Showcase Transcript

Hearing Device Wear Time to Improve LSL Outcomes

- Hi, my name is Beth Walker. I'm an associate professor at the University of Iowa and I am very excited to be presenting today for the Oberkotter Showcase. And the presentation I'm going to do is on hearing device wear time to improve listening and spoken language outcomes in children who are deaf or hard of hearing. So we'll go ahead and get started. First off, these are my financial and non-financial disclosures. I won't go through them all. You can just read them on the slide. And so now moving on to the talk. So I am very excited to be presenting on device use in children. This has been an area of interest of mine for the past 15 years as part of the research we've been doing on the Outcomes of Children with Hearing Loss Longitudinal study. So one thing that we know for certain with kids with hearing loss is that we see lots of variability in device use over time. And so you can see here on this figure, this is showing age on the X axis from six months to seven years of age. And then hearing aid use on the Y axis in the gray box plots, we have parent report of device use. In the white boxes, we have data logging. And you can see over time as the kids get older, there gets to be there gets to be less of a difference in parent report and data logging. And you can see that by this red dash line that's showing the change in the medians between the two ways of measuring device use. The other key point though that I want you to take away from this figure is just how much individual differences we see in hearing aid use for young children. So you can see here, for example, age five, we've got kids that are varying in as much as some kids are wearing the devices 24 hours per day, other kids are wearing them zero hours per day. We also see lots of variability in younger children. And so you can see here that younger kids tend to, based on data logging, where their devices about three to four hours per day but still lots of variability. So what are the reasons that are driving this variability? Well, we've done some research on this as well to look at what are the specific factors that account for individual differences. And what we've found in our research is that age, as I talked about, is a significant factor. Another factor is better ear pure tone average. So children with less severe hearing loss tend to wear their hearing aids less often than children with a more severe hearing loss. And then maternal education is also a factor driving device use. And then children who have moms with higher levels of education tend to wear their device more often. And we think of maternal education level as a proxy for socioeconomic status. And it reflects that there may be barriers in a child's, in a family's environment that is making it more difficult to wear the device consistently. And so one of our roles as service providers and professionals is to try to work with families to figure out what those barriers are and how we can overcome them. And you can see on this figure here, this is just showing the increase over time in terms of age in how much kids are wearing their devices. The factors that aren't significant according to our data are gender. We don't see a difference in device use between boys and girls. Age at hearing aid fitting hasn't accounted for any of the variants. So it doesn't seem to make a difference if a child gets their hearing aid when they're younger versus when they're older. Along with that length of device use doesn't seem to be a significant factor when we account for things like age. And then also we have not found a significant relationship in the quality of hearing aid fitting. So we do see that some kids have better fit hearing aids than other children who are more under-fit with their hearing aids. But so far we haven't seen that that factor is significantly related to amount of device use. This graph shows average hours of use grouped by different ages, so infants, toddlers, or preschoolers and school-aged children. And what we see is by elementary years, children are averaging about 10 hours per day when we measure it with data logging. But again, take home message here is that we still see a lot of variability. And so you can see the increase over time and also the amount of individual differences that we see even for school-aged children. We have also looked at trends over time. And so looking at the question of do children tend to cluster into groups of being a routine user where they wear the hearing aid consistently from early ages and then continue to wear the hearing aid consistently over time. Or children who are more limited users who either started off not wearing the device very much and continued that trend or started off wearing the device but then stopped wearing it over time. And what we see is that the children that cluster in the routine users category tended to have moms that had higher education levels. So again, that socioeconomic factor seems to be playing a role here. And the routine users also tended to be children with a more severe hearing loss. Our limited users had mothers with less education and also tended to be children who had a more mild hearing loss. So one of the big questions that we've had in our research study for years is trying to explain why we see so many individual differences in outcomes for children with hearing loss. Why do some kids seem to be very successful? Whereas other children seem to be struggling in learning language, making academic progress, and learning developmental skills. And so one of the questions that we've had is does it matter how much devices are worn? So our model looks at malleable factors, we're looking at factors that we have control over in intervention. And so what we've been interested in is does the degree of hearing loss relate to outcomes? But are there factors that are interacting with the relationship between degree of hearing loss and outcomes? And one of those factors could be the amount of hearing aid use that children are using on a daily basis. And again, we think of this as a malleable factor because this is something that we, as professionals, may be able to influence in our intervention settings by working with the families to try to increase device use. And so what we've seen here is that there is a relationship between the amount of time children are wearing devices and their language growth as they get older. And so this is a growth curve analysis that we did. We looked at growth trajectories in language skills between age two to age six, and we divided the children into groups of children that wore their hearing aids less than 10 hours per day, and children that wore their hearing aids more than 10 hours per day. And what we found was that the children who were wearing their hearing aids more than 10 hours per day showed this deep growth trajectory. So as they got older, they were making more than 12 months progress in 12 months time and effectively closing the gap between themselves and their same age hearing peers. For the children who are wearing their hearing aids less than 10 hours per day, we see basically a somewhat flat trajectory. So they are making progress, they're making about 12 months progress in 12 months time, but they aren't closing the gap between themselves and their hearing peers. And the difference between themselves and children who are wearing their devices more often is continuing to increase over time. And so these growth trajectory analyses are a really nice way to demonstrate the long-term cumulative impact of device use on language outcomes. And so here this arrow is showing the children that were wearing the hearing aids more than 10 hours per day.

This is showing the kids wearing it less than 10 hours per day and their growth trajectory. And then this shows the difference. And so what we conclude from this is that children who are consistent device users show steeper growth in their language skills than children who are wearing their hearing aids less consistently. So another question that we've had as part of our research team is how does hearing aid use affect the brain? Do we see differences in neural dynamics based on the amount of time children are wearing their devices? And so this is research that I've done with my colleagues at Boys Town National Research Hospital, including Elizabeth Heinrichs-Graham, who is a neuroscientist. And what we did in this particular study was a working memory task where children were presented, first they stared at a screen. They were in what's called a magnetoencephalography machine, which looks at the magnetic patterns of the brain, which I find very interesting. And during the test, they first fixated on this blue dot on the screen, and then they had to encode letters. And so what they were doing were all these six different letters popped up on the screen, they looked at them for two seconds, and they were supposed to think about remember those letters. Okay, so then the letters went away, they were supposed to hold them in their memory, and then a letter popped up on the screen and they had to say if they had seen that letter on the original six boxes or was it not there? And so this was looking at their ability to retrieve this letter from their long-term memory. And so when we were looking at the encoding, so just being able to encode what the letters were on the screen, we see differences in brain activity based on the amount of time children are wearing their devices. And so what we found was that the children who are wearing their devices more often, so here we were looking at it in terms of hearing aid use per week, actually we're having to recruit fewer parts of their brain in order to encode the stimuli. And this was more consistent with what we saw in our typical hearing children who were matched by age with our kids with hearing loss. The kids that had hearing, that were wearing their hearing aids less often had to recruit more parts of the brain in order to encode the stimuli that they saw on the screen. So we did find a significant negative correlation between hours of hearing aid use and encoding activity in the brain. And this was after controlling for the severity of hearing loss. And so more activity in the brain actually indicates that the brain was less efficient when it was having to encode and rehearse the letters that it was seeing on the screen. We also looked at maintenance and how the brain was able to hold that information, the stimuli in the brain when the stimuli disappeared from the screen. And again, we found the same pattern, the strong negative correlation. So we get significant negative correlation between activity on the right side of the brain during the maintenance phase. And again, less activity is actually more consistent with what we see in our typical hearing peers. So these kids that were wearing hearing aids more often are showing less activity in the brain. The kids who are wearing their hearing aids less often, we're showing more activity in the right inferior frontal cortex. And this just again indicates the brain is having to work harder both in encoding and maintenance when the devices are being used less often. And so we see more normalized neural activity in these kids wearing their hearing aids more often. Less normalized neural activity for kids wearing the hearing aids less often. So the clinical implications... oops, sorry, skipped over that. But the clinical implications of that research are that children who are wearing their devices at least 10 hours per day are showing more neural patterns and neural dynamics that are more consistent with their typical hearing peers. And so hearing aid device use does seem to have an impact on activity in the brain. Okay, so now I wanna move on and talk about what's the role of clinicians in terms of facilitating and supporting device use. And one of the things that I love about aural habilitation is that it is so interdisciplinary. There are lots of different people who are involved in the whole process of working with kids with hearing loss. And that includes audiologists, speech pathologists, deaf educators, counselors, and of course, the most important people, the parents. So what are some tools that we have that can support families in increasing device use? Well, one thing that we can do is actually try to assess the caregiver's knowledge and their own self-efficacy. How confident are they in their ability to manage their child's device use? And research by Sophie Ambrose at Boys Town National Research Hospital found that parents who had higher levels of self-efficacy and greater knowledge about their child's device felt more confident in their ability to manage the equipment. And they actually did see that this had a positive impact on outcomes. And so the way that they went about in Sophie's study of measuring this was a tool called the SPISE, the Scale of Parent Involvement and Self-efficacy. And this was a measure that you can actually give to parents that asks them more about their knowledge and their feelings of self-efficacy towards their child's device use. Another tool that we have is to do audibility-based counseling and simulations. So we have done research at Iowa that looks at the effects of doing counseling with parents by talking about the speech intelligibility index and also providing auditory simulations of what sound is like for their child with and without their hearing aids. And what we found is that parents have less concern about the impact of hearing loss and therefore, we think they have less buy-in when they're hearing terms like that their child has a mild hearing loss versus hearing their child's hearing capacity described as a function of their aided audibility, how much access they have to the speech spectrum with hearing aids on using the speech intelligibility index or with using hearing simulations. And so these tools also might be a way to support families if we're having difficulty getting families to buy into the idea that hearing aids benefit their child. And that's published from a paper by Caitlin Sapp in Ear & Hearing. Okay, so speech pathologists have lots of things that they can do to support families. Speech pathologists just see the kids more often than the audiologists do. The audiologists may see them annually as kids get older and not be seeing them on a regular basis. But speech therapy appointments are gonna happen more frequently. They also have a different level of access to caregivers than audiologists do, just because of how often they see the children. And so that provides different opportunities to counsel and provide education. So speech pathologists and teachers of the deaf play a really valuable role in educating families and supporting them to try to help overcome any barriers that are keeping the child from wearing their device on a regular basis. So what are some ways that we can maximize those opportunities with families? Well, the key thing is just collaboration. Working with the families, working with the other service providers and figuring out ways that we can try to increase device use. One thing that we can do also is checking in with parents to make sure that they understand essential information. Doing techniques like a talk back method where we ask the parents to repeat back information that we've providing with the, provided with them. Another tool that we have in our pocket is data logging. So almost all devices nowadays have a data logging feature that tells us how much we can wear the devices, how much the child is wearing the devices. We can get that information from audiologists, but a lot of times now phone apps have the data logging information. And so we can work with the families to try to increase device use over time using data logging as a tool. Also, we wanna start off very early on with our children and they're a part of this whole process as well. And we want to facilitate discussions with them from a very early age about what are they getting from their hearing aids, how can they take care of their hearing aids and take ownership of them, and what can they do to advocate for themselves. And so this may be things like asking children, "What bothers you about your device", if they're not wanting to wear it. What can we do to try to figure out ways to resolve those issues? And then what is it that you like about your device? What do you get out of it? How does it benefit you? And so just having these conversations with children at a very young age can help to increase device use over time. There are also ways when you are working with a young child to encourage device use. So this may be celebrating the use of devices from early intervention onward teaching kids that their hearing aids or their cochlear implant makes them special and is something to be very proud of. Also, incorporating clinical materials that depict devices. There are Barbies with hearing aids and cochlear implants now. There's an American Girl who has a hearing aid. There are lots of great books that you can buy that incorporate hearing aids and cochlear implants into the stories. And so these are all approaches that you can use that just are from real world regular device use that incorporate real world device use into everyday stories. Another thing that we can do to encourage device use is just encouraging children at a young age to support taking care of their devices and then teaching them self-determination and self-advocacy, providing them with explanations that are necessary to explain what their devices are and how to talk about them with other people. So in terms of counseling, just helping children understand why they're wearing their devices and what benefit they get from them. Supporting children's abilities to explain their devices to others, giving them the words to account for that. And then being able to connect families with each other so that children and caregivers can share experiences with what it's like growing up with hearing loss. And then also teaching self-advocacy skills, how to communicate with other people when you need to talk about why you're wearing a hearing aid or a cochlear implant. So in summary, our research has shown that device use makes a difference. We see that it impacts growth trajectories in language skills over time. And greater device use is gonna help close the gap between children with hearing loss and their peers with normal hearing. A key point is that we may not see immediate results from wearing the hearing aids or the cochlear implant. So we wanna counsel families on realistic expectations and stress the importance of consistent auditory access over the long term. And we wanna support and teach families to wear the devices consistently, check to make sure that the audibility is at the level it should be, and ensure the child is getting good access to speech. And so we might wanna think about what are situations where you would see low device use, how can we overcome that, and then think about ways to promote self-advocacy, both among the parents and particularly the children that we are working with. And these are my references. Thank you so much and I am appreciative of your time.

Discussion

Thank you so much, Dr. Walker. Your presentation was incredibly insightful, and the research on hearing device use really emphasizes that importance of supporting children and families to increase wear time, so that we can advance listening and spoken language outcomes. But now we have some questions here for you, if you don't mind that we can have a little bit of our discussion with our, and so ... Now if you don't mind, we have some questions for you, if you can be so kind, and we can talk a little bit, and explore a little bit more on the information.

- Great.

- So yeah. Yeah.

- I'm so excited about this.

- I know. So it's one of those conversations that you and I could probably talk all day about, or all week about, but we're probably gonna be under a little bit of a timeline, but I think it's fascinating, the big discrepancies that you showed between parent report, and data logging in younger children, and I'm curious, what strategies have you found that are most effective for discussing that gap without making families feel judged?

- Yeah, I think this is one of the things I think about a lot, because if we do make families feel judged, that is gonna be completely counterproductive, we're not gonna get buy-in from the families. And one thing I will say about this topic is there's not enough research on this. We don't have good evidence-based strategies on how to have these conversations with families. I have some tips, but one thing I will say before I talk about those tips is we need more research in this area, there is one person I know that's doing great research in this area, and that's Karen Munoz at Utah State, Sophie Ambrose has also done some work in this area, so, but there's just much more need in this to study this. But what I suggest, one of the things I talk to my students, and colleagues, and professionals about is just introducing data logging as a tool from the very first appointment. So you have that first hearing aid fitting, letting parents know that there's a tool there that is built into the hearing aids, and it's something that we can use together. And nowadays, they have this data logging capacity in people's phones, so we can actually go in and look at the cell phone, and see how often the device is being used. And again, we wanna introduce it, I would use specifically this term tool, and not describe it as obviously, something that we're doing to check and see what the device use is, that's not gonna work very well, and then also just making sure the whole team of providers, what I love about aural habilitation is it is interprofessional, we have a whole team we're working with, just discussing with the whole team of providers how we have data logging available to us, and we can use it as the child progresses on their journey.

- Yeah. Yeah, I really like your concept of introducing it as a tool to help the team, and to help so that we can support the family, I often think about, I, you know, I have two little grandchildren now, and as they were little-bitties, and growing, I kept thinking, "Oh my word, this would be really hard, keeping devices on little ears during certain times." And so I think of the data logging tool of, it might help, it would've helped, you know, maybe perhaps families learn, what's that witching hour, the bewitching hour, or the bewitching time of day, and maybe declare it that, you know, "I'm going to have that be my prize hour to overcome" and work on it together. But I think you're right. We haven't learned enough about this, and I've learned some of my best lessons from families, and every family is different, and I like your concept of it's a team effort, and it's a tool, and to always look to discover more about how we can best support and learn from each other. Yeah. It's amazing all the things we have now, right? But all the things we still don't have.

- Yep.

- So ...

- Yeah, the technology is amazing, but we have to figure out how we're gonna use it effectively. And it's something you just said reminded me of another thing that I think about that we do wanna build on successful situations, and maybe not start off with trying to get the hearing aid on during the witching hour, 'cause I know, I have three kids, I know exactly what you mean by that term, the witching hour, when they were infants, so another thing that we talk to families about is using like a situational rating scale in combination with data logging, so you would actually look at, "Okay, here are different situations that you're gonna encounter on a daily basis. How often are you using the device, the hearing aids, the cochlear implant in these situations, what's hard, what's easy, and how can we build on that?" So start off with small goals and then try to work towards easier ones.

- Yeah, I think you're right. When we say all waking hours, it becomes overwhelming very quickly, versus looking at situational times, and saying, "How does it work for you during this time? Tell me about that schedule. Tell me about your routine. How's it working for you?", and seeking to understand, so that we gain insights. Yeah, you know.

- Yep. And that's another thing. I don't know, I haven't looked at this very much. I don't know what other people are doing, but the hearing aids and the cochlear implants nowadays also have classifier information so you can see, okay, what situations are the devices being used in, and what situations is the child in throughout the day, like, how much are they in background noise? How much are they listening to music and stuff? So there's all kinds of new things being developed all the time,

- You know, what you, and so I think that puts more emphasis on using it as a tool to learn about your child, the child's listing environment, and what they're encountering, so that, and it gives more insight for parents and families to know more about their baby, or their child's hearing loss.

- Yep, yeah, I think that's a key word insight, yep, that's a really good word.

- So it's kind of like a discovery tool, isn't it?

- Yeah, yeah. And patterns too. What are the patterns throughout the day, mm-hmm, and data like that can help us with that.

- Yeah. Yeah, I think we have to be very practical in terms of what those routines are like in that daily living, and it's hard, I always tell parents by the end of this, we're gonna change their middle name to perseverance, because it takes perseverance, right?

- Absolutely. Yep, as a parent, I know that, and then having worked with parents, I hear that from them all the time, so ...

- Yeah, I know. Yeah. Well, and also in your talk you really highlighted about long-term language growth, and how it's strongly linked to consistent device use, and so I'm curious what your suggestions might be, how clinicians might integrate that information into sessions to help caregivers or even teachers understand why daily use is so important, and how it impacts language growth, and how it's linked to that device use.

- Yeah. That's one of the most, I think, impactful and interesting findings that we have gotten from our longitudinal study is just the difference in the growth trajectories for these kids as a function of how much they're wearing their hearing aids on a daily basis. That's powerful information. But then it's like, how do you incorporate that into your therapy sessions, and try to help, like use that to get buy-in from the families, one tool that we've looked at, I don't know if this exactly addresses what you're talking about, but one tool we've talked about that you clinicians can use with families, and I think audiologists can use with speech pathologists, and teachers of the deaf is audibility-based counseling, and aided listening simulations.

- Yeah.

- So audibility-based counseling is the idea of discussing the speech intelligibility index with families, and which is the percentage of access the child has to the long-term average speech spectrum with and without their hearing aids, and we've found that's a good tool to help parents kind of understand the implications of the hearing loss, how much access the child has to the speech banana, another situation that we've found that can be really useful is aided listening situations, or sorry, aided listening simulations using things, like the Verifit themselves, or the unfair spelling test, and that can really tap into the hidden impact of inconsistent device use. Now this is not stuff that you're gonna incorporate into the therapy session, but this is stuff when you're working with the family, or other service providers of the team, just if you're at that stage, where maybe it's not clicking with the whole team, why consistent device use matters for maybe for those kids that have mild-moderate hearing loss. Another thing that I think SLPs and teachers of deaf can do is tie device use back to the goals that parents really care about, and that isn't always an immediate connection for some families and for some caregivers, this idea that if we're using the device consistently, we're getting language growth over time, and that's going to help with school readiness. That's gonna help with emergent literacy. It also ties into like things like listening effort and fatigue. We have data that I don't think I talked about in my talk, just looking at how hearing aids actually reduce listening effort and listening fatigue, and we also have the neural data I talked about. And the social connections that kids can make. I think the other thing that can be incorporated into therapy sessions is just approaching things, these conversations, approaching issues related to device use with curiosity, and not making hard conclusions. So having these conversations with the kids when they're very young, like, "This is why we wear our devices", and we want to again, shift the tone from being judgmental with parents, to be more collaborative. So those are things that I've thought about that I don't know if that fits into what you were thinking about.

- Oh yeah, it does. Well it's you, you've said so much. It's like we could go into a deep dive.

- Yeah, sorry, I don't know when to stop.

- No, it's wonderful. It's wonderful stuff. You know, I think, and great insight. I think I'm curious, how would you explain the audibility index and that issue of audibility if, like, what words would you use, like if you were explaining it to your grandmother, how would you use it? How would you explain it?

- I describe the speech intelligibility index, which actually I think the term audibility index is a better term, it just doesn't get used as often as, "This is how much access you have to speech sounds without your hearing aids on, or with your hearing aids on." And one important thing to keep in mind when we're talking about audibility, and specifically the speech intelligibility index is that this only applies to hearing aids, we can't calculate speech intelligibility index with cochlear implants, so I wanna say that from the start. But I think the key is, this is the, we can calculate the percentage that a child has access to speech sounds in a quiet room, at a close distance to a listener. And that information, we've found, we've done qualitative research, and we've done some quantitative studies, and we found that just saying that really clicks with families. So if you can say to 'em, your child has 3% access based on the SII, without their hearing aids in, but 90% access with their hearing aids in, we get an aha moment. Like it really like, "Wow, that's a big jump." And maybe we wouldn't see that big a jump, but you really, you can see what a difference hearing aid use makes when you explain it in those terms.

- Yeah. I like using, you know, I think sometimes we, I'm guilty of getting caught up in wanting to make sure I wanna be completely accurate in my clinical descriptions, but I forget, and I start the mumbo-jumbo words that don't have a whole lot of meaning, and so making it clear and simple, and so that we communicate, just so that it's understandable and has meaning is important.

- Yeah. And that's what we've found is, even not so mumbo-jumbo words, but we're descriptive terms, like it's a mild hearing loss, it's a moderate hearing loss, it's a severe hearing loss, those terms are really confusing to people.

- Very confusing.

- And if we say something on top of it, like they have a 50 dB pure tone average, well that makes no sense to anybody. So, unless you've been an audiologist or speech pathologist for a long time. So yeah, if we can, that's what the beauty of talking about audibility is, it does kind of boil it down to these more real-world implications of hearing loss.

- Yeah. I really like the words you're using in terms of just using it as a tool, using it clear and simple, having those light bulbs go off about the importance of wear time, and you know, it's kind of like, if parents wanna know the one thing that they can start doing that will position their child ready for school, and to do well in school, it's device wear time.

- Yep. Yeah.

- Yeah.

- Absolutely.

- Yeah. Yeah, so I'm curious, you know, one of the things that you discussed in your research was maternal education, and the better, you know, pure tone average, better ear pure tone average, and those were strongly associated with device use. So how should we interpret that, and how do we act on the predictors in ways that can support families equitably rather than labeling them as low users?

- Mm-hmm. Yeah, this is, I think, a really important thing to think about too, and whenever I'm giving talks on this, I always wanna, I'm glad we got to have this follow-up session of Q&A, because I always wanna make sure people understand what I'm talking about, and that I'm explaining it clearly, when we're talking about maternal education level, in my mind, what we're talking about is, this is a proxy for socioeconomic status, and it's not what, we are definitely not saying that moms that have less education are going to end up with kids who have lower device use. What we think is going on is these families that are in lower SES backgrounds, we've also seen this for families who are in more rural areas, they encounter barriers that are then driving this variation in device use. And these barriers can be things like being able to make it to appointments on a regular basis, so that the ear molds fit, being able to take time off work to get to those appointments. Transportation issues, it's not a matter of, not a lack of caring on the part of the caregivers, it's trying to figure out what are the barriers are those families encountering, and what can we do as service providers, and as a collaborative team to help them overcome those barriers, and it may be, it also could be stuff like wearing it, maybe the daycare doesn't, maybe the parents are really good at getting the device on the child, but then the child goes to daycare, and the daycare provider is worried about losing the device, so they just take 'em out. I have seen that situation before too. Another thing that I've heard parents say is, "Oh, well we always take it out when we're at the park, 'cause we're afraid that they're gonna lose it in the grass." Well, that's a good, that's a valid concern, but there's things that we can do to help overcome that concern. So we just need to be able to have those conversations with families about what their concerns are. I think, again, it comes back to this idea of like framing device use as this shared issue that we are going to work on together, we're a team, and parents know best, they know their child best, and thinking about what knowledge can we use from them to build on things, and then I think there is something to think about that some families from lower SES backgrounds may need more scaffolding and more support just for things like getting to appointments, counseling about that link between device use and those long-term outcomes. And then the last thing I'll say is the thing that we do see consistently, these kids with mild hearing loss, and we've seen this, we've been tracking these kids since they were little, and the group of kids that we've seen now that they're in high school that have stopped wearing their devices are the kids with more mild hearing aid use, and with that, I think again, just emphasizing the role of audibility, why device use matters, incorporating the educational audiologist, if you have one, the teacher of the deaf, and just again, helping families. One thing that's been interesting is, I've had students who said, who had mild hearing loss, they got devices when they were kids, they stopped wearing 'em in high school, and then they've come to our program, and they're audiology students now because they became really interested in audiology. And they've said like --

- Interesting.

- "Oh man, I really wish I would've kept wearing my hearing aid throughout high school."

- Wow.

- Now that I'm an audiology student, I realize how important it is, so I mean, that's about an N of five. Not a lot of, not a huge sample size there, but anecdotally, it's been really interesting to hear what some of our students who are --

- We need to have them become --

- Right now.

- We need to have them become the poster spokespeople about it.

- I know. I know.

- Yeah, that's very interesting, and that's the problem with hearing loss is that you don't know what you missed, and you don't know how difficult it is or how easy it can be and what you're missing, and all those kinds of things, until --

- Yeah, exactly.

- And particularly then with mild hearing loss, I mean, they're turning to sound, but it's that audibility, it's that intelligibility, it's all of those things.

- Yep.

- And just ease of listening.

- Yeah. Yep, yeah, the ease of listening, again, that's what our recent study we just published, where we did what's called ecological momentary assessment, where we actually had the kids, they had cell phones with them, and we were giving them surveys every day about their listing environment. And we found that those kids that had mild hearing loss that weren't wearing the hearing aids were the ones that were the most fatigued at the end of the day, so ... Which is really interesting.

- Makes sense.

- Good listening's hard work.

- Yep. Yep.

- That's for sure. Yeah. You know, I think that the bottom line when it comes to families, I think we need to be adopting the attitude that families don't fail, systems fail families.

- Yes.

- And so we're a part of that system, and so that means we have to think about it, and individualize it, meet that family where they are, and find out what are their needs, and let's problem-solve it together, access community resources, and get them matched up with what their needs are. There's just sometimes when families have big issues, and the least of their issues might be keeping their hearing aid on their baby. I mean, it may be getting food on the table, and we have to be exactly sensitive to that, you know, and respond to that.

- Yeah. Really thinking about what are the social drivers of health that are impacting this family, yeah.

- Yes. Yeah. Well, and so I think that you're right in terms of that's the opportunity of sharing insights, learning more from research, having more research on it, learning from the research, but also learning from the families and sharing those strategies and solutions. Yeah. So I'm curious, what haven't we talked about that you think someone should have asked you about?

- What I really wish people would know, maybe not necessarily ask me about, but I want people to know is we can have such high expectations for kids with hearing loss these days. Like we don't have to, our expectation doesn't have to be, "Oh, well maybe they'll be average." Like, we should expect them to be able to achieve the level they are capable of achieving. And so that, to me, is like, what keeps me going, what keeps me excited about my job is just seeing the amazing progress that these kids have made over, I mean, in the last 20 years, and it just keeps getting more and more exciting all the time, and so that's like, if I could share a message with the world is that we can have super high expectations for these kids.

- Oh yeah. Absolutely, and, you know, it's like audiograms no longer define the outcome. And that's the message for today's kids, that is different and exciting, because we have this wonderful hearing technology on a continuum, that we can provide access to all the sounds of speech, you know, and with the different devices and opportunities we have, and so that every child can soar, and reach their full potential.

- Yeah, absolutely. Yeah.

- I love it. Well, I'll join you in that message. We can beat that same drum, okay?

- Good. Great.

- All right, well, thank you so much for joining us today, and for sharing your work, sharing your insights, and I just so value all that you continue to contribute to our knowledge base, and to the field, and it's amazing, the body of research, and all that you continue to do, so really, truly appreciate it, and just wanna say thank you so much for joining us, and I think that it's an opportunity for us to continue our conversations, to continue to learn from one another, exchange ideas, and you know, really look forward to the future as we come together, and learn more, and grow more. So I just wanna say thank you to everyone that they joined us today, and I really look forward to having each of you join us in our next showcase later on this year, so be on the lookout for that information about the event, and I know we look forward to seeing you next time, and I look forward to seeing you soon, perhaps at a conference as our paths cross.

- Absolutely.

- So ... All right. You take care.

- All right.

- Bye-bye.

- Thank you so much.

- Thank you, Dr. Walker. Bye-bye.

- Bye.