Research QuickTakes Volume 7: Clinical Tips From Recent Hearing Aid Research

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7.1 Clinical nuggets from recent research: Pre-fitting considerations

Welcome back. I'm Brian Taylor, and welcome to Quick takes volume seven. And with me today, as usual, is Gus Mueller. Gus, welcome back. It's been a while since we've done one of these.

Good to see you. Yeah, it has been. I recall we were finishing finishing up volume six a few months ago, and, and here we are on volume seven, which is great, but it has been, we've been off air for a while, and in case people thought we were just sitting around eating bonbons, we actually were busy and put in a lot of time putting all these together. Basically what we had accomplished over a year or so is we've gone through six volumes. We recorded webinars for each issue of each volume, and things count up.

And we discovered that we really had 35 different webinars, 35 different shorter articles. And so what we did is we combined those into six different volumes. Each volume has about five plus or minus one articles. We then have submitted them all to audiology online. They're all now available for ceus.

If any of you are interested. It would be, if you don't want Ceus, it's free of charge to read them. Great reading for students. And of course, many of you were signed up at audiology online for ceus. Simply go to audiology online.

And if you want the text courses, just search under text courses or if you want the recorded webinar. I played around a little bit, and they came up the easiest, fastest, most accurate. If you use Taylor, it didn't work as well with Mueller on there. I hate to say it, but. Damn, Brian.

But anyway, Taylor, research, quick takes, and I think you'll get just about all of them. And it should work. I think, from what I hear, they're very popular, and you can also find them at audiology online under the signia channel, which is on the bottom. So there's a

number of ways. I know we didn't originally want to put them on, we didn't put them on audiology online, but I'm happy that they're there.

If, no, if they go to the signet channel, they also, would they also get Ceus taking it that way, right? Yes. Any way they find it on AO, they'll be able to get CEU. And anyway, I did some quick calculations getting prepared for today, and basically they've only been all available in a package like that for three months. And over 10,000 ceus have been issued.

So, yeah, that's pretty cool. I'm taking that as a good thing. Yeah, no, it's, I think they've been popular, and it's hard to believe it's been a few months since we've done one of these and we're already at number seven. Exactly. This is sort of your.

This is sort of your forte, Gus, because I think. How many years have you been doing a version of this with your colleagues, Katherine Palmer, Bob Turner and now Ryan McCready at AAA every single year. And tell us about. Well, in April. In April, it will be the 22nd year in a row that we've done that we've actually gone through and looked for clinical nuggets.

So we're recording this before our presentation in April. So this is don't tell anybody, but some of this is fresh stuff that most people won't be hearing until April. I'm just happy that it gets in the hands of clinicians on this. So don't tell Katherine. Tell Katherine and Ryan.

I won't say a word. But thank you for taking the time to put this all together. So I'm going to let you go ahead and sort of dive in here first. Okay, good. Good.

So anyway, we start off with this famous quote from Paul Valerie, who I'm guessing probably was an audiologist somewhere. And I sort of like it is because it sort of is

what this is all about. It's just to give us a different idea of some of the things that we think we know the best. And of course, then, you know, I don't know that you, Paul, don't know this Valerie guy. And I know Brian, you're into music.

So I had to pull out a quote from Frank Gi Zappa, who said, you know, looking at him, you wouldn't guess it, but he actually was quite the reader and writer. So much to read, so little time. Good old Frank Zappa. Always good to see. Probably Brian.

You probably even know the name of his band, the mothers of invention. I think that's right. Yeah. I can't say. Don't ask me to name one of their songs.

But. No, it's a little. There are. It was sort of weird, as I recall. But anyway, good old Frank Zampa, we're going to, you know, as we go along over the next few weeks, we'll see if we can pull in some interesting quotes for all of these things.

So anyway, there's, every year, believe it or not, there's over 300 articles related to hearing aids are published. We're very lucky to the course that Brian mentioned. Laurie Zatelli from University of Pittsburgh is sort of our human search engine, and she finds a lot of this, but usually we sort of have our eye on you sort of can spot a good one if you stick with journals as the year goes on. But she always finds a few that we hadn't thought of. And some of these are pretty esoteric.

Some of the signal processing ones are tough to follow, but there are a handful, and I'm going to go so far as, say, two handfuls that have very direct clinical applications. And so what Brian and I have done here is try to find a few of those that do have some clinical applications that would be helpful for you. And in particular, something that maybe you can use on Monday morning.

This first section, and this is issue one of this volume. What we're going to look at is pre fitting consideration. So once we get to volume two, we're going to be working on pre fitting testing. These are just some things that maybe you should think about before you're even doing your pre fitting. A lot of them related to candidacy.

And then what I was showing you, there was a special issue of seminars and hearing, and we're going to pull a couple articles out of that.

This first one was written, by the way, this is all from market Track 2022. And so this first one was written by Lindsay. But again, to be clear, what she basically is doing is summarizing the data from the big survey. So some findings that I'll toss out there that I doubt is going to surprise any of you slightly more. About 2% who identify as male report having some level of hearing aid compared to females.

Actually, that's a little surprising to me. I thought maybe it would be a bigger difference in favor of males. Female respondents with hearing loss report similar hearing aid adoption rates as males. In case you're thinking that males are more accepting or females are more accepting, it's actually the same. And as you would guess, as people age, the percent to report hearing loss increases.

To summarize this, and again, this is what you've heard before, younger than 65. Now, this is people who report hearing loss. These aren't people who are tested. These are just people who say, yes, I have some hearing problems. Less than 10% for those under 65, 21%, 65 to 74, 34% of those 75 to 84 years of age, and 56% of those over the age of 85.

Which, looking at it the other way, that means 44% of people over the age of 85 have normal hearing or think they have normal hearing, which. Well, I don't know what they think. I doubt that they really do, but they think they do. They report that they. Exactly.

Nobody went out and tested these people so they could tell us whatever they want. Now, one finding that some of you might find surprising, except that it has been reported before on market track surveys, is that the adoption rate is not linear. And that is there is a greater adoption rate for the people under 35 than there are from the people between 35 and 64. There's a few theories you could toss out for that. One of them might be that these people are more in tune with taking care of their needs and they recognize they have a hearing problem and they say, yeah, I want to take care of it.

Where if you move into the generation older than that, they may want to put it off. I don't know. Brian, do you have any thoughts on why we see this u shape? Yeah, well, I think this is an interesting, I've seen this in a couple of different places. Nobody knows for sure, but I think part of it might be driven by the fact that people between 35 and 64 are not prioritizing their hearing needs.

They are raising families, they're working full time. So maybe they're not adopting hearing aids like some of the other groups. But I think the next slide that you have kind of gives us some insights into why. Yeah, I was going to save that because this is the one thing that Lindsey brought up. I don't know if they brought it up in the market track report, but there's a couple things that on here now.

So remember, this is relative to the percentage. So this is the percent of a percent. And so we're looking at getting an idea of the degree of hearing loss. There's two things on this slide that, that I find interesting. What I circled I'm going to get to in a minute.

But the first thing I want to talk about is the blue bars and that. Notice that the younger people, as you would guess, the adoption rate was higher for people with a mild loss than for the moderate group with, than the older group with a mild loss. But that could

just because the older group had more people with a moderate loss. So you don't know really what comes first. The one thing that was brought up though, is that in the younger group there's a lot more people with a profound hearing loss.

And that's what I have circled on there, which then tends to increase the adoption rate. The belief is that these are the people now who are all born during the days of early identification of hearing loss and that these people are being fitted with hearing aids at a much, much younger age. They're being identified as a much younger age. And that could influence the adoption rate. Exactly.

All right, moving on to slightly related topic, but an interesting one is this one has to do with whether or not the adoption rate is associated with the significant other in attendance. So there has been some earlier research that shows that when a significant other is there, there's a greater odds of hearing aid adoption occurring. The folks in this article, though, went beyond that and said, is there association between the type of significant other in attendance and hearing aid adoption? So this is what they did. It's a huge sample size.

This is something done in the UK with the sample size of 10,000 people who came in the door with a significant other, 37,000 who didn't. And then they looked at who the significant other was, and you can see there it goes from a partner, parent, child, sibling, friend, or caregiver.

What did they find? Well, first of all, these are all the different. If you look down along the bottom of the x axis, you see all the different significant others that came along. And I don't know if this would surprise you or not, but the winner was if you brought along your child. Now, they didn't go into detail on this, but I'm guessing this isn't your screaming four year old that you brought along.

I'm thinking this is more likely an 80 year old who brought along her 60 year old daughter, or something more like that. That acceptance rates was higher than, significantly so than all the other. All of them are higher than the people who come in by themselves by as much as 10%. And so it tells you, if somebody says, should I bring along, should I bring along a friend or bring along my, my wife or my husband? Bringing along your child seems to have the most influence.

For those of you out there who fit hearing aids recently, you probably know it's not uncommon that a child flies home from Christmas and drags their mom or dad into the clinic to buy hearing aids. I don't know if that's the influence that they're talking about, but it does happen. Yeah, I think that's a great example, Gus, of research that's confirmed with a lot of savvy clinicians have known for a long time. I think back to my days working with the miracle ear folks 20 years ago, and they were always fairly insistent that somebody would bring along a companion that lives with or spends a lot of time with the person because they knew that it was a big decision that they were going to make, and it was important that they had input from that other person. So this is just research that kind of confirms what I think a lot of people already were.

Yeah. I have a real quick story from yesterday for some of you listeners know, my wife's a clinical audiologist. She just had an experience yesterday where she was working with an older man who came in with his wife. She had in the records that she fit him three years ago. And he came in with a wife, same wife.

And he walked in the door, and the first thing he said, I've never worn these because you never showed me how to put them in. And Karen looked at the wife, and the wife said, honey, she spent a half an hour showing you how to put them in. It's like, okay, one for the wife. So it helps. It helps to have somebody else there for a variety of reasons.

Okay, back to a whole new topic. This is a fun one because it has to do with what is normal hearing. It seems so simple, but it isn't. For reasons like this. I simply went to Google images and I looked at audiograms that are being used by various organizations and various clinics.

This one I found. This one says that until your hearing loss gets worse than 25, you have normal hearing. Then there was this one that says, until your hearing loss gets worse than 20, you have normal hearing. And then there was this one that says, until your hearing loss gets worse than 15 decibels, you have normal hearing. Now, wouldn't you think that a profession like audiology, which has been around since 1946, that perhaps we all could agree on what is normal hearing?

Obviously not. And it gets worse.

Here is a speech banana. Way back when, Meade, Killian and I spent a lot of time looking at data of where the range of speech should fall, and pretty much conclusively looking at the data, it should be between 20 and 50. Hl Pavlovic, Larry Humes. A lot of us were doing speech spectrum stuff. We all tend to figure it was between 20 and 50.

And there you have it. But you know what else is I saw that's being used in a clinic. Look at this. Their speech, their soft speech is at, what is that? 40 decibels.

40 decibels. So imagine if you had a kid with a 35 decibels hearing loss. Your counseling would be, hey, Johnny's doing just fine. He's here in soft speech. And finally, I found this rather humorous.

This was a handout used at a training seminar from a major hearing aid manufacturer as recent as last summer. And guess where their speech spectrum is? It goes from 40 to 65. This is a company which I think is trying to sell hearing aids. If you're going to

mess it up, wouldn't you think you'd move the spectrum up, not down, if you were going to use an incorrect spectrum?

So as you can tell, it's a mess out there. Well, anyway, Chris, Chris Vankovic, a Vandy grad, I might add, wrote an article a few years ago and audiology today that I'm going to go back to where he built a fairly reasonable case, why 15 decibels should be the cutoff. I won't go through all the stats and everything, but here's just a brief summary. He starts off with the fact that we sort of have to assume that reference zero is fairly well established. So we start with reference zero.

Then you know that that's an average. So there's going to be variance around the average. Usually we use two standard deviations. You could use three standard deviations. We also know that in audiology and threshold testing, the variance is around a standard deviation of five decibels.

So if you take three times five, that would be 15 and you start with zero. Anybody with a hearing loss beyond worse than 15 decibels would be most definitely by 99.7% outside of normal limits. That's pretty simple to me. Well, again, that's not really what's used a lot around the world. Here's from the World Health Organization.

And so they use a four frequency average, which is a benefit rather than three frequencies. But notice the numbers are higher than 15 for sure. If you look at a mild loss, it's 20 to 34, moderate is 35 to 49. I just did a little bit of math. So if this person came into your clinic by the WHO standard, this would be normal hearing, because it's only in the best ear and it would be a pure tone average, better than 20.

To me, this person's definitely a hearing aid candidate, a bilateral hearing aid candidate, I would add, but this would be classified as someone with normal hearing. I'm going through all this because it's important then to help you understand an article

that Larry Humes published recently. And what he did in this article is he combined participants from two large studies, a total that ended up being then a pretty huge end of around 200. And he used the who criteria to classify them as normal or moderate. They were all fitted bilaterally using probe mic measures and now targets.

They all went out in the field, had a six week trial, and they all completed either the HHI or the HHIA, both pre and post. We've talked about the HHI and Haia in previous quick takes. So I just put up this up to remind you, it's a very popular test that's been around since the 1980s. When Larry did his study, he used the full blown 25 question version for clinical use. All we need to do is use the ten item version.

This is the way it would be scored. High scores are bad. You want people to say no for everything, but even people with normal hearing usually don't. This is just an example of a patient who ended up with a score of 14, which on the Larry Hume scale would be a score of 35, which then takes us to Larry's data. So what we have here is he has these groups classified as, according to the who, and he has those that would be classified as normal hearing, those classified as mild, and those is classified as moderate.

And he fit them all with hearing aids, and they all went on and used the hearing aids for six weeks. And what you have there, if we look at the blue, well, I think I have a summary. If you look at the blue, what you'll see is the unaided was essentially the same, even though they fit into three different distinct categories. If you then look at the aided benefit, which is the gray bars, they're essentially all the same for all three hearing loss categories. And at the end of the clinical trial, all of them were offered the opportunity to purchase the hearing aids at a somewhat discounted price, but not dirt cheap.

80% of those in the normal group purchase their hearing aids. Now, granted, as I showed you a couple slides back, normal by the who might not be normal, but what you consider in your clinic. But then again, it depends on what speech spectrum you're using and what cutoffs you're using. Who knows what's normal in your clinic? But the point here is that simply looking at the audiogram can be very risky when you're fitting hearing aids.

And then we'll finish up going back to that seminars and hearing journal. By the way, hearing industries association paid for all of that to be open access. And so there's about seven articles in there. I think you'd find them all useful, including the two that we're talking about here. You could simply go to seminars and hearing, and you don't have to be a subscriber.

You can read that entire issue. So this one was by Erin Paku from Vandy, and she talks about some outcome measures. Why am I bringing it up now? Because I think it's a pre fitting consideration. Because I think we aren't very good at getting this word out to our patients.

And I would encourage you not to be shy about getting the word out about this next time the local tv station has you do a little interview. Do hearing aids work? I think this is really good information. One of the things that Aaron reported was simply, does the use of hearing aids improve your quality of life? Now, you might not think 65% is fantastic, but it really is.

And it's even more fantastic when you go back just to 2015 when it was only 47%. So over whatever that would be, a seven year period, we've gone from almost, we've gone about a 20% improvement in quality of life for people using hearing aids. That's pretty fantastic. Look at this. Now, what they do, for those of you who don't follow Marketrack, what MarketTrak does is they have people report if they have a hearing

loss or not, and then, of course, what degree it is, and then they report whether or not they use hearing aids.

So they have these two groups. These are all people who have hearing loss. Now, they weren't carefully matched like you do in a research study, but my guess is they have similar hearing loss. One group, the group in blue, are people who've chosen to purchase hearing aids. The group in Orange are people who have a hearing loss but have not chosen to use hearing aids.

And. And we're calling them non owners. What I want you to look at is the huge differences about how satisfied people are in large groups. Small groups, watching tv, home with family, workplace. Going back to the people who say hearing aids don't work in background noise.

Go down and look at the large group on the far left, and we go from under 30% to over 70%. Over 70% of people are satisfied with the way their hearing aids work in large groups. This, to me, is great news. I mean, I been fitting hearing aids when they first started doing marketrack. And I can tell you, back then, satisfaction in large groups was around 30%.

I don't know, Brian, if you remember it, but I think it was maybe thirty's. It was in the high twenties, I think. Yeah. And here we are at 70. I mean, this is amazing.

I mean, I don't even know what the ceiling is. If you were to ask people with normal hearing, are you. I can tell you, I, for one, I'm not particularly satisfied in large groups. A lot of times I don't hear what's going on. So, you know, I don't think you're going to get 100%.

The ceiling might be 85%. And that's a good point, I think. What's that normal hearing. I think people with normal hearing, the satisfaction bar is probably between 80 and 90. I would think so, yeah.

Yeah. Because we all have trouble, and so it could well be Robin. That type of stuff has been done with Robin Cox's afab, where she actually has norms for older people with normal hearing and which, which really is your target. You can get your person wearing hearing aids doing as well as somebody who has normal hearing. That that's not too bad, really.

This is a really. I think that you didn't put this slide in the deck, but there's also another data point in that article that Aaron wrote that shows that people that have features like rechargeable batteries, direct streaming, and the ability to use an app to control the hearing aid, the volume, and so forth, those people have satisfaction levels around 90%, about ten points higher than the overall average. Exactly. For you listeners who are interested, there's 18 figures, I think, in that article. So there's an.

And they all tell a good story. So it's definitely something to read and it's easy to access. So here we are for Monday morning. Here's my summary. Encourage your hearing aid patients to bring along a partner.

Children seem to work the best. The 15 D cutoff for normal seems reasonable. And ensure that you use the correct speech spectrum. I would challenge you to find data that shows that 20 to 50 hl is not the best. Include a measure such as the HHI that assesses the patient's thoughts about their hearing ability.

Don't dismiss the idea of giving people with near normal hearing the opportunity to try hearing aids. I mean, I remember in the old days, we would be like, oh, gee, what if one of my competitors found out I fit somebody that didn't have anything worse than a 25

decibels loss? Fine. Let them find out that patient may be happy. And finally, don't forget to get all the good news.

Tell the good news about why hearing aids work. A lot of it's available in market track 2022. And that takes us to the end of prefitting considerations. The next time Brian, you and I get together, we're going to talk about some pre fitting testing, what should be different. Sounds good.

Well, a lot of people think that this normal hearing stuff is kind of boring, and maybe that been put to rest a long time ago, but it's actually, if you dig around just a little bit, you see that it's kind of a hot topic. I know that the Johns Hopkins group has been a proponent of something they call know your number, which is basically your pure tone average. I know Larry Humes and others have been talking about how we need to focus less on the threshold or the pure tone average and look more at auditory wellness with a measure like the HHI. So, you know, thanks for doing all this review of this topic. You know, a preview, Brian, is just recently an article came out on this very topic of fitting people with really normal hearing.

I think it was an ear in hearing article. And as we walk through this whole volume down the road someplace, we're going to be talking about actual fittings. And I'm going to try to pull that article in. We'll revisit it. Sounds good.

All right, guys, catch up to you next time. I believe it is. Hopefully it'll show up at some point in time. All right. See you next time.

Okay.

You close.

7.2 Clinical nuggets from recent research: Pre-fitting testing

Welcome back, everybody, to research QuickTakes 7.2. Today we're going to be talking about clinical nuggets from recent research involving pre fitting testing. I'm Brian Taylor, and with me again, as usual, is Gus Mueller. Gus, welcome back. Yeah, thanks.

Good to see you again. It wasn't too long ago when we did 7.1, which had to do with pre fitting considerations. And so now we're going to move beyond considerations and talk a little about testing. As I was going through some of this literature, I realized that some of this we've actually covered in some quickk takes of a year or two ago. But try to bring that up when we get to those particular issues.

And of course, we need to go with our friend Paul. Paul. Valerie, northwestern grad, I think, I don't know, a little before Carhartt who said, the purpose of research is to give us a completely different idea of the things we know best. Now, Brian, when we got together a while back, I pulled in a quote of Frank Zappa. I couldn't quite tell if you're excited about that or not, but I thought, today I'm going to sort of stay on that theme.

And this is don't gain the world and lose your soul. Wisdom is better than silver or gold. I don't think that's Frank Zappa. No, no. You know who it is?

Yeah, Bob Marley. There's a movie. Bob Marley. Bob Marley. Yep.

That's actually from a song. And right now I'm blanking on the song, but it's a good song. Of course. All the songs are good songs. You know, the reason I pulled up Bob Marley is Frank Zappa and Bob Marley both died really young.

Bob Marley was in his thirties. If they were both alive, all three of us wouldn't be about the same age.

Their careers went a lot better than mine. But then they faded earlier. They faded earlier than I. You know, Marley had some kind of old thing started in his big toe, a melanoma of his big toe or something. And I think, yeah, that's right.

It was some weird thing. He was only in his thirties. Anyway. Too bad. I love his music anyway.

And I love his quotes. Don't gain the world and lose your soul. Wisdom is better than silver or gold, which takes us to potential uses of hearing aid, prefitting measures, which are incredibly underutilized. I think you probably all know what the various uses are. And these are all the very.

These come from the different tests that you might use. And so not all of these things come from the same test. But you can determine the patient's perceived hearing loss. That would be something like the HHI or the aFap. You can quantify hearing problems, which will determine hearing aid candidacy by doing some special tests.

It might help you and what kind of technology or what assistive listening devices. I'm thinking particularly of a test like the quickksand that's going to help you providing programming the hearing aid. I'm thinking tests like loudness discomfort measures, and it will definitely be useful for counseling. Certainly you're counseling to somebody with an s and R loss of 16 is going to be very different than somebody with an SNR loss of three. So we're going to talk about three of them.

I should mention that this isn't something that Brian and I just made up because we want to talk about it. I specifically went to the pre fitting tests that are listed in the APSO best practice document. This is a standard, I should say. Actually, not even a document is putting it lightly. So this is what we would consider is the standard thing, the bare minimum that one would be doing in the clinic and fitting hearing aids.

But then I want to try to pull out the new research on each of these have been in documents for 30 years or more. First, we'll talk about speech and noise. This was a systematic review that was just recently published, and the question they asked is, are behavioral prefitting measures using speech non speech materials related to hearing aid satisfaction? A good question, because those of you out there who are busy might say, hey, you say I should do it, but they're not related to satisfaction anyway, so why bother? Well, here's the answer.

They looked at six different types of prefitting measures and all six of them are listed there. I don't need to go through it. They started out with 1342 articles, and after they looked at all the inclusion criteria, it boiled down to 21. So they then looked at these 21 to see if there was significant correlations with satisfaction. And only one of the six tests ended up being significant, and that was a speech and noise test.

This may or may not be surprising to you, but the tests that were not significant, significantly correlated with satisfaction were pure tone thresholds and speech recognition and quiet. Now, what is sort of sad is that many people fitted with hearing aids today only obtain pure tone thresholds and speech recognition and quiet, which are the very tests that don't have anything to do with hearing aid satisfaction, which is sort of ironic. You would think if one wanted to do a test, you would do a test that was related to that. But we'll talk more about that later. So obviously we're going to do a test, and the test we most likely would do if we're doing speech and noise would be the quickksin.

It's a test that has the most research. It's a speech and noise test that tends to be loaded on audiometers these days, which makes it convenient for people to do the test. Along with that, though, comes the task of doing it correctly. We talked about this in previous quickk takes, which I've referenced here. And then along with Ben Hornsby

and Todd Ricketts, we recently wrote a Tony Q article about speech and noise testing, and we focused quite a bit on the Quixin I've listed here.

A few things to remember. It's incredibly important to make sure that you account for audibility. Doing it at MCL does not cut it. There was recently an Internet poll of which 55% said that they do the Qwiks in at MCL. That's not good.

MCL was too soft. You do the testing monorailly, so you do each ear independently under earphones. You use the critical difference chart, which we published back in QuickTake 6.2 to see when a difference really is a difference. And the other important thing is only use seven of the first twelve lists that are equivalent. And the people who loaded it on your audiometer may have not pointed that out to you.

So there are those seven lists. Now, the lists that are equivalent are different for people with normal hearing and people who have hearing loss. So what I've done is I've taken the lists that are equivalent for both, because you're going to be doing the quickks in with people with normal hearing, and you're going to be doing it with people that hearing loss. And seven lists is enough. So these are equivalent for both normal hearing and hearing loss.

Those seven. So tuck that away, type it up and paste it on the front of your computer or whatever you have to do to remember it. Using the wrong list could change the score by two decibels. If you use an easy list in one year and a hard list in the other, you get a two decibels difference. So you don't want to use either one of those.

The quickksand, for whatever reason, there was just this last year there was three interesting articles published on the quickksand. None of them really have direct relationship to fitting hearing aids, but they have enough of a relationship that is worth

mentioning. The first is Matt Fitzgerald from Stanford. By the way, this article I saw was named Aaron hearing's article of the year. And I can see why it's interesting.

He didn't say anything that people haven't been saying for 30 years. But he just had a lot more data. Exactly. You've written on this, Brian, what was it, 5000 people or something? Almost six.

5808. Yeah. Yeah, a lot of people. There's some detail behind here of when you would actually do monosyllable testing in quiet. And we don't have the time, nor is it important right now to get into that.

But you do have to look and see. It has to do with what the quickksand score is. And when the quickksand score gets to a certain level. Yeah, that in relation to. What's that, Brian?

You look at the quickksand score and the high frequency pure tone average and when they get to a certain point, and you can read the article because I don't want to give you the wrong information, but when those two variables get to a certain point, then you should do word recognition and quiet. Right. The main point, the teaching point that people have been saying forever is that the go to test is speech and noise. That should be routine. I can't think of any reason in most cases why we need a speech and quiet score.

But that's a talk for another day. Actually, we've done that talk already and it doesn't seem to matter. People still, like people, are in love with speech testing and quiet for whatever reason. Well, here's a study that I found interesting, because if indeed you're a believer and you do your quickksand on all your patients, here's a finding that I thought was interesting. This is actually also from Stanford.

I'm guessing they're using some of the same data, but that they found that this is people with confirmed vestibular schwanomas, meaning they were in surgery or confirmed through MRI or wherever they were confirmed. What they found was that the right versus left quickksin asymmetry had a better sensitivity and specificity than either pure tone thresholds or standard word recognition asymmetry. Nice to know. It's like a little side benefit that you get from doing this testing. And another interesting study that I saw reported on 47 patients.

This is out of the University of Pittsburgh. Katherine Palmer is one of the authors on this, that they did the quickksand on people who had been referred for auditory processing disorder testing. And what they found is the Quixin had a sensitivity and that's the hit rate of 77%, which is pretty high for something as vague as auditory processing testing. Just a warning on this, interpreted cautiously, because the way they defined if the person really had APD was their performance on the quickksand was one of the ways that they determined if somebody really had it. So then they went back and calculated the sensitivity.

Obviously, if that's what you're using to determine if somebody has it, then the sensitivity is going to be pretty darn good, because that's how you determine they had it in the first place anyway. But take it as it's worth, it's an interesting finding for you people who are into APD testing. This is a test that's probably better than some of them that are commonly used. Well, here's a different type of speech and noise measure, the ANL. You know, we audiologists just love to take acronyms and make them into words, but this is one that nobody's ever really tried to do that, Brian.

They just call it the ANL. I just. Very astute point. Yeah. So this is the acceptable noise level test, and some of you have maybe never heard of it.

So it's a simple test to do. Oftentimes it's just done bilaterally in the sound field, not even ear specific, because it's sort of a brain thing. And so you probably don't really need to do right and left ears because it really isn't ear specific. So what you do is you do the patient's MCl for running speech in the sound field using a very careful bracketing approach, because mcls can be a little funky. So be careful.

When you do this measurement, then leaving that speech on, leaving that multi talker on, you turn on, not multi talker, single talker. You then turn on multi talker babble. So this would be presented from the same loudspeaker. And again, using a bracketing approach, the patient is instructed to put it up and down and up and down and put the noise where they can just put up with it. Like, oh, I can't put up with it any more than that.

If you can see my hand, the way I usually do it is they go up, up. No, down, down, down, and then. Okay, right there. So what you do then is you, um. You take this result, the level that they just gave you for noise, you subtract that from the speech.

And I say subtract because it's always going to be less than the speech because they have to be. They have to continue to be understanding the speech. So it can't be louder than the speech because then it would mask the speech. So it's always going to be less than the speech, unless you're equipment isn't calibrated. So then that's subtracted, and then this is called ANL, which is really an SNR.

So a few things about it. Small Anls are good, okay? Because that means people aren't really bothered by background noise. So that's seven decibels or smaller. Eight to twelve is sort of mid range, not too good, really.

And definitely if it's 13 or higher, that's bad. These are people who you'll probably get to know because they're just bothered by background noise, unless somehow you can

improve that ANL. These cutoffs are based mostly from the research at University of Tennessee, which is the home of the ANL, going all the way back to Nabalac. Geez. In the early 1990s, I believe some interesting things about the ANL, and these are interesting.

Male versus female, no difference. Degree of hearing loss, doesn't matter. Type of speech material, doesn't matter, background noise, type of background noise, doesn't matter. How well they understand speech and quiet is not correlated, and how well they understand in background noise is not correlated. So in other words, a person could understand speech really well in background noise, but they could also be very bothered by it.

So they could have a big a and I. But if they force themselves to listen, they might do very well. So what is interesting about this then, is this is sort of a unique test. It's not. You're not duplicating what you do with the Quiksin.

In fact, I did a study on that years ago, and there was zero correlation between Quicksin score and ANL score. So over the years, there's been a lot of articles about the ANL. A few years ago, an author summarized them and there were 48. And that was five years ago. So who knows how many they are today.

But what people, reasonably thinking people at least have said that the ANL can sort of be used as a red flag in identifying people who really just need more handholding and counseling. So I was thinking, I remembered that several years ago, a fellow called Brian Taylor actually had an article. And so it was called, I don't know, the red flag test or something like that. So I thought, knowing that Brian was Brian and I were going to be doing this today, I thought, you know, I should show him that I. That I really, you know, I'm really fond of his articles.

And so I went to Google and I remembered a chart, this red flag chart. So I went to Google and I googled Taylor red flag to see what I got. I found this, the red flag matrix. So, Brian, I'm thinking you did this, didn't you? Yeah, about 15 years ago.

It was me and a couple. You want to talk about it a little? Yeah, sure. It was me and a couple of audiologists up in. It was in upstate New York.

We actually collected quite a bit of data on it and we thought it was kind of a handy counseling tool, because to your point, there's not a correlation between quickksin scores. Say you get a bad score on the quickksand and somebody's a and I. So we think it's a nice way to identify people that might be at risk for having trouble with annoyance, thus the term red flag. It doesn't mean the person is going to have the problem. It means that you think they're at greater risk.

And I think both the combination of the ANL score and the quickksand in the unaided condition, before you send somebody home with hearing aids, knowing what that score is, I think you can be a little bit more, let's say, precise in your counseling. And I think people always appreciate that. And we kind of came up with these four different quadrants and how you would use those two scores to counsel the patients. Yeah, no, it makes sense with people. First of all, you got to get the people to do the testing, and it is a nice way.

And I like the fact that you have it in these different quadrants to sort of give you an idea of where you can sit back and relax and say, this is going to be a smooth fitting, or where you might get a little more concerned. Since Taylor started off with this whole thing, I actually thought maybe she could help us remember which is good and what is bad. This was halftime at the Super bowl and she was a little occupied and she'd been knocking down a few drinks. But what she came up with was that down in this

quadrant, thumbs up, if the person's down there, that means they have good snr and a small ANL and up here, not so good. So that's what she came up with.

You agree with that? Yeah, I think that's seems pretty sensible. I will say that I think one of the challenges with the ANL is I think some clinic. What I've noticed over the years is that there's just a lot of variability in how people do the test. And I think it stems from the way that we do the MCL testing.

And some people, I think it's consistent in some clinics and some clinics are sort of all over the board with how they do that. So it makes it a little hard to do. I think it does. And which is why I emphasize you need to do a careful, I use the word careful reckoning approach. A person's MCL is about twelve decibels average.

And what you need for this test is you need to be right in the middle of that twelve decibels range. And if you're up on the other end, you can be saying somebody has a big ANL when they have a small one, or a small one when they have a big one, simply because you didn't do the MCL testing correctly. That's the tricky part. Yeah, exactly. All right, enough on that.

But there's a whole reason why we went through that, because it takes us to an article that was just published a couple years on hearing aid technology. This actually originates from University of Tennessee, the home of the ANL. So it should be a surprise to no one that one of the tests that they used in this study was the ANL. Now, Brian, you and I over the past year have talked a lot about when you use advanced technology, and is there a difference between premier and basic and all that. So this is another study along those same line.

The point really only one point here that I wanted to make is when they looked at premier versus basic and they looked at laboratory perception results. Quicksin hint

and the ANL. The only one of the three that was significantly improved with the premium devices was the ANL. The other two were not. I can't quite speculate why that would be, but I should mention, I went in and looked at the data.

The improvement in the ANL was 2.9 decibels. So it wasn't huge, but it's an SNR that would maybe just be noticeable. Yeah, I don't think I'm not surprised by that.

The ANL is brain thing. And so the ANL didn't really get better. I mean, you know, if I'm, let me think of a good analogy. If I'm five foot eight and shrinking, if I stood on a four foot high box, I would be six foot tall. But I'm really not six foot tall, I'm still really five eight.

I'm standing on a four foot box. So if you have super duper directional microphones and you position the patient correctly, the ANL and you put speech in front and noise in the back, the ANL will get better by about three decibels. But in the brain it didn't really get better. You still have your same ANL. It's not going to.

Well, it's a function of all the noise reduction that you see in a premium product relative to an advanced. They just throw more stuff at it to reduce the noise. Yeah. So it's still a good thing, but the ANL sort of stayed the same. But again, it is significant that the quickksand didn't improve.

So assuming they're using the same noise reduction and everything for the Quicksin, but we don't need to get into all the details. It probably has to do with what noise was used. If it's a broadband noise, then there will be a lot of noise reduction and the ANL is going to get a nice boost. Okay. Frequency specific loudness, discomfort measures.

This isn't something that you see a lot of articles on these days. People have sort of decided, well, we know everything, we know everything that we need to know about

ldls. And that might be true, but people don't remember everything that they need to know about it. This is an article that actually I did, well, I didn't do, I hope do with the folks at Iowa, but it relates to frequency specific ldls. And so it was the only one that I really saw in the last couple of years that directly related to LDL measures, and I'll explain here how it relates.

So what we did in this particular study is we looked at MPO measurements for premier hearing aids, six leading manufacturers. We used a standard audiogram, which I'm going to show you, and we programmed all the hearing aids to each manufacturer's Nal NL two. So this is the manufacturer's NL two. We didn't do probe mic measures because we wanted to see what do you actually get and what would a person get who didn't do probe mic measures? So in all cases, there was a very close match to target in the fitting software.

Okay, not probe mic, but in the fitting cell. So here's the audiogram that we programmed in. Most of you, I'm guessing, do not know, but there are predicted ldls. For the. Now, for the NL two, we went into the standalone software where you can get these, and just for reference, this is what the NL two would predict this person's ldls would be.

And for those of you who fit hearing aids, you're looking at this. This is a cochlear pathology. That's what you would expect. You'd expect ldls up until about a 50 to 55 decibels loss for someone with a cochlear pathology are the same as somebody with normal hearing. And somebody with normal hearing has ldls around 95 to 100.

So this is very predictable. So to go back to hearing aid fitting 101 is what we want to do with the maximum output is put it just below the ldl. Okay, that's again hearing aid fitting 101. But let's look at what we get. Except for the orange curve, which is basically, looks pretty nice to me.

I'm saying, hmm, that manufacturer actually knows what they're doing. Look at these other curves. This is now the maximum power. This is for a 90 decibels input and this is as high as this hearing aid is going to go for a 90 decibels input when fitted to the manufacturer's. Now look at for three of the hearing aids, the output really isn't much above 80 decibels.

This is like telling somebody that when you work in your kitchen you can't have anything more than a 30 watt light bulb. And good luck chopping vegetables. Why would you limit output at 80 when their ldl is at 100? It's cheating people out of 20 decibels of useful sound. It's good audibility, it enhances the sound of speech, it increases audibility.

And on and on and on. It's ridiculous. But yet this is the way hearing aids are fitted every day. Every day.

So I'm not going to go into how to fix this because we did one other time. I'd love to and spend an hour doing it, but here's a. This is a great place to get a step by step of how to do, how to make things right and get the right MPO for everybody. Wow. Brian, this one has a five star review on this one.

And so for those of you who are interested on doing frequency specific ldls, using the retzul to correct a two cc coupler going into the software and programming it. It's a step by step procedure of how to do that.

So one group of outcome scales. By the way, you know, it occurred to me, Brian, we're going to. I think we decided that when we get to the fitting section. When we get to the fitting section, we're going to. I don't know if we're going to be talking about mpos or not, but we'll get into the signia fitting software a little bit.

Yeah, we'll talk about it in an upcoming. Yeah, maybe we can mention that then. At that time, I'm not too sure what we'll see. We can put something in. All right, so I'm in now another area of pre fitting testing and that's self assessment scales.

And as you guys know there's a lot of them. And as I mentioned earlier, relative to the ANL, we just love to give test names. So here we go. We got the cozy, the happy, the shappy, the Hannah, the DOSA, the saddle, the has, the pal, the DOA, the fab, the fap, the afab and echo. And they're going to say hi to their new friend who just walked in the room.

Hello. It's the happy. Doesn't that makes you feel sort of good happy? I think I'll do the happy today. This is the hearing aid, you know, the happy and the cozy, you know, some hot chocolate, marshmallows and, you know, it'd be the best.

Fitting. Everybody. Everybody feels good. Yep. Hearing aid attribute and feature importance evaluation.

I'm going to give you some history on this in case you missed the research quickktakes that Brian and I did last year. And that quickk takes, we looked at research that had looked at why some people prefer premier products and other people prefer basic products and what are the differences. And one of the articles we reviewed was this article that's listed here on the top of the page, which was actually, that isn't the article, but it was by the same senior author where they used the concept analysis stuff. And so then the concept analysis, this is from western university concept mapping. They reviewed factors that separated the entry level from premier.

So what they now have done, now that they know all these factors, they said, wouldn't it be nice if you did a self assessment scale asking people about these factors and then

maybe you could sort of predict which person would be best suited for premier, which suit, which would be best suited for a more basic, a more basic hearing aid. Again, I'm thinking, and I'm pretty sure it's the same senior author, the same author who's now at the university, Hasan Sala, who's now a professor at University of, he was a senior author on, there was two papers on that, one in audiology today and one in J AAA. And I can't remember it, but it's basically the same group of people, western university. So here's what they did. The data was collected from adult participants.

218 with self reported hearing loss has 28 different items. Might be a little long. I think I saw on their paper they're thinking about maybe shortening it. It has eight sections that falls into three subscales. And then the questions are rated in a five point scale, going from zero, not at all, to four.

Very important. And just to give you some examples, I just went through the full 28 items and just pulled out some questions that fall into various categories. You can see some have to do a smartphone programming.

Tele audiology. The hearing aid setting can be changed by the audiologist without me needing to visit the clinic. And of course, like all things in the world of hearing aids, by the time they get this thing all printed out and get it all normalized and all that kind of stuff, there will be a whole new wave of entry level hearing aids that are doing what premier hearing aids do today. And so I don't know how the, what the life of this life of this scale will be. Well, Brian, you tell me, with Signia, as far as programming, programming people at home and all that sort of stuff, can you do that with basic products or only premier products?

Yeah, I mean, I think when you talk about the advanced connectivity and streaming, I think that's the challenge here, is that in their study, they said that people that rated that highly important preferred premium. Correct. But of course, you can get that

technology across the board. So I think the challenge really is if somebody rates that important, not only do they need technology, do they need that technology, but some of them might need extra instruction on it. So to me, it's also pointing to the opportunity that a person that rates that highly important is going to need extra time.

And that extra time on instructing them might equate to premium levels of service as much as it equates to premium technology or more than it equates to premium technology. So, sure. It's an interesting thing. When they did the initial study, it was basically about five years ago. So things change rapidly.

So if you, it was actually a signia sponsored study. So if you have, the hearing aid allows direct music streaming from my phone into my ears. You know, I don't fit hearing aids. But you tell me that does, can you do that with a basic model or do you need a premier model? No, you can do it with the basic model.

So that really, that isn't going to tell you much. If the person said, yeah, that's important, they go, okay, well, you can get anything then. But it does tell you. Exactly. But then it tells you you need to spend more time with that person.

So you might, if you're going to be spending more time with them, you're probably going to have to charge them more. Yeah, exactly. Exactly. Well, we'll see how it goes. They've just launched it, and I'm sure there'll be revisions.

But it's always nice to have a new scale that has a cute name might say. Yeah. And I know that they have an abbreviated version of it. That's. Yeah, there is one already, basically.

I think it's sort of. Yeah, it's out there. It's hard to find. I think it's 50. I think it's twelve or 14 questions.

Yeah. Well, that would make sense. That would make sense, yeah. Right. Well, it's nice to have more information.

You know, if nothing else, patients just like it when you ask them. They ask, you know, when you ask them questions. I mean, it's patient centered care goes a long way. And so even if you don't use it for a lot, the fact that you actually are asking them, it gives you a lot more insight to the patient. So, you know, there's value for that.

All right, Monday morning. Always consider important procedural factors when conducting the quick sin. And this list will be available for you and you can find it in the other places that I mentioned. Beware of some side benefits when you're using the quickksit. If you're doing the test on everybody, you might find it useful for some other things unrelated to hearing aid.

Fitting the ANL is additional test that you might want to try out. As Brian mentioned, they have some, if you go to the ANL articles, they give you some very good instructions. Well, there's actually printed instructions to use. And be very careful when you're doing the measures. Do not rely on the manufacturer software to set the MPO.

As you can see, you can make big mistakes by doing that. And keep a lookout for the halve shortened version. Might be on the way. Brian thinks it's near. Might be soon.

Might be here. Might be here. Yep. And there you have it. All right.

Another one in the books. Good to see you, Gus. Thanks for all your expertise in this area and hopefully we'll see you in the not too distant future. Yeah, we'll. I think we're pretty close to finished on 7.3, so we can get moving on that before too long.

See you soon. All right.

7.3 Clinical nuggets from recent research: Signal processing and features

Welcome back, everyone, to research quicktakes. I'm Brian Taylor, and today we're at research quicktakes 7.3. We're going to be talking about signal processing and some related features. And with me, as usual, is Gus Mueller. Gus, welcome back.

Good to see you. Yeah, thank you. Thank you. Good to be. Be here again on good old volume volume seven.

And this will be our third, our third little topic for volume seven. Are we ready to roll? Yeah. So I'm kind of curious to see where you wanted to start off here with this. With this volume.

Yeah. Yeah. Well, there isn't. I didn't find a lot of new stuff, but actually, well, you see, when I start, I start out in sort of a negative way, but we'll recover as we move along. So for those of you who haven't followed our first two episodes of this, just to remind you that what we're doing here, at least attempting to do, is go through all the articles that are published every year and trying to find a handful of them that really have some direction, clinical applications.

And today we're going to be talking about features and processing. Now, when I look through the articles that are available that had been collected by our assistant Lori Zatelli from University of Pittsburgh, I found that basically two thirds of them, relative to features, come from non peer reviewed journals. I feel compelled just to talk about that a little. This is a little tricky because I'm a consultant for a manufacturer, and last I heard, Brian actually is an employee of a manufacturer, so. But I feel strong enough that it's something we can talk about.

I think our listeners can handle the truth. Yeah, but can our bosses handle the treatment? I think they can, too. All right. Okay, good.

So anyway, this I just pulled out of medically related treatments under the heading is, you can't believe everything you read. You know, I love vitamin donuts. That's a good one. And I like the one with this ad from Lucky's 20,679 physicians. It wasn't like 20,000, 30,000.

No, 20,679. So these are all ads that. A lot of them are from the thirties and forties, I guess, something like that. Well, that takes me then to today, to 2024. And or more specifically here, I'm looking at research from 2023.

These are all articles that were published in, most of them either on audiology online or in hearing review, I would say. But anyway, on journals that are not peer reviewed, mainly what it amounts to is you can mail something in, unless it's really bad, it's going to get published. So I found three examples here. And the point is that I think all of you out there need to be sophisticated readers. The rep comes to town and puts on a nice dinner at a nice restaurant.

You can get two ceus and eat lobster and steak all at the same time, knock down a couple drinks and then you sit in and you listen to the story. And here's a few of the stories that are coming out of articles. So here's one example. Over 90% of our participants rated the processing in our new premier product superior to the competition. Well, that sounds pretty good, right?

But here's the deal. When you dig a little deeper, the competition was really their previous product. So they just did generation twelve versus generation eleven. All the participants were people using generation eleven. They brought them in and they gave them a pair of new hearing aids and had them go out and use them.

And then they said, did you like these new shiny hearing aids that you got for free? Did you like them better than your old piece of crap hearing aids that you've been using for three years? This is going to shock you. But 90% of the people said yes. 90%.

Oh my God. We got a visit from Ruth Bentler. What is Ruth saying? Hey guys, that reminds me of one of my studies from years ago with digital hearing aids. Actually, I know what study she's talking about.

It actually wasn't with digital hearing aids, it was with conventional hearing aids right after digital hearing aids came out. But she did a crossover design using all the same hearing aids. But in one part of the design, people were told they were getting new digital hearing aids. And then in the other part they were just told they're getting the regular hearing aids. And guess what?

87%, close to the 90% preferred the digital hearing aids. They were all the same hearing aids. So be careful of what you read. Well, here's another article I found in this study. It said over 90% of participants perform superior on a speech and noise test with our new processing compared to our previous premier model.

Again, this is now a different company than the one I mentioned before, but they did actually laboratory testing, speech and noise testing, and they compared the new product to the old product and said it performed superior. Well, again, I dug into the data and fortunately I'm glad they did this. Not all companies would, but they actually published individual data. So you could look at the individual data. And what I found was the way they determined superior was that any SNR advantage at all, even if it was 0.1 decibels that counted as superior.

Normally, of course, you would use a critical difference, which in most studies like this would be three to five decibels. But they just said if it was better, it was better. The true

mean difference, the mean difference of all of these was one decibels, which is not even noticeable to a hard if you're in person. So if this was in a peer reviewed journal, the headline would have been, our new product is no different from our old product because it isn't. But it's not.

In a peer reviewed journal, they found that 90% of the people like it better. Well, example number three, this is yet from a different manufacturer. With our new signal processing average speech understanding improved 100%. They're going 100%. How do you get better than 100%?

Well, again, if you dig a little deeper, you see that they used a speech and noise task, and the signal to noise ratio with the I can't remember what product they used. It doesn't really matter, as you'll see. But the average signal to noise with their older product went from one decibels and ride to zero decibels with the new product, a 1 db improvement. This is pretty basic math, but I'll do it for you. If you go from one and you get a 1 db improvement, one is 100% of one.

And so indeed, everything improved by 100%, which sounds pretty darn good, except that hearing impaired people can't hear a one decibels difference. So again, the headline should have read, our new product is just like our old product. But no, it has. It really is 100% true. Okay.

All I'm saying here is be a careful reader. And, you know, marketing people get paid to market. They're not telling lies, but they're just manipulating things in a way that looks good for the company. Right. And I think if I could just defend them a little bit.

The FDA guidelines require that any marketing piece has some data to back it up. And the bar is pretty low. So those studies are not the most rigorous, as you've been saying, but they're kind of, they're done so that something is on file with the FDA to

support. And you're right. But the study themselves, in many times it has a pretty good design.

It's just the interpretation. It's the discussion section that then and what gets put in a powerpoint, you know? I mean, if the studies, many times are very nicely done, in fact, a lot of times they're done by research audio independent research audiologists. And then, yeah, the marketing team gets a hold of it and kind of changes a little bit. Yeah, exactly.

Anyway, but just for. I'd like our listeners and readers to just to think about that now and then. Exactly. You know, if something really is better, the person doing the talk at the front of your restaurant room will have the data to prove that it really is better. They'll be showing you significant differences based on critical difference significance at the 0.05 level.

And all those things. They won't be using the terminology that I just mentioned to you. Okay, so here was an interesting article that's. I liked it so much that I had the senior author do two different page stance. Tony cute for me on audiology online, he did the January and the February.

So I encourage you, if you don't read the original article, which is in frontiers in neurology, it's open access so you can go to it and actually read it. Or the summaries of them is in 20 Q for January and 20 Q for February. What he did is reviewed a lot of articles. So it was sort of a systematic review, I guess it was a systematic review and looked at all the various things relative to peripheral and central hearing loss, cognition. And the main finding was that we shouldn't treat everybody the same.

And the main point was that they go through very nicely in the first part of it is to not introduce distortions to the envelope cues with your hearing aids. And they had a very

pragmatic approach for programming for adults over 55 age that could be implemented by all of you with most current hearing aids. I'm not sure all but most. So this is not from the article. This is just something I made up for you all to think about.

It's Monday morning and it's time for another week of fun hearing aid fitting. So your 08:00 patient is a 40 year old male with a common bilateral symmetrical sloping hearing loss going from 25 to 30 in the lowest, dropping to 70 bb in the 6000 range. Just the run of the mill typical new hearing aid, user tympanometry, acoustic reflex is all normal. Ldls are coming on right where you'd predict. Quicksand scores are just borderline abnormal, two to three decibels and our loss should be pretty straightforward fitting.

Now you finish this guy up. And coincidentally your 10:00 patient is an 80 year old male, but he has almost identical pure tone thresholds, LDLs and admittance findings audio metrically. Of all the tests you did, the only thing that stands out is his quicksand scores are considerably worse than the other person. There's seven to nine decibels and r loss. And you'd guess.

Well, you know, at ad probably has some age related processing problems and some cognitive issues. So here's a question. You program this 80 year old fellow's hearing aids to the same prescriptive gain as that of the 40 year old. I would say 95% of audiologists do same. Maximum output, probably.

Maybe he didn't even get LDLs. What about directional processing? Yeah, let's do default. DNR. Default sounds good.

Same compression, knee points ratio and time constants, I'm thinking probably, yeah. So basically, the average hearing care professional, I would say, treats these two

people as they're equal. Would you agree with that, Brian? I would, I would, but I think. So.

The whole point of this article that we're talking about is don't. So, their recommendations, most of their recommendations are regarding compression. And so I'll just quickly summarize it. Their conclusion is that slow acting compression should be. We're talking about the release time, mostly because the attack time isn't that much different from product to product.

So almost all, always when we say slow acting, we're thinking about the release time should be employed for noisy environments. For all hearing aid users, there is no good reason that hearing aid should default to fast acting compression. Older adults. Okay, do any of you do that? Maybe.

If facts. Fast acting compression is used, the compression ratio should be reduced to levels that avoid distortion. A value as low as 1.5. You know what, I should have looked up, and I'm sorry that I didn't. I'm not sure if he means 1.5 that you see in the fitting software, or 1.5 effective compression, which are for speech, which are really two different things.

And I should have looked that up. All I know is that they said 1.5, there would be 2.3. Compression is probably about a 1.5 effective compression. But anyway, in other words, the main thing is you don't want a lot of squash effects. Are you talking about overall compression between gain for soft, average and loud?

Is that what you mean? Correct. Correct. Yeah. Okay.

This is for wide dynamic range compression. Yeah. Right. And they also say because of differences in individual preferences, the hearing cured provider could provide both slow acting and fast. I seen compression in separate hearing aid programs.

I seriously doubt that many people do that. But then the patient could be involved in doing the best. And the final thing, they were sort of disappointed in doing all this research that some manufacturers don't. It's very difficult to even find out what their compression speeds are as they aren't really mentioned in. I traded some emails with this author and he told me that in writing the paper, they were making calls to manufacturers.

And the people that they talked to in audiology didn't know the time constants. If they don't know, who does? But anyway, here's an example. This is actually a measure that I did myself a few years ago, many years ago, but it would be the same thing today. This actually is a Siemens product, and Siemens has always had two different, has always had a slow release and a fast release.

And what I did here is I left everything the same. This is probe mic measures, of course, and I put the compression ratio to three to one, and I did a slow release and I did a fast release. And so when you see that, when you do a fast release, because it's releasing so fast, it can capture the peaks of speech and pull them down, a slow release doesn't release fast enough to capture those peaks. So that's why the speech spectrum is bigger, that's the green than it would be in the red. Why is this important?

Well, if you're trying to fit targets and you got a narrow dynamic range, it is possible that a slow release might not pull down. See that green curve, the ltas? And notice that with the red curve, it's almost ten decibels lower. So if you were trying to match your target for 75 decibels input and it's overshooting it, you're going to get a better chance of matching target using fast compression than you are slow compression, which could

mean that some manufacturers, when you click nal two, rather than their proprietary, they may change compression properties because they're saying, ooh, Gus is concerned about matching. Now I better use a fast to help him out do that, or Gus doesn't care about matching.

Now he's just going with our proprietary, let's go with the slow release. So that's why you might see different things depending on what fitting algorithm you pick. So just to be clear for our readers, if you go back to that slide, Gus, the green, the green aided curve is slow compression speeds, correct? Correct? Yes.

Okay, so this is my point about compression versus row compression versus effective compression. So notice the spectrum for green. We're getting a little in the weeds here, but it's important topic, the bottom peak, it starts off being 30. Okay? And this is three to one compression.

So in true three to one compression, a 30 decibels input should end up being ten decibels. Right. Except look at this. I'm going to go to can you see my marker on there? Yes.

Okay, so I'm going to go from. We'll just pick 1500 here. If you go the bottom, you're going to end up at 75. If you go to the top of the green, you're going to end up at 95. So it didn't compress at three to one because it's not fast enough to compress it to three to one.

It took a 30 decibels signal and it turned it into a 20 decibels signal, which is only what? That's not even two to one. That's about 1.5 to one. So you think you have three to one, but you really don't. Now if you go to red, it goes from 75 to about, just slightly over 85.

So you almost really do have three to one compression. And the whole point of their article was that with fast compression speeds, you're adding more distortion to an already distorted system. Exactly. To try to accomplish one thing, which is package speech within the person's residual dynamic range, you're introducing something else which may be worse than allowing the speech to be a little louder. Thank you for that.

All right, we got curious George. So this has to be good. So this relates to all this is. This is something that's very fixable in the clinic. But we have to ask, does the average HCP even know the default release times for their favorite product?

If you were in an audience and there was 30 people there and you had each of them write down the release time of the product that they fit the most, would they know, do they know if the default changes for now versus DSL versus proprietary? On some manufacturers, I bet it does. Do they know if the default can be changed via programming? I'm not sure if it can be changed on all products. Do you even know where to find it to change it?

Well, since this is a Signia workshop or lecture, I don't know. Brian, do you want to talk about this at all? Yeah, I mean, sure. I think that Signia's products are slow relative to many others that are on the market. You can change it.

The default is adaptive compression enabled. As you see there, adaptive implies that it's a combination of dual, which is slow and syllabic, which is fast. Now, I wouldn't recommend anybody do this. I would stick to the default of adaptive compression. But if, for example, you wanted to follow what the Wendell et al.

Paper says, you could create a second dedicated program and you could make everything slow or dual by going in and creating a second program. In order to do that, you have to go in and change the target from, if you're using the Signia target, you got

to change it to the now and then you can go into this screen with knee points and ratios, and you can make some changes where everything is dual, like you see right there. If you wanted to do that, I think most of the time, because overall, the system is on the slow side, I would stick with the default setting. And when I'm looking at compression speeds in a Signia hearing aid. Right.

And I mentioned there on the left, and I'm thinking this is still true. It's been true for 20 years, is that when it's a syllabic, syllabic is really fast. I don't think it really says fast anywhere. No, but syllabic is fast. Right.

And it's less than, what, 200 milliseconds. Yeah. And that term came about because, in other words, it releases fast enough that you will only miss one syllable. That's how the term syllabic came about. Syllables, actually about 80 milliseconds to 150, I think for a while, the Siemens product in those days was 180.

So that's pretty fast. Okay, we made it through that, but it's important stuff. Here's one. But I'm going to go back now to Robin Cox, who unfortunately passed away way too early, five, seven years ago. This was really an area of her interest for quite a few years.

And I just wanted to mention one of her articles to sort of give you a perspective on this. And the reason I like this is the review that Wendell did. He reviewed a lot of articles, and a lot of those very articles were done in a laboratory. They weren't using real hearing aids. They were using laboratory equipment to simulate a real hearing aid.

Some of the studies, particularly the ones not using real hearing aids, use compression of four to one, which is how they made their decisions, based on fast and slow. The problem is, there are no hearing aids today that have compression of ratios of four to one. What happens at four to one might not happen when you have it set at two to one. So I like this article from Robin, because, as you see there, she used real hearing

aids programming to validated prescriptive targets. Now, as you would do, she used realistic compression time constants around two to one.

The participants based their judgments on a lengthy field trial. I think it was six weeks. It was a crossover design. So everybody use fast, everybody use slow. And I just like it because all of her research was always good.

If she says something, you can believe it. So here's the results. Oh, and then, of course, she did a cognitive test. And so what I did there is just to make this easy to interpret. Some of the drawing on there is mine, not hers.

Look at that vertical red line. So I've taken the. I've taken the zero point, and the bad cognitive scores are on the left, good ones on the right. And what we have here, then on the top are, that's when people were using the slow release. And on the bottom are when they were using the fast release.

The y axis is how strong their feelings were. You know, did you prefer this or did you prefer this? And how strongly did you believe in it? What I like about this is people weren't, like, at around a plus one or a minus one. They either really liked the slow or they really liked the fast.

But the teaching point here is, let's count people and let's go up on top. 123456. People like slow and 12345 like fast. So my point is, if you've been fitting everybody with fast, you're not really a terrible person. You're only a terrible person about half the time.

And if you've been fitting everybody with slow, you're not really a fantastic person. You're only fantastic about half the time. From Robin Cox's study. Now, granted, the

Wendell thing reviewed many, many articles, which is why you do a systematic review. But just saying it's not as simple as we'd like to make it.

But I think most everybody would agree from the research that if there is cognitive decline, the people will probably do better with a slower release. Why these people like fast, I don't know. I don't know that I'd have to look at her discussion section, but it's complicated. But it's an interesting thing to think about because it's one of the things that is so easy to change, and it would be so easy to try one in one program, another in another program, and it might be the way to solve some problem cases. I know.

I think that's true. But I think the irony is that the people that you'd want to do that with, many of them would probably struggle because of their cognitive decline. Navigating manual programs.

Yeah.

Can't they? I thought the smartphone did everything for you. I mean, it does if you want to, if you're able to use it, but some people just can't. And those are the people that are most likely not to be able to use it. Yeah.

Yeah. Okay. Anyway, I just wanted to interject. Don't make it so complicated. I had an easy solution.

That's another reason why we need reality. Anyway, go ahead, Gus, and talk about. Okay, we had a new topic. New topic. Hearing aids and music.

Before we get into the article, I want to review from just a few months ago, here's one that we talked about back in quicktakes, volume four. What you see here is when a given hearing aid got it right. So this is the signal classification system. Okay. And so,

this was a study relative to a lot of different inputs, speech and quiet, speech and noise, all kinds of things.

All I'm showing you here is the slide. When music was present, what was the probability that a given company's hearing aid said, yes, that was music. And the main point is notice, particularly for soft music, only two companies got it right. One company, company b, never got it right once. If we move over to 70 decibels, company b got it right, 60%.

And if we get over to c, by the way, these are the premier hearing aids from the leading five companies. And if you go over to an 85 decibels input, hearing aid b only got it right 20% of the time. Okay, don't fit hearing aid b to someone who wants to listen to music. Well, or maybe you can wait till we get to the end of all this. If you notice a couple hearing aid d, for example, was around 95% for soft, average and loud, fantastic blue ribbon.

And hearing aid a was pretty good. But the other three, not so good. Not so good. Well, then, that takes us to this article from Josh Alexander, and I expect maybe one of his students. I don't know who Sandgren is, but Josh Alexander's at Purdue, does good research.

And so what they did is they took the seven leading companies, and you'd say, who did they anoint as number seven was? Unitron. And so they took premier hearing aids, all ricks, they programmed them all using probe mic to the. To the NL, two prescriptive targets. And that.

I like that about this study. So everybody should have started off with the same gain and output. Then all the advanced features were all set to default, except environmental classifier and frequency lowering, which were deactivated. And then

they had 17 individuals, 18 to 24, with pure tone, normal hearing. And they rated the sound quality of ten music samples, seven point scale.

Then they also rated music when it was not processed by a hearing aid. So on this chart, when it was not processed by a hearing aid, that was the rating of 5.5. So it wasn't a seven. Remember, seven was the best. It was 5.5.

So this helps then make everything relative. And what you then see is what they did is the hearing aid was tested, they listened to the nail NL two program, and then they listened to the music program and they did their ratings. And so what you see there, the orange is the now blue is music and to the right is good. That's better. And so what you would hope for never turns out that way.

But what you would hope for is all the blue bars would be bigger than the orange bars because that's why you give them a music program, right? Well, that didn't happen. What did happen was that music was better than now for three products, but it was equal to now for two. And for two other products, now was better than the music program for listening to music. So really, not even half the time was the music program better.

So what does all that mean? Number one, we have one study saying that products are not very good at identifying music. That was that first slide I showed you. Then we have these data showing that in this study. I guess it doesn't matter if it identifies it anyway, because the devout music program is no better, worse than now program for several products.

So who cares if it doesn't identify it. In fact, maybe you don't want it to identify it because it will stay in now and you'll do better. So where does that take us? Opportunity.

Here's a concept. Why don't we program the music program? Well, you can read a lot of articles about this. Marshall Chasen has written a whole book about it and which we'll maybe be talking about on another day. But here's things that you will find out of various articles, that you increase the bass to make it sound more mellow.

You decrease treble to make it not sound as tinny. You reduce the aggressiveness of the wide dynamic range compression, which is we're just talking about. To give it a wider range, you would reduce noise reduction and you might increase the MPO. There are some data that show that people have a higher ldl listening to music than they do listening to the other sounds. So if that's true, open up the dynamic range and give them a little higher MPO.

Here's something though, to consider when you're doing all this, and we're going to get to this, I think in one of our other episodes of, of quick takes that when you're listening to music from a loudspeaker or live, there is going to be direct signal, direct to the eardrum.

Unless you had an incredibly closed ear mold with very few people fit these days. But remember, this will not be present for stream music. So when you're doing this music program, you really need to have a program for assuming your patient listens to stream music, you really need to have a program for both. And I think we're going to get into that once we get into, once we get into our next segment. Issue number four.

I think we're going to talk more about that. So some Monday morning tips. Brian, did you have anything on programming for music? No, I think your recommendations make sense. Smooth broadband and more linear response.

Yeah, but you know, if that makes so much sense, why don't manufacturers do that?

Why didn't it turn out that the music program was better than, I think it's purely based on demand. I think that there are not that many people relative to those that want improvement for speech. So it's sort of on the low end of the priority list, the music program. Yeah. Yeah.

Well, it's interesting and a question, I don't know if not to put you on the spot, but I'll put you on the spot since you work for Signia. Does Signia have different programs for, it seemed like, I remember there's a program for live music versus other music. Right. I think that there are different music programs. I think it kind of depends on if it's music that doesn't have words in it versus music like popular music is more likely to have words, therefore that the processing is a little different.

I was wondering if that related to this live versus streamed issue that I was just mentioning. Yeah, that's a good question. I don't know the exact answer. Okay. Okay.

Well, I guess we should have rehearsed, huh? But that's the beauty of this. No, but I think you captured the main point. I think that there's a difference between the music coming in from a loudspeaker in your environment versus directly through the hearing app. And I actually, when we get to number four, which I have just about finished, I just finished reading an article from Susan Scully, who talks about that.

And so Susan's going to come and visit us the next time we get together. Sounds good on a slide. Anyway, so here's our Monday morning. Be a critical reader of the articles we talked about that consider the routine use of slow release WDRC with your older patients, or at least give them the option of changing. Get to know the compression workings of your favorite product.

You might be surprised. Don't rely on the automatic music classification systems unless you have happen to fit the products that do a pretty good job. Good luck finding what those ones are. Don't rely on the default music product of your favorite products. Program of your favorite products.

Unless you fit the three of them that actually do a pretty good job. Maybe Josh will tell you. And finally embrace the opportunity to outthink the manufacturer's default music program with your programming skills. As I said, I consider that an opportunity. You know, I can think I can do better than they do.

And watch me. So to me, it's a challenge. Yeah. This is an opportunity where the patient's ability to train the hearing aid might help with. They could train their own music program.

That's a good point. Down the road, I think you'll see something like that. Yeah. Is that. Well, that would be possible now, wouldn't it?

Well, it's possible. I just don't know how readily available it is, because, again, I think that there's not. It's not. The highest priority is not to build the best news or the easiest to use music program, so. Well, I heard a wise person talk about the Signia fitting assistant recently.

Yeah, that. That's more for troubleshooting. But. But. But can't you turn gain up and down with the fitting assistant?

You can, but it's in relative. It's relative to a specific problem. Okay. Okay. I mean, of course, you could use it as a remote control to turn up gain.

Yeah, yeah. Oh, it's pretty primitive. We'll get into that in another.

All right, sounds good. Gus, thanks again for all of your expertise. We'll see you for 7.4, hopefully soon. Okay. We'll work on it.

All right, bye.

7.4 Clinical nuggets from recent research: Selection and fitting

Welcome back, everybody. I'm Brian Taylor and I'm with you today with Gus Mueller to talk about research, Quicktake 7.4. Today we're going to be talking about selection and fitting. And this has been a really great series of clinical nuggets. Gus is a real expert in this area.

And Gus, good to see you again. Yeah, thank you. Thank you. Yeah, this is, it's always sort of fun to try to find something interesting and, and then not only interesting, but something that might have clinical utility, since that's what most of our listeners are. So, yeah, there's, we got a couple things here.

This is relative to selection fitting. One of the topics is it's similar to what we talked about back on pre fitting considerations. It's just moved from being a consideration to something directly related to the fitting. So hopefully that'll, I think people enjoy listening to that. But to get us started, as we've said in these other installments, there's a lot of articles out there every year, over 300.

And we're trying to, we're trying to find some that you're going to find useful. There's a lot of articles to read. Frank Zappa, who, you never know when he's going to show up, but his line was so much to read, so little time. And the days we used to have a stack of journal on our desk, and now, because everything is electronic, there isn't even the stack of journal anymore. So I guess you don't have as much guilt as you used to.

But I'm still thinking that just because it's electronic, people probably aren't reading any more than they were when there was a stack of journals. Well, here's something we're going to start with for those of you who have stuck with us over these issues.

Back in 7.1, we talked about fitting hearing aids to people with normal hearing. So here is an article we're gonna get to in a moment. But this sort of caught my eye. These are the participants. And as we talked about in issue one, sometimes when people say

normal hearing, the participants really had a pure tone average of 20 decibels, or 25 decibels or close to that.

And so you'd say, yeah, but they weren't really normal hearing. Take a look at the participants in this group, forgetting about what goes on in the way high frequencies. But what you see there is these people really did have normal hearing. We're looking at mean audiograms of around ten decibels. We're going to get back to this in a little bit.

Before we get to that study, I'm going to go back to one that was back to 2018, way back six years or so, because it's similar. And then that'll get us to start into this one that was just published a few months ago. So in this study done by Rupp and colleagues from. Where's Rupp? Ohio state.

Ohio state, yeah. All participants had self reported. This is the HHI hearing loss, but the hearing loss was better than 25 decibels. Probably not quite as normal as what I just showed you, but normal. They also had a control group of 20 young adults without any self reported hearing difficulties.

So I like that that they had a control group in here. And so as part of the pre fitting test that they did a battery of tests that are sensitive to auditory processing. And the majority of the participants in the experimental group performed abnormally on at least one of these tests only in the experimental group. The experimental group then was fitted bilaterally with hearing aids with around ten decibels insertion gait. And they did a test that I'm guessing most of you are not familiar with, maybe never even heard of, called the revised spin.

And the revised spin has low probability and high probability. And the data that I'm going to show you are the low probability words that means there's a sentence and at the end of so high probability would be the cow in the pasture was black and white,

but you wouldn't say white, black and blank. Well, that's pretty high probability that you can maybe guess that the word could be white would be a Holstein, by the way. Probably. But there's white faced Angus anyway.

But then you could have, you could have a sentence that said the cow and the pasture was and then blank below probability. Happy? Maybe. I don't know. So anyway, what we have then here is we look at these three groups.

We have the people that say they have hearing disability, even though audiometrically they're the same as the other group. Then we have that same group with aided and then we have the controls. So what you see, this is the test done in SNR. And you see as the SNR became easier, their scores got better. You predict that.

And the two other things that I think are important is that the people who say they have a problem, even though they have normal hearing, really do have a problem. And so as you see, if you compare the blue to the gray, blue to the gray along the line, they do the same. I mean, do the same, they do not do the same. There is, in fact, the difference remains pretty constant where the people who say they have a problem really are having a problem. So what happens when you put hearing aids on those people?

Now we're looking at the orange compared to the blue and to the gray. And what you see is when you put hearing aids on them, they no longer have a problem. I personally wouldn't then call that an auditory processing disorder, because if you can make it better just with audibility, then it doesn't seem really like much of a processing. To me, it's an audibility problem. But we'll leave that discussion to another day.

They also then did the HHIA on these people, and they ended up with the same direction of benefit that we see in that bar chart is the HHIA scores went a mean of 38. Big numbers are bad. Remember, that was unaided to 20 aided, which is quite good.

So we see that same kind of improvement as we saw on the laboratory data using the HHI eight. But the bottom line was this, even though we got the real world benefit, we got the laboratory benefit.

When they were given the opportunity at the end to purchase hearing aids at a reduced cost, only three of 17 said, yes, I'd like to purchase them. Okay, let's go back to this study where people even have more normal hearing. So this was a study from ear and hearing. I see Brad Edwards name there as one of the authors. I'm thinking this came out of Australia then.

So now studying. Right. Kneeling. Right. Do you know where meals is, Brian?

Now they're all, yeah, that would make sense. Okay, so these were 27 adults and they all had hearing loss, average hearing loss, better than 25. Sort of a typical thing that you see in most of these studies. And this was, I really liked the design of this because it was double blinded. Where people completed questionnaires.

They used the saddle and the SSQ, which are both outcome measures. They also used EMA. So this is where patients are completing at a given. You know, they could be in a restaurant and their cell phone buzzes and there's a prompt to complete how they're doing at that given moment. So that's what this ecological, momentary, how that works.

They then had speech and noise testing and also a mental effort testing. The way they did this is they divided them into two groups. And the experimental group were fitted with mild gain hearing aids. The control group also were fitted with hearing aids. And I like this aspect of the study.

But their aids were programmed to zero bb insertion gait. This is, of course, to see if there was a placebo effect of just sending if people come in and oh, I have normal hearing, but I have trouble here. Put on these hearing aids and maybe you'll get well. And if a person was already suspect, they might go out and tell you they got a lot of benefit. So to see if that was true, they fit these people with one group with hearing aids, but with zero db gain.

So you would expect then if they're reporting benefit, something's wrong. They didn't, by the way, spoiler alert.

So regarding the respective questionnaires, the experimental group reported significant benefit when they were fitted with their mild gain hearing aids. The control group showed no difference. Good experimental participants, higher satisfaction with devices than those in the placebo group. Good in the EMA experimental group reported better hearing experience when they were aided. Placebo group did not.

Neither group showed an aided advantage for the laboratory testing speech and noise. I don't understand why, but they did the speech and noise testing at 75 decibels spl. There must have been a reason for it. And I read the section twice and couldn't find out the reason why it was that loud. I mean, you're dealing with people with mild hearing loss.

Nobody's, very few people are going to have trouble when the speech is 75 decibels. But anyway, that's what they did, which to me explained why there wasn't any difference. But despite the real war benefit reported by the participants, 91% had an improvement when given the option of buying a hearing aids purchase price of $3,500. For two of them, none agreed. So it actually got worse from the Rupp study.

We're three out of 17, and now we're down to zero, which takes us to. I know a topic that you've written about, Brian, in some of your books on hearing aids. It's all about value, isn't it? Or a lot of it's about value. Yeah, no, that's a really interesting study.

I think, number one, I think, before I talk about value, I think it's good to know that a hearing aid can help somebody that's got that kind of a problem. I think it speaks to how, I don't know if the microphone technology, maybe the noise floor is lower, but there's, the hearing aids sound better so they fit, they can address more issues with people in normal audiograms. That's. But setting that aside, I think our old friend Dan Quall said, at best, when these are people that have a dollar 500 problem and we offer them a $3,500 solution, and that's the mismatch with respect to value yeah, that's a good way to put it. I mean, I think that if you were to fit them with a pair of devices that were in that $500, maybe $1,000 price range, when you consider service, I think many of those people would probably end up keeping the devices.

So it's an opportunity for somebody out there to bring something to market at a lower price point that has all of these benefits. Yeah. And, you know, and we talked about this in one of our previous episodes about that. It also sends the message is if somebody comes into your clinic and they have normal hearing by pure tones, just don't toss away their complaints and maybe do some formalized testing to justify. And I think too often we just say, well, you have normal hearing, and they're gone.

So I think we really need to pay attention to this. And it shows here, as you mentioned, these people are getting real benefit. I mean, when it's showing up on EMA, on the HHIA, on speech testing, it's real. It's a real benefit.

Okay, we talked about this last year, but it was a different study, although this has a lot of the same data. So I'm going to go through it pretty quickly. And this has to do with instant fit tips, and it has to do with when you fit, instant fit tips that are labeled closed

double domes. All these terms, this is what we've all probably were trained on when we went through our programs. This is data going back from this particular slide from Harvey Dillon, 1985.

I don't think I put that on there, but this is the way we normally think about venting. This is the chart that most manufacturers use when they think about venting and when you communicate with them about venting. And the point I want to make is notice the amount of leakage that you would expect for an occluded ear mold. And let's go to 500. Think you'll see it's about one decibels.

And then let's even go to a 1 mm vent. And it's about one decibels. And we go to a two millimeter vent, and it's now only maybe two or three decibels. So this is sort of the way most of us were trained. And then now I think, Brian, you told me that instant fit tips might be as popular as 85% of the fittings.

I'll at least that. I just got the survey back that you helped me write, and it's at 85. 90% of fittings are instant fit. Okay, so the point here is simply what this study showed is that they used a 1 mm vent which recall back. Our way of thinking was that would give you about a 1 db change at 500 hz.

Look at the chart on the left, look at the mean of that. It's giving you about an eight decibels. And if we go even over to a double dome, a double dome is giving you about a five to six decibels at 500. Look at 250. What you think is a closed mold actually has about 15 to 20 decibels of leakage at 250 hz.

So the whole point of their article is that these instant fit tips are not just because they're labeled closed or labeled double. Don't think they really are. I'm just talking about the mean going back to 500 hz on the double domes. Notice that some of them

are all the way down to a 15 decibels leakage when indeed they're labeled double domes. This is from the Signia software.

And just to show you why telling the software what you're really doing makes a difference. Now if you do probe mic, this really won't matter much because you'll get it right anyway. But if for some reason you didn't do probe mic and you told your system that it's a closed fitting over on the left when it's really an open fitting, these are the differences in the Signia software that occurs when you tell it something different. Because if you tell it it's an open fitting, the software says okay, to meet target you're going to have leakage. I need to add in all these values where if you say it's a closed fitting you have over on the left, it says there's not going to be all that leakage in the lows.

So it's critical to know what you're fitting when you communicate with the software. And of course, another thing to remember is when you're fitting open, when you think you're fitting closed, one of the other problems that you will be for both directional and noise reduction, this is an example of noise reduction, is once you start doing an open fitting, you'll have very little, maybe not zero, maybe two, three decibels of noise reduction in the low frequencies for a product that you think should have ten to twelve decibels noise reduction, and the patient is telling you that the noise reduction doesn't seem to be working and your solution is to go from medium to strong, when your solution really should be to make some custom ear molds and you will have just solved the problem. And we talk, as I mentioned, we talked about this before, this might be a little hard to read, but if you go to volume four, we talk about hearing aid misconceptions and go into this in a lot of detail. And we actually did a webinar on the very same topic. So that's why I just went through it rather quickly here.

Okay. On our next research article, I want to talk a little bit about the real ear coupler difference. Some of you probably do it routinely on all your patients. Some of you have

probably never done it in your life. So for the latter group, here is what you'd see on your screen.

This is from probe mic equipment, which has the coupler response already stored. You don't have to measure that. And so what we'll see here is this is this patient's output in the real ear. This is the output in the coupler, which is already stored on your equipment. If we look down below, then we have it in gain or difference.

Actually, it is. Here's the real ear minus the coupler, which is the RECD. And down below that, they have what you'd expect for an average adult. And so then you can see in this case right away, because that REDC is considerably bigger than adult. Either you have an average, you have either a very deep fit or you have a small canal, or you have an infant, a toddler, which, of course, is a small canal because that's what's going to give you the bigger Recds.

Why do you care about Recd? Three reasons. It's a way that you can predict the ear canal NPO when it's not possible. To measure the rear 85, you simply add the Recd to the two Cc coupler MPO, and you have what the MPO is in the ear canal. Very important for infants and toddlers.

You can do a fit to target in the coupler. You can do your nal or DSL fit to target in the coupler if you know the RECD. This is called simulated Rem or Sran. The third thing, which I'm going to talk about a little more extensive, is to correct the ear canal SPL audiogram. There are some people fitting hearing aids that do this routinely.

Others do not do it routinely because either they're not aware of it or it just takes too much time. When we convert, when we're doing probe mic measures and we convert from hearing level, what we do is we add the retzpool. That's not a patient thing, that's a calibration thing. But then we also add the average Recd. So here's a patient that we

have taken their pure tone thresholds using insert earphones and the pro mic equipment converted it to ear canal spl.

So right now I got an arrow drawn to the 4k. So the question is, where did these values come from? Well, I just told you, it was the Puritone threshold and hl plus the recipe, plus the Recd, the average Recd. And that took us right here. Okay.

Now Bob and Mary are going to help us understand why you might want to do the RecD routinely for hearing aid fittings. So here's Bob and Mary. You tested both of them back to back. Mary's threshold at three k is 70 decibels hl. Her Recd is 15 decibels.

She got a 15 decibels boost from her Recd. So you know that the SPL at the eardrum for Mary was 85 decibels SpL. Okay. You think you write down 70 because you're not measuring SPL at the eardrum, you're measuring whatever on your dial. Now then you test Bob.

Bob's threshold, coincidentally, is also 70 decibels hl, except Bob's Recd is five decibels. His SPL at the eardrum was 75 decibels because he only got a five decibels boost from his RecD. But you have audiograms showing that their hearing is exactly the same. But really, Bob's hearing is ten decibels better than Mary's. You don't know that unless you do an Recd.

So if this was Mary, your fitting conclusion would be. Well, you know, at peaks of speech are audible. Geez, I wish I got average speech. But she's not going to hear average speech at 4k. But I guess that's all right.

By the way, here's where Bob would be. That's the ten decibels difference. It's a whole different interpretation of the fitting. Average speech is now audible. You have a nice fit.

All because you used an REcD correction. Because if you didn't, both Bob and Mary are going to be where Mary is. So that's the teaching point, which takes us to what might be an easier way to do. To do the Recd. And I have to say, of all the articles that we are doing in this series, this is by far the one I understand the least.

So I'm not going to pretend that I do. I'm just. This is sort of an alert because to be honest, I don't really know much about the integrated pressure level. But. So to sum this up, I encourage you to look at the article in IJ eight is what these folks have done at Western University as they have come up with a way using this IPL method to actually measure the REcD, that you don't have to use a probe tip and do all this.

So my thought is, and this is preliminary, preliminary article, but if they come up with an easy way to do this, many more hearing care practitioners are going to be willing to do the Recd. And you'll have a better, a more accurate hearing aid fitting your bob's and Mary's will no longer look the same because you'll have individual value. So I don't know that it's ready for primetime now, but when you are using it five years from now, you heard it here first. I'm guessing this is something that's going to be in the Verifit system at some point. Well, that could happen.

Yeah, that could happen. I don't know what the next step is going to be, but something to think about, which takes us, actually, we're talking about Western University, and there is Susan Scowie waving at us. Hi, Susan. Oh, you don't. So she had an interesting thing in her recent paper just a few months ago, actually, uh, December, I think it was, on, um, on hearing aid verification.

And, uh, she had an interesting section on what she called listening in. I, I can't resist telling you all this story about Mamie Olson. Um, I grew up in a town of 250 people. Uh,

and, um, when I was a kid, we didn't have telephones in the country, but they had telephones in town. And there was a little tiny building that, where Mamie Olson was.

She was the operator. And when somebody called, she had to take these things and put a call through. So she would have to take one call and then take the, and punch it into whoever they were calling. And she could listen to all the calls. Now, what makes this story interesting is this is the town.

Name of the town is writer. North Dakota maybe. Wrote the writer news.

I see where you're going with this. That's not the person you are writing.

I can still mean, I can still, I can still remember my parents sitting at the kitchen table when the weekly newspaper came out and going, oh my God, that's in the writer news. I didn't think anybody knew about that. Unfortunately, we didn't have phones, so they never found out anything about the Mueller family anyway. But anyway, Susan's talking about a different, different kind of listening in. It's something you do with headphones or whatever you choose to use, but you simply hook it up to your probe mic measure, and you probe mic equipment, and you listen to everything that the patient's hearing.

I mean, how cool is that, really? By the way, this has been Susan's writing about it now. This has been available since, I think, the very first Rastronics unit back in 1984. So this isn't in the nineties. I know I said I was doing it in the nineties.

I know that it was possible then. Yeah, but. But I bet you haven't heard or seen many people use it. It's sort of a neglected thing, but it's pretty cool. Susan, you know, she just did a little review of it and talked about, I don't know, I think these are mostly things she mentioned.

I might have added a couple when I was doing research on the occlusion effect.

That's one of the things I used. Just because you can hear the occlusion effect, which is interesting, but those are all things that you can listen to, and it's just a better way to demonstrate to the patient your concern for patient. It's like, I know, Mabel, I'm listening to the same thing you're listening. I know it sounds tinny to you, but I'm listening to it, and I don't know that it's that tinny. I think it's just the emphasis that you need to understand.

Here, let me do. And you can go on and on and on, and Mabel might like you more. Well, Susan then actually did have one thing that she outlined a little more definitively, was how they, of course, are experts on fitting, frequency lowering. And so what you see there is what started off to be c, had a little bit too much and ended up to be a, and they settled on b. So the procedure she lined this in step by step, initially fit the hearing aids to prescriptive with frequency lowering disable.

And then this will minimize how much you really need. You're going to see, with a good prescriptive fit, maybe you don't need a lot of lowering. Then enable frequency lowering and tune it for the synthetic s. This is available on your probe mic equipment, by the way. It's been taken out of the ists signal, and so it's an s sound.

Then you play running speech, listen for clarity, paying a special attention to setting that, maintain vowel quality, and let you hear the difference between SNH eight. So you're listening to this with your patient. So here we go. For Monday morning, consider that patients with normal hearing might benefit from hearing aids. Although value is an issue.

Brian commented on that, and it's something that we may have to work out as time goes on. Instant fit tips and domes remember, vent effects are much, much larger than

you think. Closed is not closed. Consider the effects of open fittings have on DNR and directional if you do probe mic verification, the RECD might be helpful for fine tuning your fittings. And if you do probe micro, routinely listen in to see what's happening in the ear canal during the fitting.

It's actually fun. And that's all we got, Brian, for this issue. No, very informative as usual, Gus. Thanks for your time. And I think we have one more in the series 7.5.

Yeah, and we will get to that before too long. Sounds good. All right, see you next time. Bye.

7.5 Clinical nuggets from recent research: Verification of the fitting

Hi, everybody. Welcome back to QuickTakes. We're on Quick takes 7.5 verification of the fitting as part of our clinical nuggets from recent research. I'm Brian Taylor, and with me, our resident expert, Gus Mueller. Gus, welcome back.

Thank you. Thank you. It's good to be back, as always. And I think, unless something comes up, this might be the last one of this volume. We sort of started with pre fitting considerations, pre fitting testings, technology.

Then we moved on to the fitting, and now we're on verification. Yeah. So there's five. This should pretty much round out the series. And I want to cover, of course, we started this a few months ago.

And, you know, there's as. As. I will probably be on one of the slides here that there's over 300 published. We could probably start all over, and there's been enough articles published to. To do it all again.

But we won't, not right now. Maybe. Maybe next year. Maybe next year. All right.

So we're ready to go? Yep. All right. The finale. Now, you know, I mean, in the earlier, earlier issues of this, you know, I was bringing in Bob Marley and Frank Zappa and all that, and I know that you were thinking that was a little too edgy for a sophisticated company like Signia.

So I thought, who could go wrong with Walt Disney? I mean, really, everybody loves Walt Disney. Who doesn't like Walt Disney? So I had to dig a little bit, but I found a Walt Disney quote, because we've had the quotes from all these other people. And Walt Disney.

There is more treasure in audiology journal articles than all the pirates loot on Treasure island. Who knew that Walt Disney knew about audiology? Who even knew he was reading journals back then? Yeah. Well, thank you, Walt.

Thank you, Walt. I don't know if he can sing or not, but anyway, what we try to do in these, if you've been following us for the previous four, is we try to go through tons of articles and pull out a few that has something in it that you can use on Monday morning. And we'll try to do that one more time here with verification things. So this was an interesting article. The title caught my eye because I really didn't even know what they meant.

They said, is the observer effect present in real ear measurement? And I thought it meant, what do you mean? If the guy's wife is there watching me do the testing, will I do the testing different? Well, that's not what they mean, so I'll explain to you what they meant. And I didn't know such a thing was ever called the observer effect.

But anyway, here's what they're talking about. That when we conduct probe mic measures, most all of you know this. The tube is usually placed on the inferior bottom of the ear canal, and then we put the ear mold or the custom hearing aid on top of the probe. So if the fitting is open or even partially open, of course there's already low frequency leakage. And in fact, if it's really open, you don't even have to put it under.

You can stick it right through the open part. But that's another topic that actually is going to come up anyway. But there's some concern by some people, including these people who did this study, that in a very closed fitting, it's been suggested that the probe introduces a venture, and therefore the measures are not valid. In other words, you're not getting the true amplification because the vent is acting as. The probe is acting as a vent.

So that immediately got me thinking about something that led to a hearing aid research flashback. And since we are on the last one, I thought maybe we'd have a little contest. I'm not sure what the prize is. I know, Brian. You have a whole stack of little signum mugs or something.

Maybe you can ship one of those out. So here's the question. Name the year that all three of these movies were in the top ten. So you got pulp fiction, Forrest Gump, and my all time favorite, Shawshank redemption. I could just watch that movie over and over again.

Forrest Gump and pulp Fiction, not so much. Anyway, the year is. Do we have guesses? I don't know, Brian. You maybe already know the answer, huh?

Yeah, I'll give you my guess. I think it's 1994. Really? Did you really know that or you just. Anyway, 1994.

And that takes us to this research. This is some research by Mueller on the occlusion effect. And there's a reason that I bring this up. I was doing some research on the occlusion effect. What we wanted to know was this is when CICs were a hot thing, and we wanted to know how much the length of the CIC influenced the occlusion effect, which isn't really, but it's an interesting topic.

The guy over on the far left, these are all for my right ear, by the way. Over on the left, that hearing aid terminated 3 mm from my tm. And then we backed it off three. Backed it off three. And then over on the right, you got Mister Shorty.

Now the, which actually isn't that short because they all actually were at my, at the entrance of my ear canals where the faceplate was. But the reason I'm showing this is because of this. We were concerned at that very fact that the probe would create vent

effects. And what, and a lot of people were. And so what they were doing back in 1994 is they were doing this.

Now I don't know if this is obvious, but, and it's the only photo I could find of this is that, notice the probe goes through the hearing aid. It's embedded in the hearing aid and there it is coming out the other end. This photo was so bad that you couldn't see it very well on with the other hearing aids. So that's why I'm using this example. But believe me, it's there for the other ones too.

So what we did then is a lot of people did this routinely is you had the probe then to do your probe mic measures and then when you finished your testing, you simply snipped off the tube at the faceplate and at the end and it served as a pressure vent. So my whole point is, this whole idea is, does the probe create venting? It's something we were thinking about 30 years ago. And the solution then was to simply embed the probe. You know, as I was looking at the photo, I had one other thought, is what happened to this poor guy over here?

Obviously he had a rough night last night or something because he sees sort of in bad shape. Anyway, we'll talk about removal strings on another day. So that then takes us to another article, sort of of the same, along the same lines. But this was just done a few years ago. This is not the main article I started with, but this is one from Steve Payton.

Remember him? Remember him, Brian? We got into a Steve Payton talk and one of our other things. Yeah, I do remember what he did was something that's a real common clinical question is what happens if you put the probe tube through the vent? It's really tempting, isn't it?

You're sitting there and you go, you know, instead of fighting this and putting it under the hearing aid and everything, why don't I just slide it through the vent? So what he did over on the left chart was he used a small vent and he has for closed open and probe invent. And you know, normally we're just interested at 500 hz, we're not too concerned at 250. So let's just look at 500. Because this, the answer is very simple.

It doesn't matter if you notice all three curves are the same at 500 hz. In fact, they're rarely different. Even at 250, the difference is not huge, it's five decibels. Then we look over on the right and we look at an extra large bent and we see there that if you see that if it's closed, then you have the blue line. If it's open, as you would expect it would be, you have the orange.

And if you put the probe in the vent again, it only changes by about one or two decibels. So the point being here from that study was the probe really has a pretty little effect. But this is slightly different than the study from just last year, which is asking a slightly different question. And that is does the probe create a slit leak? So here's the results from that study.

So what you have on the top is the yellow is the probe tube with the probe tube in the ear canal and the hearing aid on top of it. And then what you have with the blue curve is no probe tube. And what you see is indeed there is a slit leak effect. And the curve right below the top one, the bottom curve, that would be, they actually calculated the difference between those two curves. And indeed, if all you care about is that it's 500 hz, which is usually the case 500 above, you'd notice that the difference is no more than about one or two decibels.

Now down at 250 you start to get a difference of about ten decibels. And so if you have a fitting where you're really concerned at gain at 250, you might have to take that into consideration. But yeah, we'll get into it later. But you could have some direct sound

going in which will not make it bad as what this looks. But at any rate, for 500 above, don't worry about it.

Well, we're back to Susan Scully, who was with us. She was with us a couple weeks ago, Brian, she's back to visit again. It's the same article actually, and it actually ties back to our issue three when we were talking about technology and programming for music. So all these things are starting to fit together. So she had an interesting section about programming for music.

So first of all, I can't resist promoting the best music you're ever going to listen to, which you'll find@eartoons.com as it says, where music, audiology and frivolity all live in harmony. You see the second photo down, you have a Dave Fabry from his days of playing the drums. So you can, there's all kinds of different ear tunes there. I encourage you to go in and take a listen or submit an ear tune if you'd like. But going back to programming, before we get to Susan's article, I want to review one thing, and that is about the real ear occluded response, because that's actually the teaching point that Susan's going to make.

But if you don't know what it is, then the teaching point won't be very obvious. So if the fitting is open, the reor will be very similar to the reor. So the reor is conducted with the hearing aid muted or turned off. If it's open, there'll be little change in the ear canal resonance. If the fitting is very closed, however, then the reor will fall probably 15 to 20 decibels or more below the reur because you have loss of ear canal resonance, and you might always have some attenuation effects.

The hearing aid or ear mold is acting as an earplug. So this is sort of what you'd expect. This is if you used a signal that's equalized across all frequencies, which is what we used to do in the old days of probe mic measures. And it makes it an easy

way to compare things like the reor and the reur. So what you top, on the top green curve there is the reur.

And then we see the reor for an open dome. And because this would have to be a very open dome, because it really looks the same as reur, because all the sound is going directly to the ear. Then you have a tulip dome, and you notice we start to lose the reor. There's some high frequency. And then we have a power dome, which is the orange.

And now what you see is we've lost the entire ear canal resonance because it's being plugged up and there's an attenuation effect. So we're actually below the input. So this is how the reor can be used, or at least it should be understood. Now, the reor easily can masquerade as the rear, and it can cause sort of a mess for hearing aid fittings. So over the left is an example.

So what we have here is we have the program gain on this product. This is actually person I was fitting for a research project. We have the program gain set as low as we possibly could. And notice I'm still ten decibels above target. And so I'm going in and I'm calling somebody over and say, am I, like, doing this?

Right? I have zero gain programmed here, and I'm still way above target. And it was, aha. Why don't I do an reor? And I ran the reor and got the red curve, which you see is on top of the green curve.

So what I was looking at was the reorganization, which was the sound going directly to the eardrum. I was trying to program out something going directly to the eardrum using the hearing aid software. When it's impossible to do that. When it's the direct sound. Okay, a good teaching point, I hope, for all of you who have run into that problem.

It's only going to happen when somebody has normal hearing in the low frequencies, of course, and a fairly open ear mode. Here's another case. Or I kept adjusting the MPO because the output was too loud up in the three k area. This was, again, another open fitting. This was for a guy that had a very big ear canal resonance.

And again, I sort of woke up and said, why don't I just run an reor? And I ran an reor, which is the red curve, and found out I wasn't looking at the output from the hearing aid. I was looking at the reor, the sound going directly to the ear canal. So this is a 90 decibels input. His ear canal residence was 20.

And you. It all adds together and it's up. It's too high. It's at his ldl. But there isn't anything I can do about it except fit him with a closed ear mold and turn the ear mold into attenuation, which didn't seem like a good solution after running into these problems ten years ago or so.

I've always recommended, just do the reor. Routinely. Just always do it. It takes 8 seconds and you have it on the screen. And now you'll know what's really the rear and what's really the reor.

Which takes us back to Susan's article. And this is the very example, except for something different that I was showing you before. This was a hearing aid program for listening to music. Okay? And we talked about this in episode number three.

But imagine this. If you had programmed this person for listening to music. And you got the green curve over there. This looks like it's probably for soft. And you're going, hey, good job.

I got a lot of good low frequencies in there. Music is going to sound good. Except the problem is the pink curve. The pink curve is all of that low frequencies is from the reor. It's not from the hearing aid.

Okay. You say, well, who cares? You know, if I'm listening to crash test dummies, does it matter if it's the reo or it's from the hearing aid? No, of course not if it's coming from my stereo speakers. But what if I'm using streamed music?

There is no reor because it's being streamed right into the ear canal. Not good. So this is an example. Susan showed that if you use the default, if you use the default music program, then you go to streaming, you don't have all those low frequencies and you have to reprogram the hearing aid. And this is what we talked about a while back, Brian, that you really need a music program for streamed and you need a music program for live and loudspeaker music because you're going to program the hearing aid differently.

Okay, any comments on that, Brian? Are you okay? No, I think you captured the key points. Thank you. All right.

Moving on to another area of verification. The SII counting dots is fun. This is the infamous Mueller Killian count, the dot audiogram that's been around since 1990, revised in 2010. And it is sort of fun to count the dots. And you can calculate the SII.

It's gotten easier, though. Most all pro bike equipment today calculates SII for you. Here's just an example for the curve up above in pink. It shows that the unaided is what 28 and aided is 73. Okay.

It calculates that for you. That's great.

And you can actually then go to another chart and predict how well somebody will do. This happens to be the prediction for understanding words and sentences. So notice once the AI gets to be about 0.50 or so, you're going to predict this person's going to do pretty darn well. This isn't quiet, I might say, listening to words and sentences in quiet.

But all these SII values now are bouncing around and that tends, that leads to interesting social media posts. This is from one of the two popular social media sites. One of them is audiology happy hour and the other is audiology antics and anecdotes. I encourage you all to check out both of them. A lot of educational material and a lot of laughs.

So here was a post that wasn't too long ago, I just fit a patient and got a perfect match to target, but my SII was only 72%. What am I doing wrong? I got a perfect match. Oh my goodness. Help me.

Well, the question then is what comes first, the fit to target or the desired aided SII? Well, we have an answer for that again from our folks at Western University. And what they did is help us out with what we should expect.

What they did is they took the range of fit to target and aided SII associated with the fittings. This is for the DSL, as you would guess, coming from Western University. And they took into consideration hearing aid style, venting, audiometric characteristics. They looked at 281 years and they looked at the clinical averages for the range and aided SII and compared this then, and it related to pure tone average, which I'll show you shortly. So they looked at edit, they observed that within five decibels absolute deviation or within five decibels rm root mean square, actually, those two things are going to be very similar on average for typical adult hearing aid fittings.

So what they then did was calculated confidence intervals. So that explains these charts. So what you do then is you, this is for a 55 decibels input. And I think I did all of these for somebody with a pure tone average of 45 decibels. So you go down to the bottom to 45 and you go straight up.

And I just put the arrow in the middle of their range, which I assume is the mean or the median. And you see for soft, if their pure tone average is 45, you would expect the SIi for an acceptable fitting to be around 50. Okay, well, what happens when you go up to 65? Same hearing loss, 45 decibels, you would now expect it to be around 70. Right.

And now we go up to 75. You would expect it to be around 80. So the answer to the question that was posed at the social media site is that for the woman who had a perfect match at the target and only got an SII of 72, the answer is pat yourself on the back. That's what you should get. Oh my God.

Harvey Dillon. I didn't know he was going to show up. But wait, what if I want to fit my hearing aids to the Nal Nl two? That's a common question because there aren't, do my knowledge there are not charts like that for the, for the NAL NL two. But here are data going back to a thing that Earl Johnson did during the time he spent in Australia.

Back in 2011, he and Harvey published this article where they compared the NL two to the DSL and they calculated the SIIs. What I want you to look at for these are five different, very different types of audiograms, ranging from normal and the lows and sharply sloping to upward sloping to flat. All different audiograms, all cochlear hearing losses. And the only place that you see much difference is for a two that happened to be the upward sloping, where the now would give you a slightly less SII. But look at the average.

The average for the now is 0.69. Average for DSL 7.0. That tells you that I think you could probably use the DSL charts and you're going to be really close because the expected Si is, are basically the same. By the way, those DSL charts were for adults, you would have different charts for children, which had been published years back. So I didn't say that strongly enough.

Those charts were for adults. And that's what we're comparing here. For adults. For children, the DSL, there'll be a bigger difference between the now and the DSL, but for adults, they're basically the same. So that will give you a good idea of how good your fit is.

And one more thing is that when using this gets back to the RECD, which we talked about back in a different research, quick takes that when you use the RECD calculation, one of the problems is that the fitting normally will be very close to real ear, except when you start using open fittings, there will be a difference. And this has been a problem. Now, usually with children, you're going to use a closed fitting, and this is something you're going to do with children. So it hasn't been a huge problem. But more and more, we're even fitting children with open fittings.

And so there was some concern. So we have a solution that you'll find in this article, again from the Western University people published last year. And this was a file review looking at coupler fittings on 52 adults for different hearing aid styles. And the question really was, could you use corrections so that you can correct for these mistakes that you would normally make? So they remeasured each fitting at three different test levels using SRAM.

And then they did it without the new corrections. And with the new corrections and what they reported, that the vent effect algorithms reduce low frequency air by up to eleven decibels. And as expected, fitting is with more open dome or tip styles, such a

larger improvement, in other words, more correction when the vent model was added. Now that research was done with the verification, and I know that these vent corrections are on the verifit, I can't say if the corrections have been picked up by other probe mic manufacturers or not, but they are available on the verifit for those of you who do fit children and want to have a more accurate coupler fitting. So that takes us to Monday morning.

Number one, no need to worry about vent effects caused by the probe tube. Unless your focus is below 500 reor easily can masquerade at the rear and add confusion to your fitting. Consider conducting this measure with all patients. Consider the effects that the reor has on loudspeaker or music versus streamed music and account for this. If you're wondering if your SII is good enough, use the acceptability charts from the DSL group.

And finally, for two CC coupler fittings, use the vent corrections, if available, with your equipment.

Wow, that's the last of the last. That is a wrap on volume seven. A wrap on volume seven. Gus, thank you so much. Yeah, a lot of really.

You know, before we sign off, you know, we did start off with a famous quote, and then we had another famous quote, and. And then we had Walt Disney. And I think we should end with a famous quote from Mark Twain. You know, you gotta love his quotes. Mark Twain who said, training is everything, cauliflower is nothing but cabbage with a college education.

Which takes us to our final photo.

Yeah, it looks like you might be in the same location as that was taken. Yeah. And I hear this perhaps is the only pair of audiologists who have written more books than they've read. I don't know. That could be somebody stuck that on there.

I'll take that quote anytime. All right, Gus, good to see you. Thanks for all your expertise. We appreciate it. Volume eight.

Volume eight's in the planning stages. Get ready. Yeah, get ready for volume eight. All right, see you next time. See you later.

Bye.