# What's New About Getting Old? The Implications of Normal Aging for Hearing Healthcare Providers and Hearing Aid Manufacturers

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- Welcome to today's course, What's New About Getting Old? The Implications of Normal Aging for Hearing Healthcare Providers and Hearing Aid Manufacturers, presented by Brian Taylor. This month on AudiologyOnline, we're celebrating innovation in the hearing industry with our fourth Industry Innovations Summit. Thank you for joining us today and we hope to see you in other summit courses. We would like to thank our title sponsor CareCredit, and all of the companies who have participated this year. It's now my pleasure to turn the microphone over to Dr. Brian Taylor.

- Hi, you can hear me? Thank you, Melissa. Great to be with all of you. I have a lot of material to get through in the next hour, so I'm gonna go ahead and dive right in. I hope everybody is having a great day. The title, What's New About Getting Old? The Implications of Normal for Hearing Healthcare Providers and Hearing Aid Manufacturers, I wanna acknowledge Kathy Pichora-Fuller, Canadian research audiologist. I borrowed liberally the title, What's New about Getting Older, from her. She has a fantastic column. It's in just about every issue of "Canadian Audiologist". I cannot recommend reading her column whenever it comes out. You can find "Canadian Audiologist" online. She has a real knack for taking the latest research and how to apply it clinically, and it's must reading in my opinion.

And that's where my title is borrowed from. So, thank you to her. I'm Brian Taylor, Senior Director of Audiology at Signia. I hold a couple other appointments in the industry. And I'm just gonna go ahead and jump right in. Here are the three learner outcomes today. After the course, you'll be able to define the physical characteristics of the aging auditory system. You'll be able to describe some of the technical solutions that improve group conversations for people in the normal aging category. And I'm gonna talk about four clinical tools that you can use, I think, to better assess, better understand, better manage the aging auditory system. I always like to teach by starting

with some questions. My job is to kind of answer or at least give you some guidance on these five questions.

What is normal aging and how might it differ from cognitive decline in dementia? How does normal aging affect the auditory system and how can we better manage those changes? How does normal aging affect communication in demanding listening situations? How might normal aging affect how we fit in program hearing aids? And how can we ensure normal aging is successful aging? Those are the items or the questions that I'm gonna try to address today. And I'll start by addressing this question, what happens to the auditory system as we age? We go from our mid 20s, hopefully into our 80s and 90s, how does that aging process affect the way that we hear and communicate? I think a good way to look at that question is to think about what we call the lived experience of hearing loss.

And we know the lived experience of hearing loss differs from person to person. And our job in the clinic is to better understand and assess the lived experience of hearing loss. And of course, it happens, doesn't matter how old a person might be, our job is to assess and better understand this lived experience, and to remember that it's just more than what shows up on the audiogram. Of course, many of the patients that we see are coping with hearing loss that's gradual in onset. We know that most people deal with it for 7 to 10 years before they get help. And we know many of these people that have gradual hearing loss, eventually they start to experience fatigue, and frustration, and other sort of negative, maladaptive behaviors such as being withdrawn, not wanting to go out, eventually being isolated.

We talk a lot about social isolation. And then eventually many of those individuals may experience a great deal of loneliness. All of the things you see on the screen don't happen to everybody, of course, but those are some of the manifestations of untreated hearing loss, especially prominent in people as they grow older. And of course, you can

look at this lived experience in the physical realm, as we'll do today, what's happening in the auditory system as we grow older, when a person has hearing loss. But it's important to remember that what happens physically in the system, the damage that occurs there due to the aging process, also shows up in the psychological and in the social.

I use this slide to illustrate a couple of really important points. The first is when a person comes into our clinic and we do a basic hearing assessment, we're really only assessing a small part of this lived experience. And one of my takeaways today is using some validated practical tools that help us better understand the fatigue, the isolation, the withdrawal, even the loneliness of a person as they go through this process, as they grow older. The second key point that I want to illustrate is by virtue of the amount of time that we spend with our patients. And I would argue that hearing care professionals spend more time on average than just about any other healthcare professional.

For example, the last time you went to see your primary care physician, I'm willing to bet that that appointment felt rushed, and it's not their fault, it's just that the system in a lot of places is designed for them to be seeing a lot of patients. Most hearing care professionals I know have the luxury of being able to spend a bit more time with their patients. And because of that, I think we are very well equipped as a profession to assess this lived experience in a much more holistic manner. And I'm hoping by the end of my presentation today, you'll have a better understanding of that second key point. Alright, so let's look at the aging process.

And I wanna define what I mean by normal aging. Here's a slide that comes from the folks at Johns Hopkins that I think shows that point. You see two lines on the graph, two trajectories, and we're looking at cognitive ability on the Y axis and time in years on the horizontal axis. And that the lower curve, the lower trajectory is what you see for

individuals that might be diagnosed with mild cognitive impairment and dementia. Notice how that trajectory is much steeper, relative to the trajectory of somebody that has or experiences normal aging. Now all of these individuals may come into our clinic seeking help for their hearing, but it's important to remember that almost 90% of the individuals that you're likely to see in your clinic are gonna follow the trajectory of that top line, normal aging.

As we'll talk about today, yes, cognitive ability, yes, hearing is affected by the normal aging process, but it's not nearly as much as it might be on the cognitive side of things for people that have been diagnosed with dementia. And of course, there's been a lot of important work done linking untreated hearing loss with dementia. I think most of us by now are familiar with the results of the ACHIEVE study. I still think we're learning about what that relationship is and what's driving it. But the point that I wanna make here is that the vast majority of individuals you're gonna see in your clinic, some estimates of around 87% are people that are going to be on that top trajectory experiencing cognitive decline through the lens of normal aging.

More on that as we move through the presentation, but this is sort of, I'm trying to lay the groundwork for the individuals that we're gonna focus on today with this talk. Let's look at normal aging and its effects on the auditory system, or reframed as a question, how does the normal aging process, that top line, that less steep trajectory on the graph I just shared with you, how does that affect the auditory system? Before I get into some of the the ill effects of the aging process on the auditory system, I wanna make sure that we're grounded in some basic ideas and concepts around just the normal functioning of the human auditory system. I'm sure you've heard that the human auditory system is a top-down and bottom-up system.

Top-down meaning that the auditory cortex, our knowledge of language, our ability to use working memory helps us fill in the blanks of any words or utterances that might be

missed in conversation. And bottom-up, of course, means that the cochlea and the auditory cochlear nerve are feeding the auditory cortex a steady supply of sound. And it's those two systems working in tandem that allows us to hear and communicate in very demanding listening situations. So that sort of is my reminder of how the system works for everybody. But of course, as we age, as we'll talk about, there's some ill effects that impact the bottom-up and the top-down processing, and that's what we're gonna talk about in a minute.

But before I do that, I'd like to pose this question, why do people struggle in conversational situations as they age? And I'll kind of tie this into some of the latest happenings, at least here in the United States, I think many of us, especially if you live in Kansas City or in the Bay Area of San Francisco, are probably looking forward to the Super Bowl, which is in about 10 days. So I want you to imagine, many people go to Super Bowl parties, and this group of individuals that you see here on the younger side, it might be quite noisy. The signal to noise ratio might be quite adverse, especially if their favorite team scores. But I'm willing to bet, given their age, that they all do quite well in that kind of a challenging social situation.

On the other hand, maybe another group of people, just down the block, there might be a few individuals there that are a little bit older, and because of that, are likely to struggle more in a situation like this. For example, the red arrow designates a person who looks like he might not be having such a good time. If you look closely at that photo on the right, you'll notice that it's the Minnesota Vikings playing. So it's probably a good chance that that is not a Super Bowl party, but that's not the point that I wanna make. The point is you throw a couple of older individuals into the mix that are more likely to have hearing loss and the group conversational situation there, the success of everybody in that kind of a social situation, might be thrown off because one or two people are suffering the ill effects of normal aging.

So what are some of the physical manifestations in the auditory system of the normal aging process? I'm gonna talk about three or four of those now. And as I talk through these, I want you to be thinking about how you might be able to assess these or maybe understand them a little bit better in the individual coming into your clinic, given that you're only going to be spending maybe 35, maybe 45 minutes, maybe an hour if you're lucky, doing an initial assessment. And the other question I want you to be asking yourself as we go through this, does the traditional or the routine assessment, pure-tone air, and speech, word recognition in quiet, those kinds of tests that we all do in our clinics, are they sufficient to better understand or assess some of the damage that we see that results from the normal aging process?

So the first you see here on your slide is extended high frequency hearing loss. And just to show you how much of a challenge it can be, I wanna use the spectrogram to illustrate a couple of important points. You see there in the red on the bottom of the spectrogram, the utterance, I work for the school system. And then you see on the spectrogram the amount of energy that it's associated with all of the different words of that utterance. And of course, the more orange and the more red that you see there, the more energy. And then if you look on my Y axis on the right side of the spectrogram, you see frequency. And no one should be surprised to see that, what, about 75% of the energy is at 4K and below.

But you can see that there's a fair amount of energy because of those fricative sounds at 7K and even up towards 21,000 hertz. Now I'll just make the argument that for understanding speech, and even maybe more importantly, for fitting hearing aids, audibility through 4K is a must have for understanding an utterance like this. That if we can hear, and if 75% of that utterance is audible, there's a pretty good chance that the person using some top-down processing is going to be able to fill in the blanks and make sense of what's being said, even in quite adverse signal to noise ratios. I would

make the next statement that between four and seven, it maybe is not essential, but it would be nice to add that extra 10-15% more energy for understanding speech.

And then of course, ideally, if you're a young, you know, 20 something adult that has really good hearing sensitivity, I would say out through maybe not 21, but out through maybe 15-16K, that would be ideal for understanding speech. Well, a couple things we know about this is there's been a couple of different studies that tell us that people begin to lose the ideal range between, say, 8 and 21,000 kilohertz, especially down around 8, and 10, and 12,000 kilohertz, start to lose that range when you're in your 20s and 30s. And of course, the sufficient range, many people start to lose that in their 40s and 50s. And as I mentioned a few minutes ago, the goal of fitting hearing aids, just sort of a bare bones minimum goal would be to restore the necessary range, make sure that's audible.

So extended high frequency hearing loss is the first manifestation, let's say, of the normal aging process. Now you could evaluate this with extended high frequency audiometry, if you had the tools and you had the time. And I don't know if you can be reimbursed for that, I know a few years ago you could not, but it's possible. And I'm not here to say that you should do that routinely or by any stretch of the imagination. But what I am saying is if somebody comes into your clinic and they're over the age of about 35 or 40, even though they might have a normal audiogram through 8K, there's a really high probability that they'll have some extended high frequency hearing loss.

The next thing I want to talk about, really, it's focused on that white square that you see, that I've now placed in the middle of that spectrogram. I want you to focus on all of the energy and how it's distributed in that white box. And I wanna talk about something that a scientist by the name of Brian C.J. Moore basically discovered about 15 or 20 years ago, and that's this concept of a temporal fine structure inside the cochlea. And what he discovered is that people begin to lose temporal fine structure at

a relatively young age. What do we mean by temporal fine structure? Well, if you look at that top spectrogram there, that's the wave form of a short sentence, two seconds long.

And the red is the traveling wave envelope of the speech sound. And we know that cochlea, the basilar membrane, is sort of tuned to match the red traveling wave that you see there on the spectrogram. But what Moore and his colleagues discovered is that underneath that red traveling wave, there's a whole lot of energy that's happening, that's designated on my slide there on the bottom spectrogram with all that blue squiggly line. That's the temporal fine structure that's been extracted from the envelope. And essentially, the cochlea codes the information, speech information, using its temporal fine structure capability, and sends that up through the auditory nerve into the cortex of the brain. And of course, that temporal fine structure, he discovered, declines with age and with hearing loss.

In fact, some of his work suggests that age has a bigger impact on temporal fine structure than hearing loss per se. Meaning people that might have normal audiograms that are a little bit older suffer from this loss of temporal fine structure. So for example, words that are very similar sounding, like, I'll give you an example, gate, date, and bait are three words that are almost exactly the same spectrally with a couple of small differences. And when you begin to lose temporal fine structure, especially when there's some background noise, it becomes exceedingly difficult to discriminate between those words that sound very similar. So that can become a problem, especially for people as they grow older, this loss of temporal fine structure.

That's the bottom-up processing and some of the damages that occurs in it that result from normal aging. But I mentioned that the auditory system is a bottom-up and a top-down system. So let's look at some of the manifestations of normal aging in the human auditory cortex. Here is some work that I wanna showcase that comes from

Wingfield and and Peelle, and it shows you just how different parts of the auditory system are recruited or marshaled into service when a person goes into a noisier, more challenging situation. What I want you to look at is in my schematic there, labeled B on the right side, you'll notice we have the left and right hemisphere of the cortex kind of separated out.

And I wanna cue you into that red, almond shaped object that you see there on the part of the schematic labeled B. That red, almond shaped object essentially is always activated when a person is in a situation with sound. I believe that you don't even really have to be listening, you just have to be awake. And if there's sound in the environment, that red, almond shaped part of the auditory cortex will glow red on functional MRI. What these scientists discovered back 10 or 15 years ago is that other parts of the auditory cortex, you see them here noted in light blue and light red, pinkish colors, bluish colors, they are marshaled into service when a person goes into an increasingly more complex listening situation.

And what they found is, and here's a view, looking from the front to the back of the auditory cortex, those red areas that are lighting up bright red on functional MRI. As a person gets older, they don't glow or light up quite as much. They don't work maybe quite as effectively. And this is a good explanation in the top-down realm of things of how the normal aging process affects that part of auditory processing. We know that in young adults with normal hearing, those areas you see here on the slide glow bright red on functional MRI. And as you age, they don't light up as vigorously. A couple other things I wanna point out with respect to this, there's some other work that's been done by Anu Sharma, who's a researcher at the University of Colorado.

She's done some really important work on cross-modal plasticity, which means that other areas of the cortex may be responsible for vision begin to reclaim the territory of the auditory part of the cortex when there's a peripheral hearing loss. A good analogy

of this is sort of squatters' rights around some unused land. Let's say that you own a huge tract of maybe 2000 acres of land, and maybe you don't get to visit your all of your land often because it's so big and it might take a couple of hours to drive to. And maybe you visit the far reaches of your land six months from now and you find that somebody has set up a trailer on your land.

Well, that trailer set up on your land might be analogous to the visual system sort of taking over part of some real estate that it thought nobody owned or used. That's sort of the what cross-modal plasticity is. And in Sharma's lab they found that you can reverse that by fitting somebody properly with hearing aids. And of course, properly or well-fitted implies that the hearing aids are matching an audibility target and that a person is wearing them consistently for more than, say, four to six hours a day. That's sort of the working definition of well-fitted, and we know that if the hearing aids are well-fitted, that reversal of cross-modal plasticity is more likely to occur.

Anyway, these are some important changes in the auditory system that result from the normal aging process. The last one that I want to touch on is the relationship between intelligence and aging. And the key point here is not all forms of intelligence are impacted by the normal aging process. This is a slide that was recently published in AudiologyOnline's 20Q that's edited by Gus Mueller. In the most recent 20Q, he talks with a hearing scientist from the UK, his name is Richard Windle, I think. And that's where this data comes from. It's a fantastic article, I would encourage you to take a look at it. But it shows you how different types of intelligence are impacted by the aging process.

We have fluid intelligence, which is basically processing speed, how quickly you can refer to working memory to complete a task. And we know that as you get older, fluid intelligence tends to decline. But the good thing is crystallized intelligence, your wisdom that you've learned through your experience, that doesn't really change, as

you can see here, looking at the trajectory of the crystallized intelligence line. And then of course, traditional intelligence and how we measure and define it is some combination of the fluid and crystallized intelligence, and you see that represented by the dotted line there in the middle. One of the important points that Windle makes in the 20Q is that, I put the arrow in there, that inflection point where fluid intelligence starts to wane, happens at around 20, 25 years old.

So it happens maybe earlier than you think, but luckily your crystallized intelligence makes up for it. Anyway, this is another thing that we have to sort of think about, and it's part of what I would consider top-down processing. Another thing that Windle talks about in the 20Q is the relationship between speech in noise performance and working memory. What you see here on this slide are working memory scores on the X axis, the higher the number the better the person's working memory, as it relates to what's shown on the Y axis, speech in noise performance. Of course, it's expressed here as a percentage. So when you move from 80 to 20, that's a decrease in speech in noise performance.

And then you see there's four different groups of individuals from young to old-old. And what this really tells us is that for the oldest old, there's maybe a predictive effect around speech in noise ability. Meaning if somebody who's older old, old-old, maybe say over the age of 75 or 80, and you're doing speech in noise testing, say you're doing the QuickSIN, and somebody does poorly, even though they have relatively good thresholds and good word recognition performance in noise, that lower than expected score might be some sort of an indication that this person's working memory is not as effective as it was when they were 10 or 15 years younger. So I think there's a lesson here clinically on using the speech in noise test routinely with everybody and also using it maybe as a screener to evaluate working memory and some of these other issues we've talked about that result from the normal aging process.

More on that in a second. So those are some of the types of damage that we see in the auditory system that result from the normal aging process. What I wanna talk about next and kind of touch on is how do these physical changes that result from the normal aging process, how do they affect day-to-day communication? I mean, I think it's obvious that people maybe struggle a little bit more in noise, they might avoid some of those situations, they obviously are gonna be more tired at the end of the day, especially if they deal with this problem for years and years. Those are some of the things that we know quite a bit about.

There's a lot of research to support them. But one of the things that I think is kind of interesting, this is a kind of a recent finding from the ORCA science lab over in Europe that WS Audiology manages. They've kind of found some interesting results as it relates to the impact that hearing loss and normal aging might have on group conversations. So back to the Super Bowl parties and the group there on the right, how might that one individual that's having difficulty with his hearing, experiencing gradual hearing loss and all of the other issues that go along with it, how might that be not only affecting him, but everybody else that's attending the party with him?

That's where our scientists at the WSA ORCA lab, I think, have given us some great insights on how changes in conversational dynamics affect more than just the person that might be coping with the hearing loss. And what they have found I think is pretty interesting, and it's something to keep in mind when you're working with all of your patients, and you are recommending hearing aids, and you're following up with them. So what are the five conversational dynamics that affect all people in group conversations? The first dynamic we'll call alterations in speaking level. Meaning, imagine you're in that Super Bowl party, there's five or six people, you're watching TV, you're having lively conversations. If one person in that group who might be a little on the older side and has some fairly substantial untreated hearing loss, I think we all know that there's gonna be some alterations in how people speak.

They're gonna raise their voice. If there's a lot of background noise, they might have to talk even louder. We all know about the Lombard effect. So that's the first conversational dynamic. One person shows up at the party that has trouble with their hearing, it alters everybody's speaking level, perhaps. Second one, rate of speaking. One person at the party has an untreated hearing loss, this research says that your rate of speaking is going to change. You might talk a little more slowly, you might talk a little bit more deliberately. And that kind of impacts the next thing, which is turn-taking behavior. The research shows that one person at the party has a hearing loss, it throws the timing off of the back and forth, the bantering inside of a conversation.

Almost akin to how the timing of a comedian's joke, if it's a little bit off, is not quite as funny. While if the turn taking behavior within the group conversation is a little bit off, the overall enjoyment of that social interaction might be thrown off a little bit as well. The fourth result is utterance length. One person shows up at the party with untreated hearing loss, we might talk in shorter sentences, we're doing things to the way that we talk to accommodate that person and their challenge with their hearing. And then finally, speaking time, one person at the party has hearing loss, that person maybe feels a little bit left out, they don't talk as much as they want, other people have a tendency, maybe, to dominate the conversation.

So I think the big takeaway here is one person in the group might have issues with hearing loss, while really everybody at that party is also impacted by it. And ultimately, probably the most significant result here is that all five of these conversational dynamics are affected by hearing loss, and of course, worsened by background noise. But the good news is, if you treat someone with amplification, you can change for the better all of these conversational dynamics and make them much more normal, so to speak. Alright, and if you want more information on this research, I would encourage you to go the Signia channel at AudiologyOnline. I recorded, I think, a really informative

podcast with Karolina Smeds, who's one of the principal scientists in the ORCA lab over in Europe.

If you want to deep dive in this research and how it affects group conversations, I would encourage you to take a look at that. Alright, so let's kind of shift gears here a little bit and discuss what I've already talked about, how you can maybe apply what we know about damage in the auditory system that results from the normal aging process, how we can maybe refocus or realign some of the assessment tools that we use to maybe better understand what's happening to the person's physical auditory system that results from this normal aging? So we're gonna talk about some assessment tools. I'm gonna share with you, I think, four different tools. Each one of these tools measures not only the physical, but also the psychological and even the social realms of the normal aging process.

And for me to talk about this tool, each of them have to meet what I call the ABC criteria. A means you can use it in the assessment process. B means you can re-administer the tool and use it to measure benefit, looking at the difference between unaided and aided, let's say. And C means you can use it as a counseling tool. You can pull pieces of information from these different tools and you can have a more pointed, more direct, maybe even a more precise, deeper conversation with the patient around the physical, the psychological, or the social aspects of the normal aging process. So let's look at these tools through the lens of this lived experience of hearing loss.

Of course, most of our routine auditory assessment battery is there to look at the physical gradual hearing loss. But the tools I've picked here to talk about also look at things like fatigue and frustration, which may impact some of our patients. Other patients might be impacted by withdrawal and isolation, or even loneliness. And those are all different aspects of this lived experience that I think we need better tools to help us evaluate and better understand the physical, the psychological, and the social. So

here are the tools that I'll mention today, the QuickSIN, the Vanderbilt Fatigue Scale, which is relatively new, the UCLA Three-Item Loneliness Scale, which I think is something that you could consider putting on your case history.

And then finally Hearing Handicap Inventory, the Screening Version. I think these four tools combined, not only do they meet my ABC criteria, but they also give us more insights into the physical, the psychological, and the social manifestations of this normal aging process. So let's kind of briefly go through each one of these. I think most of you are well versed in the QuickSIN. In the most routine use of it, it's done under headphones at a 70 dB HL or louder intensity level. It measures something called signal to noise ratio loss. I just wanna point out to you that there's been some really compelling data. This comes from Matt Fitzgerald's clinic, Stanford Ear Institute. This was published about six months ago in "Ear and Hearing".

And it shows you the relationship between the high frequency pure-tone average and the QuickSIN score. We don't have time to get into the details here, but I just want to cue you into that red rectangular box. Every red dot you see there represents an individual, I think there are about 6,000, maybe 5,800 participants or data points in this study. Each red dot represents another patient in the clinic, essentially. And you see there, these are people that have what I would call high normal, better than 15 dB, high frequency average, or mid or lower normal, 16 to 25. And you'll notice there there are many dots that fall around 7 to 10 dB in the mild to moderate signal to noise ratio loss.

And that's an indication that, you know, they have normal audiograms essentially, some of them high normal, better than 15 dB pure-tone average and they struggle in background noise. Now what you should begin to be thinking about is many of those patients might have some extended high frequency hearing loss. They might have loss of auditory fine structure, maybe both, probably both. And if they're older, they might have some issues with working memory. Now, not that we need to pinpoint exactly

where the problem is, but we know from the QuickSIN, unlike the pure-tone audiogram, that we've quantified the problem, and it becomes apparent when the person is in background noise. So that's the pure-tones and how it relates to QuickSIN.

What about word recognition in quiet? Here you see on the right more data from Fitzgerald in this really important study at "Ear and Hearing", looking at the relationship between the NU-6 word score in quiet, you see 100 down to zero as a percentage on the X axis. And on the Y axis, again, you see QuickSIN as measured and quantified using dBs and R loss. And again, I want to cue you into the red rectangular box. All of the people in that box, all of those red dots represent a patient. And you'll notice all of them have good or excellent word recognition ability in quiet. But many of them have moderate, even severe, SNR loss. Again, the point here is you can't take the routine audiogram thresholds or NU-6 word score correct in quiet and make any sort of a judgment about how this person might do in challenging, demanding listening situations.

So I think this is great data. Fitzgerald and his colleagues at Stanford Ear have even put together some guidelines on how to use the QuickSIN as the default speech test in the clinic. So I can't recommend taking a look at this paper enough. A few other data points around the QuickSIN, here's some data that shows you take a group of individuals that come into your clinic, they're in your clinic, most of them have some amount of hearing loss. So when you look at hearing loss, plus their age, now you can start to see what the average QuickSIN score might look like. Again, we would make the assumption, based on that working memory slide I shared with you a few minutes ago, that if you're in the 70 to 79 or 80+ range, that that high score or poor score on the QuickSIN, 9.

5 average, 10.5 average might be a result of some working memory issues that the person might have. So again, this is looking, sort of hearing loss and age factored in

together, what the QuickSIN scores might look like on average in your clinic. So it definitely shows you there's an age effect related to it. One more item about the QuickSIN before I move on. I think it's a great way to sort of make recommendations around how much SNR loss a person has. Basically the more SNR loss, the more technology you bring to the table to help that person, the more counseling you bring to the table to help that person, and knowing these values before you fit somebody with hearing aids are tremendously important, I think.

It takes a lot of the guesswork out, it's a great way to temper expectations before somebody is sent out the door. So here's some basic guidance on how you would layer or bring more service and technology to the table as the SNR loss worsens. So that's sort of measuring the cochlea and the working memory. What about some other issues in the lived experience of somebody with hearing loss as they age? We know that fatigue is a real issue, and this sort of touches on the physical, the psychological, and the social. We know that if somebody has listening related fatigue, they're gonna be less productive at work, more prone to accidents, the probability of being socially isolated increases, and the probability of being depressed increases.

We know that people as they age and people with hearing loss are more likely to suffer from listening related fatigue. And there's been quite a lot of really good work in this area by both Ben Hornsby at Vanderbilt and Jack Holman, who is a research audiologist over in the UK. And you know, one message that you can share with your patients could be, potentially, with properly worn hearing aids, they have the potential to help you feel less tired, less fatigued at the end of the day. I think the challenge has been, at least up until now, it's really difficult to quantify listening related fatigue in the clinic. And fortunately, Ben Hornsby and his colleagues at Vanderbilt have created and validated this really clinically friendly Vanderbilt Fatigue Scale.

Notice it's 10 questions and it's on a zero, never, or almost never, to a four, almost always, or always for those 10 questions. So I would encourage you to administer this as part of your assessment. Get a baseline for how much fatigue might be impacting this person's daily experiences. Here's some data that I pulled from one of their publications on this, basically taking those 10 questions, summing the scores together, and then this is showing you the black line, the average scores for people with normal audiograms, and the percentage of scores for each of the different screeners on their tool for people, if that's the gray bar, for people with hearing loss. And what I want you to pay attention to, basically, if it was my clinic, if somebody had a summed score of, say, greater than 20 or 25, to me that would be a pretty strong indication that this person is suffering not only from listening related fatigue, but that with proper use of hearing aids you could probably lower that score by a fair amount.

So this is something that we've actually been dabbling with in some of the clinics that I work with. We're gonna have a poster on this at AAA. And I think this is a really nice way in the clinic to better understand how fatigue might be impacting somebody and how hearing aids might help them after they've been fitted with them. So that's fatigue. Another tool that you might wanna think about using in the clinic measures some of the psychological and the social elements of normal aging. I'm going to use the term auditory wellness, this is a term that Barbara Weinstein, Larry Humes is beginning to use, they've published a lot about that over the last couple of years.

And of course, any one of the hearing handicap inventory assessment tools, and there are at least four of them that I know of, there's a revised one. I would recommend the screening version in the clinic, because it's short, 10 questions. And it really looks at emotional and social wellness. You could administer this before you fit somebody with hearing aids, and you could see how much your treatment might improve both their social and their emotional wellbeing. Of course, this is what the HHIA looks like. It's 10 questions, you get 4 points for a yes, two points for a sometimes, zero points for a no.

Humes and others have data to show the relationship between the hearing loss on the audiogram and the hearing handicapped scores, that's what you see here.

There are a lot of individuals that have normal pure-tone audiograms that have poor auditory wellness. They've developed an auditory wellness scale, you see that they're in red. Basically the higher the number, the poorer the person's auditory wellness. Notice if the score is 16 or higher, they're deemed to have either poor or very poor auditory wellness. And really, the idea here is, if somebody's in that poor or very poor category, you could fit them with hearing aids and re-administer this a month or so later, and see how much of an impact your treatment has on their overall auditory wellness. The next element I'll briefly touch on is loneliness. In the lived experience of hearing loss, I would say that's the psychological and the social realms.

We know that a tremendous amount of individuals out there, set aside hearing loss and aging, we know that writ large, about 20% of adults in our society either feel socially isolated or lonely. We know that about close to 40% of adults between 50 and 80 report a lack of companionship some or most of the time. And I think it's fair to say that loneliness, in many places, especially after the pandemic, is at epidemic proportions. And of course, I think this is a great opportunity for us to not only better understand the relationship between loneliness and untreated hearing loss, but to think about how our ability to fit someone with hearing aids may not only help reconnect them with others, but might actually stave off or even improve loneliness.

And one way to screen for it would be to use this UCLA Three-Item Loneliness Scale. You see the three questions here, how often do you feel a lack of companionship? How often do you feel left out? How often do you feel isolated from others? Notice it's on a one to three point scale. Hardly ever, they get one point. If they say some of the time, it's two points. If they say most of the time to one of those questions, they get three points. If the score is between three and five, if you sum those up, that's not lonely. If

it's between six and nine, that's telling you the probability of them being lonely is greatly increased.

So again, think about if you were to have this on a case history, on an intake form, you could administer it pre and post fitting, and you might get some good information about not only is your treatment amplification helping a person communicate more effectively day to day, but it's also maybe reducing social isolation and loneliness. The last thing I'll very briefly mention is, I know this is kind of a hot topic and it's subject to a lot of debate. One thing that you might wanna think about when it comes to screening for cognitive decline is to ask this one question during the intake. During the past year, have you experienced confusion, memory loss, that is happening more often or getting worse?

And if the answer is yes to that question, considering a referral to an outside professional who specializes in formal cognitive assessments. There's some work out there, I know Barbara Weinstein is a proponent of this approach, and others, and you could read more about it here. So that might be something when it comes to normal aging, separating out those that might be aging normally versus those that are experiencing mild cognitive impairment and dementia. This might be an approach that makes sense in your clinic. So let's kind of put it all together here. I have about 10 minutes left, 5 minutes left. So we've talked about some of the effects of normal aging on all of these factors right here.

How does this apply to what you do in the clinic? That's what I wanna talk about next. So imagine tomorrow in your clinic you have two patients seen back to back. Let's say the first patient meets this description, SNR loss two to three, does quite well in background noise, 55 years old, versus a patient that has exactly the same audiogram, QuickSIN scores might be a little higher because they're older. The question is, would patient two's age and their SNR loss scores perhaps, would that change the way that

you fit or fine tuned their hearing aids? Or would it change the recommendations that you make if they're first time patients? So to answer that last question I just posed, would you treat those two patients or would you adjust their hearing aids differently, there's some brand new guidelines.

I already mentioned the 20Q, part two is gonna address this in more detail, that's coming out probably in a week or so. Here's a screenshot, I'm guessing most of you probably don't have "Frontiers in Neurology" on your nightstand. This is an open access article, so you can find this online. It's a fantastic resource. This group of experts, many of you are familiar with Harvey Dillion, they did an extensive research review, and they came up with some recommendations. And I'm just gonna share with you a partial list of what they recommended. They basically recommend, fit hearing aids that have smooth, wide band responses with compression ratios that are less than 2:1. They recommend doing some listening with earphones while you're conducting real ear measures.

Susan Scollie has another great 20Q on that from a couple of months ago that you can check out. They recommend using ear molds in place of open fits to improve directionality and get better bang for your buck with respect to all of the advanced features that are there to help manage noise. They recommend avoiding features, such as frequency lowering that tend to distort the speech envelope. They recommend that you should consider using slow acting compression by adding a second program with longer release times. Since this is a Signia sponsored event and talk, I wanted to spend a minute or so talking about how you might change release times. First, I would probably not as a default change anything about the first fit compression speed.

But if you wanted to add a second program, you could go into the connect software and click on that adaptive compression threshold enabled. You have to do this in the first fit tab, you have to change to now or DSL target, not Signia's proprietary target.

Then you could right click and change where it says syllabic compression to dual compression. And if you're gonna do something like that, I would do it in a second dedicated memory and maybe allow your patient to see if there's any difference between program one or program two out in the real world. Oh, and before I forget, just very briefly, I forgot to mention that, you'll notice here, the title of this is implications for setting hearing aids for older adults.

Well, their definition of an older adult is somebody who is 55 years old. I am more than 55 years old, and I don't think of myself as an older adult. So take that with a grain of salt, maybe that people just age quickly in the UK versus the US. Which brings me to my final comment here, how can we ensure that normal aging is successful aging? So successful aging, I think there are seven longitudinal studies around the world that tell us that the secret to a happy life is not how much money you make, how smart you are, how many gadgets, and houses, and toys, and cars you own. The secret to a happy life is the quality of relationships.

And of course, a big part of relationships is communication and group conversations. Doubly important I would say, to maintain those kinds of relationships as a person grows older. And when you look at Signia IX, not XI, IX technology, it's specifically designed to optimize performance in those group conversations. And it does this with regional beam forming. We don't have time to get into it, but we have the only device on the market, IX, that has three acoustic snapshots from the front, one for the rear, and inside of each one of those four different independent acoustic snapshots, we have signal processing that's identifying, detecting speech, and essentially turning up the gain in each one of those snapshots independent.

It is a fantastic device for optimizing conversation in group situations. Which brings me to my final point, which is, we've come a long way as a society when it comes to successful aging. And I would argue that older old is not 55, but more like 75 or 85.

And here's my example on how we've come a long way as a society. In 1974, the most popular show on television was "All in the Family". Now because of trademark and copyright rules, I can't show you pictures, but I can tell you, go to Google and look up Archie and Edith Bunker, and pull a picture from 1973 or 1974. Those pictures on the internet that you'll find of Archie and Edith Bunker were taken when they were in their late 40s.

But they look like they're about 75 by today's standards. Now, think about people now in their 70s and 80s. Harrison Ford is 81 years old. Look at a picture of Harrison Ford on the internet that was taken in the last year. He had a new movie that came out I think last summer. He looks younger than Archie Bunker and he is almost twice as old as the picture you'll find from 1974 of Carroll O'Connor who played Archie Bunker. Or look at any number of recently retired football coaches, the coach of the Seattle Seahawks, the coach of the Alabama Crimson Tide. Those individuals are in their early to mid 70s and they hop around like they're in their 30s or 40s.

So as a society, because of modern medicine, because of healthy living, people look a whole lot better today and age much more successfully. And of course, as hearing care professionals, we play a vital role in ensuring that people age successfully by intervening early, by following best practice principles, by thinking about the physical, the psychological, and the social manifestations of successful aging. So I see my time is up, and if anybody has any questions, I will try to entertain those now. If anybody wants to go offline and has a question, there is my email. I do wanna thank you for your time and attention. I hope this was useful information. And thank you to AudiologyOnline and Signia for having me on today.