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EHDI

NARITA A/B – THE ABCs OF COMMUNICATION DEVELOPMENT

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>> My name is Jane, I'm the boss of this room. No one will leave without giving me their evaluation. Okay. Tina is our speaker today. And she will introduce herself and tell you all her particulars. And if anyone's called, Goldilocks, too hot, too cold, let me know.  
>> Thank you, Jane, is anyone else afraid of Jane as much as I am? So my name is Tina and I'd like to acknowledge my coauthor Megan Roberts who sends her apologies for not being able to be here today. So the talk of is the ABCs of hearing and communication development. Our thought was to essentially put together kind of a fundamental or kind of bare bones talk about not only how hearing promotes spoken language development and spoken communication development but also thinking beyond once child has access to sound, what are some considerations we want to have as they're acquiring their spoken native language? All right, now I have to figure out how to move to the next slide. Hm. Is there an IT person here? Okay, yeah, it's not moving forward. They don't, no, I can't because of the caption. I mean, this is ‑‑ this is in a slideshow mode but it doesn't look like it's in a slideshow mode. Yeah that's for the caption. Let me go out. Let me try again. Actually the whole computer is kind of frozen. I wonder if it's because of the caption. Oh, there we go. Oh, darn it. Okay. So spoken communication is fundamental to our human existence. It allows us to socially interact with our friends and family. It is the signal that we use to communicate, have conversations, and one of the key components to successful communication is to ensure that the partners, communication partners share similar understanding of the language. So not only what the words are but how different sounds form those words. Meanings of those words. And how those words come together to form sentences. Now the focus of the talk today is going to largely fall on spoken communication, spoken language development but many of these ideas can also be applied to other modes of communication like sign language. So in order to have a shared understanding of language, we develop our native spoken language, our multiple languages and one of the key components to driving spoken language development is hearing so we need to be able to hear the speech sounds of our native language and learn about how those sounds come together to form words and sentences. Hearing also supports social communication, so I'm sure many of you have been in a scenario where if you're having communication difficulties where your partner cannot hear you whether it's on a really crappy cell phone or in a really noisy restaurant where you're having a hard time accessing speech you will know that hearing is critical to having effective communication. Spoken communication. And these, when we think about this, with regard to children, we know that successful spoken language development and spoken communication contributes to successful academic success, social relationships and career success. Now when we think about children are learning their language from birth. If not a little bit before. And as I had indicated they need to hear their language so that they can learn what sounds go together and what how those sounds form words and social interactions are key to this process. It's not surprising when children have hearing loss or born without hearing that that development is delayed unless there is property identification and intervention. And for today's talk though what I want to do is sort of start us off at the point following hearing loss identification and intervention. So I want you to sort of imagine a child who already has ‑‑ is enrolled in those services, has proper hearing devices and has access to sound. And what I want to focus on and it's sort of a very kind of bare bones type of lecture but I want to focus on the things that we need to consider for that child as they are trying to acquire their native language. And so the first thing is hearing. And you might be sitting there, thinking, well, duh, we already know that but what I mean by hearing in this case is audibility. And so just because a child has hearing devices doesn't always mean that they have appropriate access to sound. And in fact, a lot of, some of this work has come out of a collaborative study done by Boys Town National Research Hospital University of Iowa and University of North Carolina and in one of their early research shows 55‑60% of children with mild to moderately severe hearing loss who had hearing aids went down from their prescriptive target. So you can see here on this graph, sorry on this graph.

This is the frequencies they were testing in terms of the prescriptive fit. This is the deviation from target. The clear boxes are for speech inputs, conversational speech so around 65 DB SPL and the hash boxes are for softer speech. So the key takeaway here is that you can see that the average values fall below that zero line which means that the majority of children were under fit. The other thing I want to point out and I hope you can appreciate these standard error bars and how broad they are.

How does this apply to our day‑to‑day lives? This suggests there may be some children who may look like they have good access to sound but maybe under fit and not hearing everything they should be hearing. Another thing to think about particularly in younger children is the presence of outer or middle ear problems that can also contribute to their audibility. To eight of ten children will have an ear infection by the time they're three years of age. If there's fluid it can be associated with hearing loss that is on top of the hearing loss the child has. And so this is just, I love anatomy and physiology so this is the ear. And in areas 1‑4 that is considered the outer area. Area six is the inner ear and any issues in those areas are going to reflect some deductive hearing loss where the sound is unable to get into the ear and going to be limited as it gets into the inner ear where our hearing organ is. And so for children who have sensorineural permanent hearing loss the hearing loss is located in this inner ear or along the auditory nerve and typically the hearing aids are fitted to that loss. But if there is fluid in the middle ear that's going to add additional loss reducing audibility of sound for that child. And so I'm sure many of you are familiar with the work by Fred and the folks at Vanderbilt showing the long‑term negative effects of fluctuating or temporary hearing loss in children.

And so this is just another data point by Wallis et al showing that children who have chronic otitis media have declines or are delayed in their expressive language.

So if you think about it we are already working with a population of children who are at risk.

We're talking specifically for children who have hearing aids, this can contribute to that delay. And so it's important to think about or to educate parents on monitoring for those temporary fluctuations especially if the child is prone to middle ear infections and so whether it's a poorly fit hearing aid or cochlear implant or chronic ear infections where there's fluid. This is for those of you who might not be as familiar with this graph. This is an audio graph. It is a map of our hearing sensitivity. And one of the reasons why I like this particular graph is because it shows this yellow region here show where is most of the speech sounds in our English language occur and so across the top are the different frequencies so these are low pitches and high pitches and the Y axis is the intensity. So higher up on the graph are softer sounds and lower on the graph are louder sounds and so what you can see is that the speech sounds kind of fall within this speech banana. We call it a speech banana and so if you have reduced that ability it suggests that children may not be hearing these sounds to the extent that we think they are.

Based on what we think their hearing loss is like. And so this is just an example. So if children's thresholds even with hearing aids or cochlear implants are falling along this 30‑40 DB range which is still fairly good audibility if you were ‑‑ if it was a quiet room and you were to say their name they would probably understand that you're saying their name. But if you look at the number of speech sounds that they might be missing with that poor audibility, that can have significant implications on their language development.

The other thing to note is when audibility is poor you may also recognize that in the speech production. So oftentimes this is a great opportunity for speech language pathologists and audiologists to work together because the speech language pathologist who is working with these children on a day in and day out basis and the parents may see that all of a sudden the child's production of specific speech sounds might be dropping off or might be altered and so using a child's speech production as a measure of, okay, what exactly are they hearing can be communicated to the audiologist and potentially have that hearing aid or that cochlear implant reprogrammed. The other thing too is that if a child has poor audibility it's going to be harder for them to pay attention. It's going to be harder for them to follow along and so those children can often be mistaken for attention problems or behavior problems. And that's not uncommon for any child with hearing loss.

But I think it's this issue when the child, you think that they have that good audibility and they don't. These can be problems. So you have hearing, now children need to actually have exposure. They need to be able to experience their native language. And there's been a large body of work in language development field showing that exposure, language exposure, both the quantity of it as well as the quality of it directly relate to vocabulary development. This is some data from a colleague of mine while she was in the lab. And what they did here was they quantified how many words children heard at 19 months of age and that's on the X axis here. And they measure the children's vocabulary and what this shows is that children who heard more words at 19 months of age had bigger vocabularies when they were two and it's this idea that as children are experiencing their language they're figuring out what sounds go together. They're hearing multiple iterations of specific words. It helps them map those speech sounds and those words into their long‑term memory. And one aspect of this is the language exposure children have, also relate to their ability to process the input as it's ‑ coming in. Number of us who study language processing in children use a technique called eye tracking to look at the speed of which children can process information.

In this this is just a real short example of the paradigm. Children usually sit in front of a screen. They see objects. And then they hear one of the objects labeled. And then we want to know how quickly does it take for them to visually fixate that object as they hear the word. And what we found is that children who ‑‑ what they found is children who had more language exposure actually were faster processors and in a study that I had ‑‑ I was able to contribute to showed that in two‑year‑olds the amount of time it took for children to do this task, if they had normal hearing was about 600 milliseconds so as that word started to unfold they were able to kind of visually fixate that image. But when we looked at the same process in children who had cochlear implants, in children who had hearing loss they were working on a 200 millisecond delay. Even though they knew that was a baby and even know they were able to fixate that image it took them about 200 milliseconds longer and what that means is that if they are in their naturalistic environment or if in a setting where they are getting rapid information. They may miss information or they may miss opportunity for more words. Even though long is all around them if they are slowing to process that may also contribute to their vocabulary development and I should mention too if anyone has questions on the spot please raise your hand. Yes, please.  
>> I have a quick clarification.  
>> Sure.  
>> So normal hearing, cochlear implant and hearing loss. The hearing loss there's no device, no ‑‑  
>> Oh, sorry, that should be hearing aids. That's hearing aids. Sorry about that. Yep so, the cochlear implant group, hearing aid group and normal hearing and these were all children between 2‑3 years of age. Thank you for that question. Finally you have language experience. Your child is hearing. Now they have to make sense of it all. And so when we think about language development in early childhood we think about their ability to acquire information about their speech sounds in their native language. There's some really interesting work showing that children are essentially they're able to discriminate all the sounds when they are very young. But after they gain some experience with language, they become more sensitive to discriminating sounds in their native language and not the sounds in their nonnative language. They also have really good pattern detecters so as speech is coming through children are able to figure out what sounds go together and what sound don't go together and as they do that, that lays a foundation for identifying individual words. And then word learning which the gateway to vocabulary development.

What do these new sounds represent in my world so when I hear baby, what does that mean? And there's just some amazing literature out there. Showing the sort of conceptual development of semantics and creation throughout early development.

So how is development altered when there is poor audibility or hearing loss? Again, if children can't hear the language as being spoken to them they will have trouble learning it. If they don't experience language they will be trouble learning it and if they can't put it together they will experience delays. So one of the things that we wanted to do with this talk is sort of give this general overview but then talk about how parents can be encouraged to provide additional language to their children in their day‑to‑day lives. The first, I will say I'm not a speech language pathologist. Audiology is my background so this is Meg's contribution so please be kind to me. So you want to follow the child's lead. Let them lead the play. When their attention is on a topic they're going to be more primed for lack of a better word to take in the language input that a parent provides.

Notice respond to all child communication by saying what you want the child to say in the moment. So if the child point to the ball the child can say ball. Balance your communicative terms. This is the play communication catch. You respond to the child and wait for them to take another turn.

Imitate what your child is doing and talk about what you are doing. So if a child is pretending to stir soup, you can also stir soup and say, I'm stirring my soup. And expand the child's communication by adding words and this is one of my, again, I'm not a speech language pathologist but this is one of my favorite strategies called expansion. For those of you out there please tell me if I'm wrong. If the child point to the bunny, the adult does and says bunny and maybe say other things like the bunny hops or isn't the bunny cute? So the overall goals is to set up the opportunity to encourage the child to communicate. So if there's not enough of something, you may only give a little bit of something. Say one cheerio or one little bit of Play‑Doh. One of the stories Megan tells is a parent was frustrated because a child would not initiate communication and would give things to her and give the parent the object to manipulate. And the parent was very overwhelmed and Meg said I told her to pick one thing. One thing you want to your child to communicate.

And it was peanut butter. And so it was open. And so the parent was patient for that one thing but it worked and the child understood that I have to vocalize here for me to get you to do something. And so giving the child the space to make that production and it doesn't have to be a big step. But maybe a little tiny step that will get that communication going. Wait until the child communicates so again, waiting for the child. So I want to end by essentially saying that we often think about language development.

But language development is not ‑‑ is not only key to being able to communicate, but it also supports a number of other areas of development so social development, emotional development and cognitive development. I think I'm going to leave this up here and stop because I want to make sure we have time for any questions and I'll stop there.  
>> (Speaker far from mic).  
>> This was the outcomes of children with hearing loss study and it was led by groups at Boys Town National Research Hospital University of Iowa and University of North Carolina. And the OCHL, they have a website. I strongly encourage people to go to this website. They have developed a number of really interesting materials for parents, for providers but there is ‑‑ and they have all their publications there. So Ryan McCreery is the first author.  
>> I have a question about that same article. They know actually why those children were under fit. Was it due to growing?  
>> Yeah, it's interesting. I don't think they went into the reasons why. They did, however, look at site specific, I guess errors or the fittings at the different sites. And I am not going to say which one because I know I'll be wrong but it did vary by site where one of the sites was actually pretty good and the other ones weren't. I mean, were ‑‑ had larger errors but I think the why the underfitting was happening I think is still a source of ‑‑ still an area of investigation. I think one of the speculations is that the ‑‑ when you're fitting pediatric patients you oftentimes are conservative and you don't want to overstimulate them.  
>> Thank you very much. You can take questions out in the hall.  
>> Yes.  
>> (Applause).