Aural Rehabilitation Approaches for Adults with Early Onset Hearing Loss and Long■Term Deafness, in partnership with RIT/National Technical Institute for the Deaf

Presenter: Erin Pickett, AuD, CCC-A/SLP

At this time, it's my pleasure to introduce our presenter. And I should also mention that today's presentation is presented in partnership with the Rochester Institute of Technology, National Technical Institute for the Deaf. We have several courses in our library in partnership with RIT ntid and you can search those using the topic filter in our course library. So please check out the others in this series. So let me introduce our presenter, Dr. Pickett.

She is a dually certified audiologist and speech language pathologist. She began her career as a research SLP for six years before pursuing her audiology degree and she is now a full time audiologist at RIT NTID where she supports deaf and hard of hearing students and clients as they work towards their communication goals. Dr. Pickett, it's great to have you here. I'll turn the microphone over to you.

Thank you, Carolyn. Welcome everyone. Thanks for joining us. So today I want to talk to you about oral rehabilitation, or AR as I'll call it throughout the presentation approaches that we use here at NTID for adults with early onset hearing loss and long term deafness.

Here are the disclosures for this course, my disclosures and these are the limitations and risks about this presentation and these are the learning outcomes for the course.

And so first I'll tell you a little bit about ntid. Those of you who have taken some other courses from us will, will be familiar with this by now. But for those of you who are not, NTID or the National Technical Institute for the Deaf is one of the nine colleges of the Rochester Institute of Technology or RIT in Rochester, New York. And NTID was actually formed in 1965 through laws from the U.S. congress. And our mission is to provide higher education opportunities for deaf and hard of hearing students.

A little bit about our students. They are deaf and hard of hearing and they use, they're quite, quite use a lot of various listening technology and communication modes. So if you look at this chart on the left here, the way they use listening technology, actually about a quarter of our students don't use any. No

hearing aids, no cochlear implant. About 34% use hearing aids.

Another quarter use cochlear implants. And about 13% wear both hearing aids and cochlear implants. In terms of communication modes, this is also quite variable. 38% use American Sign Language as their primary mode of communication. A quarter 25% use spoken language.

And then 30% use spoken and sign language together. And about 7% use something else, for example, writing as our primary communication mode.

And here at NTID all of us audiologists and SLPs are ASHA certified. And again, our main mission is to support the communication needs and communication skill development of our students. We all use American Sign Language and we can match our student and client's language and communication modalities. So however they want to communicate, we can match that.

And here's a little bit about our services for Audiology center and our speech and language center. We're pretty offer comprehensive services, you know, where we call ourselves kind of their clinic away from home. So when they're here at college, you know, we can support them.

And now a little bit more about what we're going to talk about today. The first one we've already done, we introduce ntid. Then I'm going to talk a little bit about more basic typical AR process and protocol just to make sure we're all on the same page. And I can, you know, we'll highlight kind of what we use here, ntid, what we tend to rely on. I'll tell you a little bit about the clientele we see.

But then the meat of this presentation is really these three case studies that I'm going to get into with some real people that we've worked with and then there'll be a little bit of takeaways and then hopefully some time for questions.

So ar, There's a definition used by the ASHA clinical practice guideline on AR for adults with hearing loss. This was published in 2023 and the definition they use came from an article by Arthur Boothroyd in 2007 which states Arkansas is the reduction of hearing loss induced deficits of function, activity participation and quality of life through sensory management instruction, perceptual training and counseling.

I want to tell you a little bit more about this clinical practice guideline because it's fairly recent. It's from asha. It's basically was a meta analysis of research to give some recommendations about ar. And the main recommendations were first that AR should be person centered, meaning that patients preferences and needs are respected and incorporated in treatment planning and patients are giving choices and they're encouraged to be involved in their care. Arkansas has four main components and that was taken directly from that Boothroid explanation I just showed you.

So four components. First is sensory management. So this could be, you know, managing the hearing loss either through hearing aids or cochlear implants or assistive devices. Informational counseling. So one example would be explaining the audiogram or maybe talking about when you go into a crowded restaurant, where is the best place to sit for hearing the best you can.

Things like that perceptual training, also called listening practice. And this will be really what I'm focused on for most of this presentation. And then personal adjustment counseling, which where you're counseling clients about the social or emotional impact of the hearing loss. And for some clients you use just one of these components. For others you'll use a multi component approach.

Now, in these guidelines, their recommendations, they stated, apply to adults with all types and degrees of hearing loss, including both early and late onset. But what I noticed in reading over these guidelines is that most of the studies that they evaluated which were out there, the participants had mild to moderate hearing loss. There were a few with severe to profound losses, but it didn't specify whether

they were early losses or late onset. And so that leaves a little room for us to talk about, you know, how do we do AR here working with that early onset population? And just one little comment.

In our experience, the early onset population needs less informational and personal adjustment counseling than the late onset. So we do also work with some older adults with presbycusis as well. And you know, we're doing a lot of informational and personal adjustment counseling with those folks, the early onset, when they come and see us for ar, it's really more about that listening practice, although there is other, other parts of those components included as well.

So some AR basics that we want to make sure we share with you. One big take home point we hope you'll take with you today is that before beginning ar, we want to, you know, you want to make sure the person you're working with has optimal listening with their devices. If you're going to be working on listening and that you can understand what do they have access to. So how do you do this? Well, one is to, you know, ask the client about their hearing aid and cochlear implant.

And if they're working well for them, you can ask them if they know about the various features. For example, if they're concerned about listening to speech and noise, are they using speech and noise features in their hearing aid or cochlear implant? If they don't know, definitely, you can refer them to audiology and get that checked out. You also will want to get some information. You want to review their audiogram.

We recommend having an aided audiogram and speech recognition testing having been done within the past year. And I wanted to show you in this example of this audiogram, the red C is a right cochlear implant and the blue C is the left cochlear implant. Just to remind you with an audiogram. We have frequency across the top, low pitch to high pitch, and then loudness. Very soft at the top, getting louder and louder as we go to the bottom.

This gray area here represents the speech spectrum. You can see this right cochlear implant. These are the person's thresholds listening to sound field, to warble tones. These are their thresholds. Any sounds above this area are too quiet for them to hear, and anything below is loud enough for them to hear in their listening range.

This right cochlear implant has access to pretty much all the speech sounds, but this left cochlear implant has access to pretty much no speech sounds. This is something you want to know. You're not going to want to start architectural doing listening training if they can't even hear. And so it's great to get that information. If you need a little review about audiogram reading, we have a couple presentations.

I'll put a plug in them for them. Coming up. Part one in July and part two in October. You can check those out.

Now, you know, we've all been trained in basic therapy methods from perhaps some of us a long time ago. But when we're doing some training and therapy, we want to have a pre assessment to know where people are at and what to work on. We perform the training and then we do a post assessment to see if our training made a difference. The way I think about pre assessments when I'm doing AR with my clients is I think about doing formal, informal, and then questionnaires. So formal assessments, I mean, basically speech recognition tests in the sound booth.

Maybe something, you know, standardized tester or something that's easy to compare across time, that has norms, more formal assessments, informal assessments. You might do, you know, just sitting in speech, reading some everyday sentences, or the speed that they can do tracking, which if you don't know, tracking. I'll talk about that more later. And then some questionnaires we give. Client's question is at the beginning to know what sort of things they want to work on.

How do they rate themselves on things like their own speech reading ability, their listening abilities. Do the training and the post assessment. We want to repeat those assessments from the beginning to see if we can see any progress. And this is how I'll be presenting our case studies as well.

And a couple things that you probably all heard before, but I just want to reiterate them and things that we think about when we come up with our goals and working with our clients. So Erbers hierarchy, if you remember, and it's often Seen as a ladder. And this is listening skills. So when someone is starting out listening, an early skill would be detection. Can they just hear that there's sound present?

And then the next more sophisticated skill would be discrimination. Can they hear the difference between sounds or words? Not necessarily identifying the sounds or words, but hearing the differences. And oftentimes that's a task of same or different. And then the next level above that is identification.

Usually that's done by pointing to pictures or repeating back the stimuli. And then the final most, the highest level is comprehension. They're actually understanding the utterance, what is being said, and the meaning. Other things we use when we think about AR is analytic training versus synthetic training. Now, analytic is we can think of as bottom up.

It's looking at very small parts. So typically it's phoneme, working with phonemes, phoneme identification, phoneme discrimination. And that's at a very, you know, at one end, analytic looking at very small parts. And then you can think of the continuum all the way on the other end of synthetic, where you're really getting at the meaning. Maybe you're not worrying about them getting every single little sound or word correct, but they're understanding the meaning of what's being said.

It's a continuum. So we work along that continuum. And ways those kind of go together could be, maybe I'm doing an analytic activity where we're really focused on, you know, vowel discrimination.

Now, I already know they can hear them, but I want to know, can they discriminate them? So we might do some minimal pairs to see, okay, are you.

Is this, you know, I say two words. Are they the same or different? And then after that, we might move to identification. Here's two words. I'm going to say one of them.

Which one did I say? That's more identification.

But we'd like to remember we're working with adults. So we follow an adult learner model. And to us, this means that they're shared decision making with our clients. The clients will help us develop goals and then help us rank them in the order of importance to them.

And in this, we also will, you know, our job is we need to counsel them on realistic expectations. So we'll look at their hearing history, we'll go over with them their current test results, the implications for AR services, and what goals we can expect to be realistic. For example, someone who wears one hearing aid and only has a little bit of that speech area accessible to them. It's not going to be a goal to be able to, for example, walk into A conversation and understand everything that's being said.

We also rely a lot on collaboration. So here at NTID, the audiologists and the SLPs, we are together in the same department, often seeing the same students. So we consider ourselves partners. And the SLPs will refer their students to come and see us, even sometimes walking them over to our window where the students can sign up for services with us to get that, those aided audiograms. So the SLP knows how the person's hearing or you know, they're having trouble with their CI, can they make an appointment for that?

Also we consider the students themselves as our partners as well. And you know, they may bring in materials as well, vocabulary from classes, they're working on, an app they found for communication.

They want to practice things like that. We rely on them to participate as well. And also, of course, other medical professionals.

So if we may need to reach out to mental health or their academic advisors or things like that, we can do that as well. And also part of the adult learner model, we see ourselves as being able to offer a safe space to push the students, to challenge them. We might explore worst case scenarios with them, we might come up with what ifs and try to plan out for those. So give it a place that we can, you know, give them a little push, but also trying to help them become more independent. A lot of times the students, this is their first time, you know, being away from home and they're, you know, we're trying to help them take responsibility for their own goals and how to reach them.

So the clientele we see at ntid, they're typically young adults or, you know, college students, but we do see a range of adult ages. For example, a lot of the faculty staff here are hard of hearing or deaf, and they may see us as well. Most of our clients do have some listening experience and do use some sort of listening technology, but the amount varies tremendously. So we can have someone we're seeing who relies on their devices for listening all day, every day and are only among people who use spoken English all day long versus someone who spends all their time in classes or with other people who are deaf and only use asl, and the only time they do listen is when they come and see us for one hour a week. And again, we will match the client's preferred communication modality.

Another thing I wanted to point out about us is that we do offer our services free for RIT students, faculty and staff. And we are not bound by reimbursement rules. We're not, you know, trying to get any insurance coverage for any of our services for this population. And so our audiologists also will do AR because we're not trying to bill for it or anything. And we have the luxury of spending a lot of time with people.

So who comes trying to find AR services with us? So here's some examples, some real life examples. Someone who recently got a cochlear implant for the first time, recently implanted, or maybe they just upgraded their hearing aid technology and feel they can hear better and now want to practice. Someone who has had a unilateral cochlear implant for a long time and recently got a second CI and really want to focus on getting that second CI up to speed. Another example is a long term bilateral CI user who never really got used to that second CI and wants to try again.

Other people maybe have stopped using other devices for a while, but now they would like to retrain using them. Or we might see someone who communicates in asl, doesn't really use spoken English, but they have a hearing aid or CI and they want to build up their listening skills and build up their confidence in interacting with hearing individuals.

So I'm going to talk to you a little bit about some resources and activities I'll be discussing in those case studies.

I'm not going to mention every single possible assessment or activity we might ever do, but I wanted to mention some that I'm going to talk about during the case studies and some and highlight some that you maybe haven't heard of before. So when we're testing word recognition, one test we love to use is called the four choice Bondi test. And this is a close set word recognition test. Here's an example here. So someone has four choices, they hear a word and they pick which one they heard.

So in this case the stimulus was eardrum and they circled eardrum.

This test is great because we like to try to find a way to give them success, find something they can do. So someone who may not have open set speech understanding often can do this task and get a score that is more than just chance. Another test we'll be talking about is a CNC word test. This is quite commonly used for people with cochlear implants. It's a single, you know, monosyllabic open set word

test.

For sentence recognition we frequently use these three tests, cid, everyday sentences, hint and az, bio. And I've listed them here. In a way we think about them in terms of our hierarchy of easier to more difficult. So CID everyday sentences are as it says everyday sentences for example. Here we go.

Hint. Sentences are a little bit harder but have a lot of context. The cat jumped over the fence and then az bio a little bit less context. Both male and female speakers spoken a bit more quickly.

We also use something called the NTID Speech reading test which as you can see guess was developed here a very long time ago although it is still available. And this consists of videos of a female speaker speaking those cid everyday sentences. And we tend to give this in three conditions to compare. So we'll give it in auditory only. So we'll block out the video, visual only.

So turn off the sound and then auditory plus visual. Together we can get a sense of how well the person's speech reads and how much the auditory part is adding to their speech reading or not. We also love to use these screening tests from cochlear. Cochlear had a adult rehabilitation manual which we have a few copies of that still which we love to use. That's not available anymore.

But this, there is a home based therapy guide with a guide for clinicians and in there are these screening tests and they can great for pre and post assessment and also it gives you a guide, you know, where did the person end up? And start at this level of training with the guide. So it's really great.

Another assessment you may or may not know is the esp, the early speech perception Test. This cochlear had an adult version which we have some copies lying around. Again I don't think you can get it anymore but you can get the kids version and it's easily adapted. So for example, you know, instead of using the cute pictures you just use written words. In this we're looking at speech perception, pattern

perception.

So can the person tell the difference between length of words? So as you can see here we have single syllable, two syllable and longer syllable. Can the person tell, you know, one syllable versus four syllable? In this example the person got 20 out of 24 correct. Just looking at categories, you know how many they got correct that were single syllable, you know, in these black boxes here.

And that means they had some pattern perception. They could tell the difference between a short word and a long word.

So again this is in the, in the sense of trying to find things that can do, oh, you've got some pattern perception or no, you don't have pattern perception. So we have a sense of where to start.

And now here are a few treatment or training examples that again will come up in the case studies. Again this is a very small list but we also have included a handout with this presentation of a lot of resources for you. Whereas, you know, as of last week, all the links were working to get you started. So some examples of analytic training we might use are, you know, minimal pairs, the color vowel chart, which is really cool. If you have never seen that, check it out.

It relates vowels to colors. So, for example, red for e. And it's just a way to really make vowels visual, which is important in this population. Angel Sound, if you're familiar with that, has some analytic modules in there. That's a computer program. It does look quite juvenile, but it has some great things in it.

More synthetic types of training we might use or some materials would be speech tracking. Talk more about that in a minute. Alpha Cats is just a book providing lists of words based on a category on Alphabet. So animals and animals starting with A, starting with B. It's just these, you know, these

materials that are already made for you.

Another thing we really love to use is The Phonak and AB's hearing success site, which includes Sound Success and the Listening Room. Really great online auditory training programs. But again, check out that handout. It's got lots of resources for you.

Speech tracking I just want to spend a little time on because we use it a lot and it's very versatile. And if you're not familiar with it, I want to make sure it's something you can add to your toolbox. So this is a way of listening Practice listening to connected speech. It's great because you can choose any material based on the client's interests and their language level. I'll often choose an article on a topic that they enjoy, for example, dancing or nutrition or whatever they would like.

The main method that we use it for is you have a passage, you'll break it into appropriate chunks. So you might say a word at a time or a few words at a time. The client will repeat each chunk you say, and you want to get them to repeat it verbatim before you move on. And you get through the passage. You time how long it takes you to get through the passage, and you calculate words per minute.

Again, this is versatile. You can do it. If you're working on speech reading, you can do it with visual cues, or if you're working on auditory only, no visual cues. You can use it to practice various strategies, you know, training them how to use context to figure out words or conversational repair strategies. At the end, you can check their overall comprehension of the passage.

You can infuse target vocabulary. There's Just so many things you can do with this. And I just wanted to give a little example. Let's just say this was the passage you were working on. And the number of words in here is 42.

It took us a minute and 30 seconds to get through the passage with me saying, you know, Serena loved. And the person repeats, Serena loved. You can set up your criteria. For example, I may say to myself, okay, I'm going to repeat it three times, and if they don't get it, then I will give them visual cues and then they'll repeat it and then we'll move on. And you just want to be somewhat consistent if you want to compare, obviously, from time to time.

All right, case studies.

This first case study, this is a student who was a unilateral hearing aid user. They primarily used asl. Deaf since infancy, had some intermittent hearing aid use, but the last couple years have been using a hearing aid regularly on their right ear. They were also attending speech therapy at the same time to work on expressing functional words and phrases. And I saw this person in individual weekly AR sessions for three semesters.

Now, when we started, here's their audiogram, their left ear had no audible hearing, so they were just using the hearing aid on the right ear. Well, when we started, no access to speech. So, you know, speech reading is maybe where we're headed.

The client's goals, what she wanted to do, were to improve her ability to speech read her mom. She wanted to improve her ability to understand common things people would say when she's out and about at restaurants and public places. And also she found that she was often getting startled by environmental sounds. So she wanted to be able to recognize them better to not get startled.

We did our pre AR assessment. We did that four choice bondee, where she got 30% correct. Now there's four choices. So 25% is chance. So that's really about chance.

On the NTID speech reading test, we did both auditory and visual together. And then she only got zero percent correct. And then the ESP we found no pattern perception. Speech perception, category one. Now, I put a little asterisk here to remind myself to tell you that she did perform above chance on that esp, but it didn't reach the level of saying she had pattern perception.

So what I got from that was basically she had no speech recognition ability, very limited speech reading skills. And I only said that because also in the ESP there was a spondee recognition task. And we did it both with visual cues and without. And without. She had, you know, that Chance levels and with greater than chance did better with.

So the speech reading was doing something for her. And then also limited word length or pattern perception skills. So here's a chance where I just wanted to get your input on what your thoughts are for. Some goals and objectives we might use for her. If you remember back to her own goals were to speech read her mom speech read people in the environment and not be startled by environmental sounds.

Do you just have some thoughts about a goal or objective you might think to work on with her? Just wanted to get your, you know, go ahead and put in some thoughts in that Q and A. I'll give you a minute there. Think of something.

Okay, I see someone put in there.

Environmental awareness might be a good goal to shoot for at the very least. Great, great idea. Any other ideas? Give me a few more seconds here. Add your thoughts in.

Great. Another person said focus on speech reading.

Another person says I'd like to understand the student's goals, but given their limited speech recognition, having a solid foundation on environmental awareness and differentiating sounds too. Great. Another person added a list of common restaurant phrases and practice, auditory and speech reading practice and role playing scenarios for restaurants and other environments. These are all really great ideas and it makes me feel good because you'll see our thoughts are along the same lines. So the objectives we came up with to work on were pattern perception or word length recognition.

Just because this was an early goal to work on and it was really, you know, kind of perception itself is obviously not going to help understand words. But really to support the speech reading, if you can start to understand and discriminate short versus long and things like that, it can help with the speech reading, environmental sound recognition and then speech reading with sound, common words and phrases.

Okay, but first we want to get her hearing as well as she can, as that is a goal of hers. So as we mentioned, as I showed you before, with the hearing aid she came in with, she really didn't have access to sound. First we tried reprogramming that hearing aid, but we maxed it out and couldn't get any more. And I realized and it wasn't a power hearing aid, so she really needs a more appropriate hearing aid. So I worked with VR to get her a new power hearing aid.

We spent a lot of time getting that. And you can see with her new hearing aid now, she at least has some access to some speech sounds. Not everything, but definitely more than she had before.

Okay, so just a smattering of things we used or worked on with environmental sound recognition. Angelsound has an environmental sound recognition module. So we use that among other things, pattern perception and word length discrimination. Again, we use a lot of different resources but one thing the listening room does have some exercises on the computer. Speech predicting with sound.

We use custom lists as well as published lists of various everyday sentences. And then for we did. I didn't mention this as a goal. We did at one point just add on vowel discrimination. Worked on that for a little bit.

Especially once she had a hearing aid where maybe she could hear some vowels. We use that color vowel chart.

And one thing we typically do is we'll start with live voice and then move to more recorded stimuli to help with that carryover listening to other voices.

So after three semesters of working together we, you know, here are some outcomes. So the environmental sound recognition goal. One way to test that is Angelsound actually has an environmental sounds test. Pre she had 40% correct post 56%. So a little bit of improvement there that those screening tests I mentioned from that cochlear rehab manual where length identification is one of them.

Pre 65% host 80% and on that ESP pattern perception pre 14 out of 24 post 14 out of 24. So a little improvement on that cochlear test. Not so much on the ESP for speech reading with sound more formal assessments, the NTID speech reading test even post we couldn't get any words correct on there. And on that spondy identification I mentioned in the esp pre5 post7 not really a big difference. However with more informal on our custom lists we worked on numbers.

So for example pre with numbers was 60% she got up to 90%. She brought in a list of her family name she wanted to understand better 3 70% up to 100% by the time we were done we had a published list of common phrases and sentence. We improved from 60% to 90% and then on a custom list 53% up to 80%. So you can see on more formal assessments, not necessarily a lot of improvement but on our own custom informal assessments some improvement. I had mentioned how we do some

questionnaires, a self assessment.

So the student rated herself on scales from 1 to 5, 1 meaning none, 5 meaning understanding everything. On listening without lip reading before therapy she rated herself a two, only a few words and post also a two on the lip reading without listening again no change. Lip reading with listening, which is what we worked on, a little bit of a change. Her confidence increased and this sort of catch all question at the end, you know my communication has Improved because of the AR services. She gave it a five strongly agree.

And on her own specific goals that she had, she rated her ability to improve speech, reading her mom as better, understanding things, common things people say slightly better and environmental sounds as better. So I like this case because it shows you someone who maybe we're not going to see a lot of improvement on formal assessments, but she really valued the treatment and the time we spent together and improved her confidence.

And on our more informal tasks we were able to show improvement.

Okay, let's get into our second case study. This was an international student who got a CI right before they started AR. This person was born outside the US but immigrated at the age of 7, had profound hearing loss since childhood, wore hearing aids starting at the age of 12 and again as I mentioned, at age 22, had a CI surgery and also upgraded their hearing aid. On their opposite side. Their first language was Cantonese.

English and ASL were introduced at age 7. And at the current time of AR they were listening depending on mixed communication, listening, speech, reading and asl. Now they're bimodal, meaning using a CI on one ear and a hearing aid on the other. And in fact they're implant had a hearing aid built in. They were using electroacoustic stimulation.

They started AR about one month after their initial activation of their CI and they attended weekly AR for a couple of semesters. So you can see with their CI they're getting pretty good access. With their CI and their hearing aid they have some low frequency access which is, you know, what we would expect. All right. Their pre assessment, they were tested on CNC words.

CI alone, 10% bimodal. So hearing aid plus CI together, 32% the phonemes. So I don't know if you're familiar with the CNC, but you give both a word score. So there's 50 words. How many of the words they got correct out of 50?

But also each word consists of three phonemes. And maybe they got the word incorrect, but they got two of the three phonemes correct. So you give a score for the phonemes as well. That was about 55% Azbio sentences, they tested only with the CI, 11%. These are their pre assessment scores.

And this student wanted to have dedicated time for listening practice to improve his speech understanding with his new CI.

So here was a more interprofessional collaboration approach he was getting at the same time he was getting AR services with an audiologist. He also was seeing an SLA for articulation and self monitoring for speech errors in therapy. The Audiologists worked with their CI only and with their opposite ear plugged some analytic training. You can see some various things they did for analytic training. Also focus on more synthetic training such as sentence recognition and a lot of small talk and everyday conversation.

However, a lot of appointments were spent on troubleshooting and fixing the equipment. Sometimes that acoustic piece of the CI would break and they'd have to fix that. There were some various things that happened and they had to spend a lot of time making sure the equipment was working. In speech

and language therapy, they were working on using repair strategies, pronouncing new words within conversations about academics and hobbies. Also, they practice professional communication by doing presentations.

Practicing presentations.

The outcomes for this student more objective outcomes. With the speech and language therapy they were able to show improved articulation and intelligibility scores. And with listening with that CI alone, those AZ bio sentences, the score improved from 11% pre to 33% post. Subjectively, the student reported that listening was still really a challenge for them, but he definitely felt more confident in his speaking across different communication scenarios.

And one more case study for you.

This was also a person who had a recent cochlear implant, who was a bimodal listener, had a hearing aid on the other side. This person was not a college student, but more an adult, 35 years old. She also had hearing loss from birth and had before her CI surgery had a bilateral steeply sloping moderate to profound loss which you can see in the right ear. Both ears were similar to this ear. She wore hearing aids since she was a child, very consistently.

And then before ar, just before, a little while before AR got a cochlear implant in her left ear. Very similar to the last case where CI thresholds are where we'd expect CI threshold to be with the hearing aid, some access to low frequency sounds.

And this person also used listening and speech reading and ASL on a daily basis both at work and at home.

So this person, when they first got their CI, was struggling for the first year or so. When she came to start ar, she reported that she's now just depending on that hearing aid. Now she feels like she's hearing only on one side, just with that hearing aid where before the CI surgery she was using her two ears. She felt she couldn't distinguish sounds when she was wearing only the CI. The sound quality was poor and unnatural.

Also the CI was louder than the hearing aid and she just had no time to practice. She's a busy professional, busy family life, wanted some structured therapy sessions, a time to come in and really focus on listening. So her goal was to improve her word and sentence recognition both with CI only and when listening with both the hearing aid and CI together.

She was seen weekly over four semesters. They use both live speech and recorded materials. The typical stimulus presentation would be first she would hear a stimulus auditory only. The clinician would repeat, the client would guess and then she would get an auditory and visual confirmation since she was really an excellent speech reader. When they worked on CI only, the contralateral ear would be plugged and they focus on bimodal listening when they were doing the more analytical training and doing training in noisy conditions.

And this just gives you an idea for this particular client how each, you know, sort of a typical session was structured. Our sessions are 50 to 60 minutes, typically usually once a week. And that first 10 minutes of the session they would do a technology check, as we mentioned, over and over. We want to make sure that technology is working as best it can. They would have a discussion about what happened in the past week, how did it go, what were some successes, what were some challenges.

And then they'd move to do some speech tracking that would be CI only. And then move into analytical drill and practice, sometimes with just the CI, sometimes with both devices. Then they move on to the computer to get some, you know, different voices in there, topic related sentences. And as I mentioned

before, that AB sound success, that has a lot of sentences from closed set to open to more open set. And you can have different speakers, you can put different kinds of background noise.

If you're working on background noise, it's really great for that. They also came up with customized vocabulary lists usually related to work. They worked on that with the CI only. And then at the end they would spend a little time discussing, okay, how difficult were these activities today? Let's give it a rating.

And then they would work together to plan for the next session. So again, using that adult learner model, having the client help plan out what to work on next.

Now, we had a lot of audiology integrated into these sessions. They would do, you know, audiograms a couple times a year to keep track of how are things going with the devices. Again, there's a lot of CI programming and troubleshooting. When we're seeing these people week after week, you know, things happen. Sometimes we need to do some remapping, sometimes troubleshooting.

If equipment's not working, you know, we're not going to do listening practice if the equipment is not working. In this case, they talked a lot about speech and noise. So they Made sure they added in noise reduction programs into that CI. These are specific to cochlear and also the troubleshooting. For example, the client reported the sound was dull so they changed the microphone cover.

Just an example of kind of troubleshooting we might do. So again just really emphasizing that need to refer to audiology if there's some doubts that the equipment is working quite right.

They also fit a new hearing aid on that opposite ear. Again, added that restaurant program and noise reduction since listening in noisy situations was important to this client. And they linked the hearing aid to the CI for bimodal streaming so she could listen from devices to both. From like a phone or computer or something to both devices.

They also worked with a remote microphone for listening practice. So that could be. That's really great to use in therapy. If you're really trying to focus on CI only with the microphone, it can go straight to the CI. Obviously if you're talking out loud, you still want to plug that opposite ear.

But say you're doing work on the computer, you can plug it into the computer and now it's just stimulating that CI side.

Also, the client would use this microphone with both a hearing aid and cochlear implant with her family when she was at conferences and in the car. Very versatile use. Some processors can connect Bluetooth directly with computers and phones now as well.

So the kinds of things they would work on together. Synthetic practice. So they use customized alphabetical word lists, vocabulary from work sentence lists. One thing that they started off of course trying to be easier and really build this client's confidence. If you remember at the beginning she was really almost disappointed in the CI and maybe regretting having had the surgery.

So they really wanted to work in confidence building in the beginning. So they started with highly predictable sentences with just one keyword missing. Like you can hear the sentence, you got that keyword. And they also worked on speech tracking with work related materials. And she generally was performing 50 to 130 words per minute, which is actually pretty good.

More analytic training. They did a lot with Ling6 sounds. One of the handouts we included with this presentation is a worksheet we use with ling6 sounds. So definitely check that out. Using minimal pairs.

Again, high frequency word lists meaning lists of words that had high frequency sounds in them like pick like puck sheets. Because now with the CI she has access to those high frequency sounds which

she never had before with the hearing aids. So they really focused on that and also a lot of counseling. You know, a lot of sounds have overlapping phoneme Formants and it's hard to tell the difference. So for example, here M and N. Oftentimes people with cochlear implants have a lot of difficulty distinguishing between these sounds.

And here you can see why. Their first format is exactly the same. The second format is exactly the same. The third format are not exactly the same, but they greatly overlap.

So we could counsel on that. You know, okay, you're having trouble with these two sounds. Well, look how similar they are. That makes sense.

And now we'll talk to you a little bit about outcomes and working with this client. So this chart is showing a consonant analysis. This is a little activity we do where we go through all the consonants kind of in a aca, so like abba, aba and the client has to identify from all the consonants which one they heard. And you can analyze that based on place, manner and voicing. So you can also say, okay, how many of the consonants did they get correct or incorrect, but based on place?

Like maybe they got T wrong, but they called it a D. So we call it a win because they got the right place. Same thing with manner, same thing with voicing. So in that first year for the pre assessment bimodally, you can see she was scoring in the 50s bimodally. Now the next year now scoring in the 80s 90s, even up to 100% for voicing, especially for this voicing. Now that she had access to those high frequency sounds with her CI she could tell differences in voicing, whether something was voiced or voiceless.

And then in the second year they also looked with a CI only, which she had not the confidence to do in the first year. And also scoring pretty highly, especially distinguishing manner and voicing. And here's some other outcomes for her with more kind of formal assessments. First of all, you can see through mapping and experience now she has really great access to speech on her audiogram CID everyday

sentences. Bimodally she improved from 80% to 96% with CI only started off at 20% and went up to 84% with those everyday sentences.

And this is listening only AZ bio sentences, which as I mentioned before, we consider those, they're a lot harder than those CID sentences. Again, because they're so much harder. They didn't even test them initially because she wouldn't have had the confidence to try that test. Bimodal issue was at 88% and with the CI only 46%. And now CNC words, again, we wouldn't have even tried testing single words in the beginning because of her confidence.

Bimodally she improved from 26% words up to 58% and the phoneme score from 55 to 80 with CI only by the end she was getting 34% and 58% phonemes given. You know, again, we couldn't even have tested it before, so she was doing really great.

Some observations that now by the end she was primarily listening bimodally. Work listening, both with CI and hearing aid, they were blending more. She wasn't feeling lopsided anymore. And having gone through this therapy, she was able to make room in her life for more independent listening practice. Listening to podcasts, TikTok videos, apps on her phone.

So doing more independent listening. And she mentioned she really relied on her hearing aid for music support still, which makes sense. And I love this quote, that at a conference she reported a better ability to understand a variety of speakers, even with background noise with her CI compared to the year before. So, yeah, we were really happy of how things went with her. She stated how supportive that in person AR was for her, not only having that time to take out of her busy life to really focus on listening, but actually giving her hope that she could improve and finally, in the end, feeling glad that she got the CI.

All right, so some takeaways I'd like you to take with you. You know, some things we've really talked about and want to emphasize. First of all that collaboration between speech pathologists and audiologists is critical.

You know, SLPs need to know what the devices are capable of. Not that you need to know all the ins and outs, but to know, oh, there are, you know, speech and noise programs that can be put in there and certain, you know, they might want to visit their audiologist to make sure they're accessing everything that they can.

Again, you want to look at that audiogram and know what do they have access to? What is their speech understanding like in the beginning? Also, we're working with adults here, so client involvement is key. We really get their buy in and their goals and their participation themselves. Because now they're adults, you know, we want them to eventually be able to take over their own practice and everything.

And also as I mentioned with that first case, those more informal and self assessments may be an effective way to document progress. And again here, because we're not, we don't use IEPs, we're not, you know, no one is checking up to whether we're not going to get a paycheck, whether or not someone improves or not. And so, you know, you may have things you certainly have to do and show improvement on. But one way to get at that could be through these more informal and self assessments if we're not seeing a lot of progress on those more formal kind of bigger assessments. One thing I didn't talk too much about, but you know, we understand there are multiple ways to deliver ar.

I talked here about how we see, you know, individual one on one ar and because a lot of people really find that helpful and supportive as in case number three and two and one, all of them. But of course some people don't need all that, or maybe you don't have time for all that. And you can definitely set up more home programs, you know, work with a client through one session to set up a home program for them. And you can look at that handout of resources I mentioned you can use to help develop home

based programs as well.

And I would like to acknowledge my co creators. I did not make this presentation by myself. Another audiologist, Catherine Clark, who's been here for a long time and has done a lot of AR in her time here, and then Jewel Morris, an SLP here, we worked together to create this presentation and we also asked all our SLPs and audiologists to give us their favorite resources and we use that to help come up with our handout. So kind of everybody participated, but these two were equal partners with me in developing this presentation. So I'd like to say thank you to them.

One thing is that we love to get your feedback here at RIT ntid. We would like to know what you thought of this presentation and what your thoughts are for more things you want to learn about from us. So if you would, sometime later you can snap this QR code here or in the handout later. This link will be active to go to the survey. It's just five questions, really quick and we would greatly appreciate your input.

Thank you so much, Dr. Pickett. That was wonderful. Amazing to see those outcomes. We have one question so far. Oh, we have more coming in.

Great. So we're going to stay over for a few minutes with questions if people have them, so don't hesitate, please type them in the Q and A. The first one regarding the third case study there, were they using a version of Chinese Sign Language until age seven? Great. I assume you're talking about case number two that I do not know because I didn't work with that client myself directly.

So I don't know. That is a great question. I'd love to know that too.

And then the next question says in case studies and in general the cases go over years or multiple semesters. Can you give an average time between pre and post assessment or the incremental

assessment timeframes you use? Understanding everyone is different, and so time frames may sometimes vary. Great. Yes, we generally.

And of course, each clinician is slightly different to how they go about it, but we do generally give, you know, more comprehensive assessment at the beginning and then at the end of each semester, we do write a little report. And we may do some assessments then, but definitely annually, I would say. So I work with someone over an academic year. I may give some assessments in the middle, but if I know for sure they're coming back in the spring, I will wait until the end of that spring semester to give a more comprehensive assessment. So basically annually, sometimes per semester.

Great. Thank you. Another good question came in here. Have you worked with people who are experiencing interference with their cochlear implant and hearing aid, and what do you normally recommend or do do in those situations?

Huh. Let's see. That's a great question. I guess I've encountered interference more and it's only been a couple times, but interference more with two hearing aids, I haven't really had it come up with when someone who's a bimodal listener, usually as a bimodal listener, they're kind of relying typically more on the CI for speech understanding. And the hearing aid helps support, you know, kind of sound quality and music.

So I. I'm sorry, I can't tell you what I would do because I really haven't experienced that. But what I have experienced with two hearing aids, sometimes it has happened where having that bilateral input, sometimes we'll end up recommending, even though you're hearing a candidate on both sides, maybe you just use the one. Yeah, that's interesting. Yeah, it's. It's actually interesting to me that you haven't encountered that.

So, I mean, as a hearing aid audiologist myself, in the old days, I would see that with hearing aids as well. Great questions. All right, we have time for one more. Just popped up here. How often do you find technical problems with the devices, for example, dead batteries not working at full function?

Interested in family awareness of the functioning of devices? Yeah, I'd say looking, you know, thinking back to people I've worked with like this on a weekly basis over a long time, maybe a couple times a semester. So, you know, semester is 14 weeks or so. So maybe every couple months, even could be as often as that. I mean, that sounds very often.

I don't know if it's really quite that, but, you know, it's. For some people, it can happen a lot. You know, moisture issues and tubes getting blocked and things like that. Something definitely to look out for.

Great. Well, thank you. We really appreciate your expertise. And all of the faculty have been presenting at Rochester Institute of Technology, National Technical Institute for the Deaf. You just have so much experience in this area, and so many of our participants at Audiology Online are really looking for it.

So, again, please, for those of you who are interested in these topics, you can look at RIT in our course library under the topic category and find all the courses. And as Dr. Pickett mentioned, there's more coming. So if we can get your feedback on that survey, you can maybe have input to some of those newer courses. Last but not least, want to remind everyone, if you are earning the CEU today, please log into your account. Take the short outcome measure, the multiple choice exam there.

It'll be available in about 10 or 15 minutes from now. Dr. Pickett has been a pleasure. Thank you again. Thank you. Hope to see everybody soon.

Have a great afternoon, everybody. You too.