measures including pure tone audiometry level difference for 500 Hz photoacoustic emissions, as well as a noise mission rating. And then she incorporated some tests of central function like word monitoring and sentences test, an audio visual adaptive sentence test and a dichotic listening test. I think a lot of people are familiar with the staggered spontaneous words test, which is still a very popular type of test to measure that type of function. But then here's where I think she kind of was onto something early in the game which we've gotten away from and that's looking more at like personality type of measures.

So she used the Crown Crisp experimental index as well as what they call the PS discrepancy measure. And I think this is a fascinating test because it measures the degree of misjudgment of hearing ability. So this test asks people to rate how well they think they performed and then compares their self assessment of performance from their actual performance, which is a fascinating test that we don't really do anymore. Now let's fast forward 28 years later and Victoria Tepe and her group developed a test battery for veterans. Now you can see from that group's recommendation they focused specifically on tests of auditory function.

So they said there are several different tests that you can incorporate, but you want to measure different functions by incorporating these different tests. So they recommended having a test of binaural interaction temporal processing and sequencing temporal processing with Resolution dichotic listening test and a mono load redundancy test. The thing that I really liked about this group's research was that every recommendation that they included for their test battery did show evidence from other research that supported inclusion of these test measures. And this was again specifically for the veteran population. So not only was it a battery specific for veterans, but the research they cited was

veteran specific research.

So very well done by this group to say, okay, here's what we recommend and here is why we recommend this specific battery of tests that got us thinking in my lab at Pitt to think, okay, if we have these measures that are available to us, how well do they predict who, who is going to actually show deficits on these tests? Because if we know we have a group of tests where veterans have difficulty, how can we expand that beyond just looking at measures of auditory performance? And that is where Dr. Kathryn Palmer and Elaine Morner recommended that as part of my pre dissertation project, perhaps I should do a scoping review and just evaluate any diagnostic, any diagnostic measure research that was completed in veterans with SPLD to see how well they would perform on these tests and to see if maybe we could fine tune that proposed test battery a little bit better based on updated research. And what was fascinating was the results were a lot different than what we expected. So the aims we had for this study was to see, okay, do any of our currently implemented assessment measures show significant differences among people who are veterans or the military population with SPLD compared to those without measured hearing loss and no reports of self perceived listening difficulty?

So to do this, we followed the PRISMA guidelines of completing a literature search. We did two databases including PubMed and CINAHL and the initial search yielded over 1800 articles. Now from that we kind of went through the process of eliminating articles that didn't necessarily apply to what we wanted to include. And throughout our filtering process that got us down to 11 articles for inclusion. From these articles, we took a look at every single diagnostic measure from those 11 and we ended up grouping the diagnostic measures into one of five categories.

I'm going to give you a little spoiler alert. The first one and the only one to show significant differences between groups for every measure was our hearing questionnaire category. We also had

electrophysiological measures, speech testing measures, APD testing, as well as some non audiological tests as well. So this is just kind of the breakdown from the article. This article is open access, so you should be able to take a look at this chart if it's a little bit difficult to read during the recording.

But this is just how things kind of broke down based on the different tests that we had. So even though we had 11 articles, we did have good representation of different measures for inclusion. What we wanted to do, though, was to not just look at P values to say, okay, this was a significant difference between those with SPLD and the control groups. We wanted to say, okay, if there's a difference difference, how big of a difference is there actually going to be between the groups? So more clinically relevant.

And we decided then, let's use effect size to see how big the differences are between the groups. Most people, when they think of effect size, will refer to Cohen's D. And Cohen's D is a fantastic measure, but we're not going to use that for the purposes of this project. At the recommendation of Hari Bardwa, we decided to use Hedges G. Hedges G is very similar to Cohen's D with the exception of it takes in consideration sample size. So this way, studies that have smaller sample sizes aren't going to have the same type of impact as a study with a larger sample size. I guess you could say that studies with smaller sample size are almost punished for smaller sample sizes.

But that's because when you're doing a study, hopefully you're completing a power analysis and having an appropriate sample size for the studies that you're conducting. And in some cases, the studies that we included did have smaller sample sizes, which is why we decided to use Hedges G to measure effect size. So when it comes to Hedges D or Hedges G, the same significant levels are used compared to coins. So if you get an effect size of 0 to 0.2, that's going to be negligible. Meaning even though you may have had a significant difference as calculated by your P values, clinically it's a

negligible difference.

Then you can have small, moderate and large. And don't worry, the pictures that we'll show you will have these categorizations as well. So you won't have to memorize this. There will not be any type of significance levels. Use it in the test of the np.

So what were our findings? Spoiled a little bit earlier. But what we did find was the hearing questionnaires were our best tools to identify individuals with SPLD compared to those with the control groups. So we had things like the fhq, the Functional Hearing Questionnaire, the Hearing Handicap Inventory for Adults, as well as the ssq. Now, the interesting thing with the SSQ was the studies were able to break this out by questions.

So, like the FHQ and the hhia, those were giving us a total score. So you can see every single response that found a difference in all of these studies were large effect sizes, meaning that not only were the groups different, but they were extremely different. On when we're comparing them clinically, the SSQ, I think, gives us some really nice information because we're not just looking at just overall hearing. We can break it down by questions, so it's going to break it down by selective attention. Spatial perception, which you can see there was no difference in spatial perception between the groups as well as sound quality.

So in this case, we already know right off the bat, our hearing questionnaires are going to be a great tool for us to use when it comes to individuals that don't have measured hearing loss but have these auditory complaints. But what if you're thinking, okay, that's great, should I just believe a patient when they tell me that they're having difficulties and the hearing questionnaire confirms it? Absolutely. As much as, you know, we love seeing our patients and as much as we think they love seeing us, most of these individuals are going to be, you know, on the younger side of the patients that we probably see, they're probably busy, they might have family, so they probably don't want to take time out of their day

to see an audiologist unless they have to. And in this case, they're experiencing these problems to the point where they are taking time out of their day to come to us for our help.

But now you're thinking, okay, should we then do some other test measures? Well, let's take a look, see what the evidence says. There have been some studies, both veterans and outside of the veteran population, which show on the electrophysiological side that our longer latency responses, things like the EFR and whatnot, frequency following response, they will show differences. And the test measures that we had in this study were kind of interesting because we found studies that some showed significant differences between groups and they had small and medium effect sizes, such as, like the abr, whereas other studies didn't show any significant differences between the groups. Melissa Pappish and her group, they did the acoustic startle reflex, which I think is a very interesting electrophys study or electrophys measure to include in this type of population.

And they found a large effect size between it. DPOAEs. You might be thinking, dave, that's not an electrophys test. Well, we didn't really have a better home for it. So that's how DPOAEs got put in There.

But we did see a small effect size as far as differences go between that group. The EFR with different modulation levels did show difference with modulation level 40 and 100 compared to 63. And then our P200 showed a difference, but the P300 did not. The other thing is, if you take a look at these tests, which ones are you using clinically? I bet if most of you are doing some of these measures, you're probably just doing ABRS and dpoae.

I don't know of anybody personally that's doing the acoustic startle reflex or these long latency responses clinically. So this again might just be more on the research side of things. But again, if we're seeing differences in our longer latency responses, that might be a good pathway for us to take in future research to say, okay, could this be more attentional basis. These are more measures of

attention in this population. And if you're doing ahrs, since we do have individuals that have differences, or at least the studies that show differences among these individuals, they might be clinically different, but they might not be because the data isn't consistent.

How about in our speech testing? This is one that we thought was interesting because that's probably one thing that all audiologists that work with this population are doing is when they come in reporting difficulty in background noise, we're likely doing some different types of speech tests. So we had Melissa Pappish did a couple different studies looking at the AZ bio with different signal to noise ratios and and they found that there was no significant differences with the azbios and the BKB SIN and the CNC words. No significant differences there as well. The hint however did show a significant difference, which is what we would typically expect if the individuals are coming in reporting difficulty hearing in background noise.

And we do what I think is a pretty good speech and noise type of measure. And then we also have the listen s as well, which did show some negligible and small differences as well. So at least the speech testing did show some differences. And the thing that I liked about this review was that it did show in quiet. We didn't see differences which we didn't expect there to be.

So at least it confirms what we know to be true.

All right, let's move on to our next one we just titled as our Auditory Processing disorder tests. This is where we actually were quite surprised in the results because we thought, okay, these individuals will likely have some forms of auditory processing disorder regardless of the domain. So we expected there to be more significant differences and in fact, of all the tests that were included, only the SSW showed differences. So we had two studies which showed a medium effect size and one which showed a large effect size. But Melissa Papish also had a study which didn't show any significance in the ssw.

So that was really interesting that three of the four studies showed a difference where one did not. But on our other tests, like dichotic digits, gaps in noise, masking level, difference for 500 Hz as well as the total score on the scan 3a, no significant differences between the groups. So that kind of stood out. And how about our non audiological tests? So this kind of gets back to the original 1992 proposal from Gabby Saunders and her group where they said, okay, maybe you should include some of these, like personality tests or things like that.

The most of the non audiological tests that we had were more tests of attention and cognitive processing. What really stood out to us was that the PTSD screener that Eric Gallen used in his study in 2016 showed quite the large differences between the two groups. The upper one which showed the differences was the tmt, which is the trail making task. The trail making task is the test where you have to go from letter to number to letter to number. So it be like A to 1, B to 2, C to 3.

They did find a large difference in part A compared to part B which had a negligible difference. What was interesting about that finding is that the part A of the trail making task is actually supposed to be easier than part B. So for whatever reason in their study, the first group. I'm sorry, the first part of the study showed a large effect size difference between groups compared to the. What was supposed to be the harder part?

The large effect size for the PTSD group. I again just thought that was interesting because I had done some work before I started my PhD, I became very interested in the comorbidities for individuals with SPLD at the VA in Pittsburgh. So Wesley Zen and I did a study where we did a chart review and we wanted to compare the comorbidities for people who didn't have measurable hearing loss reporting SPLD compared to people who weren't reporting SPLD but didn't have any measurable hearing loss as well. And we found that PTSD and the associated comorbid comorbidities that fall under the PTSD umbrella, those were the best predictor of who was going to have spld. So if you are building a case

history form for your individuals that have complaints consistent with spld it would likely be worth your time to include asking them if they've ever been diagnosed or if they do have tinnitus, anxiety, insomnia, ptsd, low back pain, really any chronic body pain, anger, hypervigilance, any tobacco use adjustment disorder, and sleep apnea.

Because we kind of categorize these into groups that people with chronic pain, people with any type of sleep impairment, and people with specific mental health comorbidities would oftentimes likely have complaints related to spld. And one of the other things that we looked at, which we haven't published yet, we should probably get on that, was that when we did this chart review study, we looked at from, I think about 20, sorry, 2009 to 2018 and a few of these individuals actually came back for repeat testing. And on some of our measures, the individuals who had improvements over time were individuals who were much more engaged in their treatment for these specific comorbidities. Specifically people that were engaged in PTSD support groups, people that had their sleep apnea treated, people that went to pain management clinics. So it was fascinating to see how scores on some of our tests actually improved whenever people were receiving treatment for these comorbidities.

But maybe we'll do another audiology online talk down the road once we get that data published. So what are our take home messages from this first study? Well, first questionnaires are our best tool to identify individuals who have self perceived listening difficulties. Traditional APD tests aren't sensitive enough to identify differences for all individuals. They might identify differences in people who do have specific auditory processing impairments.

So say they have like an ear advantage or auditory working memory problems, but as a group whole they're not going to be sensitive enough to identify the differences for everybody. And our electrophys measures, they do have promise, but many of these aren't standard clinical measures. And even if we do start incorporating them more clinically, say somebody does have an abnormality on a frequency

following response or envelope following response, how is that going to guide our treatment? And personally, I think what we need to do on the research side of things is we kind of need to refocus the way that we are approaching how we're working with these individuals, at least on again the research side of things. Because a lot of what we focused on for now the last 20, 30 years has been okay, people are coming to us with these difficulties, they're reporting these problems.

We are a helping profession. Our goal is to try to help individuals in any way we can when they have these auditory complaints. So what do we do as audiologists, we lean into our tool bag of audiological tests and we lean into our tool bag for audiology related treatments. I think if we kind of refocus how we're approaching things on the research side, this could lead to better long term success for our patients. And that means starting at the very beginning, we need to identify what are the underlying mechanisms of those with self perceived listening difficulties without measured hearing loss.

Then go into the next step of translating that to say, okay, let's take this research approach to identify which clinical measures will then differentiate how to best treat the condition. And that might mean needing to develop new clinical measures that might mean maybe we just focus on the questionnaire side of things. If we could maybe perhaps identify patient profiles to say, okay, this person has these complaints, perhaps the complaints that they're having could be identified within a questionnaire under a certain personality type or a certain disorder type that could then be better treated based on evidence. And the evidence would then need to be developed once we've completed the identification of the clinical measures that would best focus. And right now a lot of our treatments are based on educated guesses.

We know that hearing aid technologies can provide some directionality. We understand that there are some noise reduction features within the hearing aid. So perhaps that's why low gain hearing aids could be better evaluated if we have better, I guess, research to support or refute their use. Same thing

with things like oral rehabilitation. We know from some of the early work that oral rehabilitation works really well in this population.

But the biggest problem is people don't like doing oral rehabilitation. And a lot of times audiologists don't always feel comfortable in doing this. If maybe we could find a happy medium, perhaps that would work. But again, we need as researchers to kind of reframe how we are approaching the, the research methodology and the focus in order to best treat our patients. Now I'm going to take a break before we go into the, the next part of the study because we did have some comments that I think would be worthwhile addressing at this time.

So we do. I have a question from William that said, perhaps these individuals might have extended high frequency damage. Absolutely. And I think that is one of the reasons why I'm a supporter of at least administering DPOAEs at minimum in this patient population and perhaps including extended high frequency testing. One of the interesting things that was found from the study I did with Leslie Zan and maybe what we can include in part two was for this group of patients that we were working with, I was completing DPOAEs on the vast majority of people that we were testing for spld.

And we did find that. And for a group of them, they did have instant or reduced high frequency DPOAE responses. And when they came back a couple years later for testing and the high frequency hearing loss developed. So these individuals were likely experiencing difficulty because damage had been already occurring in the auditory system and it wasn't measurable for us until later on. So that would be, I think, a great clinical recommendation at this time because you could use it for counseling to tell a person, look, your audiometric thresholds may have fell within normal limits and at this time, but that doesn't mean that you're out of the woods yet.

This could be something that might develop later on and then you can set the stage for, okay, how are we going to tackle this problem if it does develop into hearing loss later on? And then another person

asked if I've tried Christina Rupes adult Questionnaire. It's an adult version of the chaps. I am aware of it. I have not included it.

I think Christina does some great work at Ohio State in this population. Again, that's just one of those things where perhaps, you know, more research could identify if her adult questionnaire is going to be something that could be a great clinical tool for us to use in this population. So I think there's a lot of value in questionnaires. I think there's a lot of value in clinical research that can be completed. So maybe that falls on my shoulders to do.

Maybe if anybody out there is, you know, feeling adventurous and they want to start collecting data on some of their patients using Chris Christina Roop's questionnaire, have at it. At worst, it's only going to help the field move forward. So thank you for the questions. If you do have any other questions, please feel free to type them in the chat and I'll try to answer them as best as I can. But with that, let's move on to the second study that I want to talk about.

And this is going to be focusing more on the treatment for individuals with spld. So this study was looking at hearing aid use among veterans with hearing loss compared to veterans who were being fit with hearing aids as a treatment for self perceived listening difficulties, or spld. We wanted to do this study because when we engaged in this research, There were about two or three interesting studies that were released in like the 2010s that looked at hearing aid use as a treatment for spld. And this was essentially completed just looking at low gain hearing aids to see how patients reported their success and whatnot. And some of the interesting findings were that people did report benefit.

And when individuals were offered the opportunity to purchase the hearing aids either at a discount or at full price, they had low uptake. And when you have a treatment that people report is beneficial, but there's a low uptake, that's what we would refer to as poor efficiency of treatment, meaning that for whatever reason, the individuals didn't feel that the burden. And in this case, the research identified

price as a potential burden for the treatment of care as the holdup between a successful outcome. So we wanted to take a look at this same type of question in the veteran population simply because if you are receiving hearing health care through the va, you will not incur an out of pocket cost for the devices. So this is a great way to study if the burden of cost is what's leading to poor efficiency of treatment within this population.

The reason why we included a group of individuals with hearing loss was because we wanted to see how hearing aid use would differ between people who are receiving the treatment for hearing loss versus people receiving the treatment due to self perceived listening difficulties. And again, the cost barrier was removed by doing this in the veteran population. So luckily that's where I work and I had access to the population that we were studying. We wanted to keep the groups as close as possible as far as demographics. So we only included people who were aged 18 to 51 years.

And if you're thinking 51 is a weird cutoff, why did you choose that? Well, that's because we typically use the scan as one of our measures for SPLD group. And for any of you who are familiar with the scan, you'll know that 51 years is about the cutoff range for that test. So we had a lot of people that came into our clinic if they were over the age of 51 that didn't complete the scan. So we were looking at a whole bunch of other measures in this group, but that's how we came up with that 18 to 51 years group.

We also wanted to look at only new hearing aid users. We did not want them having any type of experience with hearing aid technology in the past. Now, we did take a look at hearing aids that were fit between October 2009 in October of 2018. These dates were very important for us. October 2009 is whenever I was doing my externship at the Pittsburgh va and that is when we first developed our auditory processing disorder testing protocol along with Lindsey Jorgensen and Ginny Milne, two experts in this area who I had the pleasure of working with at the va. We cut them the or the time frame

off at October 2018 because every May 1 and November 1 the VA receives a hearing aid contract update, meaning that manufacturers can update their technology.

And the big thing that happened for the VA in October or, sorry, November 1st of 2018 was that rechargeable hearing aids came onto our contract. So what this meant was, was that if we were going to use hearing aid use and try to measure the outcomes, we wanted to take a look at supply orders. So that meant we were going to track battery orders and if you're using rechargeable batteries, you don't need to order them. So that makes it a lot harder to track the population. So that gave us 10 years worth of data which really helped us out.

We kept things limited to only people who were fit with open fit behind the ear devices or receiver and canal devices. So that meant that our individuals with hearing loss just had that, that standard what you would expect to stereotypical high frequency hearing loss that fits beautifully with an open fit hearing aid. We identified our subjects in the study just using the ICD diagnostic codes as well as code V5020 because we do really are measured on everybody and I hope you all do too as well. All right, so here's just a comparison of the audiogram. So you can see the top line is going to be your individuals in the SPLD group.

So you can see on average no measured hearing loss even with the error bars included. And then those who were fit due to hearing loss have the dashed lines on bottom. Again, no measured hearing loss through about 1,000 hertz. And then we get into 2,000 and higher. That's when we see the dip and in my opinion making them perfect open fit hearing aid candidates.

So the first thing we decided to compare in these individuals was looking at the differences among the cosi. They're the client oriented scale of improvement. What was interesting was if we broke this down just by how many individuals reported that was their goal. You can see in the SPLD group they were not as interested in hearing the TV like the their counterparts who have measured hearing loss. But

when it came to hearing in more challenging environments like listening and background noise, 42% of the individuals with SPLD identified that as one of their main goals.

The other thing is that both groups near the top indicated that they wanted to hear their spouse or significant other or their partner or whichever family member said hey, you need to go see audiology and get your hearing improved because you're certainly having differences or difficulties. And you know, we didn't see too much of a difference between those groups because again, communication with your partner is going to be one of the best referral tools that you can have as an audiologist. Now if you're taking a look at just the end, you can see we had a much higher number of participants in the hearing loss group versus those in the SPLD group, which is why I included the percentages on the right side of this chart. So here's where I think things start to get pretty interesting. So we took a look at the follow up data.

How much information could we glean and then use that to compare differences between the groups? So I mentioned we had more participants in the hearing loss group versus the SPLD group. Here's your specific numbers. 186 individuals fit with hearing aids due to having hearing loss versus 81 individuals fit with low gain hearing aids for the purposes of treating the self perceived listening difficulties. For those who had follow up visits, 70 of them had measured hearing aid data logging data compared to only 12 in the SPLV group.

We had 80% of individuals with any type of return visit. So that wasn't just within one month. We always schedule our new hearing aid users for a one month follow up to see how they're doing. So back in this time frame of October 2009 through October 2018, these would have been in person visits. Now a good majority of what we're doing for follow up visits is going to be done remotely, either through our VA Video Connect feature or through the manufacturer apps.

So this way, in case a patient needs an adjustment on the fly, we can do that at the follow up visit. If we take a look at were there significant differences between the data logging numbers and the participants with number of return visits? Yep, there sure was. So we found that people who were fit with hearing aids for the purposes of hearing loss were likely to wear their hearing aids significantly more compared to those who have spld. And some people out there might be thinking, oh wow, that's kind of interesting.

Why are people with hearing loss wearing their hearing aids? More to that, I just give the answer, well, how often are you in situations with background noise? So if these individuals are reporting difficulty hearing in background noise and they're wearing their devices to help them hear in background noise, that difference in hours of use per day actually makes sense. So in this case, I don't think we should hold our individuals who are fit with hearing aids for the purposes of SPLD to the same usage standards as those who are being fit for the purposes of hearing loss. So even though we saw a significant difference, we felt that was just explainable based on the environments in which they would perceive benefits.

But when we took a look at the number of participants with a return visit, we did see a significant difference there where just under half or about 43% of individuals fit with hearing loss came back for a return visit. Whereas only a quarter of the individuals fit for SPLD came back for any type of follow up visit. And not only that, the average number of return visits was higher. It was actually almost double for those fit with hearing loss compared to spld. So you're thinking, all right, individuals with the SPLD fitting, they're not wearing their hearing aids as much, they're not returning for follow up visits as much, maybe they're not perceiving benefit and that's why you're not seeing them as often.

But if we take a look at the hearing half the hearing handicap inventory for the adults, the screening that we do for these individuals, the there was very similar results. It was not significantly different refitting.

So the average score is 29 for individuals with hearing loss and 27 for individuals with SPLD. And when we take a look at the post score fitting, this is where things really stood out because we thought that people with SPLD likely would not see a significant improvement because one hearing difficulty or hearing difficulty in noise should be should be improved with low end hearing aids but it likely won't be perfect. So maybe we're not going to meet their expectations especially since they're open fit.

So directionality is going to be impacted and noise suppression is going to be impacted just because of the physical features of the hearing aids. But both groups saw significant reductions. We're looking at over a 20 point reduction on HHIS post fitting for both groups. And again so there was no significant Difference HHIA pre vs post fitting for each group. Even though we were seeing differences in return data as well as differences in hearing aid use.

And one of the things that I say is really important for when you're doing research studies is if you include measures where you have an expectation of what the results should be based on previous data, it at least confirms that your data is aligned with other research. So it can verify that what you're doing hopefully is measuring what you hope it will. And this pre and post fitting data aligns very well with the studies from Christina Roope and Kiri Millings and a few others. Now that show that even when you have people that are treated for their complaints of spld, they will likely report better outcome scores regardless of uptake of the device. Which is really interesting.

And that could be another research question that we have to answer. Are people just happy that some time and effort was spent in providing the treatment? Or the other explanation could be is if you take a look at the number of individuals who completed the HHI, you'll see that we only had 10 people out of 81 return and complete this. So maybe it's just that the 10 people that came back were people that were getting benefit from their hearing aids and that's why they came back and that's why they were satisfied. So perhaps, maybe we need to do a better job of getting those other 71 individuals back to

collect their data to see okay, for the people that didn't return, maybe they don't have as good of data or should say, I shouldn't say data is never good or bad data is what it is.

Maybe they don't have as much of an improvement in their HHEI post fitting compared to the people who did return. So again, questions that we should try to answer now the other thing we could say is okay, maybe the people that we fit and this could be a pat on our back that we did such a great job that these individuals that, you know, they're happy, they don't need to come back, everything is great. That's why we decided to measure the hearing aid supply orders because Again, this group, 18 to 51, they are younger adults, probably very active, likely to have busy schedules, maybe they can't come back in as easily and that's why they didn't come back for their follow up visits. But they would still need to order hearing aid batteries and hearing aid supplies like tubes and domes and filters. So that's why we included in part two of the study the hearing aid supply orders.

Whenever we issue hearing aids through the va, we certify it in a system, what's called rose, the remote ordering entry system. Whenever we certify the hearing aids in that system, it activates the warranty. And if a person does have hearing aids that uses batteries, it will automatically send an initial shipment to the patient's address. And in many cases this is going to be about a six month supply. Now, since we know that people who are fit with hearing aids for the purposes of hearing loss are wearing their hearing aids almost twice as long as individuals with spld, we expect that people with hearing loss are going to need to order batteries more frequently than individuals with SPLD because longer use time equals faster battery needing to be replaced.

So in this case, our initial batteries ordered from that six to 12 months. So after the first supply should be depleted, we had only six individuals. Seven percent in the SPLD group actually ordered batteries in that first six to 12 month period, whereas 80%, 43 of the individuals with hearing loss ordered the batteries. That kind of aligns nicely though with our follow up data because we get about the same

number of people who came back for follow up visits as we're ordering their supplies. So this could be an indicator that people who are returning for their visits and people who are ordering supplies are going to be good long term users of the devices.

But if we're thinking, okay, the SPLD group is not going to run through their batteries as frequently as people who are fit with hearing loss just simply because of the hours of use, we should then see an uptick in the number of individuals who are ordering batteries in that 12 to 24 month range compared to that 6 to 12 month range. And we didn't. What was fascinating was the same six individuals that ordered batteries in that six to 12 month range after the initial fitting also ordered batteries again in that 12 to 24 month range. And one additional person ordered batteries in that timeframe as well. And in the hearing loss group, that number went up slightly from 80 to 84.

So we did measure this. We used the P values to see were they significant. They certainly were. So individuals were going to be much more likely to order batteries when they were fit with hearing aids for the purposes of hearing loss compared to individuals fit with spld. And then we thought, okay, maybe people were just wearing them part time, that these were the best batteries ever created being issued to these individuals, that they were lasting for much longer than we would expect.

But at some point you're going to need to order more. So we took a look at, okay, 24 months out, two years, how many people had ordered batteries after that initial fitting. For the SPLD group, that number went up by one again. So we had eight out of our 81 individuals or in batteries. And then the number for people with hearing loss, that number jumped up.

That went from 84 up to 91. And again, this was still a significant difference. And we also wanted to take a look at supplies because if you are wearing your hearing aids frequently, we would expect that you will need to change domes and filters or if you were one of the people fit, you know, in that 2009-2012 range, you likely had tubes that needed to be replaced. And we would, you know, teach

individuals how to order these supplies through the remote ordering system as well. Only six individuals in the SPL LD group ordered hearing aid supplies at any point compared to the hearing loss group where nearly half of the people ordered supplies.

And again, that was a significant difference. And just for consistency sake, we did run the effect size. So we did see that the, we did have a small effect size between the groups for all four of these categories as well.

Now, how about the comorbidities? Going back to the study with Leslie Zen and herself, we wanted to take a look at would these individuals have different, you know, consistent comorbid conditions? And what we found was no surprise. VA tinnitus is the number one service connected condition among veterans and it was occurring in 90% of the people with hearing loss that were fit with these hearing aids and 86% of the individuals with SPLD. So this group did not show a difference as far as tinnitus being a comorbidity.

But when we jumped into the ones we mentioned earlier, like PTSD, mental health, chronic pain, sleep impairments and traumatic brain injury, we saw significant differences between the groups again. So when Leslie Zen and I did our study, we compared the same group of younger veterans with SPLD compared to individuals without measured hearing loss. We did the same comparison again with the individuals who do have hearing aids. So while many individuals from that 2023 study were going to be overlapped, many of the same participants in this study, the individual hearing loss were completely new to this comparison. So every one of these comorbidities where it's going to be much more prevalent in the individuals with SPLD, the ones that really stand out.

Mental health, any type of mental health, comorbidity. 90% of individuals with SPLD had a diagnosis, so that could be things like depression, anxiety, hypervigilance, anger. Whereas only half of the individuals with hearing loss had a mental health comorbidity that was diagnosed. Chronic pain is

another big one. When we developed our APD clinic, we really were just audiology focused at the beginning.

But then we started talking about some of the issues these individuals were having with our speech colleagues. And they were the ones that alerted us that the individuals we were seeing were very similar to the younger individuals that our speech colleagues were seeing for cognitive evaluations that had higher levels of chronic pain and poor sleep hygiene. So that's what made us take a look into this. And we realized there's going to be some comorbidities in this group that audiologists, we are not trained as the experts to work with. So we really needed to build a team to try to help that help our patients improve in all aspects.

And that led us to developing this interest and developing what we feel is now a pretty nice interdisciplinary team or all of these main comorbidities that you're seeing here. We openly refer to our colleagues for ENT for sleep medicine for chronic pain. We have a traumatic brain or a polytrauma team that we refer people out to as well. And what's nice is we are now getting referrals from these same colleagues where they'll say, patients receiving treatment for these issues, but they're still reporting hearing difficulties. So it was a great gateway for us to expand our referral network and to think about the patients much beyond just the ear and the brain, as many of us have done for so long.

So if you don't have a good network of people that you can refer to or solicit referrals from with this population, I strongly recommend just emailing people, try to develop these networks. And it just started with cold emails within the BA system to say, hey, look, we're working with patients that have these issues. And we sent these data to these providers, and they were really shocked to see that people with these complaints were reporting difficulty, especially hearing in noise. So we really feel like this was one of the better treatment approaches that we had, was going from audiologists treating hearing difficulties, thinking that we are the gatekeepers of all hearing healthcare, to realize, look, there are

going to be things in our scope of practice that we can handle well, and there's going to be things outside that could lead to improvements, especially hearing in, you know, public places that other professionals could help with. And we're seeing a lot, you know, better interdisciplinary care with, like our tinnitus colleagues when we do progressive tinnitus management.

So our I think that that's going to be one of the big waves of the future is realizing that our best outcomes are going to occur when we are approaching more of that whole health type of dynamic with other professionals that will lead to better overall outcomes across multiple domains for our patients. One of the cool things that I think if you ever want to test this out in your clinic, is based on these comorbidities. You can actually almost estimate what a person's HHIA is going to be with this formula based on the comorbidities that are present. So I have to give all of the credit to Leslie Zen, who developed this formula and we tested this on a few of our patients. And it's pretty darn accurate when you compare the actual HHIA score that the patient gives you when they're completing it out compared to what you would predict it to be.

And I will say that is one benefit that we do have in the VA is that we have access to the patient's medical record so we can see these other diagnosis that the patient has. Whereas, you know, if you're in a clinical practice or whatnot, you might have might not have access to these types of things. But any, you know, medical system, you might get an idea of how a patient is going to respond on the HHIA just based on the other comorbidities that are present. So we're getting close to the end of time here. So what are going to be your take home messages?

Well, SPLD users, they are likely going to have fewer hours of daily use of their hearing aids. So for people who are consistent, users expect them to have fewer hours of usage just because they're likely not going to be in background noise all of the time. And the about, you know, three and a half hours of use that we found in our study that was consistent with these other studies that showed people that

reported benefit from their logain hearing aids. If you are on a private practice or in a healthcare system where you sell devices, don't be surprised if you do have poor uptake of the devices just because there is that poor efficiency of care or there's that burden within efficiency of care because for whatever reason the cost benefit ratio hasn't gotten to where we need it to be. You can expect to see perhaps fewer return visits among this population.

Specifically if you are working with the va. And again, if you have people using their hearing aids less often or for a few hours per day, you would expect fewer battery and supply orders. Although I think most of us now probably are more fitting, open fit hearing aids are likely doing the majority of rechargeable technology. Our objective indicators suggest minimal or discontinued long term use. Whenever we do treat individuals with SPLD with low gain hearing aids. This is consistent with the uptake data from previous studies.

We do see that While we have 10% of our patients coming in with no measured hearing loss for SPLD, we have about 10% of our people that we fit with low gain hearing aids that are going to be great users. So it was nice that we had consistency among our studies. Individuals with SPLB are going to have significantly more comorbidities, especially in the veteran population. So if you're not asking about these in your questionnaires or case history forms, maybe go ahead and include those. And HHIA scores will improve despite limited use of hearing aids.

So again, we don't know why that is, but that can be a question that we need to answer moving forward. How can we continue to improve? Well, I think from study number one, use your clinic time wisely. I think one of the traps we can fall into is, especially with the litany of APD tests that we have available is maybe we want to throw every single test we have at a patient. But if these patients we know have chronic pain, maybe they have some anxiety and whatnot, do you really want to put them through a three to four hour test battery knowing that they're going to fit, be fatigued?

My big take home message is that when a person is coming to see you reporting a problem, believe your patient because they're not coming in just to see our smiling faces every morning. They're coming in because they are having a problem and we are the individuals they are hoping can help them improve and don't provide band aid, hearing aid treatments. I think one of the problems we can run into is that with audiologists we know what tests we can do, we know what treatments we have and we're comfortable living in that domain. So if a person says, I have difficulty hearing a noise, well, here are some low gain hearing aids. I'm a big believer that if you're going to be fitting low gain hearing aids on this population because they're having difficulty in background noise, they should be using some type of remote microphone technology.

Now, luckily, with hearing aid connectivity to phones most of the time, we can actually now use the phones for remote microphone purchases. So if you don't want to have to ask your patient to pay for an additional accessory, teach them how to use the live listen feature in the iPhones and whatnot because that might provide more benefit for the patient than just simply a low gain hearing aid by itself. Also, put on your counseling hat. It's amazing to me how many times whenever I tell a patient, okay, your test results came back, we didn't identify any impairment. But that doesn't mean that you're not having difficulty.

And a person will just have a big sigh of relief just by saying, thank you for believing me, that's all I needed to hear is that, yep, I'm struggling, I know I'm struggling and they're okay with it. And then other times you'll say, okay, believe me, what's going to be our next steps? And a Lot of times that means, you know, providing them with some oral rehabilitation options, providing, you know, care through what I believe is best for all patients. And that's going to be the whole healthcare model. So if you're seeing patients with some of these comorbidities that they're not receiving effective treatment or they're not receiving treatment at all, don't be afraid to make those types of referrals.

On the research side of things, I think we need to change the way in which we're approaching how we're doing our research. We need to think just outside of assessment and treatment for ways in which we're comfortable because there are things that we've done the entire time and that means we need to identify the source or sources and go for curing the root issue rather than just simply managing the symptoms. And I do believe that for these individuals it could be a whole host or spectrum of root issues that are causing the problem. So to say it's just in the auditory system or it's just attentional that's doing a disservice to the patient. Because in many cases you're going to see patients where you think, okay, you're coming in for these issues and all of a sudden you find, yeah, they just have very poor speech, understanding and voice.

Great, let's work on auditory training and use remote microphone technology to improve in those situations. If it's something like having a near advantage, we can work on that. But if it's okay, you have difficulty in noise because you're working in a high stress environment, you are only sleeping two hours a night and the sleep that you're getting is poor quality, that might explain it. Maybe we need to help you get the care that you need to get better sleep to manage the chronic pain. So think about managing the patient as a whole rather than just with the auditory complaint.

So thank you for attending the session here today. This is my email, should you have any questions. I see we do have some questions in the chat which I will answer now. So one of the questions we have from Sandra is can you share your version of the cozy? Well, we just use the standard published cozy and really the only thing you would need to put on there is identify three listening situations in which you would like to improve.

There we go. The cozy gives an open ended opportunity for the patients to identify what, what their main complaints and problems are. And I'm a big believer whenever I'm doing a case history with these individuals, I always start with the same first question, which is what brings you in today and the last

question I ask for the patient just to get a better feel is I say in your opinion or what would you define as a successful treatment outcome? This way you can get an idea if a patient has expectations that maybe align with the treatments we can provide at this time, or maybe they have expectations that need to be tempered a bit. So either way you're going to get good information from asking that person to you what would you define as a successful treatment?

If you are interested in potentially, you know, asking something like specific targeted questions in this population for patients with ecosi, feel free to use the identified list that I provided on one of those earlier slides where you can say do you have difficulty with any of the following like hearing your spouse and partner, hearing in background noise, hearing the tv, because now you have some data to say, okay, people with spld, these are the areas in which they feel that they are having the most difficulty. Christine asked, did you fit them with battery operated versus rechargeable aids so you can use it as a measure? The answer to that was yes. So the group that we looked at From October of 2009 through October of 2018, this was when we were fitting hearing aids with traditional zinc air batteries before rechargeable ric style devices were available commonly on our hearing aid contract, we wanted to do this just because this would be a better what we felt proxy measure for hearing aid use. So in our situation, having the disposable batteries, the zinc air batteries, was a great way for us to measure use simply because even if patients weren't coming back to see us, if they were still ordering the batteries and supplies, this was a great way for us to assess if they were using the devices.

So now since, you know, I think over 90% of the rig style and open fit style devices that we order are rechargeable. We couldn't use battery supplies as a proxy order. And I don't think that using other supply orders like domes and wax traps perhaps could be a great proxy at this time just because you might have people that are changing their filters every week because they feel confident in doing so and they feel more comfortable when they're fresh. And then you might, other people might have other people who aren't producing much cerumen. So for them they don't have to change it that often.

So thank you all again for attending the lecture. I hope you gained some useful information and again please feel free to email me with any questions. And also I love feedback. So if you have any ideas of like further research or anything that you're seeing in this population you have been finding to be beneficial. Please share that with me.

One of the best things I feel about Audiology online is that this information is available to everyone, regardless of whether you're going for CEUS or not. So dissemination of information is critical for our field, especially in this population in which we're still just at the forefront. So keep doing your best work possible. And again, thank you for attending the session today. Awesome.

Thank you so much for a great presentation. A couple of reminders for folks who are going to be claiming CEUs for this the post exam will be available in your account in the next several minutes. Once it's ready, you can access it by going into your account, selecting pending courses and then take exam. To receive course credit, you'll need to earn a score of 80% or higher and you'll have seven days to complete that exam. And we've provided you with helpful quiz hints noted by the cue markers to help you in passing that exam.

We value your feedback, which helps us us improve our courses and bring you topics of interest. Thank you so much for attending today.