Literacy: The Auditory-Brain Connection

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Introduction

- **Carol Flexer, PhD, FAAA, CCC-A, LSLS Cert. AVT**, received her doctorate in Audiology from Kent State University in 1982.
- She is a Distinguished Professor Emeritus of Audiology, The University of Akron.
- An international lecturer in pediatric and educational audiology and 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 AG Bell Academy for Listening and Spoken Language.

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Topics Covered:

Topic One: Create a context for counseling and managing hearing loss: Begin with the brain

Topic Two: Connecting the dots from research to practice for development of spoken language, literacy, and music

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Topic One: To Create a Context for Counseling and Managing Hearing Loss, Start with the Brain

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We Must Begin with the Critical Question: What is the Family's Desired Outcome?

- The family's desired outcome guides us – ethically and legally.
- What is your long term goal for your child, and what does it take to get there?
- **How do you want to communicate with your child? What language(s) do you know?**
- *95% of children with hearing loss are born to hearing and speaking families.*
- Many families, at home, speak a language other than the community language – so, they are interested in their child speaking several languages.
- **The information in this presentation is for families who want a listening, spoken language, and literacy outcome for their child.**

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First Steps: Hearing is about the Brain

We tend to think we hear with our ears, but actually we hear with our brain.

- Ears act like a doorway to help to get sound or auditory information to the brain.
- Think of a hearing loss as a "doorway" problem.
- The doorway can be blocked a little bit or a lot, depending on the hearing loss.
- This means that auditory information, such as conversations, lullabies, reading aloud, and more, isn't reaching the child's brain clearly.
- Modern hearing technologies such as digital hearing aids, cochlear implants, and other assistive listening devices are designed to break through the blocked doorway to deliver clearer auditory information to a child's brain so they can learn to understand the full meaning of sounds, words, and all the language they experience.

Sound carries information and information becomes knowledge!

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The Purpose of Technologies

- The purpose of technologies (e.g. hearing aids, cochlear implants, remote wireless systems) is to get sound -- auditory language information -- through the obstructed doorway to the brain.
- There is no other purpose!
- The choice of hearing technology depends on what is happening in the child's doorway.

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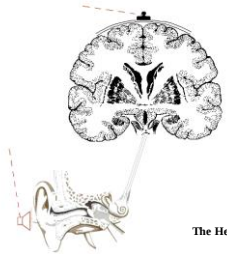
Summary: The Hearing and Listening Mechanisms



The Listening Mechanism: Learns the meaning of the neural events

The Hearing Mechanism: Takes in Vibrations

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Topic Two: Connect the Dots between Hearing and Literacy and Music

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How do Children Learn to Listen, Talk, and Read?

- Children learn to listen and talk by hearing and listening to the speech and spoken language of their parents, caregivers, and family members.
- A child who has a hearing loss can also learn spoken language just like their hearing peers when they are identified early, consistently wear appropriate hearing devices such as hearing aids and/or cochlear implants and are taught to listen through special auditory-verbal teaching techniques that are guided by LSL Specialists.
- A child who has a hearing loss can also learn to read just like their hearing peers when they are identified early, consistently wear appropriate hearing devices such as hearing aids and/or cochlear implants, and are taught to listen through special LSL teaching techniques that are guided by LSL Specialists.

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Neurocircuitry Related to Reading

- Reading is probably the most complex task humans perform using the most parts of the brain.
- Speech is biologically programmed using specific parts of the brain; children learn to speak naturally.
- Reading is not natural; it requires explicit instruction in the code. We are not "hard-wired" for reading; we need to create the wiring.
- The brain has not evolved to have "built-in" specialized regions for reading; we need to create the regions.
- Therefore, reading is an exercise in plasticity.

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Listening is the Foundation of Reading

- It takes approximately 20,000 hours of listening to speech before a child's brain has clear mental referents for each of the speech sounds.
- This listening ability is necessary to enjoy rhyming and to develop phonological awareness skills.
- Reading is built upon on listening.
- We should be reading chapter books to children by age 4.
- **The Goal is grade-level literacy by the end of third grade!**

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Vocabulary is one of the biggest predictors of kindergarten success.

Therefore, early intervention is not about the child, it is about the family learning about vocabulary development.

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Number of English Words Understood by Typically Developing Children

Age	# of Words
2	300 words
2.5	500 words
3	900 words
4	1,500 words
5	2,500 words
6	13,000 words
7	20,000 words

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It is generally agreed that these 5 areas need to be addressed to develop and enhance literacy:

- Phonemic/phonological Awareness (ability to recognize and work with sounds in spoken language)
- Phonics (decoding sounds and letters)
- Reading Fluency (automaticity in recognizing words)
- Vocabulary (word meaning)
- Comprehension (background knowledge, prediction, imagery, asking questions, compare and contrast, metacognitive awareness)

Robertson, L. (2014). *Literacy and deafness: Listening and spoken language* (2nd ed.). San Diego, CA: Plural Publishing, Inc.

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Simple Summary: Decoding + Comprehension = Reading

- Decoding skills, such as phonological and phonemic awareness, phonics, and print knowledge, allow information to "get to the brain".
- Language Comprehension, such as vocabulary, grammar and narrative skills allows the brain to learn to make sense of the information once it gets to the brain.
  - Therefore, to read, children must have phonemic awareness – knowledge of the sound structure of words for coding.
  - Children also need vocabulary, language, and background knowledge in order to understand what they read.

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The Key is – Teach Sounds

- Motherese, rhyming, and singing teach children sounds, and how to hear and understand sounds – not letters.
- The key is the sound first.
- **Phonemic awareness is a weak point for our children – teach it early and often!**
- Everyone has a speaking voice and a singing voice. Ask the child with CI to use their singing voice, not their monotone, speaking voice. A singing voice has a much broader range.

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How to Teach Phonological Awareness

- The best way to teach phonological awareness to young children is through fun books, games, and songs in addition to a wide variety of hands-on activities.
- Teachers and parents can encourage play with words as part of their overall literacy programs.
- **Nursery rhymes**, songs, poems, and read-alouds that manipulate sounds are all effective methods to develop phonemic awareness.

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Books to Facilitate Phonological Awareness

- ***Jesse Bear, What Will you Wear?*** **by** Nancy White Carlstrom
- ***Silly Sally*** **by** Audrey Wood
- ***Is Your Mamma a Llama?*** **by** Deborah Guarino
- ***Polar Bear, Polar Bear, What Do you Hear?*** **by** Bill Martin, Jr.
- ***Time for Bed*** **By** Mem Fox
- ***Chicka Chicka Boom Boom*** **by** Bill Martin, Jr.
- ***Sheep in a Jeep*** **by** Nancy E. Shaw
- ***In The Tall, Tall Grass*** **by** Denise Fleming
- ***Miss Mary Mack*** **by** Mary Ann Hoberman **&** Nadine Bernard Westcott
- ***Good Night Moon*** **by** Margaret Wise Brown

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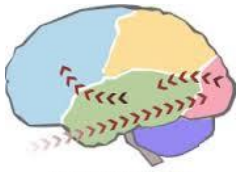
Audiologists -- Coach Families to Read, Read, Read to children!

Creating Neural Pathways for Reading: An Exercise in Plasticity, because Reading is not Natural



The Reading Brain

Exposure to storybooks is the biggest factor in a preschooler's vocabulary.

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Why Read Aloud?

- Exposure to storybooks is the biggest factor in a preschooler's vocabulary.
- More parent-child conversations occur during read alouds than during any other activity.
- Children who receive read-alouds show gains of more than twice as many new words.
- Reading aloud to children before age 6 effects language, literacy and reading development.

Think about reading aloud as a conversation, not as a task to be completed.

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Tip: Name the Characters in the Books

- For infants, finding books that name different characters may lead to higher-quality shared book reading experiences and results in more learning and brain development benefits.
- It's possible that books that include named characters result in more talking by the parent.

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List of Appropriate Spanish Chapter Books for Preschoolers with Hearing Loss

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What about Music?

What does music have to do with brain and literacy development?

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Music

By music, we mean adult-directed singing out loud with the child throughout the day – an active and interactive conversation.

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The Brain LOVES Music!
Audiologists, coach families to include music activities, daily.

- Music is a whole brain work-out!
- The brain loves music – the words stimulate the left hemisphere and rhythm stimulates the right hemisphere, and the corpus callosum is "exercised" by cross-over – called interhemispheric transfer.
- Music enhances "paralinguistics"-- emotion.
- Rhythm is foundational for literacy development.

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Begin Early through MOVEMENT & MUSIC

- A child's perception of rhythm is linked to their body movements.
- Movement helps a baby develop a Basic Beat foundation of both music and communication.
- Move while you sing to the baby, making the connection between rhythm and movement.
- Make music interactive by adding actions and fun routines.

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Why is *Basic Beat* so important?

Beat Synchronization in preschoolers

- Children who can synchronize to a beat tend to be better at reading – related skills, such as:
  - Phonological awareness
  - Short term auditory working memory
  - Rapid naming
  - Encoding of speech sounds

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Summary Ideas about Music and the Developing Brain
(Laurel Trainor -- http://trainorlab.mcmaster.ca/)

- Infants' brains become specialized for what they are hearing.
- Active participation is better than passive listening.
- By the end of the first year after birth, infants are becoming specialized for the rhythmic and tonal structure of the music they hear.
- Listening to auditory stimuli effects movement; music and movement are intimately connected.
- Across cultures, infants experience concurrent movement and singing in everyday life.
- Synchronizing rhythmically with others is important for social development.

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Recommendations from audiologists about literacy and music-- in addition to 10-12 hours per day of technology use:

- A literacy recommendation should be emphasized, e.g. read 10 "baby" books each day to your baby.
- A singing out loud and "dancing" recommendation also should be emphasized as a holistic brain development activity that stimulates language development, literacy development and social development.
  - Sing out loud and move and dance to music with your baby/child
  - Join a music class

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Audiologists are Pivotal!

- Until Audiologists do their job, no one else can to theirs.
- Acoustic access to the brain, including access to incidental (free) information (the way 90% of knowledge is obtained by young children), is the biggest challenge for today's children with hearing loss (doorway problems) -- worldwide.
- We must have very high expectations for brain access of auditory information.
- If a child is not progressing as expected, suspect the equipment first.

Audiologists must work collaboratively with other professionals and ***provide evidence of auditory brain access, appropriate technology function and use, and language and literacy enrichment.***

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To Summarize

- Hearing loss is a neuro-biological emergency, and we must act urgently to avoid auditory sensory deprivation that will negatively impact the child's opportunity to learn how to read.
- For families choosing a listening and spoken language (LSL) and literacy outcome for their children who are deaf or hard of hearing (status of the doorway), the appropriate hearing technologies for breaching that doorway must be fit and managed as soon as possible after birth by a pediatric audiologist.

Fitting hearing technologies is the first line of treatment for auditory sensory deprivation and audiologists are the first responders!

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To Summarize

- Brain access devices must be worn at least 10 to 12 hours per day, and families are encouraged to speak their home language, beginning in infancy. Use a remote microphone system at home as well as at school.
- Children need to be immersed in a conversation-enriched (talking, reading aloud, and musical) environment to nourish their brain with knowledge for spoken language and literacy development. The neurological concept is, *"experience dependent plasticity".*

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Participation: One Action

Based on what you have learned in this presentation, what do you plan to DO new, better, or different?

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Resources

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Hearing First

- https://hearingfirst.org/
- This website offers many ideas for the advancement of listening, talking and pre-literacy skills. Their suggestions are helpful and appropriate for all children, not only for children with hearing loss.

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BabyBeats

Search for 'Advanced Bionics' in the iTunes® or the Google Play™ store.

Look for the BabyBeats app and download. This App is free!

BabyBeats™

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Supporting Success for Children with Hearing Loss – Karen Anderson

- http://successforkidswithhearingloss.com/
- Teacher Tools is designed to support all aspects of instruction by addressing underlying skills and word knowledge that support all curriculum content. There are articles related to current topics and trends, sections on developing instructional skills, student self-advocacy, self-concept and a forum for discussion of current issues and concerns. A Teacher Tools membership includes materials such as worksheets and activities appropriate for all school age levels and an extensive information resource library.

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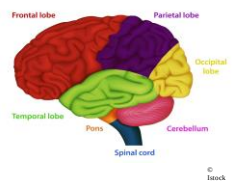
Thank you for Listening!



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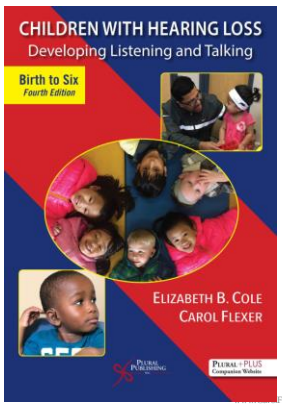

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The fourth edition of *Children with Hearing Loss: Developing Listening and Talking, Birth to Six* provides updated information from the previous three editions. It focuses on brain-based listening and spoken language by featuring auditory brain development, audiologic technologies, auditory skill development, spoken language development, as well as family-focused intervention for young children with hearing loss whose parents have chosen to have them learn to listen and talk.

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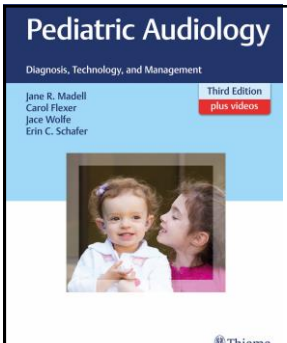

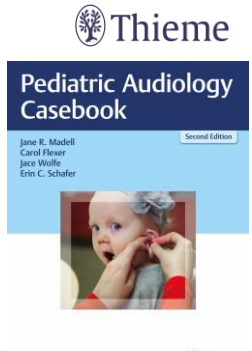

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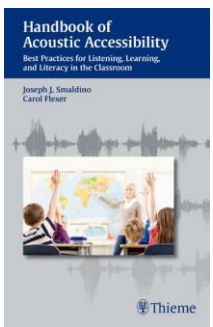

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