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Hearing Loss and Communication

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SpeechPathology.com

Learner Outcomes

- List developmentally appropriate speech, language, and auditory milestones in relation to chronological age.
- Explain different types, degrees and etiologies of hearing loss.
- Describe how different types, degrees, and etiologies of hearing loss can impact speech and language.
- List and explain the four main communication options for children with hearing loss.
- List and explain the four levels of the auditory hierarchy.

CONTINUED™

Where Are We Going?

- How Does the Ear Work and What About the Brain
- The Audiogram
- Typical Development of Auditory, Speech and Language Skills
- Hearing Loss: Types, Degrees and Configurations
- The Impact of Hearing Loss on Speech and Language Development
- Communication Considerations and Options
- The Assessment Process
- Intervention Considerations
- Parents As Our Partners
- Questions

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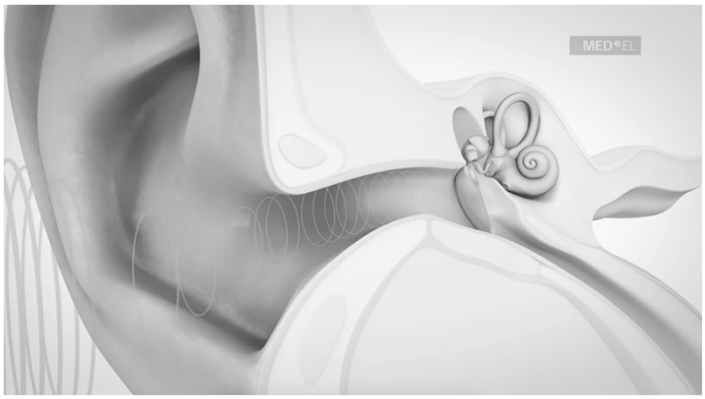
The Ear ~ its parts and functions



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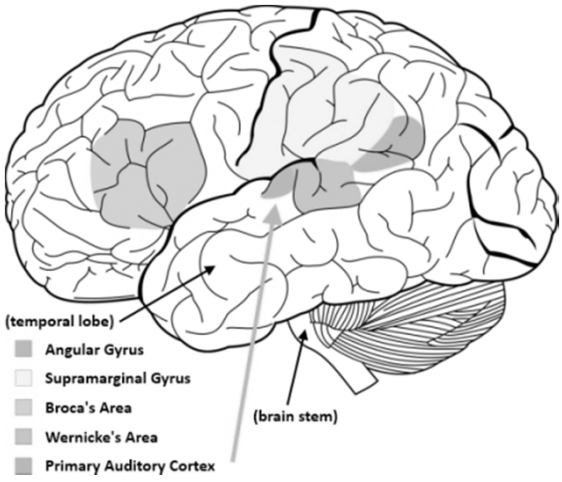
Our Anatomical Focus Today



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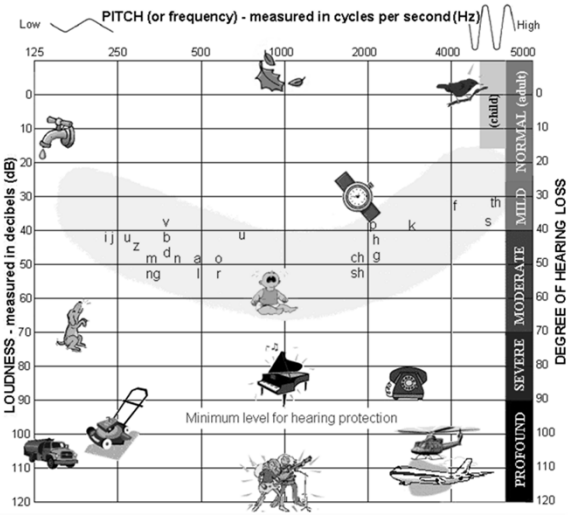
The Audiogram



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Typical Auditory Development

Auditory Development: 20 weeks gestation – 3 months

- Auditory development starts at 20 weeks gestation
- Startle reflex
- Detection of sound through eye widening or movement of the arms/legs
- Sensitivity to a wide range of sounds, including prosodic and rhythmic cues
- Recognition and preference to mother's voice
- Responds differently to different frequencies/pitches

Auditory Development: 3-6 months

- Shows awareness of **human speech**
- Attends to and searches for voices or other interesting sounds
- Distinguishes between friendly and angry voices, and reacts appropriately
- Pays attention to and reacts to music by cooing or stopping his cry
- Notices toys that make sounds

Auditory Development: 6-12 months

- Specifically (up/down/left/right) locates sound
- Responds to human speech by smiling or vocalizing
- Association of hearing with sound production is now evident, in that he repeats selected heard sounds
- Begins to understand words in context
- Listens with selective interest; an increase of a **"listening attitude**" to conversation

www.asha.org/public/speech/development/01

Typical Speech and Language Development

Speech/Language Development: Birth to Three

- Critical period for speech and language development
- Brain grows and changes rapidly
- Demonstrates early communication and engages with their environment
- Pragmatic behaviors and pragmatic language develops
- Listening attitude and intent develops
- Incidental learning occurs

The First 18 Months…..

- By 12 months
  - Understands that voice is a tool
  - Uses intonation as a means to communicate
  - Uses few words and word approximations to label
  - Uses many different consonant sounds at the beginning of words
- By 18 months
  - Has 50+ words
  - Starts to use 2 word combinations
  - Adds new words daily
  - Learns from direct teaching as well as incidentally

24 Months to Preschool…..

- 24 months
  - Follows simple directions
  - Points to body parts
  - Continues to grow vocabulary
- 3 years
  - Speaks in 2-3 word sentences
  - Understands many words
  - Follows more complex directions (e.g., “Drop the ball and go get your shoes.”)
  - Speech is 75% intelligible to most people

www.asha.org/public/speech/development/34

Speech and Language Development: Preschool

- Speech
  - Should be easy to understand (90% intelligible)
  - Some developmental errors may persist
- Language
  - Uses longer sentences to tell about events (going to the zoo or park)
  - Starts using simple "wh" questions

Preschool Language

- Vocabulary and grammar
  - Uses pronouns (I, me, we, they)
  - Hears and understands most of what is said at home and school from direct conversation incidentally.
- Social language with peers during play continues to develop

www.asha.org/public/speech/development/34

CONTINUED™

Speech and Language Development: Elementary School

- Mastery of all speech sounds by age 8
- Expressive **vocabulary** continues to grow by direct teaching and by incidental learning
  - Subject-specific vocabulary in math, science, social studies
- Receptive/expressive language development aligns with growing academic demands

Elementary Language

- Social language
  - Negotiating
  - Persuading
  - Informing
  - Adapting language depending on context

www.asha.org/public/hearing/Effects-of-Hearing-Loss-on-Development

CONTINUED™

Speech and Language Development: Middle and High School

- Vocabulary
  - Continued growth through direct instruction and by incidental learning
- Firmer understanding of figurative language (idioms, similes, metaphors)
  - Important for reading comprehension
  - Often learned incidentally

Middle and High School

- Use of complex sentence structures while talking and writing
- Continued growth of social language ***through incidental learning***
  - Slang
  - Sarcasm
  - Code switching
  - "Social language" of texting (shorthand phrases such as "LOL" and "TTYL")

www.asha.org/public/hearing/Effects-of-Hearing-Loss-on-Development

What Does Hearing Loss Look and Sound Like?

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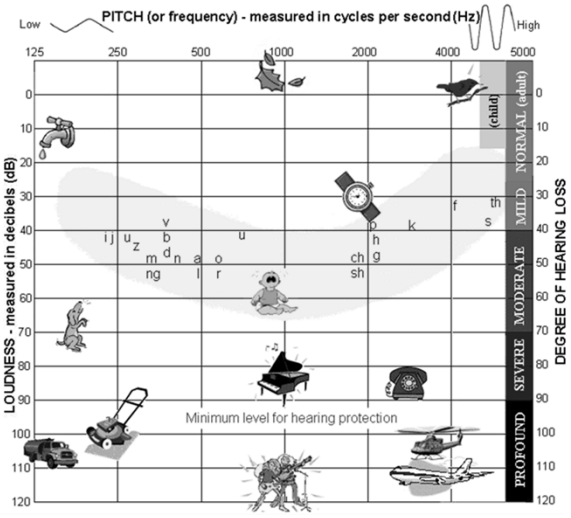
The Audiogram



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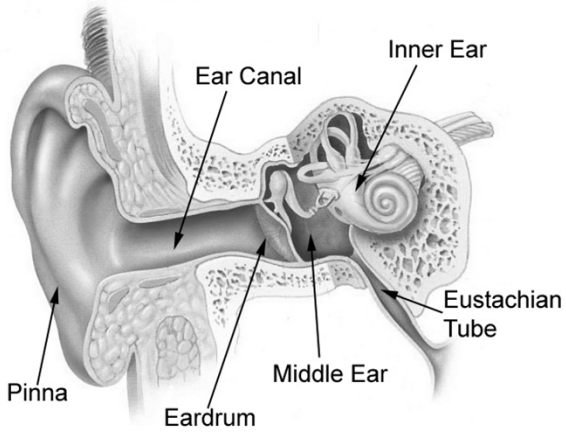
Hearing Loss Comes in All Shapes and Sizes

- Conductive (temporary)
- Sensorineural (permanent)
- Mixed
- Stable or progressive
- Unilateral or bilateral
- Varying severities (mild, moderate, severe, profound)

www.asha.org/public/hearing/Types-of-Hearing-Loss/

Landmarks



www.healthcareinsighter.com

Conductive Hearing Loss

- Outer and/or middle ear is involved
- Can be temporary
- Is treatable with medication, surgical procedure or change in one's behavior.
  - Cerumen buildup or foreign object
  - Middle ear fluid
  - Acquired (exposure to loud noise)
  - Anatomical

www.asha.org/public/hearing/Causes-of-Hearing-Loss

Sensorineural Hearing Loss

- Inner ear and beyond is involved
- Is permanent
- Can be acquired (normal hearing at birth) or congenital (present at birth)
- Acquired
  - Medications
  - Illness
  - Head trauma
- Congenital
  - Genetic
  - Anatomical

www.asha.org/public/hearing/Causes-of-Hearing-Loss

Levels of Hearing Loss (dBHL)

- Normal hearing -10 to 15dB
- Slight 16 to 25dB
- Mild 26 to 40dB
- Moderate 41 to 55dB
- Moderately severe 56-70dB
- Severe71 to 90dB
- Profound 90+ dB

www.asha.org/public/hearing/Degree-of-Hearing-Loss

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Hearing Loss Simulation Reading Passage

On rainy days people say what a dull gray day, when clouds cover the sun the whole world seems dull and gray. The sky is gray. The water in the rivers and lakes looks brown and muddy. The grass is a dark, dull green. Even the flowers seem pale and faded.

www.starkey.com/hearing-loss-simulator

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Hearing Loss Simulation Coffee Shop

So I'm looking at this menu, the only thing that is jumping out at me is the surf and turf. Surf and turf is definitely the way to go. Oh yeah I love all of it - the steak is great here. You know the shrimp, its alright but... well I'm not thinking shrimp, I'm thinking lobster, really? If you're going to do the surf and turf you gotta do it the whole way to be honest....

www.starkey.com/hearing-loss-simulator

Unilateral Hearing Loss

- Unilateral hearing loss or SSD, regardless of severity, may lead to difficulty with:
  - Localization of sound
  - Hearing in the presence of background noise
  - Understanding speech from a distance
  - Realizing academic success
  - Social success
  - Being perceived as "stand-offish", distracted or inattentive

Bess, F.H. (1986). Unilateral hearing loss in children. *Ear and Hearing* 7(1).

Bilateral Hearing Loss

- Bilateral hearing loss, regardless of severity, may lead to difficulty with all of the above ***and***
  - understanding language
  - producing speech
  - managing social situations

The Impact of Hearing Loss on Speech/Language Development

How Does HL Impact S/L Development?

- Hearing loss negatively impacts the development of auditory skills, vocabulary, sentence structure and speech sound production.
- Impaired development of key language skills in turn impact academic success.
- Difficulties communicating can lead to social isolation and poor self-concept.
- It can negatively impact job opportunities and options.

Hearing Loss and Vocabulary Development

Hearing Loss and Vocabulary

- Missed Incidental learning opportunities
- Vocabulary develops at a slower rate and is more narrow due to direct teaching needs.
- "Function" words are problematic
- Concrete vs abstract words
- Difficulty with multiple meaning words
- Difficulty with figurative language

www.asha.org/public/hearing/Effects-of-Hearing-Loss-on-Development

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Hearing Loss and Sentence Structure

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Hearing Loss and Sentence Structure

- Children with hearing loss use and understand shorter and less complex sentences
- Difficulty hearing and using word endings, such as:
  - plural /s/ (I see the dog**s**)
  - possessive nouns (The man**'s** hat)
  - past tense "ed" (I walk**ed** to the store)
- This will also impact reading and writing

www.asha.org/public/hearing/Effects-of-Hearing-Loss-on-Development

Hearing Loss and Speech Sound Production

Hearing Loss and Speech Sounds

- Difficulty hearing and subsequently using soft speech sounds (s, sh, f, th, t, k)
- Conversational speech may break down to a level that the child is not understood
- May have trouble hearing themselves, so may speak too quietly or loudly
- May use a high pitch or sound monotone

www.asha.org/public/hearing/Effects-of-Hearing-Loss-on-Development

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Hearing Loss and Academics

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Hearing Loss and Academics

- Difficulty in all subjects, especially reading and math
- Mild to moderate HL may achieve 1-4 grade levels below peers
- Severe to profound HL may not achieve skills above a 3-4th grade level
- Studies have suggested that 1 out of every 2 to 3 school-aged children with mild degrees of bilateral hearing loss or unilateral hearing loss have academic, social, and behavioral difficulties.

- Bess, F., & Tharpe, A. (1988). Performance and management of children with unilateral sensorineural hearing loss. *Scandinavian Audiology. Supplementum, 30*, 75–79.

Academics cont.

- Achievement gap widens as kids get older
- Better outcomes associated with..
  - Involved parents/caregivers/family members
  - Appropriate support services
  - Early and consistent intervention

Moeller, M. (2000). Early intervention and language development in children who are deaf and hard of hearing. *Pediatrics, 106*, 1–9.

Hearing Loss and Social Language

Hearing Loss and Social Language

- Group social situations can be difficult
- Some children with hearing loss report feeling lonely and unhappy at school
- Appropriate and supervised online interactions/texting can make social exchanges easier

www.asha.org/public/hearing/Effects-of-Hearing-Loss-on-Development

Communication Options and Educational Considerations

Communication Options

1. Listening and Spoken Language
2. Cued Speech/Language
3. American Sign Language/English (Bilingual/Bicultural)
4. Total Communication

Listening and Spoken Language

- Philosophy: children can learn to listen and talk with appropriate support
- Incorporates the "1-3-6" rule
- Consistent use of amplification and regular audiologic assessments are emphasized

Adapted from *Communication Considerations for Children with Hearing Loss*, The ASHA Leader Blog, May 2016.

Cued Speech/Language

- Visual mode of communication
- Employs use of hand shapes to aid in speech perception
- Goal is to improve speech reading and literacy

Adapted from *Communication Considerations for Children with Hearing Loss*, The ASHA Leader Blog, May 2016.

Bilingual/Bicultural

- ASL is first language; English is second language
- Family must commit to learning ASL
- Exposure to Deaf Culture

Adapted from *Communication Considerations for Children with Hearing Loss*, The ASHA Leader Blog, May 2016.

Total Communication

- Can incorporate many communication modalities
- Amplification use is encouraged
- Families collaborate with the school regarding type of input/instruction their child is receiving

Adapted from *Communication Considerations for Children with Hearing Loss*, The ASHA Leader Blog, May 2016.

Informed Decision Making

- Focus on **informed decision making** - provide unbiased information to help the family make an informed decision
- Emphasize the importance of early language stimulation, regardless of the chosen language
- Communication options drive educational placement and long-term communicative goals

Adapted from "Refocusing on Choices," The ASHA Leader, May 2016, p. 44-49.

Early Intervention

- First point of support
- Assist in selecting a communication option
- Support family regardless of communication approach
- Support transition to preschool at age 3

Educational Placement

- Communication options lead to educational placement
- Educational options will vary by city and state
- In the Cincinnati area, the main educational options for children with hearing loss are:
  - **Public school** (listening and spoken language, bilingual/bicultural, or total communication)
  - **Residential school** (bilingual/bicultural or total communication)
  - **Auditory-oral school** (listening and spoken language)

Speech-Language Evaluations for Children with Hearing Loss

Goals of the Evaluation

- Gather baseline information
- Determine qualification for therapy
- Counsel the family
- Support the use of amplification

The Joint Commission on Infant Hearing, Year 2007 Position Statement: Principles and Guidelines for Early Hearing Detection and Intervention Programs, Pediatrics, October 2007, Volume 120, Issue 4

Key Components of the Evaluation

- Case history
- Auditory skills
- Standardized speech-language assessments
- Non-standardized or “informal” speech-language assessments

CONTINUED™

Components of the Case History

1. Hearing History
   - Newborn hearing screening results
   - Age of hearing loss identification
   - Age at amplification
   - Type of amplification and how often used
   - History of recurrent otitis media/PE tubes
   - Etiology of hearing loss
   - Associated syndromes/diagnoses

Case History (continued)

2. Pregnancy/Birth History
   - Pregnancy – full term or premature
   - Birth complications/NICU stay

3. Developmental History
   - Early speech and language milestones
   - Milestones in gross motor, fine motor, and feeding (could lead to possible referrals; many children with HL have additional dx)
   - Other known diagnoses

Case History (continued)

4. Language exposure at home
   - If exposed to 2+ languages, by whom, and what percentage of the time for each language

5. Involvement in early intervention or school-based therapies
   - Collaboration with other professionals is important for a unified treatment plan

Auditory Skills

- Use the **auditory hierarchy** as a guide
  - Detection (is there a sound?)
  - Discrimination (are two sounds the same or different?)
  - Identification (repeat a stimulus, or point to a picture corresponding to stimulus)
  - Comprehension (understanding what was heard – e.g. following directions or answering questions)

Erber, N. (1982). *Auditory Training*. Washington DC: Alexander Graham Bell Association, pp. 92-94

CONTINUED™

Assessments

- Standardized speech-language assessments
- Non-standardized or informal speech-language assessments

CCHMC Birth – Three Evaluation Protocol

- **Rossetti Infant-Toddler Language Scale**
  - Interaction/Attachment
  - Pragmatics
  - Gesture
  - Play
  - Receptive Language
  - Expressive Language
- **MacArthur-Bates CDI**
  - Receptive Vocabulary
  - Expressive Vocabulary

CONTINUED™

CCHMC Preschool+ Evaluation Protocol

- **Clinical Evaluation of Language Fundamentals-Preschool Edition** (CELF-P2)
  - Ages 3:0 – 6;11
- **Clinical Evaluation of Language Fundamentals – Fifth Edition** (CELF-5)
  - Ages 5;0 – 21;11
- **Goldman-Fristoe Test of Articulation – 3rd Edition** (GFTA-3)
  - Ages 2;0 – 21;11

- Non-standardized tools: Parent report/clinical observation of pragmatic language skills, and functional communication skills with family and peers

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Intervention with Families and Children with Hearing Loss

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Best Outcomes

Therapeutic best outcomes are associated with:

- **Actively involved families**
- Age of hearing loss onset and identification
- Degree of hearing loss
- Early and consistent audiologic management
- Consistent and appropriate amplification
- Support of qualified professionals

The Joint Commission on Infant Hearing, Year 2007 Position Statement: Principles and Guidelines for Early Hearing Detection and Intervention Programs, Pediatrics, October 2007, Volume 120, Issue 4.

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Parents (and Families) are our Partners

- Parents are a child's primary language model
- It is essential to engage parents in therapy
- Consider learning styles
- Have parents provide a summary of home practice

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First things first….

CHECK THE DEVICE(S)!

How to check the devices:

- Ling 6 sound test
- Listening tube for hearing aids (check devices directly)
- Train parents and school to do daily!

The Ling 6 Sound Test

- Looks at low, mid, and high frequency sounds
- Determines whether amplification is providing adequate access to speech stimuli
- Can be the first sign of a device failure or a change in hearing

(2 Ling 6 videos)

Ling, D. (1989). *Foundations of spoken language for the hearing-impaired child.* Washington, DC: Alexander Graham Bell Association for the Deaf.

Auditory Skills

- Auditory access is the first consideration in therapy
- The auditory hierarchy (Erber, 1982) guides goals and expectations for later speech and language development
- Auditory Hierarchy:
  - Detection
  - Discrimination
  - Identification
  - Comprehension

Estabrooks, W. & Marlow, J. (2000) *The Baby is Listening*. Washington DC: Alexander Graham Bell Association, p. 22 -25. Modified from Erber (1982) and Estabrooks (1994, 1998, 2000).

Detection

Detection: The ability to respond to the presence of sound.

Measured by:

- Searching for/turning toward sound; startling; increasing/decreasing movement; becoming quiet; vocalizing; conditioned response
- Ling 6 example: parent says "ah" behind child, child turns toward sound

(Detection video)

Estabrooks, W. & Marlow, J. (2000) *The Baby is Listening*. Washington DC: Alexander Graham Bell Association, p. 22 -25. Modified from Erber (1982) and Estabrooks (1994, 1998, 2000).

Discrimination

Discrimination: The ability to determine whether two (or more) speech stimuli are the same or different.

Measured by:

- Verbally stating "same or different" after hearing two sounds; pointing to minimal pairs
- Generally used for remedial purposes; sometimes "skipped" with kids who are amplified early

(Discrimination video)

Estabrooks, W. & Marlow, J. (2000) *The Baby is Listening*. Washington DC: Alexander Graham Bell Association, p. 22 -25. Modified from Erber (1982) and Estabrooks (1994, 1998, 2000).

Identification

Identification: The ability to label a speech stimuli.

Measured by:

- Pointing to a picture from a closed set; repeating a word spoken aloud; writing what was heard
- Ling 6 example: child points to baby from field of 6 pictures when the "sh" sound is presented

(Identification video)

Estabrooks, W. & Marlow, J. (2000) *The Baby is Listening*. Washington DC: Alexander Graham Bell Association, p. 22 -25. Modified from Erber (1982) and Estabrooks (1994, 1998, 2000).

CONTINUED™

Comprehension

Comprehension: The ability to understand the meaning of speech.

Measured by:

- Having a conversation; answering questions; following directions; retelling information; paraphrasing

(Comprehension video)

Estabrooks, W. & Marlow, J. (2000) *The Baby is Listening*. Washington DC: Alexander Graham Bell Association, p. 22 -25. Modified from Erber (1982) and Estabrooks (1994, 1998, 2000).

Auditory Hierarchy

How does the auditory hierarchy guide our treatment?

- Gives insight into what the child is hearing
- Allows us to monitor changes in responses to sound
- Guides goals and family expectations

Therapy Considerations

- Consider chronological age and "listening age"
- Goal = close the gap between the two ages as much as possible

Cole, E. & Flexer, C. (2011). Children with Hearing Loss: Developing Listening and Talking, 2nd Edition. San Diego, CA: Plural Publishing.

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Therapy Strategies

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Therapy Strategies for Early Listeners

- Listening Response
- Suprasegmentals
- Auditory Sandwich
- Pause time
- Parentese
- Short Periods of Prelinguistic Input (SPPI) **(Ertmer & Nathani Iyer, 2010)**

Bloom, L. & Lahey, M. (1978). Language development and language disorders. New York, NY: John Wiley & Sons.

Cole, E. & Flexer, C. (2011). Children with Hearing Loss: Developing Listening and Talking, 2nd Edition. San Diego, CA: Plural Publishing.

Listening Response

- Point to your ear and say "I hear x!"
- Why?
  - Improves auditory attention and focus
  - Helps tie meaning to sound

Suprasegmentals

- Model variations in duration, pitch, and intensity
- Example:
  - Duration: "Up up up!" versus Dooowwwwn"
  - Pitch: "Peep peep" versus "Moooo"
  - Intensity: "Night night" versus "Wake up!"
- Why?
  - Suprasegmental information = the "melody" of speech; much is carried in the low frequencies

Auditory Sandwich

- Auditory only; Auditory + visual; Auditory only
- Example:
  - "I have a cow. It says moo!" (cow is hidden in a box)
  - "Here is the cow!" (bring cow out for child to see. Can also sign "cow" or add other visual)
  - (Cow goes back in box). "That was the cow that said moo!"
- Why?
  - Increases auditory attention/auditory learning

Pause Time

- Pause and wait for the child to respond
- Example:
  - "Put the dog in."
  - (Pause…pause…pause)
  - (Child puts the dog in)
  - "You put the dog in!"
- Why?
  - Children benefit from time to process what they heard and to demonstrate what they processed

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Parentese

- Sing-song quality to speech that adults use when interacting with children
- Why?
  - All children benefit (early language learning)
  - Children with hearing loss often have better access to low-frequency information

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Short Periods of Prelinguistic Input (SPPI)

- Model developmentally-appropriate vocalizations every 5 seconds for 1 minute, 5 times per day (by the parent)
- Why?
  - To provide focused stimulation of age-appropriate vocalizations and to increase phonemic inventory

Ertmer, D.J. & Nathani Iyer, S. (2010). Pre-linguistic vocalizations in infants and toddlers with hearing loss: Identifying and stimulating auditory-guided speech development. Oxford Handbook of Deaf Studies, Language, and Education (Vol. 2). New York, NY: Oxford University Press.

Therapy Strategies for Later Listeners

- Positioning
- Repetition
- Modeling
- Attention
- Acoustic highlighting
- Expectant look
- Clear speech (not LOUD speech)
- Ask, "What did you hear?"
- **Put it back into listening!**

Estabrooks, W. (1998). Cochlear Implants for Kids. Washington, D.C.: Alexander Graham Bell Association for the Deaf.

Estabrooks, W., MacIver-Lux, K., & Rhoades, E. (2016). Auditory-Verbal Therapy for Young Children with Hearing Loss and Their Families, and the Practitioners who Guide Them. Plural Publishing.

Positioning

- Consider the child's hearing loss/amplification when positioning yourself
- Move closer to the device rather than getting louder
- Why?
  - Helps engage auditory modality

Repetition and Pre-teaching

- Repeat key words and vocabulary many times
- Why?
  - Helps remedy lack of "incidental learning"

(repetition video)

Modeling

- Model what you want the child to say
- Child repeats the adult model
- Why?
  - Helps child practice correct sentence structure
  - Helps build auditory feedback loop

(modeling video)

Attention

- Obtain auditory attention before giving information
- Example:
  - "John, we're going to listen. Are you ready?"
- Why?
  - Ensures child is auditorily-engaged and ready for the information

CONTINUED™

Acoustic Highlighting

- Make key information slightly longer, higher-pitched, or otherwise more "emphasized" or "highlighted"
- Example:
  - "The dog **IS** running" (if the child omits "is")
  - "The dog is runn**ING**" (if the child omits "ing")
- Why?
  - Helps auditorily distinguish key information to help child produce the target

(acoustic highlighting video)

Expectant Look

- Look expectantly at the child after you say something that requires a response
- Example:
  - "Put the ball in the box"
  - (Child looks at you, unsure of what to do next)
  - Raise eyebrows, widen eyes, shrug shoulders, etc
- Why?
  - Provides nonverbal cue that child is expected to perform an action

Clear Speech

- Focus on making speech clear (including slightly slower pacing) rather than LOUD
- Why?
  - Hearing aids and cochlear implants do a good job of amplifying speech
  - Children need to hear a **clear** model to learn speech and language

"What did you hear?"

- Confirm that the child heard you correctly by having them repeat you
- Example:
  - Adult: "What are you going to buy at the store?"
  - Child: "What did you say?"
  - Adult: "What did you hear me say?"
- Why?
  - Ensures a good "auditory feedback loop"

CONTINUED™

Put it back into listening!

- Always tie information back into the auditory modality
- Example:
  - Make a summarizing statement after a book is done
  - Say an animal name again after you put it away
  - "Narrate" what the child did ("You made the boy jump")
- Why?
  - Helps tie the child's experiences to listening/hearing

Putting it All Together – Example Therapy Session

- Parent discussion/review of home program
- Ling 6/device check
- Speech sound activity
- Expressive language activity
- Receptive language activity
- Pragmatic language/play activity
- Auditory activity
- Summary/plan for home

Questions?

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