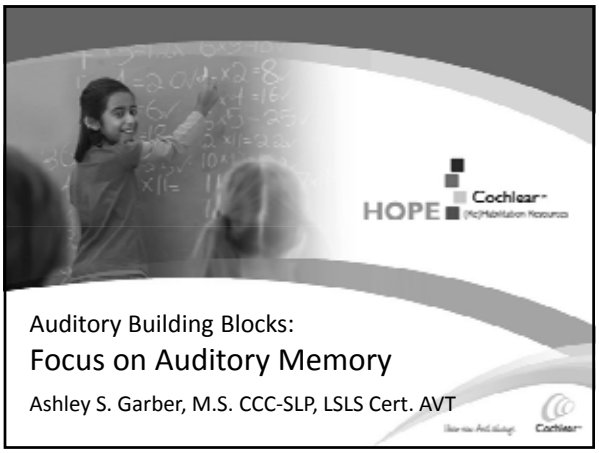

Auditory Building Blocks:

Focus on Auditory Memory

Ashley S. Garber, M.S. CCC-SLP, LSLS Cert. AVT

Introduction

Cochlear America's Commitment to Educational Outreach

Our Presenter

Ashley S. Garber, MS CCC-SLP, LSLS Cert. AVT

–Private practitioner specializing in auditory verbal therapy and consultation services

–Over fifteen years of experience working in a variety of settings with children and adults with hearing loss who use cochlear implants

Agenda

- Relating auditory memory to auditory comprehension
- Research Findings
- Building Auditory Memory
  - Strategies
  - Increasing contextual support
- Discussion and Questions

Comprehension - By Definition

- Demonstrating understanding of particular input
- A novel response or generation of new ideas – one that is "qualitatively different than the stimuli presented" (Estabrooks, 2000)
  - Answering a question
  - Continuing a thought
  - Describing an object
  - Paraphrasing

The Auditory Comprehension Level

- Different scholars and clinicians have categorized comprehension skills in different ways:
  - Stredler-Brown & DeConde Johnson, 2004
    - Comprehension
    - Auditory memory
    - Auditory processing of linguistic information
  - Estabrooks, 2000
    - Auditory Memory & Sequencing
    - Auditory/Cognitive Skills in a Structured Set
    - Auditory Cognitive Skills in Conversation

Another Organizational Framework:

- Auditory Memory
  - Store and recall auditory stimuli
- Auditory Memory Span and Sequencing
  - Remember varying lengths of auditory information in exact order
- Auditory Processing
  - Make cognitive judgments about auditory information.
- Auditory Understanding
  - Comprehend auditory information in any situation

(Caleffe-Schenck, 2005)

Auditory Memory

- No matter how the steps are categorized, we recognize that auditory memory is a critical component of overall auditory comprehension
- To take one step toward comprehension of even a single spoken word, a child must utilize auditory memory skills
  - to connect a spoken word with an object or concept and retrieve that connection at a later time … auditory memory

Auditory Memory – By Definition

- In general, a process in which we use our hearing to *encode*, *store* and then *retrieve* information
  - Auditory attention is a pre-requisite
- Much research dedicated to the study of auditory memory has further described processes of
  - Short term/working memory
  - Long term memory

Subskills:

Auditory Comprehension

- Developing memory and concept for a single word
- Showing understanding of Learning to Listen Sounds (i.e. sound/word associations e.g. “moooo” for cow)
- Responding appropriately to common expressions (e.g. “all gone”, “don’t touch”)
- Following simple directions (e.g. “give it to me”)
- Answering common questions with abundant contextual support (e.g. “what’s that?”, “where’s mommy?”)

(Estabrooks, 2000, Walker, 1995)

Subskills cont.

- Completing a known linguistic message (“auditory closure” – a nursery rhyme, song or common phrase)
- Recall/Sequence 2, 3, and 4 critical elements in a message
  - 2 critical elements (“on the table”, “red hat”)
  - 2 item memory (e.g. “hat and gloves”)
  - 3 critical elements (e.g. “in daddy’s pocket”, “big white dog”)
  - 4 critical elements (e.g. “daddy walks to the store”, “throw the big blue ball”)

(Estabrooks, 2000, Walker, 1995)

- Identify a picture related to a story presented auditorily
- Answering common questions about a familiar topic
- Answer questions about a story
- Identifying an object based on several related descriptors
- Recall/sequence multiple elements to follow auditory directions

Subskills, cont.

- Recall details of a story
  - With topic disclosed
  - Familiar topic
  - Open set (topic not disclosed)
- Retell a story
  - Topic disclosed
  - Undisclosed topic
- Follow a conversation
  - Paraphrase remarks of another
  - Make spontaneous, relevant remarks

(Estabrooks, 2000, Walker, 1995)

Research Findings

Pisoni and Geers (1998)

- Found a correlation between poor *working memory* skills (measured via auditory digit span tasks) and speech perception, spoken word recognition, language comprehension, and reading for children using cochlear implants
- Proposed that the *phonological loop* mechanism is directly impacted by auditory exposure and experience and therefore, that it may be the key to variable cochlear implant performance

Working Memory

- "Interface between initial stimuli and stored knowledge base" (Pisoni and Geers, 1998)
- Temporary storage system and manipulation of information necessary for complex cognitive tasks (e.g. language comprehension, learning, reasoning)
- An extension of the concept of "short term memory"; considered to include 4 subsystems or processes, one of which is the
  - *phonological loop* – stores and rehearses speech based input

Baddeley, A. (2003)

- Baddeley's work suggests that all of 4 impact (typical) language development; most especially the *phonological loop* (2003)
- 2 processes
  - Temporary storage system – from which memory traces decay unless refreshed via…
  - *Subvocal rehearsal* – preserves information in storage as well as allows for visual information to register phonologically
    - e.g. a written sequence like "B, K, W, R, X, Z" will be transferred by the subject into an acoustic sequence

Burkholder and Pisoni (2003)

- "Progress Report" synthesized multiple studies on short term/working memory processes for children with cochlear implants
- "In addition to perceptual difficulties related to their hearing impairment and the decoding of degraded input, atypical development of subvocal verbal rehearsal and serial scanning also contribute to the decreased memory spans of deaf children using cochlear implants."

- In addition, these studies suggest that the amount and/or nature of the auditory exposure that children receive after implantation can influence their performance on immediate memory tasks that require the encoding, verbal rehearsal, and serial scanning of phonological information in working memory.

Building Auditory Memory Skills

Keys to Maximizing Success

- Considering research findings
- Using effective strategies
- Emphasizing thinking skills while targeting auditory comprehension
- Teaching across contexts

Cues from Research

- Subvocal rehearsal
  - Begin by having child repeat lists or directions out loud
    - "Tell me, what did you hear?"
    - This allows you to check his/her perception as well
  - Later move toward having him rehearse information "to himself"
  - Use your listening turn to model this strategy for the child

Build on skills

- Words used to build memory skills should be familiar
- Begin with single syllable words, move toward multi-syllable words
- Words that are phonologically dis-similar are easier to remember than are similar words
  - e.g. "cat, ball, church, top" should be easier than "cat, man, hat, can, mat"
- Work within categories or contextual groups before unrelated words
  - e.g. "peas, carrots, peppers, grapes" before "paper, car, frog, sand"

Keep Working Memory Working

- Build in delay time
  - From a young age, begin adding a slight delay into activities between the time you ask for an object and the time the child gets it
    - For example, place toys around the room and then ask "Where's the *car?*" so that the child has a moment between hearing the object and then finding it
  - With slightly older children, encourage the use of subvocal rehearsal while moving to follow directions
    - For example, the child has a dumptruck on one side of the room and the colored blocks from which he has to choose "2 reds and a yellow" are on the other

Effective Strategies:
Turn Taking

- Utilize teacher and/or parent turns to show child *how* to think and remember
- Developing meta-cognitive skills
  - Rehearsal strategies: repetition, highlighting important facts, physical cues
  - Elaboration strategies: creating mental images, paraphrasing
  - Organizational strategies: grouping, classifying, identifying main ideas

(Duncan, 2007)

Acoustic Highlighting

- Using your voice to emphasize key words or features of words
- Specific strategies for memory tasks
  - "chunking" – using pausing to put information together into manageable bits
    - E.g. telephone numbers… 555 - 867 - 5309
  - Adding melody/rhythm
    - E.g. "put the baby .. one the bed .. and the doggy.. on the car"

Wait Time

- Pausing before auditory input is given allows the child to attend more closely
- Children may need time to process what they have heard
- While repetitions are sometimes necessary, wait time provides an opportunity to find out
- If we repeat or rephrase too soon, we may interrupt the child's internal rehearsal strategies

Thinking Skills

- In this context "thinking and listening" is all about helping the child to make connections
  - At an early language age, these are connections between what a child is hearing and what he is doing, seeing, touching. We stimulate language and cognition concurrently
  - As language grows, these are connections between what he is hearing and how it relates to the greater world around him and his experience. We use language and listening as the bridge to higher level thinking skills

Cycling Through Language

- As with other comprehension skills, language is inextricably linked.
- Therefore, we must cycle through higher language levels with the same auditory goals as they are achieved
  - Use higher levels of vocabulary
  - Use more complex grammar

Cycling Through Language

- Recall two critical elements
  - "Get the *ball* and a *bear"*
  - "Get the ball and a stapler"
  - "Get a *stethoscope* and some *tongs*"
- Follow directions containing 4 critical elements
  - "Throw the ball, wave to the girl"
  - "Toss the ball to the nearest female"
  - "After the hike, pass it to the receiver"

Move Toward Natural Context

- Remember to make activities fun and relevant
- Putting things into context builds "stored knowledge base" with which working memory must interface
- Consider:
  - When it is important to remember multiple items?
  - When is it typical to have to put things in order ?
  - When is it natural remember and repeat events?

Ideas

- Hamburger Stand
  - "I'll have a burger with cheese, ketchup and pickles"
  - "Make my burger with tomato on top and cheese on the bottom"
- Ice Cream Stand
  - "I'll have 3 scoops: chocolate, vanilla and mint"
- Jewelry Shop
  - Would you make my bracelet with 3 red beads, then a blue bead, then 2 more red"
- Reporter
  - "Today at the park, a man threw a frisbee into the tree and a squirrel ate a girl's sandwich"

Other Favorite Memory Games

- "Telephone"
- "Going to Grandma's House"
- "Simon" – this is a visual game, but we typically verbally encode the color combinations in order to use subvocal rehearsal
- "Concentration"
  - Traditional play uses verbal encoding of visual information as above
  - Modify the game to make it auditory only in order to use only auditory memory

Add Music!

- Increasing amounts of data to correlate musical training to language development
- Tierney and Pisoni (2004) specifically found "that musical experience and activity may affect verbal rehearsal, phonological coding, and the allocation of attention in sequence memory tasks"

In Summary

- By taking each level of auditory function in turn we can examine its significance and consider our approaches to teaching
- As one aspect of Auditory Comprehension, Auditory Memory deserves special consideration for it's link to the variability in cochlear implant performance
- Added attention to strategies that both recognize and move to combat the difficulties that children with cochlear implants have with working memory skills may serve to improve outcomes

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Questions and Discussion

New Parent Resource

- Practical, applied guidance on specific topics
- Most recent HOPE booklet: *Fun and Games*
  - *Choosing Games and Toys*
  - *Fun Finds: Resources at Your Fingertips*
  - *Optimizing Participation in Summer or After School Activities*
  - *Maximizing Auditory Skills in Outdoor Play*
- Now in the Parent Section of HOPE www.cochlearamericas.com/hope

Children with Cochlear Implants: The Words and the Music

- One day introductory level workshops on reading, vocabulary and music
- One remaining sites: Washington (DC) on March 13
- For more information, go to www.regonline.com/hopeworkshops
- Or call Sarah Gard at 303.524.6848, sgard@cochlear.com

Upcoming Online Sessions

Next Up:

Wednesday, February 15, 3-4:30 pm ET (90 minutes)

Early Language Development and First Words in Young Children

Pauline Nott, Ph.D., Taralye—The Oral Language Centre for Deaf Children, Melbourne (AU)

Andrew Kendrick, M.SpEd, LSLS Cert. AVT, Cochlear Ltd

Thursday March 1, 3:00 pm ET

There's An App for That! (Professionals, Parents)

Ashley S. Garber, M.S. CCC-SLP, LSLS Cert. AVT

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