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Changing Counseling Conversations About Hearing Loss: It's All About the Brain

Presenter: Carol Flexer, PhD, CCC-A

Sam Foreign and Welcome to today's course, Changing Counseling Conversations about Hearing Loss. It's all about the Brain. Before we go ahead and get started, I do want to review just one housekeeping item with everybody. These are the risks and benefits associated with today's class that you can find in your handout if you would like to read about them later.

And now it is my pleasure to turn the presentation over to Native Sensory. For our presentation today on behalf of the Hearing and Balance Academy and Natus Sensory, welcome to today's online seminar, Changing Counseling Conversations about Hearing Loss. It's all about the Brain. My name is Chris Fazakli and I'm the Global Medical Education Manager at Natus Sensory. And we are delighted to welcome our guest lecturer today, Dr.

Carol Flexer. Carol Flexer, Ph.D. is a distinguished Professor Emeritus of audiology, the University of Akron, Ohio, usa. She is an international lecturer in pediatric audiology and an author of more than 155 publications, including 17 books. Dr.

Flexer is a past president of the Educational Audiology association, the American Academy of audiology, and the A.G. bell Academy for Listening and Spoken Language. Thank you so much for joining us today, Dr. Flexer. Please feel free to start whenever you are ready.

All righty. And thank you so much for inviting me. I'm delighted to be here and thank you for that introduction. I'm just coming to you from Cleveland, well, Hudson, Ohio, which is northeastern Ohio. And we're having snow today.

Yes, that's right, snow. There's over an inch on the ground now, so we're hanging on to the bad weather so you all can have wonderful weather there. Right. So I'm going to cover two main topics today. One is a brief discussion of some of the latest brain research that highlights the connection between the brain and hearing and use of technologies.

And second is a description of two family friendly counseling narratives. And the goal of this type of brain counseling is to emphasize the urgency of the child's technology wear time. So see, what I'm talking about today is not how to set hearing aids or how to program cochlear implants or how to connect remote microphones to other technologies, but why we're using those technologies. So at the conclusion, you'll be learning how to summarize what we now know about the auditory brain, how to present family friendly narratives about the urgency of getting sound of their baby's brain and why the auditory brain development is the foundation for listening, language and literacy and discuss our hearing health care provider's role in supporting a child's literacy Development. You know, I think that many families don't know that what we do here is setting the brain up for that child, learning to read from the first day they're born.

We always. It's important for us to have very critical conversations with the family. What is the family's desired outcome for their child? It's the family's choice. What's their long term goal of how they want to communicate with their child?

What language or languages do they know? We know that about 95% of children with hearing loss are born to hearing and speaking families. And many families speak a language at home that's different from the language at school. So they would like their child to speak several languages. Well, we can do that in this day and age if we do what it takes.

So the first topic. Let's start with the brain. The world of course, has changed. We used to talk about hearing loss like it was all about the ears. But now we know that's not the case because understanding the meaning of sound occurs in the brain.

I'd like to show this brief clip from Concepts in Early Development. The National Scientific Council, Harvard University. This website has many, many clips that are free and downloadable and there short.

They're excellent to play with families and with colleagues. So take a listen.

A child's experiences during the earliest years of life have a lasting impact on the architecture of the developing brain. Genes provide the basic blueprint, but experiences shape the process that determines whether a child's brain will provide a strong or weak foundation for all future learning, behavior and health. During this important period of brain development, billions of brain cells called neurons send electrical signals to communicate with each other. These connections form circuits that become the basic foundation of brain architecture. Circuits and connections proliferate at a rapid pace and are reinforced through repeated use.

Our experiences and environment dictate which circuits and connections get more use. Connections that are used more grow stronger and more permanent. Meanwhile, connections that are used less fade away through a normal process called pruning. Well used circuits create lightning fast pathways for neural signals to travel across regions of the brain. Simple circuits form first, providing a foundation for more complex circuits to build on later.

Through this process, neurons form strong circuits and connections for emotions, motor skills, behavioral control, logic, language and memory. During the early critical period of development, with repeated use, these circuits become more efficient and connect to other areas of the brain more rapidly. While they originate in specific areas of the brain, the circuits are interconnected. You can't have one type of skill without the others to support it. Like building a house.

Everything is connected. And what comes first forms a foundation for all that comes later.

So it's a great video clip, isn't it? And brain development applies to all of our children, whether or not they have a hearing loss. And so this understanding about auditory brain development is applicable for every, everyone. And it's especially important to speak about when we have a child with hearing loss.

So how do we take our knowledge of neuroplasticity and create counseling narratives?

Well, let's start with a brief summary of what we now know about the auditory brain. This is a sample of references. There are many, many more. But these show some of the basic science research that underlies information that I'll be presenting today. The brain, unlike any other organ, is essentially unformed when one is born.

Brain development is completely dependent on environmental experience.

Everything that comes into our minds reduces to patterns of neural activities. The brain can only process neural electric energy. May not the months the person found that at the time human infants are born, the neural preparation for language is specialized to speech. Due to spoken language being heard in utero at birth, the human brain responds uniquely to speech. We know that about the 20th week of gestation, the auditory mechanism is mostly formed through transmission through the mother's body.

The mother's voice is heard all the time. We can talk to the bump, so the father's voice is heard. Obviously, meaning to that sound is not made because meaning is learned through social interactions with people who love that baby, who are involved with that baby daily. But what does happen is there is that neural development and the recognition of those particular speech sounds so that when the baby is born, we know that they right away will recognize their mother's speech. It's really amazing, isn't it?

The results of Dr. Krall's studies, who's done a lot of this research, show that when the brain doesn't have access to intelligible speech during the early months and years of that child's life, this meaningful input, it doesn't coordinate activity between the primary and secondary auditory cortex, because we have to have the two linked. The auditory cortex is in layers. The primary receives the auditory information, sends it upstairs to the secondary auditory cortex for distribution throughout the rest of the

brain. The secondary auditory cortex, again serves as this launching pad to distribute auditory information to the rest of the brain and to provide feedback from higher order areas of the brain back to the primary auditory cortex to tune in to the most relevant properties and to tune out less important auditory information.

Sorry, I seem to have a little cold.

Moving on. So this is A graphic of the primary auditory cortex, and then we have the secondary auditory cortex that distributes this auditory information to the rest of the brain. The key point is the brain undergoes time sensitive neuroplastic changes, and early sensory input is crucial for proper auditory development. So here's the key. Hearing loss is not just an auditory disorder, but a neurological condition that affects multiple brain regions, alters brain asymmetry, and may contribute in later years to cognitive decline.

The findings of auditory brain research enforce the importance of early intervention hearing aids or cochlear implants to potentially slow down or prevent negative structural changes. The brain's ability to adapt decreases as it matures. If auditory input isn't restored early, if those auditory centers aren't activated early, the synaptic plasticity needed for normal auditory function can be lost, making it difficult for the brain to process sound later in life. I mean, obviously we have neuroplasticity throughout life, or we could never learn anything, right? If we couldn't create new pathways, we would learn nothing.

But those first three years of life, the brain has magic neuroplasticity to enable that brain to grow and develop and create synaptic connections. The auditory system has more relays connecting the sensory organ to the brain than any other sensory systems. The auditory system contains some of the longest axonal tracks, which directionally link each of the auditory relays between the ear, brainstem, midbrain, and cortex. So, as we saw in that video clip, babies are born with billions of neurons, but no connections between neurons. The synaptic connections between neurons are created strictly by

environmental experiences.

What kind of exposure does that brain have to the world, to spoken language, to music? Because without exposure, Neural connection synapses will not be formed. And we can't have neural exposure to sound if we have a hearing loss until we use technology. The focus of this talk is the why we have to get that technology on early. And the huge gift that newborn hearing screening is because we can find out right away if that brain is going to receive auditory information that will allow experiences and exposure to create these valuable synaptic connections.

Sound processing is one of the most computationally demanding tasks that the nervous system has to perform. Because this task of sound processing, that is understanding learning the meaning of incoming auditory information, Relies on the exquisite timing of the auditory system, which input more than a thousand times faster Than the photoreceptors of the visual systems. Humans can hear faster than we can see, taste, smell, or feel. So think about this. With an intact organic ear, that ear can receive vibrations from 20 to 20,000 cycles per second.

The mid frequency of speech is a thousand cycles per second. That's a thousand back and forth, right? We can't even see 20 cycles per second, but we can receive vibrations up to 23,000 cycles per second. There is no substitute for auditory processing. There isn't, because temporal processing is a whole different thing than visual processing.

So this is an illustration of the auditory portion of the human brain's connectome. This is part of Qual's research. See, the auditory system isn't just one little nugget that hangs out by itself in the brain. The value is that there's a connection of auditory information throughout the brain. So when we talk about auditory brain development, what's actually at stake?

Well, there's, I look at this as two related processes. One, the actual physiological development of the auditory brain by coupling the primary to the secondary auditory cortex for the distribution, connection and integration of synaptic pathways throughout the brain. So this is a neurological synaptic phenomenon. The second is the growth of the child's knowledge through the child's brain exposure to auditory information during every waking moment. So I look at the second process is the figurative development of data files of knowledge.

You see, the child doesn't know stuff until stuff information gets to the brain. When the child's ear, their doorway is severely obstructed, they have a hearing loss. Then the wearing of optimally inserted and programmed technology is essential for both of these processes. We all have to know how to program and manage and verify and validate the function of the technology that we fit on everyone, but especially on our babies and children, because we have a brain to build. You see, adults already who are losing their hearing with aging, they've already developed their synaptic auditory pathways.

What they may be losing is some of those connections without additional stimulation. But for our babies, nothing is developed. Nothing. It's up to us to make sure that information gets to the brain, to develop the pathways and to teach information to know stuff. So how do we actually start a counseling narrative to create a context for understanding hearing?

We have to connect the dots. You see, most parents don't know that this is connected to this, right? We have to connect the dots between hearing, brain plasticity, technology, listening, talking, communicating and literacy. How do children learn language, how to communicate, how to listen and talk? Well, parents teach them.

Children learn how to listen, talk and communicate by hearing. By being exposed to the listening and speech and spoken language of their parents, caregivers, family members in face to face personal situations. Children don't learn to talk from a screen. They learn it from people in a social environment,

face to face. And a child with a hearing loss can learn the same way, Provided we professionals do what it takes to fit the technology to get data to their brain.

And the same with reading. They can learn children with hearing loss to read the same way as children with typical hearing, Provided we get typical auditory information to their say it with me brain. It's all about the brain. And then we do need LSL as listening and spoken language specialists, because there is a way to make sure that that child learns how to listen and gather information auditorily. So the following slides will describe a counseling narrative.

Right from the start, we have a responsibility to explain complex information in a way that families can understand. Because they might not know what we're talking about. We need to explain, beginning with sound. What's sound? Sound is an event.

For example, we don't hear mommy any more than you hear a table table. You hear mommy in action, walking, talking, singing, dancing. Why? An action and event creates vibrations and vibrations. Those are the raw auditory data that are picked up by the ear, this doorway, and sent to the brain as energy for coding.

And then through exposure and practice, the baby child learns the meaning of the information that has reached the brain. What's language? Language is an organized system for communication used to share information. Spoken language consists of sounds, words, grammar, used to express our inner thoughts, emotions. Spoken language, of course, includes facial expressions, body movements, gestures.

Language organizes the ideas, the knowledge in our head that we want to communicate to others. So here's the first counseling narrative. I call it the doorway. So how does information from the world get into the child's brain? See, the brain is this squishy organ.

It's a little more than that. It's completely encased in bone. The brain has no direct access to the world. So how does the brain know anything? How does it actually know everything?

Fortunately, humans have five amazing senses that capture different types of environmental information, transform that information into neural impulses that are read by the brain. What are our senses? Hearing, sight, smell, taste, touch. Now, there are other senses. These are senses that manage data from the external world.

We do have internal senses that give us information about our internal body bodily states, not talking about those today, Looking at our external senses. The nose is the doorway to the brain for the sense of smell. So what goes through our nose are our olfactory molecules. And those molecules, this nosy organ transforms those olfactory molecules into neural impulses sent to the brain. Through exposure and practice and language the brain learns the meaning of those molecules.

So when we smell horse or cookie, does the nose know horse? Cookie? No, the nose knows nothing. What knows the meaning of horse? Cookie?

It's the brain. How does the brain know? Exposure, practice, experience, repetition, language. Oh, and this is a picture of one of my granddaughters. And this was her horse.

This horse was the best thing that happened to her at that point in her life. Now, the horse is white, right? She named the horse Cabernet. Yeah, so, I mean, she said she was a child, so she didn't know. Cabernet was a red wine, right?

Should have been Chardonnay, but this is Cabbie. Cabbie was an amazing gift for this granddaughter. Another example. The eyes are the doorway to the brain for visual information. But what gets into the

brain through the eyes, it's optic wavelengths.

And then those optic wavelengths are transformed into neural impulses through neural.

The visual nerve right into the brain. So then when you see mommy, you see horse. You see table.

Does the. I know Mommy.

Horse. Table. The eye knows nothing. What learns the meaning of those optic wavelengths? It's the brain.

Oh, and by the way, when I'm counseling families, just as I pause and I'm waiting for you to say brain. I do that to children. Do that. I do that. I have that strategy for children as well.

I want them to say brain. Brain. Brain. Every time I see them, I bring up the brain. Because the brain is the purpose of everything we do.

And I've never met a family that didn't know their child had a brain. What brain? My child. They all know. Everyone knows about the brain.

What they don't know is the relationship of this, this, this to this. Well, you know where I'm going, right?

The ear. The ear is the doorway to the brain for sound. Now, when we say sound, I don't mean beep, beep, beep, beep.

I mean spoken language, information, talking, reading aloud, singing. What goes into the brain are vibrations. Those vibrations are transformed to neural impulses that are sent to the brain where learning occurs. So when we receive vibrations of mommy talking or the dog barking, does the ear know? Oh, that's Mommy.

No, the ear knows nothing. What knows Mommy dog? It's the. I hope you're all saying it out loud. Right.

It's the brain. How does the brain know? Exposure, practice, language, repetition. So we have to. We audiologists, we who test hearing, have to be careful that we're not accidentally misinforming families when we say, oh, the right ear has 90% speech to scrim the right Ear has no speech to scrim.

The right ear is the organ that allows vibrations into the brain, where the brain can learn to discriminate and perceive through electrical wiring, those impulses. It's the brain that might distinguish 90% of the words. The ear distinguishes nothing. Right. It's all about the brain.

The five sense organs are portals to the brain environmental data.

The only purpose, therefore, of technologies, whether it's hearing aids, implants, remote wireless systems, is to get sound. And what sound? Auditory language, information through the obstructed doorway to the brain. There is no other purpose. None.

None. And the choice of technology depends on what is happening in the doorway. And we need to know how to fit, verify, and validate the effectiveness of that technology. And we also need to know how we can keep track of how that doorway is functioning. Because we know that about 52% of, of children born with a doorway problem, that doorway may close more over time, causing more of a hearing loss.

So we need to keep track of that doorway because if that changes, we need to change the programming of our technologies, and we may need to change the technology, because the purpose of the technology is to get the to the brain. So brain integration in real life, learning to hear and then to process is a multisensory neurodevelopmental procedure. So, for example, when you're hugging your baby and kissing them, you are tasting them, smelling them, seeing them, hearing their little coos, getting all of the, all of the sensory experiences. When your baby's kissing you, when they're touching

you, you're hugging them, they're tasting you, smelling you, seeing you, touching you, hearing you.

Auditory input to the brain is a critical part of the neurodevelopmental process, which is why as soon as we find out there's a doorway problem, we need to get, get sound through that doorway using technology to integrate that whole neural system.

So here's the second narrative. I call this the computer keyboard analogy. You know, and I'm sure all of you have your own narratives. You need a whole toolbox of narratives, because what strikes one person might not strike another person. So this narrative goes like data input precedes data processing.

Hearing loss or a poor acoustic environment can be thought of as analogous to having a malfunctioning computer keyboard that interferes with data entry to the child's brain. This is the hard drive. This is the keyboard amplification technologies, hearing aids, RM systems, implants facilitate data entry to the child's brain by providing a more accessible keyboard. Now, a great keyboard doesn't fix the hard drive. So if that hard drive, that baby has gone for months or years without a good keyboard.

Getting a good keyboard doesn't automatically repair the hard drive, does it? Now we have a way into the hard drive. Now all we have to do is fix three years of negligent or faulty data entry. The longer that brain, that hard drive, is deprived of a functioning keyboard, the more behind that hard drive becomes, the more faulty becomes the program, the less that program knows. The thing we also have to realize is, as wonderful as our current technologies are, they are not the same as the organic keyboard.

Not yet. So we need to fit the best possible highest fidelity keyboard. But then we need extra practice to the brain, which is why technology by itself is not sufficient to get the best programming to the hard drive. We need to have extra management, extra talking, extra reading aloud, extra coaching for the families to make sure that the brain has enough practice to develop and solidify these synaptic connections. So then, what's hearing?

Hearing can be defined as brain perception of auditory information. Hearing is a first order event for the development of spoken language. If that family wants spoken language, we've got to get auditory data to the brain. Anytime we use the word hearing, think auditory brain development using a billion neurons. With our job to develop a quadrillion connections.

And connections are made only through auditory experience. An acoustic accessibility of intelligible that's clear spoken language is essential for brain growth. Now think about it. Okay, close your eyes. Close them, close them.

What happens with your eyelids? Can't see, right? Okay, open them. Okay, close your ear lids. Oh, that's right.

You don't have any ear lids. No ear lids. You forgot the ear lids. No ear lids. Think about what that means.

The auditory brain is available for auditory data 24 7. That's how important auditory stimulation is for that brain's functioning for neural functioning. Now, unfortunately, until we have fully implantable devices, our current technology is not designed for 24 hour wear. So we need to keep that technology on as often every waking moment. We know that 12 hours really what we're aiming for in order to give that brain auditory data.

Now, signal to noise ratio, the relationship between the desired signal and background sound is critical for obtaining an intelligible signal. Speech must be 10 times louder than background sound. So we need to have other conversations about fitting remote control microphone technologies on our babies. Yep, yep, yep, yep. We need remote mics at home.

And that's a whole conversation about how to fit our remote microphone accessories to be able to get the highest fidelity information to that baby brain during those magical early weeks, months, and years. And we need to make sure we have a sound level meter app on our devices, and the families do, too, and children as soon as they have devices, because we know that noise and distance will compromise the fidelity of the auditory data that gets even to the doorway and then to the brain. So in order to manage sound, we have to first measure it. That's another conversation. Hearing, therefore, is acoustic access to the brain.

Now, here's the thing. We often say the child needs access. You need access. Just saying you need access, in my view, is incomplete. Because what are we accessing?

Elbows, knees? People think we mean we're accessing ears. We're not accessing ears. We're using the earth to access the. What are we accessing?

Let me hear you. Brain. We're accessing the brain. That's what hearing is. Now, listening is attending to those auditory events with intentionality, paying attention.

In order to pay attention, we're activating this prefrontal cortex, understanding, learning the meaning of auditory information. Through receiving auditory events to the brain, to focusing on those events, and through redundancy and exposure and practice and language, the child learns stuff. They learn to understand the meaning of auditory and information. See, this is true for all of our children. It's just that for our kids with hearing loss, we need a technology in this loop because hearing must be made available to the brain before listening can be taught, pay attention, and information learned.

We have to know and manage the hearing thing before we can do the listening thing. So here's the poll. Do you think, in your opinion, do most children and families really know that the only purpose of wearing hearing technology is to deliver auditory knowledge, auditory information to their child's brain

for the growth of knowledge, for developing their child's cognition so their child can learn stuff? Yes, no, or unsure. And I think Chris may be putting up a poll so that you can enter your answer.

Are you confident that everyone really knows that this is all about the brain, the why of technology? The why is the brain? Yes, they know. No, they don't. Or maybe they do.

You're unsure. Great. Thank you, Carol. I'm just going to launch that poll for everyone now, so it should come up on your screen very shortly. So you'll be able to answer this.

Hopefully, but apparently it doesn't like me.

Okay, so I'm afraid we're having a technical difficulty. Of course we are. With this poll. What a surprise. We've had many hurdles, haven't we, Carol?

Yes, we have. Okay, so if anybody would like to pop any responses in the questions section and just very, very quickly, just put yes, no or unsure, we can have a very quick overview for Dr. Flexer. So we've got some nos. No, no, no, no, no, no, no.

So the general consensus and all the thumbs down I'm also getting is all no. Yes. So thank you so much for everyone for interacting because you saved my bacon with that technical glitch. Well done, everyone. Thank you.

So there we go. The answer is no. Thank you so much. And I have to say, that's what the answer is practically everywhere. And that's on us.

Now, we, we know it's about the brain, right? We do. But what happens is often as professionals, we assume that everyone knows it's about the brain. So here's how I know. When families know it's about

the brain, it's when that child has that technology on for 12 hours a day.

Because once families get it's about the brain, they're not going to deprive their child's brain, brain of knowledge. Would you, would you say, listen, are you interested in your child's brain developing? Of course you are. Well, then you've got to get data to the brain. So this cartoon shows how the system works.

We have vibrations from the environment. The vibrations don't mean anything yet. They're just vibrations caused by events such as talking, singing, etc. They go through the door, the outer middle and inner ear. Obviously, this is not drawn to scale up the auditory nerve transduced or transformed to neural impulses where through exposure, practice language, the brain, the child learns the meaning of the auditory events.

And what goes out was a function of what went in. English in, English out, French in, French out. You don't put French in and get Spanish out. Clear speech in. Clear speech out.

Garbled in, garbled out. If the children have garbled speech, the very first thing we have to check is their input systems. What's going in if it's garbled in, garbled out, we better recheck the programming of our technology. Do we need to reprogram? Do we need different technologies?

So what I want to show briefly is how this input output system actually shows up. I want to play some brief audio clips of what outcomes spoken language outcomes were like in the olden days. I'm playing these clips not to make fun of anyone at all. They were made in 1982 of young people who were college age, who were young adults talking. Now they're not intelligible because in the olden days.

This tape was made, it was made at the National Technical Institute of the deaf in 1982. So when were they born? In the 60s. Did we have newborn hearing screening? No.

Cochlear implants? No. Digital hearing aids? No. No early intervention.

So what happens is speech is unintelligible not because the person couldn't learn spoken language, but because they didn't have their brain, didn't have access because a closed doorway in those days remained closed. Then I'm going to play a video clip for what we expect in this day and age. So again, not making fun of anyone, it's just to show if you have very distorted, limited input to the brain, this is what output sounds like.

And here's another example.

See that's what output sounds like when input is severely limited or virtually absent. When all we could do was visual, visual looking at lip reading and all was always severely limited. Now this is a clip from my friends in Australia and I'm sure you have children who sound like this in this day and age too. They're introducing themselves, they have an Australian accent. They were also born with a closed doorway but they were born at a different point in time where we could get to that brain with higher level technology.

They're introducing themselves.

My name is Katie Douglas and I attended Hearnsay Centre when I was first months old. Hi, I am Jamie Lee Lewis and I'm 17 and I came here at hearing NC when I was one years old and there was only five students with Dimitri Dumlin at that time. Hi, I'm Gina Preston and when I first went to hear NSA I was 2 1/2 years old. My name is Bill Raymond, I'm 24 years old and I've been going to the Huron I centre for about 14 years. My name is Darcy and this is my sister Claudia.

She is four and a half and she'll be turning five and I am nine Now Darcy and Claudia both received binaural cochlear implants at 6 months of age in Sydney, Australia. If they were born in 1960, 70, 80, even 90, they might well have sounded like what you heard on the audio clips. What's the difference? Being able to get through the doorway to the brain early? With exposure and practice you can learn spoken language.

It's a different era. 2025 deaf looks very different than 1990 deaf. 1990 was at least in the United States when we had the, we could implant the first multi channel cochlear implants in children. And even then they were five Years old. You know, now we're implanting, we can implant nine months old, in some places, six months old with a full term, healthy baby.

So there's nothing wrong with the word deaf. It's that it's a whole different world. We have a whole different set of variables because it's all about the brain. Hearing loss isn't about ears, our technologies, our brain access tools. So I suggest that all of us start conversations with families, with children, with the real ear, with the why start with the brain?

You see, historically, in the olden days, we started conversations in the doorway. But when we start in the doorway, and of course, the doorway is important because we manage the doorway for the purpose of getting information to the brain. So the doorway is critical, but it's not the point. The point is the brain. So start with the point, carry pictures of the brain, start there, and then this is the means, this is the end.

Okay, now we need to connect the dots between the auditory brain, literacy, music. You know, I've had families say, well, I'm interested. When I ask a family, are you interested in your child reading? Can you imagine a family saying, oh, no, not interested. No, no, we don't do reading here.

Of course they're interested. But what they don't know likely is that what we do to the auditory brain in those early weeks and months lays the foundation upon which we scaffold literacy skills. It takes about

20,000 hours of listening to speech before its child's brain has clear mental reference for the speech sounds. Our goal for all of our children, whether or not they have a doorway issue, is reading chapter books to children by age 4. So we professionals coach families to read, read, read aloud to children beginning in infancy.

See, our brains are programmed to talk spoken language once we stimulate through experience and exposure the appropriate neural centers. Our brains are not pre wired to read. We have to create the wiring in the brain. We have to create pathways between the prefrontal cortex, occipital lobes, temporal lobes, temporal parietal, occipital, frontal, we have to create all that. And exposure to storybooks is the biggest factor in a preschooler's vocabulary.

So all of us have children's books everywhere, in your clinics, in your homes, introduce families to libraries. Exposure to stories. This is for all our children and especially critical for our children. Children with hearing loss, because their brains need more exposure, more practice, more read aloud. We know that more parent child conversations occur during read alouds than during any other activity.

Children who receive read aloud show gains of more than twice as many New words. I love the website Growing book by book. You can never read too much. You know when I have a family come in and they're two month old, has those I see by data logging now a two month old isn't awake 12 hours a day. So we want those devices on every waking moment.

Right. And what I say is, you know, I'm so glad to see your 2 month old with their devices because I know you're setting their brain up for reading. Talk about reading from the very beginning. Well, what about music? What does music have to do with brain development?

Now, by music for babies and young children, I'm not talking about a screen, I'm talking about a person. Because we know babies and young children learn how to communicate, learn theory of mind, learn

developing their executive functions through interactions with a person right in front of them. And that includes music. Singing music is a whole brain workout. The words stimulate mostly the left hemisphere, the rhythm, the right hemisphere and the two cross over and link the neural pathways through the corpus callosum.

That's called interhemispheric transfer. Yeah, there's a science behind it. Right? So singing to a child is not only fun, you are connecting the hemispheres. Interhemispheric transfer and music enhances paralinguistics.

This is all children, especially critical for our children with a doorway problem who need extra exposure and practice. Rhythm, rhyme and repetition is the basis of literacy. Rhythm, rhyme and repetition. Sing, sing, sing everything. Now it's time to go to bed.

Go to bed. Clean up, clean up. Now it's time to clean your toys. The rhythm, babies love it. Use clarity of speech, use sentences.

So if listening and spoken language are desired outcomes of families and remember about 95% of our families listen and talk. That's how their family functions, then they're going to be interested in that. But we need a system, a whole system in place to optimize reaching that outcome. So I call that the logics chain, which is a system that the first thing is auditory brain development and integration. Ongoing and continual conversations about the why.

Using narratives we are interested in building, activating, developing your child's brain. That's what this is all about. How's your child's brain doing? How's your child's brain doing with beginning to read? How is your child's brain doing when you sing to them?

Let's wonder how your child's brain is. Is your child's brain brain receiving the highest fidelity signal from their technology? Let's verify and validate the technology fittings and of Course, you got to wear the technology. We need to stimulate the brain. We need to have a professional who can guide the family because it's all about what the family does.

It's not about what the professional does, it's what the family does during routines of daily living to ongoingly experience and expose that child to the knowledge of the world. Audiologists are pivotal. Until we do our job, no one else can do theirs. Because we've got to get access to the brain and we have to have very high expectation for access and we need to collaborate with other professionals. So what are we thinking?

If a child's listening and spoken language development isn't progressing as expected? What do we look at? Start with the technology. Suspect that first, is it programmed right? Do we need a different program?

Do we need different technology? Is the brain receiving every single speech sound? Remember, what goes in is what comes out. Where time is critical, we have data. We have data.

10 to 12 hours a day is critical for brain development. If that child is wearing technology for only four hours a day, it will take their brain six years to receive the auditory exposure that a child with typical hearing receives. In one year, will a child with limited wear time be behind in their language, in their reading, in their theory of mind, in their academic development? You can count on it. You can count on it because the brain has to receive information in order to learn.

If information isn't received, learning won't occur. So wear time is critical. And we have to have hair on fire with wear time. Wear time isn't optional. We're not just suggesting that the child wear the technology.

I'm real clear with the family. What is your desired outcome and what does that outcome take and how can we support you in attaining that outcome? If you're interested in your child communicating, using spoken language, reading, having friends, learning how to interact socially, then we've got to get that information to the brain. Is the child in an enriched environment? Is someone talking with them?

Are they using a lot of vocabulary? Is every experience made into a learning experience? So, okay, so based on what we talked about, I want to thank you for listening, but I want to go back here. So now it's time for you to type into chat and Chris is going to read it out. Based on what we've talked about, what you're thinking, I'm wondering, I'm wondering, what do you plan to do?

New, better or different? Let me know. Type in chat.

Thank you, Dr. Flexer. We're just getting some responses through at the moment and brilliant one to Kick off. Start with the brain.

Absolutely.

You know, and here's the thing about the brain. We sometimes think if we just mention the brain once the family has it here to tell you they don't have it. Not with one casual introduction. It's discussion. Because there's so much information going into that family all at once that I recommend every single time that anyone sees them or meets with them, talk about the brain every single time.

So how's your child's brain doing? Let's see how that child's brain might be functioning. Let's see, how is that brain growing for literally what's going on with the technology that's getting information to the brain? And if that family still isn't using that technology, they don't get the brain. Why, once they get the brain, why, they will be at your doorstep every single second.

If they think that technology isn't working, they will get those ear molds made immediately. They will make sure that that technology is in place and on if it's not, that family doesn't get it yet. And we need to bring out another narrative to help them understand that without brain development, their outcomes will not be attained.

Fantastic. There's so many other amazing comments. Where are you, Dr. Flexer, with your presentation? Do we have.

I'm done. Oh, wow. Okay, this is it. This is it. I'm gonna switch my camera back on because I know everyone's been dying to see my face again.

Wow. Do you know, I've spent a long time, probably not as experienced as others, but I've seen messaging from manufacturers at conferences and stuff, and they're trying to focus on the brain. And I think we've all used, like, cognitive phrasing and things like that to maybe give the sense that we do understand what we're talking about. But actually, I feel very challenged today. I didn't ever give any thought.

And I totally agree with this comment that came through that your explanation about the doorway, as in the ear being the organ and the doorway is absolutely brilliant. Some of the other comments that came through, which are very interesting, check data logging more often, ask families for songs, and maybe provide examples of that. They're doing them. Yes.

Explain the difference between listening and hearing.

Good, good.

Very, very inspiring comments coming through.

As you. As I briefly explained to you before, we've got people all over the world listening in today. A lovely comment from my friend in Croatia who says you are incredible. A very interesting seminar. Oh, thank you.

So that was lovely to hear.

So I'm just checking. There was a Couple of questions. Let me zip back because we've had incredible amount of chat on this particular seminar. There was one question I thought was interesting. Okay, here we go.

What happens when all the hearing test results seem to be normal, but the patient still can't pick up information? As in can't speak or communicate? Okay, if you're talking about a child, then we have to explore further what's going on. There are a number of reasons why a child isn't speaking. Of course, the first thing we check is their input doorway is information getting to that brain.

Then the other issue is what is the brain doing with that information? So that's when we need perhaps a neurologist or a developmental pediatrician. We need to find out if we've determined that auditory data is in fact getting to the brain, but the child is not responding to auditory information, then we need to find out what else is happening with that child. Because something is going on. Something's happening.

And we need to collaborate with other professionals who can look further into the neurology, into behaviors, and into other pathologies.

Absolutely. And if I may say so, I think it's actually brilliant if you are able to offer any child a multidisciplinary approach. There's so much more information and accuracy you can get in that

diagnosis if you allow that to happen. Absolutely. I mean, I'm sure you yourself have worked with children with apd, for example.

So there might be conditions where children are only getting it or understanding every tenth word and that needs investigating why. Or there might be real physiological damage that maybe hasn't been identified in the cochlea. If we're doing an oae, because we're just looking for a mechanical response there versus no auditory nerve. So it's really important that we look into that. I've just realized that we are starting to run over time.

I'm just going to quickly check if there were any. I'm going to send you all these comments. They are incredible. Everyone has been super impressed. Thank you very, very much.

So a few of these questions I can post. Probably answer now.

Dr. Flexer, just before I end today's seminar, is there anything you'd like to finish on as a final sort of key message? No. I just want to thank you all for being here and thank you for really working with children and for making sure that they have the best opportunity for development. Because, you see, it's what we do in these early months and years that sets that neurological foundation for the rest of their lives.

So being a pediatric audiologist, working with children is a privilege and a huge responsibility because we have that neuroplasticity that will never be at that level anytime else in their life it's up to us to get them going so they have a opportunities for development of cognition so thank you for all that you're doing well thank you Dr. Flexer for your time and your teaching today. For everyone who's inquired the recording of today's seminar will be available on the Hearing and Balance Academy within the next few weeks. Just before we let you all go please can you take two minutes to complete the survey that automatically comes up at the end of this section seminar so we can continue to provide further

education to all of our colleagues around the world but that does conclude our E seminar for today so I will say thank you and goodbye and Dr. Flexer you're incredible thank you so much for your time thank you thank you bye bye take care everyone Bye for now.

Sam.