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Exploring New Domains in Pediatric Amplification: Case Studies in Auditory Acclimatization

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Presenter: Dave Gordey, PhD

- Welcome everyone to today's presentation, exploring new domains in pediatric amplification case studies in auditory acclimatization. My name is Dave Gordey. I am the Director of Pediatric Audiology and Research for Oticon, and thank you again for everybody joining today. So just to review our learning objectives for today's session. At the end of this session, you will be able to define auditory acclimatization, describe facilitators towards successful auditory acclimatization and describe barriers towards successful auditory acclimatization. So to begin with, I wanna start off with describing a little bit about the evidence that we've gathered for the Oticon Play PX hearing aid, and how it actually fits into our topic that we're going to discuss today. So as you may know, the Oticon Play PX is the latest addition to the Oticon pediatric hearing aid portfolio.

And as we do with most of our hearing aid for kids, we try and gather as much internal and external research or evidence as possible to support the use of our products. The Oticon Play PX is designed with our best research and embraces our brain hearing philosophy. And we believe this hearing aid is very well suited for infants, children's, and teens, primarily because it is the first of its kind rechargeable and a mini BTE that really compliments our current Oticon pediatric portfolio. So if you think back to our first wave of evidence that we introduced for the Play PX, we had studies that looked at the ability for more sound intelligence to provide access to communication, and this was a study completed by Dr.

Andrea Pittman who looked at children and teens who are deaf or hard of hearing, and their ability to use this technology to improve in areas of word recall and word recognition in complex listening environments. The second study that we completed was using Oticon remote care with the Play PX and how it might be used successfully as a counseling tool. In other words, for us to have the audiologist use remote care with families in the comfort of their own home as a way to support and develop self-determination. And last, we did a small survey that looked at parents' desires to

use and utilize rechargeable hearing aid solutions for their young children. And this really was a check-in just to make sure when we develop a rechargeable hearing solution, that we are ensuring full usability by all stakeholders, including parents.

So really what we're going to talk about today is part of what we describe as our second wave of evidence for Play PX. And when I think about research for hearing aids, I'm always thinking about the experiences of our kids who are deaf or hard of hearing and how they interact, participate, and engage in their local elementary school. So if we think about kids today, most are attending their neighborhood school and are being educated alongside their peers that have normal or typical hearing. And so when thinking about research studies for our hearing aids, I always like to imagine if I was a student with hearing differences and wearing our hearing aids, what is it that I would need to be fully included or embrace those concepts of inclusion to really participate?

And so that's really what was the focus for this second wave of research, was looking at different studies that really might help that immersive or inclusive experience for children who are deaf or hard of hearing in their neighborhood school. And so these studies are in the area of auditory acclimatization which we're going to talk about today, and then two additional studies which you'll hear about in the future, accuracy of first fitting and voice emotion recognition in noisy environments. But as I said, today's topic is really focused on looking at auditory acclimatization and really digging into learning more about this very important domain. So a great place for us to start is really a definition. What is it that we mean when we talk about auditory or perceptual acclimatization?

So looking at the literature, we find this definition that it seems to come up in many research articles, and it is by Arlinger and colleagues from 1996. And what Stig Arlinger describes as auditory acclimatization can be best said as the adjustment time relating to learning to accommodate to new auditory inputs through hearing technology. So

other researchers, when talking about auditory acclimatization, they often will say it refers to improvement over time as users learn to make optimal use of altered patterns of auditory inputs. So in other words, when getting a new hearing aid, this time period or adjustment period to really get used to those new sounds that they're experiencing. Others describe auditory acclimatization as a point of reference to explain how individuals who are deaf or hard of hearing, experience different types of hearing aid systems.

Why some may have an immediate boost in benefit the moment that they try a new hearing aid, whereas others it may take a longer period of time. And yet others talk about auditory acclimatization as part of the process of optimizing that first fitting programming of that instrument, to really reflect on how we are setting gain or output to really support that adjustment process as individuals begin to use this new hearing aid. So why should we be exploring auditory acclimatization? Well, I think initially when we think of everybody, it's really important that we have an understanding of what are those key elements we should be utilizing when we're counseling our patients and talking about this adjustment period.

I also think it's important to explore this topic, because it might help us select really appropriate management strategies, again, to guide those individuals through that adjustment process. So really thinking about, is there behavioral training that's needed? Are there cognitive capacity issues we should be thinking about, or are there specific strategies we should be recommending to really help facilitate this process? So I think a great place to get us started, as we eat our lunch or have our morning cup of coffee is to look at the literature. And I think this is really nice to get us situated in the world of auditory acclimatization and looking at some of the more recent research articles and help us understand where we're at when we think about auditory acclimatization.

So let's start there. So when looking at research studies on auditory acclimatization, I think there are some general takeaways that we can discuss when looking at the full body of information. First, most of the research focuses on first time hearing aid fittings and adults with hearing loss okay? So if you type in to Google Scholar auditory acclimatization, you're going to be populated with a very long list, most of it relating to adults who are using and getting hearing aids for the very first time. The other thing I think that is a really main takeaway of this old body of research is that the findings are very mixed. Acclimatization is reported with a small effect size and a lot of variability among individuals.

So what do we mean when we say a small effect size? Well if we think of statistical significance as something that tells us about how likely a result will occur due to chance, an effect size is really a measure of how important a difference between groups is or how meaningful a relationship between variables is. So when we see a small effect size, it tells us that, that relationship between those variables is not that important or limited in its practical applications. I think the other thing to really hone in on here on the screen is variability among individuals. This means that when we look at the research on this topic, it's really hard to take groups of people and generalize findings or make recommendations on those outcomes that can translate to large groups.

In fact, the variability between individuals from one person to another seems to exist. And so I think that's important for us to recognize when we're working with our patients in the clinic. Now there are some conflicting outcomes across studies that we see. So in other words, when we compare the results of studies, we see some differences and I think there's some reasons for that, that are worth mentioning. So this could be because of the attention or lack of attention paid towards the accuracy of the hearing aid fitting. Okay when we look at these articles, we don't get a lot of detail on how

these hearing aids were fit. There isn't a description to say, "I used evidence-based practice.

I met NAL-2 or DSL targets and used these set of outcome measures to validate the fitting. None of that information was available." And so when we think of this as a conflicting outcome, it really could be because the way the hearing aids were fit in these different studies, they could be fit in a number of different ways, which actually predicted how successful of a fit that was for that individual. The other thing that is not mentioned is the types of signal processing that is utilized in the hearing aid. So for example, did some of the individuals have frequency lowering enabled? And we know from the literature that those that utilized frequency lowering may have a longer acclimatization period, or what types of signals processing strategies were being used, were they using directional microphones?

Was adaptive noise reduction enabled? There's a lot of variables we know that we can consider or options we have to consider when fitting hearing aids. And again, these are not well described and not knowing that, again, if there are differences might affect how different people performed in these studies as we compare them. Age of patients. Now this is well described in the articles, the age of the participants, but what is not described is if any cognitive screening was done prior to the study to identify any cognitive differences or limitations among the participants. So in some of the studies, we do have participants who are in the age range of 60 to 70 years of age, and we know that some of those individuals may have differences in their cognitive abilities.

So not knowing this and as a function of age also, may be a reason to see these differences across studies. And then last, which I think is quite important, and still where we find ourselves today, is that we don't find ourselves with a set of standardized or well-validated measures to document or rate levels of acclimatization okay? So in these studies, we see sometimes that speech recognition testing was used

to document, adjustment or acclimatization, but there were not really well described outcome measures that had been validated that had been also utilized for acclimatization. So this is again, a consideration and a reason why we might see those differences. So this is really factors at the research level.

Then I was thinking about, what about factors at the patient level that might affect the acclimatization? So what do I mean by that? Well think about things that patients might experience when getting a new hearing aid that might affect their adjustment or their acclimatization. So this could be things like wearing comfort. If the hearing aid they perceive it to be not comfortable in their ear, does that mean they're fully utilizing that technology all waking hours or does it mean that they're constantly fussing with it, taking it in and out of their ear? And this could actually have a direct impact on wearing time, which we know is correlated to acclimatization. I also thought about the practical aspects.

Are they actually remembering to put the hearing aid in? So again, this also speaks to hours of use. If you're forgetting to wear it all waking hours, this also may in fact have an impact on acclimatization. And last I was thinking about the psychological factors. How are they managing self perceived stigma of wearing a hearing device, when they reconsider their self-image now that they're utilizing hearing aids? And does this impact their motivation to wear the hearing device and also persevere getting used to those different sounds in their environment. So all sorts of really interesting things for us to consider when we think about auditory acclimatization. So what do we know about auditory acclimatization in children who are deaf or hard of hearing and wear hearing aids?

Well, one of the things I thought about was looking at all of this research with adults and not seeing a lot on kids. How might children differ in their auditory acclimatization experiences? We know that research on adjustment pattern differences exist. So in

other words, thinking about auditory maturation in children versus adults, we know that some of that data is readily available, but there's not a lot. We also know that children's auditory systems continue to mature and developed through adolescence. And so this has led some researchers to assert that because of this maturation period that's ongoing, children are going to have a very different acclimatization pattern than an adult. And I think that makes pretty good sense, doesn't it?

So the one article that I did come across that spoke to kids who use hearing aids and talked about this concept of auditory acclimatization was related to a study from Blisten colleagues at Western University who looked at how children who wore Y dynamic range compression hearing aids adjusted when they were given hearing aids with frequency lowering processing. So for their study their research question was, how long does it take to adjust to frequency lowering technology for children who are long-term users of WDRC hearing aid processing? So they had six participants aged 11 to 18 years of age. They chose older kids because they felt it might help minimize any maturational compounds or challenges that might be presented by younger ages and that uncertainty related to auditory development.

For their study, they use speech perception as a measure to try and track different levels of auditory acclimatization. So these participants, they all had sloping high frequency symmetrical hearing loss that was well suited to utilizing frequency lowering systems. As I mentioned, for these speech perception tests that they did, they used four different types of tests to try and track those levels of adjustment over time. Those appointment times included appointment times over a period of six months, and those were 10 visits to the audiology clinic. at these 10 visits, each time they attended, they completed a test of speech sound detection using the Ling sound test. They completed plural recognition using the UWO plurals test, which assesses the participant's ability to use the phonemes S and Z.

The third test was the S and F discrimination test. So discriminating between the phonemes S and F, and last consonant recognition, a test that is sensitive to consonant confusion, which is something that has been previously documented to occur in some individuals using frequency lowering. So in other words, they knew from previous studies on frequency lowering that sometimes in those early days kids mix up hearing the differences between a consonant, let's say like S and H. And so they purposefully wanted to use a test that would try and tax that difficulty or assess that difficulty to see how it might change over time. So what did they find? Well what was interesting for some participants an acclimatization period was required to achieve previous performance levels on speech perception tests.

So in other words, they needed a time of adjustment to get back to those levels of how they were performing when they were using WDRC. So for these participants, they didn't show the initial benefits to using frequency lowering, but over that treatment interval of six months, they started slowly to adjust to using this technology. Now what was interesting is for others, they demonstrated initial benefit using frequency lowering that was very similar to how they performed with their WDRC technology, and this remains stable over the study interval. So what does this tell us? Well for children and teens in this study, auditory acclimatization to frequency lowering from WDRC was really an individual experience that there was some variability, some kids needed that adjustment time, others showed initial benefit.

So we're seeing something that kind of agrees with that research we just discussed with adults that this seems to be highly individual. So I'd like to end our research discussion, our literature review with a discussion about a auditory acclimatization workshop that was held to discuss this topic and to identify gaps in research that really needed some some work. So this workshop was held at Eric's home, and if you're not familiar with Eric's home, this is the research arm of Oticon, where they do all of the high level research on our hearing aids for hearing aids that might be developed five to

10 years, even 20 years down the line. In fact, there's a lab there that does research on the brain computer interface.

So looking at how electrodes say placed in an ear mold might communicate and send messages back and forth between the brain to inform listening preferences. They also do research on rehabilitative audiology. So looking at how individuals might have better experiences when wearing first time hearing aids. And last, looking at the development of algorithms that really help hearing aid users perform in those complex but important listening environments. And really this is where, you know, technology like more sound intelligence, open sound navigator, this is where all of these systems were born and developed. So really interesting area just outside of Copenhagen in Denmark. Now back on topic, the Eric's home facility hosted researchers who had an interest in auditory acclimatization.

Okay, so these individuals were interested or had been doing research in this particular area and had contributed to the body of work on this topic. Within this group of researchers, there was an agreement that auditory acclimatization does in fact occur and that there are some really important implications for clinical practice. So amazing that they were thinking about clinical audiologists and their daily practice. So really what they wanted to do at this workshop was identify as I said, future areas of research that would really fill in some of these gaps that they felt were really important. So what did these gaps look like? Well, first question they identified was, when should the effectiveness of amplification be assessed as it relates to auditory acclimatization?

So what do they mean by that? Well they mean that when you do that first time fitting on an individual who's never worn hearing aids, when is it that you should put them in the sound booth or give them that outcome questionnaire, where you feel like you're going to be really measuring their best possible benefit when they've fully adjusted and gotten used to these new auditory inputs? Okay so very important question. Next

question they were interested in exploring was, as we mentioned earlier on, how does hearing aid processing strategies impact auditory acclimatization? So if we think of hearing aid companies today and all these amazing systems that are being developed to help performance in complex listening environments, what does that mean for this adjustment period?

Does it make it easier to employ those systems? Does it make it difficult? What is it that we need to know about or should we be exploring when we think of that adjustment process? How does age configuration and degree of hearing loss affect auditory acclimatization? And I think this is one that I have thought about a lot, is that to me it seems like those with lesser degrees of hearing loss may have a harder time adjusting because of perhaps a higher awareness or more opportunity for that full soundscape of sounds that their capacity, perhaps they might be overwhelmed than someone with more severe losses, who at first is just simply managing audibility and then progressing onto adjusting.

I don't know. I think it's really interesting though to explore this as it relates to degree of hearing loss. Also as we said, age is also interesting. So if there's a little brain plasticity still available, does that make the process easier? And what about cognitive capacity? How does that impact on the way individuals are going to adjust? And you know, so many of us now that work with adults are considering cognitive screening tools and is this an important part of something that we should consider? Last questions they thought were important. Are there mechanisms to accelerate acclimatization? You know, so are there things that we as audiologists can do to really help support our patients through this journey of adjusting to new sounds?

And they felt it was important to conduct research to identify when auditory acclimatization may be observed. So when is it that we could actually start documenting that adjustment process? And what are those markers for that

adjustment process that we can actually make note of and take an interest in over a period of time? Okay. So how is it that I'm here today talking to you about auditory acclimatization in children? You know, how is it that this study came to be? I guess you could say. Well this is a story filled of revenge, love, espionage, and research. Okay well maybe the first three things are not true, but really the inspiration for this study did come from a previous research study.

So let me tell you a little bit about that, and I hope you find this entertaining. So in April, 2020, I was conducting data collection for a study on voice emotion recognition in noise for children and teens who wear hearing aids. So the aim of this study was to compare voice, emotion recognition abilities to those children who wear hearing aids and compare that to the performance of voice emotion recognition in those that have typical or normal hearing. So had two groups, one group that are deaf or hard of hearing and one group that have typical or normal hearing. And I wanted to compare that performance of understanding the emotions of happiness, sadness, anger, and fear, and how they could perceive those emotions in noisy environments.

So as part of that study, hearing aid users were invited to participate, and when they came in, part of the plan was that they would be fit with Oticon hearing aids that utilized more sound intelligence like that is found in Oticon More and Oticon Play PX, and they were told that they were going to wear the hearing aids just for the duration of the 90 minute appointment while they completed all of this voice emotion recognition testing. So one of the participants was a teen who was 14 years of age, and he had only ever worn Phonak hearing aids, and he volunteered to participate in this study. So he came in, his audiologist fit him to DSL targets, providing him with the gain and MPO, very similar to the way his previous hearing aids had been fit.

So when the audiologist turned the hearing aid on and she asked him, "Can you hear me? Can you hear me? Are these hearing aids working?" His mother then also said,

"What do you think of these hearing aids?" So what do you think happened? Well this is when things I would describe got very awkward and uncomfortable because it was a teenage meltdown. He got very emotional and said that he did not like the hearing aids, did not like the way they sounded, did not like his own voice, and he wanted these hearing aids off now. So what happened next? Or better question, how would you have responded to that scenario? Well what I observed was the mother, she flushed, she was embarrassed, her face went red, the audiologist looked uncomfortable and turned to me and said, "Dave, any suggestions for next steps?"

So at that point, I reminded the team that he could withdraw from the study at any time. This meant that he didn't have to wear the hearing aids any longer, didn't have to complete the testing, but it also meant that he was no longer eligible for that Amazon gift card. I think he really wanted that Amazon gift card. He indicated he wanted to continue, he would wear the hearing aids, and we went into the sound booth where he completed the voice emotion recognition testing. So after about an hour, maybe a little more, we walked out to the waiting room and he said to his mother, "Mom, I love these hearing aids. I'm hearing everything so clearly.

They're fantastic." What the heck just happened? I think is what we all thought in that waiting room. Perhaps not such a polite word as heck, but really I started to think about this process of auditory acclimatization when we try and move kids from a different manufacturer. So I thought, how difficult is it for children to change hearing aid brands? You know, based on this experience, I thought this was really something interesting that was worth pursuing. So I started by reaching out to friends and colleagues who are working in clinical practice, and I told them this story and I asked them, you know, "What's your experience with changing a child from one brand to another?" Overall, these anecdotal reports from friends and colleagues working in the US and Canada, they said, you know, "I'm just really unsure of how to approach this process of auditory acclimatization.

You know, there's no clinical guideline, nothing that AAA has endorsed or that I can find that kind of gives me some steps to follow, when engaging in this sort of clinical behavior." Some clinical audiologists, you know, that had been in practice for more than 20 years said "Sometimes they're just a little reluctant to do this, to make this change because they really feel like this adjustment may be very difficult." Some other audiologists described a trial and error approach, which means they simply asked, "How does it sound?" And you know, they kind of just took it from there. Other audiologists said they gave them a pep talk, the kids by saying, "Hey, you're getting something new today. I'm excited, I hope you're excited."

Some others actually at the end of this conversation said, "Are you aware of any tools that help support the acclimatization process?" The other thing that was really common was that audiologists shared that for the kids, that they did try to make this changes, some of the children and teens were quite nervous because they were really worried of how this change in hearing technology was going to impact their feelings of confidence in their important communication environment. So, you know, we think of kids, they know what they can hear, they know how to manage their listening environments. You know, certainly those kids that are older, and they know what their hearing aids can do and some of them actually maybe know what they can't do.

So when we introduce new hearing technology, we do turn that a little bit upside down. And so, some of the kids were a little nervous when we said, "We're getting you something quite different." Okay, so let's now talk about the research study. So for this research study, I decided to use something called "Case Studies", "Exploratory Case studies" on acclimatization. So first a little bit about "Case Studies" and why we use them. So the reason why we typically will use "Case Studies" is because they are a really nice research strategy when you're trying to understand research questions that

have a how or a why, these questions are being posed, also when the investigator has little knowledge or little control over events.

So also when they're focusing on some sort of phenomenon that exists in real life context. So I don't know, doesn't that sound like a perfect fit for auditory acclimatization? This phenomena that so far we don't really know a lot about, so we don't have a lot of control, and also it's something that is really related to real life. Now the reason why we use something called "Exploratory Case Studies" is because we are acknowledging that in this research we need to develop an initial understanding of a phenomenon or area of interest, because there's really little information that exists, which I think we can agree on. When we looked at auditory acclimatization in kids, we just found the one study, didn't we?

Just the one on frequency lowering. So really when we use exploratory research, the focus is on discovering for the purpose of scientific research, identifying some structure, some dynamics, some contexts that are really going to help us inform us about the research topic. They're also really useful in developing research questions to be tested or answered, design options to be used, and they really give us lots of tips for future domains to be investigated in larger scale studies. So that's why the decision was made to use exploratory research, 'cause it is very well-suited to examining this unfamiliar phenomenon of auditory acclimatization in children. Now I'm gonna talk about a very small sample size in a clinical context.

And again, the idea was let's use this research to help inform the development of a larger study and be really, really sure of what we need to research in the future. So in this qualitative research study, we were looking to answer two questions. First, how do we approach the introduction of new hearing technology from a different manufacturer, from the perspective of teams, and are there facilitators and barriers to actually have a positive acclimatization experience and really give them that sense of readiness to

move to a different manufacturer. Second, what is the auditory experience of teens who were fitted with a different hearing aid manufacturer just within that typical appointment time? So what was it like in that one hour appointment time for that child?

So who were the participants? Well we were able to get two people, two teenagers to participate in this exploratory case studies. They were two individuals who identified as female and they were 15 and 17 years of age. They both had mild to moderate, severe sensory neural hearing loss and more. Another manufacturers pediatric hearing aids that were less than five years old. Both of these individuals had only ever worn these other manufacturers' hearing aids. These two participants were recruited from a large pediatric audiology clinical practice found in a large urban setting in a city in Western Canada. So let me tell you a little bit about the study methodology. This was a qualitative study and it was on arrival to the clinic appointment, it was explained to them that they were going to be fit with hearing aids from a different manufacturer, and that they were going to be asked some questions through a structured interview process.

So phase one is they were going to have an interview with myself talking about what it is they wanted to know before actually being fit with a new hearing aid from a different manufacturer, and then they were told they were actually going to participate in an in-clinic trial with the Oticon Play PX mini rechargeable hearing aids. So first of all they were asked, "How should the audiologist prepare you to try new hearing aids from another manufacturer?" So again, after they addressed this question, they were then fitted by their clinical audiologist with the Oticon Play PX mini BTE, which had a similar form factor to their old hearing aids. Okay so in other words, they were almost the same size and the same shape as their previous hearing aids.

So we weren't moving them from a UE 12 PPL that was that big to the little tiny Oticon Play PX, not the case, in fact, the form factor was very similar. The way the hearing

aids were fit, they were all fit to DSL just like they were previously. They were using default fitting features based on their age in their old hearing aids, and so they used the default fitting features of the Oticon Play PX. Both were fit with real ear and both met targets for gain and for output. Participants were also advised that they would only be using the new hearing aids during the clinic appointment time. After the fitting, they engaged in a 15 minute conversation with me about recreational activities, and this was really only for the purpose of them to experience sound inputs through the newly fit hearing aids.

Then they were asked, "Tell me about the sound quality of my voice and your own voice with the new hearing aids." Next, the Oticon Play PX was paired to their mobile phone. They streamed their favorite song and participated in a short phone call with me, where we talked back and forth, and then they were asked to reflect upon the question, "Tell me about your listening and music preferences based on talking on the mobile phone and listening to music." So the participant responses, they were audio recorded and then they were transcribed by a certified transcriptionist. So that meant there was an individual who listened to the recording and transcribed all of the discussions into text. That allowed me to then go through and do what's called coding, which is a process of systematically looking for specific excerpts that seem to be important in what the individuals were saying, and from there, developing themes that fit or create categories of those important things that the participants were telling us about this auditory adjustment experience.

So thematic analysis, very common for qualitative research, and in this study there were three major themes that emerged. They were the importance of the audiologist setting expectations, the importance for the audiologist providing information about the new hearing aids, and then the importance for opportunities to try new technology and connect it to different devices, while they were in their clinic appointment time. So if we look at the first theme for participants in this study, having the audiologist set

expectations for hearing aids was crucial. Okay they relied on their hearing aids for social activities for learning. They wanted the audiologist to use very simple concrete language to explain how the hearing aids might sound when they were activated.

They also want the audiologist to share concrete examples how other kids experienced these hearing aids and what the adjustment period was like for them. One teen said, "It's helps to feel prepared that the sound will be different so that I'm not blindsided. I really want to know what to expect even if it may sound weird." So this theme is really supported in the literature that describes how setting expectations really plays a role in positive patient outcomes. The next theme is information. So a barrier to successful acclimatization is the lack of informative counseling. So participants in this study felt it was really important to understand the new hearing aids, what features were available, and how these new features might really support their listening in all of their different important listening environments in quiet and in noise.

They were also very interested in having this information explained with multiple different touchpoints. So having that information shared visually, auditorily and also by demonstration. So Amy said, "If you tell me I can hear more with the new hearing aids, without having everything magnified all at once, this is very good." The final theme was opportunities. And in this study, participants felt a sense of excitement to try new hearing aids if they knew there was new opportunities to connect to important electronic devices, the types that their hearing peers use, and really experience those devices in a very improved way. So when after the connection period, Amy said, "I thought I wasn't going to like new hearing aids until I realized they were better than the last one.

It was really cool to see the new ways that I can connect to phones and computers." So one of the things that was identified as one of the second questions if you recall, was tell me about the sound quality of my voice and your own voice with the Oticon

Play PX hearing aids. And we were really excited to see that the teens really had positive reports after being fit with the Play PX. Abby said, "I just don't know how to feel about them. I've used my old hearing aids for so long and now we are switching them out to something different. But you know what? It is refreshing to hear something new, different, I really like it a lot."

Abby said, "I'm slowly adjusting to it. It sounds a bit weird, but I like the features of the hearing aids and I really like the way that they feel." So listening to the music and talking on the mobile phone was really a very positive feature to facilitate positive outcomes towards just auditory acclimatization. Amy said, "I like the way they connect to the phone and how clear the music comes through. I really like it." Abby said, "You know, compared to my old hearing aids, I can really hear much better on the phone. It sounds so clear, and I really like that." So how long do you think it took Abby and Amy to start to feel the effects of having a positive acclimatization experience?

Well while these experiences were individual, both felt that at the end of the one hour clinic appointment time, they were moving towards feeling really well adjusted. So much so, that they both expressed they could leave wearing these hearing aids today. So what did we learn from this study? Well first of all, this was a case specific study that was an "Exploratory Research", where we saw some positive insights and outcomes with these two participants. First, we noticed that the audiologist has a very important role to prepare teens for technology change. So in other words, setting expectations for initial hearing aid activation is important. Explaining new hearing aid features and how they may help hearing aid communication is essential, and having demonstrations and opportunities to connect to electronics was very useful for the participants in this study.

Now if you'd like to learn more about this study, all of the details are found in the Oticon Play PX Clinical Studies white paper that can be found under evidence on the

oticon.com website. Now obviously there are some limitations when we do exploratory research like limited sample size, having only a couple of people with similar age and similar degrees of hearing loss. But that's really what gets me excited about this "Exploratory Research" because now we are really well informed to take on a new study. So what's this next study going to look like? Well, we are going to have a very large sample size where we're going to explore, does degree of hearing loss have an impact on auditory acclimatization?

How does chronological age impact auditory acclimatization? Assuming that these kids have been early fit with hearing aids and that they've been well fitted. And finally, what is the expected acclimatization for most children who are switching manufacturers? But I think based on what we've learned from the "Exploratory Research", we're really well positioned to investigate this research, and this is a study that's going to start later this year. So that does conclude today's presentation. Thank you very much for joining and taking the time. Here's my email address should you want to reach out. And we do have a couple of minutes for any questions you might have. So here's a nice question, in comparing new hearing aids from a different manufacturer, should they be similar in recency when they came into the marketplace?

In other words, you know, do we need to be careful about comparing performance to hearing aids that are really old? And what I would say is that in this case, we did have individuals whose hearing aid technology... These two individuals, their hearing aids were only two years old. So it was considered to be current hearing technology. Are we able to keep up the pace with, well this manufacturer is a new hearing aid, now this other one does? You know, those windows become a little challenging to manage, but I think it's a good point that we don't want to be comparing a hearing aid, that is let's say more than two years old and it's performance to a hearing aid, that is really relatively new to the marketplace, simply because we're going to see things like faster

processing time of auditory inputs, wider bandwidth, which means more amplification available, these types of things.

So thank you for that question. Next question was, what was the key barrier to successful auditory acclimatization? And for these individuals they said that when they were not given information to set expectations. So they really wanted to know why is it that you've picked this hearing aid? Tell me about why other kids like this, and what's it going to sound like for me? And when you don't do that, like we saw in the teenage teenage meltdown example, we see those initial reactions of, "Hey, whoa, I don't like the sound of this. You're really, really disrupting all my confidence in my communication environments and I don't like that." So that seemed a big barrier. And time for one more question.

Along with opportunities theme, could assistive listening devices be further explored on the effects for acclimatization? And I would say, you know, definitely the answer is yes, is that if we opened up the opportunities for Bluetooth connectivity to their PlayStation and Xbox where they didn't hear those sounds well before and now they're hearing that information much better. You know, that's going to be a strong facilitator and really that's where we're going to ask the kids, "Hey, tell me what is it that you like to listen to and what do you wish you could hear better?" And if we know that we might be able to use that as a facilitator to positive auditory acclimatization. So thank you for that and really look forward to sharing with you later this fall, some of those outcomes from the larger scale study that is less exploratory and more concrete. Thank you again for attending and have a good rest of the day.