Transcript

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Karen Gordon

Hello and welcome to the award-winning Hear Here podcast. I'm Karen Gordon. I'm an audiologist and scientist at the Hospital for Sick Children in Toronto, Canada, and I'm delighted to introduce our season five. You'll be hearing episodes hosted by our Hear Here Podcast Team. They are an amazing group of individuals who have experience living with hearing loss themselves or with siblings who have hearing loss. So you'll be hearing from Maria Khan, Nimrat Chani, Sofia Olaizola, Annika Gasse, May Wang, and Maryam Othman. In season five, we recognize the contributions that many families have made to our research conducted at Archie's Cochlear Implant Laboratory here at the Hospital for Sick Children. We discuss the findings of studies that often take many, many years and represent so many hours that children and their caregivers and loved ones spend with us and we really appreciate them and all of this contribution they've made.

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Maryam Othman

So hello, everyone. Thank you for joining today's podcast. I'm here with Dr. Gordon, Melissa, and Robel. I'm very lucky to have them here on this podcast today on bimodal hearing. So maybe we'll start off with introductions. Dr. Gordon, if you could go first.

Karen Gordon

Thank you, Maryam. Thanks for hosting. I'm really thrilled to be part of this discussion, especially with this group of My esteemed colleagues. So I am the director of Archie's Cochlear Implant Lab at the Hospital for Sick Children. I'm an audiologist and a scientist, and I've been working with amazing people like the three of you. And these are both doctors who completed their PhDs in the lab with me. And so looking forward to hearing from them.

Melissa Polonenko

Thank you. This is Melissa Polonenko, and I'm really happy to be joining you today. It is a treat, as Karen mentioned, I did my PhD in the lab, and now I have my own lab at the University of Minnesota, where I get to continue on some interesting and fun work. I also am an audiologist and worked clinically before I got to join Karen's lab, and I'm also a scientist. I'm very excited to talk about some of the work that we have done together.

Robel Alemu

And my name is Robel Alemu. I'm also very excited to be here with you all. And I just very recently completed my PhD studies at Archie's lab. And so I'm very excited to talk about some of the amazing work that we've done. Thank you so much.

Maryam Othman

Okay, thank you everyone for introducing yourselves. I'll also kick off with an introduction. So hello, my name is Maryam. I'm a medical student at Western University. My connection with this work is that I'm hard of hearing myself, so I wear the implant on my left and a hearing aid on the right. And so it is fitting to talk about today's topic and I'm excited to learn alongside the audience too. So thank you everyone for joining and I'm excited to start off our podcast. I think the first and foremost question we should start off is, What is bimodal hearing?

Melissa Polonenko

Oh, there's a general definition. As you know, you have bimodal means two modes. And so in this context, we think about it as you're listening with acoustic hearing as one mode and electric hearing with another mode. And that can span quite a bit of different subgroups. In one extreme, we have Single-sided deafness, where you have normal hearing, normal acoustic hearing on one side, and you use a cochlear implant on the other side that did not have much hearing left in it, so... people went on to get a cochlear implant. And then you can have anything in the mix, where usually if you have a hearing aid still on one side, the ear that doesn't have an implant, that's more than what people traditionally call bimodal hearing, and then specify single-sided deaf for those who have a normal hearing ear. But you could have... Mild hearing loss with a hearing aid up until some children still use severe hearing. They still have a severe loss and still wear a hearing aid with the implant on the other side. But all of them tend to have a difference or asymmetry in their hearing. So they have one better hearing ear with the acoustic hearing. That's spurred on needing to get an implant on the ear that did not hear so well.

Maryam Othman

Thank you for the definition. I was just wondering what the difference is between acoustic hearing and electrical hearing.

Karen Gordon

Yeah, these are terms we use all the time, right? And we think, oh, everyone knows what we're talking about. What's electrical hearing? It's a very unique way of hearing because of

this amazing device, the cochlear implant. So this is a surgically placed array of electrodes that bypasses the inner ear. It's placed in the inner ear and what it does is it stimulates the auditory nerve with electrical pulses. So we only do this when we know that, there's just a lot of changes in the cochlea that we just can't, we're trying to use what's left in there with a hearing aid and there's just not enough to really get enough stimulation of that auditory nerve to get hearing that's usable. And so the cochlear implant, as you've heard us talk about on different episodes right through the through the podcast is just this amazing tool that lets us bypass all those all that change in the ear and stimulate the auditory nerve directly with these electrical pulses. So now we call this electric hearing because it's so different than what we do with normal hearing. It's you know, converting the sound in our environment from, and that's what we call acoustic sound into these electrical pulses. As opposed to the other ear, when we say acoustic sound, could be as Melissa, as Dr. Polonenko, Melissa said, It could be a normal hearing ear on the other side, so we don't need to do anything. But there could be hearing loss. It could be mild. It could be worsened. We have hearing aids that can be adjusted to ensure that we're using the residual hearing there as effectively as we can so that acoustic sound is accessible to that side.

Melissa Polonenko

And there are some differences too, just in how much you can convey that sound through electrical pulses compared to acoustic hearing. And so usually you have thousands and thousands of what we call these little hair cells that help convert some of the sound that goes to these movements in the cochlea and that then sends these signals to the nerve. So eventually the nerve is stimulated, but there's thousands and thousands of channels in your cochlea or your inner ear that help tell all the different little sounds like pitches or what we call frequencies in your sound. And then a cochlear implant can have, depending on the array, like the electrode array that's put in, can have, you know, between 10 to 22 electrodes that are sending these pulses. And so there's quite a bit of differences on just There's way more than those. I don't know if we want to go into all of those today, but there's a lot that can make it very different. But what is sort of surprising when you talk to some people who have both devices and how, you know, as a scientist, sometimes we're like, how do they not sound more different than what you're telling me? And sometimes this is very, I mean, some people can say like the big differences, but this is one of the things when I was working with a lot of the children who were old enough to know what hearing was before they had their cochlear implant. And sometimes they're just like, it's louder when I put it on. I'm like, how is it just louder? And so there's a lot of different ways that people perceive with these different types of signals as well. Like not everybody will

have that experience, but there's quite a range in the experiences that you have with these different modes of hearing.

Maryam Othman

Yeah, I think we've touched on a few different interesting things. I think from my perspective as someone who does have bimodal hearing, when you're talking about children saying that it's louder, I think it can be compared to if you have earphones on and you're listening at one level, and if you go up a few notches, you can tell that it's been increased. And so that's sort of the experience that they're talking about. So it's really interesting to hear that sometimes they're saying it's actually not much of a difference compared to what I was dealing with before. I think for me personally, I do notice a huge difference when I have my devices on versus off. But of course, it's very individualistic. I think I was also wondering, what is the process towards arriving at bimodal hearing for someone who is hard of hearing?

Karen Gordon

Yeah, the candidacy assessment for bimodal hearing is just so different now than it used to be. I mean, we started like long, long time ago, where if we were going to consider a cochlear implant for a child, they had to have like really no residual hearing in either ear. So we put on these really strong, high-powered hearing aids in both ears. And they just were really struggling to hear anything through them. And so we would put one cochlear implant and we would not put a hearing aid on the other side because we were thinking like, why would we bother? They didn't, they couldn't hear anything with those hearing aids. But it was actually, you know, a little, a few years later where there were some clinics who said, you know what, when we put the hearing aid back on, even though there's so little hearing on the other side, like, the children who are wearing the two together are telling us, yeah, it's giving them a little boost, exactly like what you said, Maryam.

Like, it's just, it's not much, but a little boost is helpful. And so then we saw this change over time. Well, maybe like, We could do this in children who have a little more usable hearing on that one side. So it's still, we still really don't want to put a cochlear implant into an ear that has something usable. We don't want to take that away with the surgery. But on the other side, we have this greater flexibility. First of all, we don't, we don't mind if you have that residual hearing on one side, as long as, so we think about it by ear now. So if you have an ear that is an implant candidate because it just can't be stimulated with a hearing aid, then that's fine. And then we'll deal with the other ear separately. And that brought us to, you know, people who had severe hearing loss, and then moderate hearing loss, and then mild hearing loss, and then to children who had no hearing loss that we could see in

that other ear, just profound loss on the other side, so those single-sided. And, you know, I never thought that I would see that in my career, but, you know, this is something that we've been doing already for well over, I don't even know, I think it's like, It's eight years already that we've been doing, we've been getting an implant.

Melissa Polonenko

2012 was when I. Oh no, it's like even longer. I wanted to mention like this is sort of what motivated, like when I was working clinically, I was seeing these children and they didn't qualify for an implant 'cause you had to have poor hearing in both ears in order to qualify. And all these children were like struggling in school and there's difficulty, even though they had one better ear. they were really struggling. And this was the time when we were starting to think about, well, maybe we should go based on the ear instead of the two ear thing. And they're showing these difficulties in situations where you need your two ears, like listening and noise, like classrooms are noisy. People are moving around. A kid is not just going to sit there looking at you nice and quietly still most of the time. And so a lot of our environment is like that and two years help us. And so That's actually what probably like a big part of why I came to Karen's lab was to also, okay, if we give this implant, how do you integrate the two together? Because they're very different. And so I remember that was the start of, okay, like Karen had mentioned, starting off, okay, let's be cautious to start out and those that, you know, had worse hearing on both sides. And then as we were seeing that, you know, that was helping with development. And actually we were doing by waiting to put an implant in, we were causing the brain to change and like affect our ability. Like they actually started having their brains changing in response to the sound.

And so that opened up going, okay, well, we need to do this and maybe we can open it up to more people so we can, especially for children where you're mapping your hearing world right here. what you're exposed to, so much of your brain is changing during these key sensitive periods and you're hearing. You have the, it's like Lego, you have the Lego there, you have the building blocks when you're born, but you need the experience to help shape them into different objects and like more difficult hearing skills. And so that's sort of like the progression even over the six years I was, in the lab change, we started with a few and then grew to quite a few and like quite a variety so that we could see, you know, the advantages to more types and degrees of hearing loss, like how much hearing you had and that it was okay. We looked at a lot of different measures, not just about, you know, does it work, but does it give us the benefits that we thought it would? or not, and not just for, you know, your brain developing, but also, you know, for music. Are we impacting that or your speech and language development? So there were a lot of different aspects that we looked at.

Robel Alemu

Dr. Polonenko brought up some very interesting points, and I felt it was a good segue to talk about some of the work that we did with spatial hearing. And it's interesting because we started out with looking at spatial hearing not even necessarily in children with hearing loss, but even children and adults with typical hearing. So we had this new setup and we were trying to measure how we were trying to evaluate the setup initially. And then we ended up putting an earplug in one ear. And so these were individuals that had typically developed hearing systems and everything. And just with that one earplug, we would see immediate challenges. What was more interesting was that In response to that challenge, there was this adaptive behavior to move their heads to compensate for that deficit. And so this brought us to applying this type of methodology to children with bimodal hearing, so including SSD. listeners as well as children that had amplification with the hearing aid on the other side.

And importantly, we found that the use of this cochlear implant definitely provided a modest benefit for localization, especially when sound was presented to that side that would have otherwise been completely deaf. And so I think that was really important. But also one of the interesting things that emerged was that they had challenges moving their heads to be able to effectively support their listening. And so, you know, there was a little bit of thought of some children potentially even strategizing and using that in a strategic way to utilize the better hearing ear. But for the most part, a lot of these children struggled. And so I think in this context of all of these different metrics, the spatial hearing thing sometimes is overlooked. But I think it's actually told us some very interesting things about this group as well as many others.

Melissa Polonenko

So just to clarify, like, so some of the spatial hearing would be sort of like you're walking outside, maybe you're on a street and you want to know where a car is coming from. They would have a harder time knowing where that car is coming from and they don't know how to, we naturally, you were saying naturally move our heads to help that, but the children who have bimodal hearing weren't actually using those cues to help them. It wasn't something that they learned to do. Am I correct in like that kind of?

Robel Alemu

Absolutely. I mean, it can be crossing the street. It can be on a playground. Being able to hear in three dimensions is something that I think a lot of people take for granted, but it just seeps into all aspects of day-to-day life. And so we thought this was really important, but it was very interesting how having that access to the electric hearing despite the differences

between the two modes of hearing, did provide some type of benefit. So we found that to be very interesting. But yeah, let me, I know you were saying something earlier, Maryam, so I don't want you to lose your train of thought.

Maryam Othman

No. So thank you, Dr. Alemu. Actually, I was heading towards that benefits segue anyway. So you guys have talked about some benefits already. Are you able to share others with parents who are maybe listening in bimodal hearing as opposed to other modes of hearing?

Karen Gordon

You know what? I think you've heard us say this so many times is that These benefits for bimodal are more like what you were talking about. Like when you say it, it's that little boost of hearing on that side. That's by having, you know, the implant. That's kind of what we're seeing. So that gives us a lot of... It makes everyone feel good that at least there's something helpful there. I think we're a little disappointed, to be honest, that we don't have more to show for it. And I think, you know, just to get into the nitty gritty of it is that we've talked a little about the differences between the acoustic hearing side and the electric hearing side. And that's really where we're at is because those two ears are so different, they don't match well. And that's what Melissa was talking about. And that is really the problem for the spatial hearing that Robel, Dr. Alamu, was, Ash, telling us about in terms of his studies that he just completed. And that's a bit of an issue, right? Because if spatial hearing is so important and we are getting a little bit closer, but we're still far away from, you know, really clear, accurate spatial hearing, then we still have these struggles. And that's a bit of a worry in terms of how much you're gonna use the implant. So, I think in this group, the adoption of wearing the implant can be a little more variable than what we've seen in the past, particularly for those children with single-sided deafness. So this idea of having a normal hearing, ear, and cochlear implants, because we're not quite sure that that boost on that side is something that they feel is enough of an advantage for them to wear it all the time? I mean, I don't know, you could, maybe you have some more insights into that. You can help us understand it better.

Maryam Othman

Yeah, certainly. So I wasn't always wearing a hearing aid on my right side, but that sort of came to a head when I was realizing that I was missing a lot in school, actually. And It was affecting my ability to converse, particularly in restaurant settings or loud settings, even in a loud classroom environment. And if I'm being completely honest, I agree. I don't think it's 100% foolproof, the ultimate cure or anything. I think this is a condition that requires a lot

of tweaking and adjusting back and forth with health care professionals and appointments. And so it is a lot of personal investment on your end too. It doesn't just end with the procedures or the devices. But the difference is there, and it's enough for me to justify wearing it as opposed to not, because when it dies or when I don't have it on me, I notice it and I pick up on it. And I don't know if that's just because I have that comparative factor now, but I think it's the boost is really important. And it's the matter of hearing S's and certain vowels or certain consonant sounds that you wouldn't pick up on before. that help with your speech and help with your comprehension and allow you to be that much more quicker in any sort of environment.

Karen Gordon

Yeah, that makes a lot of sense to me. You know, I'd also be interested in your impressions about what we were talking about with spatial hearing. So if you're struggling to tell that a sound is coming from your left or from your right, you know, we're in the booth, so we're measuring this down to like the tiniest little angle and we want to know and, you know, we're measuring whether it helps you to have noise over here or over there as opposed to where speech is. But in the real world, you know, maybe you can help us also understand what do you do in those situations to try to make use of space to help out, to listen?

Maryam Othman

Yeah, I mean, that's something I've grappled with my whole life, right? Localization is such a huge thing, and I don't think people understand enough how much it can be a part of your learning and your awareness of a situation. So I think a lot of it is because I've been dealing with my hearing loss for so long that I've developed a lot of ways to overcome the gaps when it comes to localization. I think it just causes me to be a lot more hyper aware of what's going on. And so I don't really have that luxury of taking a backseat. Or if I'm outside where there may be cars coming or if there's a loud noise, I try to localize it myself before it surprises me, if that makes sense. But even explaining the experience is really tough because I don't know how my brain does it. And it's an innate thing. And it's part of the human experience, the ability to turn when a sound is coming through and you know where it's coming from. And I see it when if I'm out with friends who have perfect hearing and a sound comes through, well, it may take me a few more seconds to figure out what it is or where it's coming from. It's like, oh, you know, there's a ruckus up the street on the left. Like, that's so weird. Like, you have a vision into the future. Like, how did you just, it got to them before I even heard it kind of thing. So I don't know. It's difficult to explain, but I think it's something that you just figure out as you grow older.

Karen Gordon

Robel, does that ring true? You know, when I think about all, you just saw, You were interacting with so many families and so many of the children who have bimodal devices. What did you hear from them?

Robel Alemu

Yeah, I mean, what Maryam described, I think, was really educational for me. I mean, I've listened to all types of accounts from children from, you know, school aged up to young adults and Much of the time, what's striking to me is that even more sensitive than our own measures are just their reports, just what they say about their own experiences. You know, they're very much aware of, you know, what these types of experiences are like because they live it, right, on a daily basis. And so for me as a researcher, you know, as we're looking at the numbers, listening to them is always very interesting and informative. And I think you know, it leads to a lot of questions from our side. In fact, for example, just a few years ago, we had maybe more than a few years ago, we had the whole pandemic situation, which was, you know, such a paradigm shift for a lot of children in terms of the school situation, going from in classroom learning to, you know, maybe Zoom or digital or whatever platform they were using, and how that would affect maybe how often they're using their devices, And then the amount of opportunities for engaging with their colleagues, their peers, their teachers, and all of these other parts of their day-to-day routine.

So I think what I've been hearing is that there are challenges. In terms of our testing, it was kind of simplified. We're just looking at sounds coming from in front of them. just within an arc of about 120 degrees, 180. And so that compared to a real life situation where they could have, you know, sounds coming from 360 degrees up, down, you know, it gets increasingly more complex. And so we can imagine how, you know, there could be all types of challenges, but for the most part, they're pretty aware, I would say. They're very descriptive, even the little ones, you know, there were kids I remember who, would even talk about, you know, maybe playing sports or engaging in some activities, and they would describe to me exactly what that experience looked like for them. But, you know, interestingly, I think with some of the technology, it has restored some ability for them to engage with their environments, even if it's not, you know, on par with some of their their their colleagues or their peers. But overall, I think, you know, this has been something that is that continues to be a learning process for all of us, I would say.

Karen Gordon

I think for parents who are listening and they're wondering, well, like, you know, why don't we just gather all these stories? Why do we need to come to the lab and do all this research? But I think, you know, getting these stories together into something that we can

describe as group phenomena is important still. That's, as a scientist, I still believe in that. and doing studies that are clearly designed so that we can answer these questions. So for example, what Robelle had used also was a questionnaire asking, you know, the same questions of everybody who came in, how they're hearing. And you know, I was actually a little skeptical about the questionnaire to this. spatial hearing qualities of, hearing. the SSQ, what a backward and forward revolve. But I was really fascinated to see how clearly they were saying, yeah, I've got challenges and it's really clear when we're talking about spatial hearing and we could like put a number on it. It's not that number is not going to fit everybody, but it is going to give us like a sense of how much challenge there was. I think Robel, you wanted to say something, so I'm going to shut up for a second.

Robel Alemu

No, I mean, that was a very relevant point, Karen. I think the SSQ, the Speech, Spatial and Qualities of Hearing Scale, it's a self-test question that we would administer. And sometimes when the kids were old enough and to understand the questions, they could fill it out themselves. And some of the time they would need some help from parents. So there was a parent version for the younger ones. But really that was about capturing their own perception of their spatial hearing skills, of their ability to interact in various types of day-to-day hearing situations that were encapsulated in these questions. And as it turns out, the scores that they reported themselves on this questionnaire actually highly correlated with the scores that we would get from our actual spatial hearing test. So it just goes back to what I was saying that, you know, these kids are really very aware of their experiences. And to me, that was very amazing to see.

Karen Gordon

Yeah, I just wanted go a little bit further into some of those. when we see variability and we always talk about, wow, there's not one single child that looks like our mean data. Like nobody's an average person. Everybody's got their own way of doing it. And across the whole group, we get kind of an idea of, that what we call a distribution, you know, what does everybody do and how does that group look different than another group? And so we're talking about the bimodals. Within this group, it's so varied in terms of how they come to bimodal devices. And actually, it was Melissa who looked at that first because, you know, the hearing loss could have progressed. And it could have progressed, you know, changed from differently in one ear versus another. It could have, you know, it could have declined more rapidly on one ear versus another. It could have started at different times in childhood from one ear to the other.

You know, that we started to learn a lot more about why you might have these asymmetries in hearing. which we didn't really know anything about before. You know, the causes, we can talk about those causes that kind of look different than a child who's born with severe to profound hearing loss in both ears. So, you know, the children with bimodal hearing are really a unique group. And I do think, Robelle touched on this, is that having some good hearing. I mean, we've got some children who had normal hearing both ears and just suddenly as in teenage years, there was a sudden drop on one side and now you've got the most asymmetric hearing you could have. But it does turn out that that hearing that you have with normal hearing both sides, that bilateral normal hearing, gives you a good foundation. Those building blocks that Melissa was talking about are so important to use later. And that's a lot of the very, but I actually don't know the percentage. I can't remember, Abel, I'm sorry. But there was a significant percentage of that variability that could be explained that way by just having access to hearing early in life. Mel, I don't know if you found anything in your demographics. I can't recall what Mel taught us all how to do all these analyses of all these different, like all of these factors for timing of hearing loss and when we got the devices and all of that.

Melissa Polonenko

Timing was a very important aspect. The timing of when you had good hearing, when you first lost, like started to progress, like Karen was mentioning. and the timing of that asymmetry between your ears and especially in the ear that became that had the significant hearing loss. How long did you have that before you went on to get an implant to give access to hearing again, even though the access to hearing with the two devices doesn't give all the benefit like the same what we call two ear or binaural benefits that someone with acoustic hearing in both ears may have or But the longer we waited, the more the brain reorganized to prefer the only hearing ears, so they weren't making use of the implant as well. So that timing. But even afterwards, if the ear that had the hearing aid continued to progress to have very little residual hearing, the longer you waited, that could also impact. So then they prefer. So your preference over time can change depending on how much access you have with these two different devices. If we think about you want good access to sound with both devices. And so it was the relative timing of how when do you have good access to sound with both ears, whether that's with an implant or and a hearing aid, two hearing aids or, you know, whatever combination. And so it was really those timings and etiology does play a role, especially in like the quality of the sound.

Like Karen had mentioned, someone who had normal hearing and then suddenly lost it. We had two in my group when we first started doing the single sided deafness group, we had two teenagers about the same age and one lost it overnight, probably because of viral.

infection, it's still largely unknown, but that's probably the kind and how that changed the cochlea, the hearing organ and the kind of residual functioning nerves and things left over gave her a very different sound quality with her implant compared to the kid that had normal hearing in both ears and then went to do a basketball hoop and fell off the hoop and cracked through his cochlea. So the the nerves were all intact and like we had all those thousands of resolution, like if you think about your high def TV, they still have that and then you put the implant in compared to a virus that may make, you know, your TV a little bit more, not have great reception and sort of like our blurred backgrounds here on our Zoom meeting. But, you know, so there's a lot of, especially in this group that you mentioned are highly variable in their hearing trajectories and their hearing journeys can be quite different and that brings in a lot of variability. But we've done these sort of, by coming into the lab and really looking at all these different metrics, we can sort of, with so many children now, sort of try and make sense of this variability. And there have been some of those clear things that we've been able to pull out, like the timing of the difference, that asymmetry in hearing between your ears. And how much hearing do you have in each ear? Sort of these kind of interplay of factors. And then we also can identify like how much wiggle room do we have in making these decisions? Right. Like you don't have to make a decision absolutely today for most things, unless there's like otosclerosis and or sorry, I'm blanking. What is that one? Oh, the men.

Karen Gordon

Yeah, it's viral. Yeah.

Melissa Polonenko

It's a little bit faster of a decision because of how the cochlea changes after that. But like for a lot of them, you know, we have some time to make a decision, but we also identify that there's still a sensitive period to getting good access of sound with both devices. And that is about two to three years where you get changes. You can reverse some if you do it within that time, but ideally for your best getting access in your auditory system to both sounds, a two to three-year range, we would like to get it as early as possible so we can promote that access to the sound. So you can get some, even if it's not true, like perfect localization, getting access to the sound in both ears and encouraging the pathways from both sides to develop and get some of those benefits of, you know, you put it on and you were saying it helps you understand it's not perfect. But you can tell the difference and that is now giving you something to help. And so there's a lot of interplay in those decisions and when should we go for a different device or not. And it's based on a lot of the hearing history for if we look at each child. And that's what a lot of the decisions are still as a team looking at, but all these different factors.

Maryam Othman

Okay, yeah, I think a lot has been shared here and it's really great to hear it from the clinician point of view and the researcher's point of view. For parents that are listening, maybe a question that they have is how can we then optimize the experience for children? What can be done at home or at school to ensure that there's adherence to the devices, that maybe the gap between the sound quality is less?

Karen Gordon

Yeah, this is a huge question. And I think, you know, the parents' decision-making here is really important and how much support they're going to have before and after the cochlear implant from us and everyone around them. So I think the bottom line is we don't really give parents a lot of time to make these decisions because we know that this child is growing every day and that, you know, whatever we wait to do will cause affects just like what we decide to do. So unfortunately, there is a pressure to make a decision about a cochlear implant quickly, because every day that child is growing, it's changing. And you got to accept the change that's occurring because of the lack of sound, along with what's going to happen when we do give sound with the implant. After the implant, the same thing is true as we're really trying to support use. You know, we've got the device, so you've got to use it. The device is not going to work if it's not on the head. And if it's not worn and if the batteries aren't in or if it's not working or whatever that is. And so, you know, we really try to provide as much support as we can to keep the devices on it, and it becomes this sort of catch-22, right?

So for children who have trouble wearing the device, then they don't get as much benefit, and then they don't want to, then, you know, they don't like it, and then they don't want to wear it. And so we just get into this kind of problematic cycle. At the same time, I want to tell parents sometimes, particularly for children with single-sided deafness, that sometimes the child not wanting to wear the device is telling us something too. So we want to really listen to these children when they're saying, Yeah, really, I don't want to wear it's not helping me, because we want to understand that feeling as well. Definitely, you know, we've seen changes and benefits with implant use. They're greater the longer that you wear it, the more consistent you wear it. We've seen brain changes and spatial hearing changes and all sorts of things. But at the same time, if we get all these like beautiful hearing through the device, but you still don't want to wear it, what does that mean? Like we have to try to understand that. And it may just come down to understanding that, it's going to help in some situations more than the others. And we're still learning that.

Maryam Othman

Sort of deal in on what you're saying about maybe the kid is trying to tell us something about why they don't want to wear it. So I can sort of speak to that myself. Sometimes it wasn't even about the sound itself, but the device could be uncomfortable, especially if it's something new that you're learning to use. One issue I struggled with a lot as a kid was the spot would get really irritated and I would take it off to give it a rest. But then I was missing out on all these crucial hearing moments where I could be maybe rewiring my brain to be better at processing certain sounds. And it's definitely dependent on how often you have it on and how long. So if you're taking frequent pauses and you're not wearing it for much of the day, then you're not optimizing your experience with it.

Karen Gordon

But that is so perfect. It is just, you know, sometimes And with a young child, we don't know. Like, what is bugging you? Tell us what's bugging you. We just sometimes don't know. And, you know, so we do, the audiologist, they'll check the way that the device is fitting and they'll check, you know, that there's nothing wrong with the device and they'll check, they'll check, check, check, check, just to really like find what is going on. And it can be something so simple like that. Like, it's just, you know, it's causing a bit of irritation. So we're just going to give a little rest, put a little pad in there, loosen up the magnet on the device so it's not tight. It's not sitting so tight. And just, you know, like let's find a solution. So there can be physical things. It can be the, you know, the way the sound is. And that makes me think too about some of the things that we're doing and not doing with fitting the device. So it may need to be a little different in children with bimodal hearing than what we do with other cochlear implant users. It may need to be a little different depending, who knows, maybe even your old experience, you know, when you didn't have hearing aids that you remember, or when you got two hearing aids that you do remember, and that we're trying to fit onto all of that old experience, which is important. So this just might be too different from that. So that's part of it. And encouraging, you know, the brain to adapt as it will, and not just the brain, but your whole behavior of how, you know, and this for me was important. Robel was talking about Well, Melissa was talking about like specific brain changes that we measure. Like you put the implant on the brain, it will like respond and change. It's amazing. You see changes in like a month when you're using the device. And then six months of device use and it's looking like pretty good. It looks like you know what we would expect from children with normal hearing. It's like incredible to see and yet you still want to hear it and they're still not moving their heads around. So like maybe we can help out with How about some different kind of training? You know, like maybe we can give some support with some visual cues to get a sense of what's going on. Maybe we could do something different with how we program the device. Maybe we can think about, you know, well, this is what we're thinking about in the lab. All these things that we could try to do to

make the sound quality just better for each child individually to map onto what they're hearing, what they're hearing aid on the other side.

Maryam Othman

Other things that could be taken into account when it comes to even an out of the gap, like maybe parents could go for devices that are made by the same company, for example.

Karen Gordon

This is a really interesting question because cochlear implants are made by certain manufacturers and hearing aids are made by other manufacturers. And there has been a push as we get to more bimodal hearing between the partnerships between the companies. And it is nice to see because there is this like revelation, oh, you know what, we may need to like make these two talk to each other and actually fit together. We might even have to do that even within one manufacturer for two hearing aids, is those devices don't actually talk to each other very well. So we might have to think a little bit more in audiology about how we fit these Whatever device is going in each ear, great. We know how to make sounds audible in each ear, but we don't really know how to connect them and make them match very well. And that's kind of what we're thinking about next.

Maryam Othman

Yeah, because these are very important things to consider as we move into the future of bimodal hearing. And I know personally from my experience that when I first on the hearing aid after when just the implant for so long, there was that difference where the implant felt a lot more natural and didn't have the feedback, the hearing aid did. And that was an adjustment process too. And my audiologist recommended that I maybe get the hearing aid from the same company that's making the implant. And then that was another thing itself. And so I think the important takeaways, there's a lot of things The nicky things that you're gonna have to work out and listening to your kid as a parent is gonna be the golden ticket here. When they're telling you that something is bothering them, it's important to listen to that. Not everything has a cure, but many things are fixable and the audiologists are here to support parents and children and recognize that these are limitations that do exist with the devices, but it's a teamwork, it's a partnership and there's a lot of back and forth. But the end result can be really, really good and can foster excellent growth and development in children.

Melissa Polonenko

Yeah, I'm looking forward to, I mean, I like to understand what's happening under the, in the brain and things as we, you know, learn more and more about, I'm really interested in

how the brain is changing with the different access to sound and like all these different skills that are developing and, We've got new ways of sort of tapping into that. And I think for parents, it's like, you know, this is a journey and, you know, I think ask all the questions you have. I think that's a great thing to, as you said, teamwork with your team and, you know, it's a journey and it can be an exciting one too.

Robel Alemu

For me, Dr. Gordon touched on some interesting concepts with getting the two devices to talk together. I think more as we see potential breakthroughs in that area, it's going to be very interesting to see how that translates into changes in how, you know, children hear with these two devices in terms of spatial hearing, in terms of all these other measures that we do in labs like ours. Because ultimately, what we do in our lab is to translate into real life day-to-day situations and improving the lives of these children. And so I think we're on the precipice of potentially seeing some of those changes as we see all types of breakthroughs in different aspects of the field. And I'm very excited to see what the future has in store. So it's a very amazing time to be following this research, really.

Karen Gordon

Yeah, I'm just glad to be part of the process. You know, Maryam, you talked, it's so important, the families with the clinical team and we in Archie's lab are so lucky, lucky to be part of the team. And we do like to push a little bit into what could we do that makes this better? So, when I think really far ahead, we are going to have smarter devices, smarter ways of measuring what our auditory system does in real time with the devices, right? We will have abilities, I think, to understand How children are actually developing day-to-day, not just when they come to the lab, but I would love to know what is actually changing day by day, what's working and what isn't, and that kind of feedback and information. You know, when we talk about AI, that's really what we're talking about. We're talking about being able to pull information and make things better in real time and support it, right? So all of those kind of training paradigms that we do and trying to get, you know, that spatial information, get more real life, that kind of thing we could do if we knew what was going on, get the feedback and know how to improve it in real time. So I am, I'm looking forward to that because I think it's going to come sooner than we think.

Maryam Othman

Yeah, definitely an exciting time to be doing this kind of research. And I too am very hopeful over the course of the 10, 15 years that I've been dealing with this. I've seen a lot of change come on. It's gradual, but it does come. And when it comes, it just feels so different. It feels like something new has come on the field, and you can't believe you didn't have this

before. And so that's how it feels to the user. And every work that goes into it is so important. And I'm just so grateful to have people like you guys out in the field doing the work, doing the real work, really. The research you find and come up with is then forwarded to important people, and that's where change happens. Thank you.

Karen Gordon

Oh, thank you for discussing it. And I, you know, I learned from you every time we talk, every time. So it's just been a pleasure to talk again.

Robel Alemu

Thank you so much. It's been a pleasure, Maryam, and it was very interesting to hear you articulate some of the things that you did. You did it so masterfully. Thank you so much.

Melissa Polonenko

Yeah, thank you very much. And thank you for sharing your experiences, I think. It'll be very helpful for us to continually learn. And also, I think the parents, it's really helpful to hear the real lived experiences of people.

Maryam Othman

Of course, anytime. Thank you all so much for joining once again, and we hope that you enjoyed our podcast. Thank you.

[MUSIC]

Karen Gordon

Thank you for listening to our award-winning Hear Hear Podcast. Thank you again to children and their families who have spent their time and energy with us in Archie's Cochlear Implant Laboratory. Thank you also to our Hear, Hear podcast team and a special shout out to Dr. Blake Papsin who composed and performed our Hear, Hear podcast theme music.

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