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Defining Success with HA/CI, in partnership with RIT/National Technical Institute for the Deaf

Presenter: Rebecca Jackson, AuD, CCC-A

Hello everyone, and welcome to today's webinar Measuring what Success with Hearing Aids and Cochlear Implants for Adults with Severe to Profound Hearing Loss. This is presented in partnership with RIT and the National Technical Institute for the Deaf. We are so pleased to be partnering with RIT and NTID for a number of webinars. And today's presentation is going to be given to you by Dr. Rebecca Jackson. If you'd like to learn more about our presenter for today, you can certainly go to our Pending Courses page and read her full bio.

But at this time, I'm going to hand things over to you, Dr. Jackson. Thank you, Kim. Well, hello everybody. Thank you so much for joining me today. I'm very excited to share a little bit about what we do at NTID and some of the unique situations that we find ourselves in.

Again, my name is Rebecca Jackson. I am an audiologist with the National Technical Institute for the Deaf and I have been there for over 10 years. Let's go ahead and dive in a little bit. I do in fact work for ntid, so you'll see that here on the screen. And these are some limitations and risks and these are the learning outcomes.

So what is ntid? NTID is one of the two colleges for the deaf located in the United States. We are actually housed in Rochester, New York at the RIT campus. So RIT has nine colleges. You know, the School of Business, they have the School of Science.

And one of the nine schools on campus is the National Technical Institute for the Deaf. So students may be enrolled at classes at NTID earning associate level degrees, or they may be over at ritual earning bachelor level degrees. Either way, they are eligible for our services. And on the screen here, you can see a little bit about our students, their profile. What do they look like?

On the left there as I'm looking at the screen, you can see the type of hearing listening technology that the students use. We have quite a bit of a mix. So we have some students who use cochlear implants,

we have students who use hearing aids, we have students who are bimodal, and again, we have some students who choose not to use any type of listening technology at all. On the right hand of the screen you will see the types of communication that our students use. It's again, a bit of a mix.

We do have students who use American Sign Language. About a third of our students use American Sign Language exclusively. We also have students who use simultaneous communication so they sign and they speak at the same time. And we also have about A little less than a third of our students who use spoken English as their primary mode of communication. So as you can see, deafness is very much a spectrum here on campus.

We see everything and anything. We see hearing aids from every single manufacturer. We see every type of communication style. So we really are very unique environment.

So who are we as the NTID audiologists and speech language pathologists? We are ASHA certified. I believe that there are six speech language pathologists and there are seven audiologists on staff. And we provide comprehensive audiological and speech language services to members of the RIT community. We all are able to provide services in both asl, in simultaneous communication and in spoken English.

And we really do try to match our students needs and their desires when we are providing those services.

So I'm not going to read you this list of our services, but you can see that we run a full service clinic on campus.

If you'd like to learn more about NTID or more about our department in particular, there are some brochures available in the handout section so you can read a little bit more about us.

Okay, so here we are. Here's the content. This is the meet. This is what I'm really excited to get to today. And before again, I dive in.

Just a brief, brief housekeeping and then I'm going to wrap up the housekeeping. So I am an audiologist. Today's presentation will be from the Framework. As an audiologist, I work with adults and I work with people who are primarily deaf. Although obviously, like I said, deafness on campus is a little bit of a spectrum.

So you may see people with more of a moderate or moderately severe hearing loss. But we do see people who are mostly prelingually, deafened, some people who are postlingually deafened. Everything that I say today I think is true for ntid. I think it would also be true if you were working with children or other adults outside of this type of environment. But today's presentation is specifically about adults with severe to profound hearing loss and the ones who choose to use hearing aids and cochlear implants.

I think we have a mixed group today in the audience. So there are some speech language pathologists who will be watching this presentation and there are obviously a lot of audiologists here as well. So I am going to try to make this as inclusive as possible so some of my speech friends can understand a little bit more some of the more advanced audiology tests that we do. But again, I am an audiologist, so this is going to be from the Framework as an Audiologist.

So how do we define success with hearing aids and cochlear implants? Traditionally, we are looking at three measurements of success. When we are trying to fit hearing aids, trying to fit cochlear implants, we are looking to optimize audibility. We want to make sure that people can actually hear. We are trying to optimize comfort so we do not want sound to be too loud, and we are trying to optimize intelligibility.

So can the person understand speech? When we are looking at fitting hearing aids and cochlear implants, the perfect, the sweet spot is right there in the middle where all three of those things combine and overlap.

So let's look at audibility and comfort again. We all know this. When we are fitting hearing aids on anyone that walks through our doors, we are looking to improve their access to sound. Soft sound, average sound. But we do not want it to be so loud that it becomes uncomfortable.

So what are some of the traditional measurements of success? How do we know that we are meeting our goals to provide audibility and comfort? So traditionally, we are going to use real ear as our gold standard for measuring audibility. So for my speech friends, real ear measurements essentially use a probe microphone to measure the output of the hearing aid inside the client's ear canal. So we are using targets, prescriptive targets, to verify that we are in fact meeting these clients hearing needs, that we are getting the amplification loud enough that the person can actually have full access to speech.

So that's kind of our gold standard for measuring audibility. We also could use a sound field testing. We could put our clients in the booth. We can test them with their hearing aids, with their cochlear implants, find their thresholds, what is the softest level that they can consistently respond to? And finally, we have most comfortable level and uncomfortable level measurements.

So we are looking to ensure that the hearing aids are loud enough and comfortable speech intelligibility. This is probably the primary goal of most people who are looking to wear hearing aids, especially people who are not part of the deaf population. They want to be able to understand speech. That is their goal for wearing hearing aids. So how do we measure that they do in fact understand speech while they're wearing their hearing aids or their cochlear implants.

We could measure a speech recognition threshold. We can try to find the softest level in which they can consistently respond to spondy words. We could use word recognition testing, we could use sentence recognition testing. And if we really want to make it Challenging. We could do speech and noise testing.

So when we see deaf people in the clinic, we don't always know what their auditory skill is. But when we're doing word and sentence testing, when we're looking at what speech materials to use, we really have to think about what materials, what, how easy and how hard, what can this client do? So when we are picking the materials, we need to be aware of both ceiling and floor effects. We need to make sure that we are picking an appropriate level of material. So, for example, we do not want something too difficult, something beyond their auditory skills.

Not only can this be very frustrating and can this be discouraging to clients, it also doesn't allow us to track any type of improvement. Because even if we have well fitted hearing aids or a well fitted cochlear implant on someone, if the task is beyond their auditory skill level, they're going to score zero percent on every task. On the flip side, we don't want it to be too easy. One, it misrepresents their progress. It looks like they may be performing very well with their hearing aids or cochlear implants, even if they are actually struggling in the real world.

And it's also patronizing.

Another thing that we like to do at NTAD is to use monitored live voice. Now, I wouldn't do this on every client, but sometimes recorded materials can be difficult for people, especially people who do not use spoken English or people with lower levels of auditory skills. So I have found that because one, if this is someone I've worked with for a while, they're more familiar with my voice, so they tend to do a little bit better. It's a little bit more representative of how they perform with their typical communication partners. And it also is just a little bit more natural.

And the clients are able to. They just feel more comfortable. They're. They're able to perform a little bit better on this task, and that can be encouraging for people.

Okay, so we obviously want to ensure that we are picking the appropriate materials for the task and for their auditory skill set. So how do we know what their auditory skill set is? Let's say there's a deaf client who shows up. You have no idea. You have no audiogram.

You have no idea what their speech intelligibility is like. What could you do? So you could go all the way back to Norm Erber's auditory hierarchy. Start from the bottom and work your way up. So Norm Erber developed this auditory hierarchy to, to indicate the different levels of auditory skills, starting at the bottom with detection.

So this is the ability to hear sound, to be aware that something is going on in the environment. You do not need to know what that sound is. You just need to hear it. That's detection. The next rung up the ladder is discrimination.

This is the ability to, if you hear two different sounds or two sounds, to know whether it's the same or the diff or different. Again, you don't need to know what the sounds are. You just need to know, I heard two sounds. Yes, they're the same or no, they are different. Third rung up the ladder, you have identification.

So now we are asking the clients to do a little bit more complex task. They have to lay, label and repeat the words or the sentences or the stimuli that they heard. And fourth up the ladder is comprehension.

So this is obviously the most complicated auditory skill. We're asking clients to understand the speech, they're understanding directions, they're participating in conversation, having a back and forth.

This is a task that is generally not assessed formally by audiologists. My speech friends would obviously have many ways to assess this. But as I'm talking as an audiologist, I'm just going to be talking about tasks that we can, we that we can use to measure the three lowest auditory skills.

So detection. A lot of these are probably tasks that you are familiar with. How do we measure basic detection? Some of the tools in our tool belts are speech awareness threshold. So that's an sat.

You could use that with recorded running speech or you could use it monitored live voice to try to find what is the softest level that a person can consistently respond to speech stimuli. Again, they do not need to repeat what it is what you're saying. They just need to indicate that they've heard it. We can also do a sound field audiogram. So using the hearing aids or the cochlear implant in the booth and trying to figure out again, frequency specific information.

What is the softest level that this person is able to respond to warble tones in the booth? Ling sound detection. This is something that we use a lot here at ntid. The ling sounds, if you're not familiar, are ah e oo sh m and they essentially represent the spectrum of speech sounds. And we, it gives us a little bit more specific information about what the client is able to, to hear specifically related to phonemes.

So we could, you know, pull the clients into the booth. We could try to figure out exactly what is the softest level. They could hear each of the individual ling sounds. And then you could also do the early Speech perception, the esp, it does have a detection subtask.

So discrimination, same difference. We could use ling sounds for a discrimination task as well. So I could have a client in a booth, typically at a comfortable level, like their mcl, present two different ling sounds. Ah oo. And the client would tell me, yes, they are the same or no, they are different.

Could also do minimal pairs discrimination. So minimal pairs would be words that have three phonemes and two of the three phonemes would be the same and there would only be one difference. And so one example of a minimal pair would be bat and pat.

And I could present these minimal pairs at a comfortable level and ask the student, are these two words the same or are they different? And this would give me an idea about their discrimination skills.

Moving up the ladder. Identification. So this is kind of the sweet spot. I think this is where most audiologists live. When we are testing in the booth, we are looking at word and sentence recognition.

Again, we are asking the client to repeat exactly what they've heard. Now, identification can be challenging for a lot of our students. This is where some of the most of the time, I would say this is where their auditory skills start to break down. So we have different levels of difficulty when it comes to identification tasks. The easiest would be a closed set task.

So the test that we use is called the four choice spondy test. And you can actually find it. It's in the minimum auditory capabilities test battery.

Essentially what we're doing is presenting the student with a list of four words. We are then presenting the students with a stimuli which is one of the words in that list. And the student has to circle the word that they think they heard. That is obviously the easiest task because it's close set. The student does not have every single word in the English language to pick from.

They have simply the four words.

Then we have open set word tasks. This can be very challenging again because there are no context. You just have to hear the phonemes in the words and repeat them back exactly as they are presented.

So the first two word lists under my open set word section there, the CID W22 word list and the NU6 word list, those are very common tests in audiology. And for those word lists, obviously you have to have 100% recognition of the word in order to get to, to be scored correctly for that for that word.

But for the CNC word list, this is something that's used a lot in cochlear implant testing. And that's where the students can actually get partial credit for Any phonemes that they hear correctly. So that gives us a little bit more information. Even if a student does pretty poorly on word identification, we can see what phonemes they're able to hear and which ones they consistently are getting incorrect. Finally, we have sentence recognition.

And this again is very challenging. Although compared to words this is a little bit easier because there, depending on the word list, there's a little bit of context. So if a client maybe didn't quite hear the full sentence, they can try filling in some words that might make sense in that context. So if you look at the list that I have underneath the sentence recognition, I have the sentence list that we use at NTID in order of difficulty. So starting with the easiest, we have the CID everyday sentences.

And those truly are everyday sentences. They are short, they are very high context. For example, good morning is one of the sentences on this list. So again, something that these students would be hearing a lot. Then we have the hint and noise test.

Now the hint and noise test is a little bit easier than the CID everyday sentences, but it's still fairly high. I'm sorry, it's a little bit harder than the CID everyday sentences, but it's still fairly high context. And that can be performed in quiet and in noise. And then we have the AZ bio sentences. That's kind of the gold star for cochlear implant measures looking at the success of a cochlear implant.

And again, this can be used in both quiet and in noise. And one of the interesting things, one of the very challenging things about this test is that there are different speakers. We have female speakers and

male speakers. So it's very difficult for people to predict these sentences. They're very low context, they're very out there.

And so this would really be reserved for our students who have excellent high level intelligibility and identification scores.

So how might this work in practice? I'm going to start out with a case study here to show you our thought process, how we can use that auditory hierarchy in decision making when we have a deaf client in front of us. So this is actually not a student. This was an alumnus 37 year old guy who had a long standing history of severe to profound hearing loss. Identified as a baby, had used hearing aids bilaterally all of his life and he communicated with simultaneous communication.

So he signed and he spoke. At the same time he underwent cochlear implant surgery at another clinic. We do not have an ent, we do not have physicians here at ntid. So we don't do any type of cochlear implant surgery or initial simulations here. So he, he did actually go somewhere else to get the CI surgery.

And he had been using the cochlear implant for about seven years prior to being seen again here at ntid. And he wasn't really that thrilled with the cochlear implant. He was using it, but he was definitely depending on the hearing aid and he just felt like it wasn't really adding much to his life. And he was, he really, he was asking me about whether or not he should even keep using the cochlear implant. So when he showed up, he.

His goal was actually to improve his speech understanding. He worked with a lot of hearing people and people who didn't sign, and he wanted to really ensure that he was having good communication at work.

So what do we do with this goal in mind? I am trying to figure out what his auditory skills are so that I can see what his intelligibility is like. So we started with soundfield audiogram. We've got pretty decent results, honestly, for someone who received a cochlear implant later in life, someone who does not necessarily depend on their audition. These are pretty standard results for cochlear implants.

Again, pretty good audibility across the board. I also wanted to test his sat, so his speech awareness threshold. So again, starting with detection, what can you actually hear? He. His SAT was great.

It came in at 25 decibels. So I said, okay, what is your SAT across the frequency range? So I decided to do sat with link 6 ounce. And the results also looked fairly good. It matched up with his cochlear implant thresholds.

We've got thresholds about 20 to 40 across the frequencies. So I said, okay. He was able to identify the ling sounds at threshold. He didn't have to in the detection task, but he was actually repeating the ling sounds that I said. So I knew that he could already do some identification.

So we moved on to a different identification task. And that was an open set speech recognition threshold. This was difficult. He struggled with this. And you can see that because his SRT was 60 dB, which is higher than would be expected based on his cochlear implant thresholds.

So I said, okay, if I give you just six bondies to choose from, where are we doing? What are we doing with that? So I gave him six bondies. I said, you are only going to hear these six words. And in a close set task, he was able to do much better.

His SRT landed around 35 decibels. So then I said, okay. What about sentences? We started with our easiest sentence list, the CID everyday sentences at 60 decibels. And this guy was able to score 40, 40% on the sentence list, which he's not a superstar here or a cochlear implant user, but this was

someone who had consistently seen a score of zero on all of his CI outcome measures, and he was feeling a little bit defeated by that number.

So even seeing a score that was over just 0% helped him to buy into the idea that the cochlear implant is not doing nothing, and it actually is providing quite a bit of benefit.

So we've been talking about traditional measures of success, particularly speech scores. How well someone is understanding speech with their cochlear implant or their hearing aid. And those are great, Absolutely wonderful. A lot of our deaf students, they really want to improve their speech understanding. So we do not discount speech scores at all.

But we do recognize that for many of our clients, it does not give the full picture of their goals and their abilities. So it definitely measures a very narrow skill set that not everybody has and not everybody uses. A lot of our clients who are deaf ASL users, if their friends and family are also ASL users, they might not be exposed to speech on in a daily situation, especially here, where their professors would all sign. So speech understanding might not really be relevant to them, and it doesn't necessarily reflect how well they communicate in the real world and how well they function.

So here we try to reframe success. We're not replacing the traditional standard of success, but we are adding to it. So I don't need to tell you all how important client centered care is for us, especially because we're dealing with members of the deaf community. We really want to ensure that we are prioritizing their goals, that we are respecting their culture, and that we are avoiding assumptions about what they can and can't do and also about what's even relevant to them. So we know that for everybody, success is not one size fits all.

But as I can speak specifically about our students here, it's really important to get to what their goals are, understand fundamentally what they are looking to get from the hearing aids, and then figuring out

how we can measure that we have successfully met their goals.

So what might success look like for some of our students? Maybe it's, hey, I want to hear the environment, I want to hear voices, I want to be aware of traffic, I want to be aware of the fire alarm. I want to be able to figure out where sound is coming from. Those are all things that could be a goal.

Improved enjoyment of especially music. Our students love music.

They are also often enrolled in speech language services. So enjoying speech and being able to listen to themselves, being able to listen to their speech instructor, those are all things that might be important to them.

Social connection. We know that hearing aids and cochlear implants can improve speech reading. And many of our students depend on speech reading for communication in different environments. So being able to improve speech reading, maybe that might not be something that a student would list as a goal, but it's very often an outcome of success that we measure pretty, pretty frequently.

The ability to interact with hearing people to feel confident. Maybe they're going on an interview for a job, maybe they're going to ask out somebody that they like who's hearing, and they want to feel confident in hearing themselves, in regulating their own voice and in participating in a conversation and just feeling overall independent that they do not need to rely on speech to text technology, they do not need to necessarily rely on an interpreter in every situation that they can hear what they want to hear and be able to be included and to communicate or to even just be aware of what's going on.

So I'm going to dive into a few special considerations when we're working with deaf and hard of hearing students here at ntad. Some things that maybe you haven't thought of in your own practice if you don't work with culturally deaf people very often. So I'll start with hearing aids. When we are measuring

outcomes with hearing aids on people who have severe to profound hearing loss, especially people who are members of the deaf community who maybe use ASL as a first language, it is very common for real ear to not meet targets. Very often it looks like these people are underfit, and that's okay.

Very often it's because these students don't like to be at full prescription. They don't necessarily want to hear the world at full volume. They just want to have access to know that someone's speaking again, not necessarily to hear every single individual speech sound. When you do an aided audiogram, you may actually see results that look pretty poor. So you may find that aided results are around the level of a moderate or even moderately severe hearing loss, rather than, you know, closer to normal or mild hearing loss.

And when you're testing the high frequencies, you, you may not get any responses at all. And a lot of that is due to the limitations of hearing aid technology and also comfort. With high frequencies, we see people who have grown up with no access to the high frequencies. So even when they get hearing aid technologies that, that might be able to give them better access to the high pitches, they do not like that.

And finally, when you are fitting the hearing aids and also therefore when you are running real ear measures, you may want to consider using DSL as a prescriptive method instead of nal. So DSL is desired sensation level. It is a hearing aid fitting method that is generally geared primarily to children. But we find that number one, if our students have been using hearing aids since they were children, they like the sound quality that they're used to and they want to continue using that dsl. But second of all, DSL provides a lot of power and some deaf people really like that sound quality because again, they, there are some, some deaf people that just want to hear everything as much as is possible and they don't necessarily, they're not necessary to, not necessarily looking for clarity, they're not necessarily looking for speech understanding, but they're looking for access and sound.

And that's what DSL can give you.

We're not usually chasing high frequency audibility. I know that when we're working with people who have presbycusis, that we are primarily chasing high frequency audibility because that's primarily where the hearing loss lives for people with presbycusis. But when we're looking at people with severe to profound hearing loss, especially this population where they might be using manual communication, sometimes we just have to let that high frequency audibility go.

Okay, so here's another case study that we have here. This is a student, he's very representative of many of our students that we see on campus. This is an 18 year old freshman, an ASL user from a deaf family. He stopped using hearing aids in middle school, has not used any type of technology since then. And he was kind of an average part time user even in middle school.

Couldn't establish an srt, tried a four choice Fong test and he actually did great with the closed set task. So 100% word recognition on the right and 90% on the left. And the whole reason that he wanted to get hearing aids was because he wanted to listen to music and he wanted to listen to video games. So these were the most important things to him. Not speechless, not environmental awareness, music and enjoyment.

He was fit with bilateral superpower hearing aids. You can see here, when we're looking at the objective measures, things don't really look all that great. We have real ear which is under target, particularly very much so in the high pitches and the aided audiogram looked, oh, you know, pretty, pretty poor, honestly. I mean, he doesn't really have access to a whole lot of speech sounds based solely on these results. So, again, objective measures, just looking at this does not look too great.

But if we move to stick to the subjective measures, it tells a completely different story. So we have the International Outcome Inventory Hearing with Hearing Aids, which is the IOIHA, which is a

questionnaire. He scored 34 out of 35. So these hearing aids were really impacting his life in a lot of positive ways. He went from essentially a non user to a consistent daily user.

He reported that he perceived the hearing aids to be very beneficial. He also reported that he enjoyed music and video games so much more, and he felt that getting hearing aids was very much worth the trouble. So, again, a lot of positive outcomes, which, if we were looking solely on the object on the objective measures, we do not see those positive outcomes. So switching our perspective to include some things that are not necessarily speech outcomes shows a completely different profile, completely different picture.

All right, moving on to cochlear implants. What are some of the special considerations when we're programming cochlear implants? When we are measuring outcomes with cochlear implants for some students who would be. Would match our student profile. So again, someone with severe to profound hearing loss who may not necessarily depend on spoken English for communication.

When we're looking at sound field thresholds in the booth, we may notice that results aren't necessarily falling around that 15, 20, 25dB threshold, which is what we've come to expect for CI users. We may find that thresholds are landing somewhere around 30 or 35, sometimes even 40, and that's okay. We also may find this is more rare, but we may find that the frequency allocation table has been adjust this. I see more often with deaf adults who are even older than our students who have gone, you know, maybe 30, 40, 50 years using hearing aids and no access to the high pitches. So when they get that cochlear implant and they, you know, in their 40s or 50s, and they finally have access to those high frequencies, and they cannot get used to it.

So again, this is rare, but we do see it that sometimes the frequency allocation has been adjusted so that instead of going out to 7 or 8,000 hertz, we're seeing that the cochlear implant will only go out to maybe even like 3 or 4,000 hertz. So results in the sound booth will indicate that.

And then finally, consider an acoustic component. Even if the client is maybe not an ideal picture perfect hybrid client. So I'm not advocating for necessarily a shorter electrode array, but I am saying that in many cases you can add an acoustic component to the processor that the person has, either by adding the acoustic ear hook or adding a receiver. And you would be surprised by the number of people who look as though they would not necessarily benefit from the acoustic stimulation, who, who actually end up loving the sound quality. They feel as if music sounds a little bit more natural and they feel like they can hear some of the super segmentals of speech a little bit better.

And overall, even if their objective measures do not look significantly different, they prefer the sound quality of the electroacoustic stimulation.

So this is an audiogram of a CI user who at first glance, looking at their unaided thresholds, you would not consider them a candidate for hybrid technology for electroacoustic stimulation. But this is someone who uses an acoustic ear hook and cannot live without it. He absolutely loves the way that it sounds. We actually tried mapping him without the acoustic component in order to potentially use a off the ear processor, but he absolutely hated the way that it sounded, or at least he preferred the way that it sounded with the acoustic component. And he felt like he was hearing better with that.

So again, not a traditional client, but may actually benefit even though does not look like they would.

Bimodal listening. So we actually did a little bit of research into bimodal listening about nine or ten years ago. Here we took a cohort of students who were long time unilateral cochlear implant users with no stimulation on the contralateral ear. And, and we were curious, we were wondering, if we added a hearing aid to that contralateral ear, would they benefit from that? Again, on face value, that looks like it would be an epic failure.

We know that these people have not been stimulating their auditory system on that side and so they likely would not benefit from adding a contralateral hearing aid. And for many people that's true. But we did find that after a month, maybe a couple months of adjustment, these students actually grew to not only like their bimodal configuration, but to depend on their hearing aid and felt that they were not hearing as well without it. We did have to initially program the hearing aids. Very, very soft.

Initially, the clients, the students, they found the hearing aid stimulation to be very unpleasant, mostly vibrations. But as they used it, they did notice quite a few subjective benefits. So improved localization was a big one. Reduced listening effort and an improved overall richness in sound quality.

Speech reading. Now speech reading is a big one. That we use when we're trying to measure success with hearing technology here, Mostly because all of our students utilize it in one way or another. And it's a really good real world task that we can measure. The way that we measure it is using a test that was actually designed here at ntid.

It's the NTID speech reading test, and it utilizes the cid, Everyday sentences.

I believe that it is still available through auditech, but you would have to have a way to play it like a DVD player, CD ROM player on your computer. So not everybody has that these days. But there's a list of. There's 10 tasks, and each list has 10 sentences. And you would present these lists in three different conditions.

So one would be speech reading alone. There would be no audition involved. In fact, a lot of times we ask the clients to just take off their technology. Then we would do speech reading and listening combined, and then we would do listening alone. So we would compare the results of these three conditions to see if the clients actually benefit from their hearing aid or their cochlear implant.

Here's a still from the NTID speech reading task. As you can see, it is definitely an oldie, but definitely still a goodie.

All right, so we have been talking a lot about language. We've been talking about audition. But there's also quality of life, which is extremely important to these students. So how do we get to goals that involve quality of life? We do a lot of open ended interviews, a lot of questionnaires here.

We're very big on the cozy, the client oriented scale of improvement, because the students can indicate the measures that are most important to them. They can indicate their own personal goals, and they can track improvement as we go along with treatment or management. Another one that we like to use, especially with cochlear implant users, is the hearing implant sound quality index. And the international outcome inventory of hearing aids would be for hearing aid users.

All right, this is my last case study, and I saved it to the end because I feel like it's representative of some of the things we talked about with cochlear implants, Some of the things we talked about with hearing aids, bimodal and speech reading. So here we go. This is a non traditional student, somebody who returned to school. You can take a look at his hearing loss. This was a congenital hearing loss and likely progressive.

Although I didn't have all of his audiograms for comparison purposes, he had never really used hearing aids. So think about this guy walking around on his daily life. Depending on speech reading and captioning for all communication, he did not sign, he used spoken English, and he did not use hearing aids at all. So this was someone who was really struggling with communication that had kind of accepted that that was going to be his life because he had tried hearing aids, and he did not find them to be useful at all.

So he did actually undergo CI surgery again at another center in the right ear. He decided to go with an off the ear processor, so the Rondo 3. And when he was initially activated, he had absolutely no sound perception. He reported that sound was experienced like light. And so his primary goal was to improve his ability to identify sounds, to understand words, and to improve his communication confidence.

This was someone who had a history of mental health and anxiety and depression struggles. And I was working with him through oral rehabilitation and listening practice about starting about a month after his activation.

So I worked with him from about January to May. And in May, we measured some outcomes. We started with the NTID speech reading test because I felt it was representative of the way that he communicated on a daily basis.

Again, the audition only task, he scored 0%, which is essentially what we were both expecting. In the vision only test, he scored 68%. So he was, again, a pretty strong speech reader. He could do pretty well with even without the cochlear implant. But then we added the cochlear implant.

We did vision and audition together, and he scored 90%, which is fantastic. I mean, again, this is someone who started off thinking this cochlear implant was a horrible idea. I can't even hear anything. When we did the hearing implant sound quality questionnaire, he reported a moderate sound quality. And again, from someone who heard nothing initially to reporting moderate sound quality, those are good outcomes.

And then he did celebrate a few small wins. During the four or five months that we worked together. He reported that he was able to hear the blinker in his car. For the first time, he was able to identify environmental sounds, and he could distinguish between voices. Especially he could recognize his mother's voice.

He could recognize some of his regular communication partners.

We did the cozy at the beginning of the oral rehabilitation. For his first goal, he wanted to identify and distinguish between sounds. He reported that he, you know, after the four or five months he could do that better, he was seeing an improvement. And then he wanted to improve understanding of common words and phrases. He reported, you know, it's not quite there, but it's slightly better than it was.

But the. The last goal was increased social contact, increased confidence with interactions, and he reported no change. So Again, this was someone who was isolating himself previously to having the cochlear implant. He was continuing to isolate himself. He was experiencing a lot of depression because he felt like the hearing or the cochlear implant was not doing what he expected expected it to do, even though he had undergone extensive counseling both with me and with his mapping audiologist.

And again, this is someone who was wanting to probably stop use of the cochlear implant. So I decided that even though I would not necessarily usually introduce a hearing aid this soon after initiating cochlear implant use, I decided that I would try him in a bimodal configuration just to get him hearing as much as possible so that he could feel more confident in social situations.

So we fit him with a hearing aid. Even though he has mostly a profound hearing loss, he could not tolerate a bte, a power bte. He was extremely underfit in a RICK technology with a mold, but this was essentially what he could tolerate. He we only gave him low frequency gain. And results of results of the aided audiogram indicate, you know, that he's not still, even with the hearing aid, not able to hear anything above 750 hertz.

So he's really not using this hearing aid for speech understanding. But just adding this hearing aid was enough for him to feel confident enough interacting with other people that he started attending yoga and meditation classes more frequently and he joined a DND group and he was able to interact with more people, socialize. And again, that was one of his major goals. So adding this hearing aid, even the minimal benefit that he was getting from that, was enough to truly improve his life.

All right, so I'm going to start wrapping this up because I got an eye on the time here. So clinical strategies, how can you make this work for your practice? If you have a deaf or hard of hearing person who, who uses manual communication or non traditional communication, if they walk into the practice, what could you do? So you could start with open end goals interview, trying to figure out what exactly do you want to use this hearing aid for? Are you a physician and, or a PA or you know, do you need to hear a heartbeat and that's all that you want the hearing aids for?

Do you, are you a musician? Do you appreciate music? Are you only wanting the Bluetooth streaming capabilities or do you want to be able to understand speech? There's a range of things that people could be seen for and trying to really recognize what their primary intent is with the hearing aid or the cochlear implant is extremely important.

You Share decision making. Sometimes when I have students who come into the booth, I ask them, hey, do you want me to test your word understanding today? Very often students do not care. It is not relevant to them unless I'm required to do it for, you know, an application for something. I might not do any speech recognition testing.

We might do speech reading instead, for example. Revisit goals periodically. So goals obviously evolve and change. A student may start off desiring to just hear environmental sounds and music, but as they go through college, you may find like, hey, now I'm applying for internships. Now I'm working and I'm interacting with more hearing people.

Now I want to be able to hear more speech. Now my goals have changed. How can we now ensure that this person is being successful and successfully meeting their goals? And after they've changed, consider trying a hearing aid on someone who may have a long history of auditory stimulation. It's worth a shot.

It may be initially uncomfortable and it's okay. Obviously we do not want it to be painful. We do not want anyone to leave the clinic with a hearing aid that is painful. But underfitting someone giving them some experience with audition with those hearing aids and slowly building up to a. A better fit closer to target that it's, that's totally reasonable.

We do not necessarily need to prevent someone from trying a hearing aid just because they have a long history of auditory lack of auditory stimulation. And obviously we should educate clients and families about realistic expectations. I think that's true for pretty much all clients that we work with. Hearing aids and cochlear implants are not a magic bullet. They need to understand limitations of the technology in order to truly be successful or to feel successful.

A few more considerations I want to leave you with. Again, we shouldn't be relying solely on speech scores because not only might we underestimate the benefit of the hearing aid, but we may also overestimate the risk or, excuse me, the benefit of the hearing aid. So there may be someone who is a superstar CI user, someone who has amazing speech recognition skills with their cochlear implant, but they still feel like music sounds awful. And they may have a goal to really appreciate music, and we're not meeting their goal. So again, looking outside of the intelligibility box to try to make sure that we are meeting their needs and their goals.

The other thing that I would caution people on is to respect autonomy and technology use. I see a lot of people who are what I would call part time hearing aid users. They view their hearing aid or their

cochlear implant as a tool and they use the tool when they feel they need it. Sometimes they don't feel they need it and sometimes they do. So we know that full time hearing aid and cochlear implant use will generally produce the best outcomes, especially for speech understanding.

But sometimes it's not a realistic expectation and that's okay. Our clients are adults and we allow them to use their technology in the way that they see fit.

All right. Success is very personal. I don't need to tell you that. I don't need to tell you how important client centered care is.

I'm hoping that today's presentation allows you to just think a little bit outside the box. If you ever see a deaf individual in your own practice, try not to be so married to real ear and so married to speech intelligibility tests. Start thinking about some of the other factors of success. Some of the things like enjoyment, some of the things like, like awareness of sound, different forms of communication, like speech reading, looking at the entire picture of a client and not just what they can do in the booth.

All right, so thank you so much for letting me provide you a little snapshot of some of the things that we do here at NTAD and some of the people that we work with. And I hope that you found the case studies interesting. Before I open up to questions, I'd love for you to fill out this survey. Again, we work in an educational setting, RIT NTID is an educational setting. And we are constantly trying to get feedback so that we can improve our services and try to understand how we can best serve the broader community.

So if you could please complete this survey, you could either use the QR code or there is a link in the handouts.

Thank you so much, Dr. Jackson. This was a wonderful presentation. Really, really informative. I would like to thank RIT and TID for their partnership in this course today. That concludes today's course.

Thank you again, Dr. Jackson for a wonderful presentation. We'll see you all next time. Thank you.