What to Expect for a Child’s Auditory Development

MaryKay Therres, M.S., CCC-SLP, LSLS Cert. AVT
Virgi Mills, M.E.D.
EHDI Pre-session, April 13, 2014
Disclosure

MaryKay and Virgi are both employees of MED-EL

- MaryKay: Manager of Education and Therapy
- Virgi: Outreach Manager, SE Region
Presentation

- Expectations of Outcomes
- Hierarchy of Auditory Skills, Goals and Timelines
- Assessment Tools
- Case Studies
Expectations

- Ability to develop auditory and oral-verbal/listening and spoken language/listen and talk
- Not everyone who receives a cochlear implant will have the same expectations
- Expectations should be held high to ensure that each recipient reaches their individual potential
- Use as a counselling tool to identify and discuss factors that may impact outcomes
This presentation will address expectations in children

- Children: Those who have developed minimal to no language or have had progressive loss and have developed further language skills; up to around age 5 to 7; use a **habilitative** approach
Children and Influencing Factors-Intrinsic

- Age
- Pre/post lingual deafened
- Medical findings
- Neural survival
- Etiology
- Cognition
- Additional disabilities
Children and Influencing Factors - Extrinsic

- Functional use of hearing aids
- Communicative intent
- Available habilitation services
- Educational program
- Child’s behavior (i.e., focus/attention)
- Parental involvement (i.e., compliance with follow up, stressors, support)
ChIP: Children’s Implant Profile-Modified

- Others have modified to meet their specific implant center’s needs
- Profile usually divided into 5 sections
- Rate each item in the section (usually as no concern, some concern, great concern)
- Overall profile of areas of that impact expectations-strengths and concerns
ChlP Areas

- Medical (physical health, radiological, age)
- Audiology (degree of hearing loss, ability to test, functional use of amplification/residual hearing, audiologic history)
- Speech-Language (non verbal and verbal receptive and expressive language, speech development, child’s attention/behavior for language development)
- Family (child’s developmental ability, family follow up/compliance with recommendations, family stressors, understanding and expectations of hearing loss and technology)
- Habilitation (availability of services, educational placement, knowledge and skill of service providers, parent participation)
## Modified ChIP-example

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Expectations

Through experience and without being judgmental have recognized three general descriptive categories applicable to recipients of all ages:

- Comparable aural-oral skills to individuals with typical hearing
- Functional aural-oral communication
- Aural-oral skills that assist in communication

Range within each category
Comparable communication

Children would be expected to develop aural-oral skills that are comparable to peers with typical hearing

- Language and academic learning can be accomplished through auditory modality
- Deafness in only challenge
- Expected to maintain and compete with peers mainstream education
- Appropriate to utilize auditory based approach
Functional communication

Children would be expected to develop aural-oral skills for functional language and academic learning but not to level of peers with typical hearing (i.e., lower vocabulary, difficulty with lengthy and abstract information through listening alone)

- Not done with ease and require intensive support;
- Language is not at level of peers with typical hearing
- Other mild to moderate issues may be present, particularly language issues
- Child may have been implanted outside the optimal age of implantation
- Appropriate to utilize auditory based approach with additional visual strategies (speech reading, reading, gesture cues)
Assist to communication

Children would be expected to develop some aural-oral skills to assist communication but primary communication will be through visual means.

- Deafness is not primary challenge, present with other issues (i.e.: deaf plus)
- Realistic expectations-keep whole child perspective
- Educational Program/Support Services should include consideration of primary disability
- Appropriate to develop auditory and verbal skills to basic level (i.e., familiar words/phrases); communication development will be through multi-modality approach
Conclusion on Expectations

- Factors that influence expectations
- Profile to guide expectations
- Range of expectations (comparable, functional, assist)
- Intervention approach based on expectations
- Resources to assist in setting expectations (later)
Auditory Hierarchy, Goals and Timelines

- Organized hierarchical plan to facilitate development of auditory skills
- Children receive best benefit from combination of direct instruction and exposure to language in natural environments (home and school)
- Direct instruction helps develop skills that can be carried over into natural environments which is the most meaningful context
- Provides accountability-monitor and track progress
- Developing speech perception skills facilitate development of spoken language skills
Auditory Hierarchy, Goals and Timelines

- The following are guidelines of expectations of development of a specific skill
- Has come about from clinical experience
- Range: when first start to see (emerging) to when child should have developed skill (red flag)
- If not developed by end time, then is a red flag indicator
Auditory Hierarchy, Goals and Timelines

- Timeline guidelines are provided for under 2 years of age and over 2 years of age.
- Timeline goals are from AuSpLan.
- Once child reaches 3rd Level/Stage, guidelines become similar to those implanted over 2 years of age.
- Acquisition of skill guidelines are for Comparable and Functional development for implanted under 2-child is on listening and spoken language track.
Auditory Hierarchy, Goals and Timelines

Auditory Hierarchy

AuSpLan (Auditory Speech Language) A Manual for Professionals Working with Children who have Cochlear Implants or Amplification

McClatchie & Therres 2003
Auditory Skills Pyramid

Level 5A and B
  Processing
  Comprehension

Level 4
  Identification

Level 3
  Segmental-Association/
  Identification

Level 2
  Suprasegmental-Discrimination/
  Association

Level 1
  Awareness
Auditory Level 1: Awareness

- Awareness of Voicing
- Awareness of Environmental Sounds
- Awareness of Ling Sounds
- Voice in Distraction
Timelines-Auditory Level 1 (under age 2)

Level 1: Awareness

Goal: Show awareness to all Ling sounds

Emerging: 1 week post-implant

Red Flag: 6 weeks post-implant
Auditory Level 1
(over age 2)

Low Goal: Sit in “listening posture” and respond to voicing.

High Goal: Sit in “listening posture” and respond to all Ling sounds.

Mastery: 8/10 presentations
## Timeline Auditory Level 1

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Auditory Level 2: Suprasegmental-Discrimination

- Vocal Length
- Onomatopoeic Content
- Word Length
- Sentence Length
- Intensity/Pitch
- Oral/Nasal Resonance
- Prosody
Level 2: Suprasegmental Discrimination/Association

Goal: Discriminate between familiar words/phrases/sentences by suprasegmental

Emerging: 3 months post-implant

Red Flag: 6 months post-implant
Auditory Level 2: Suprasegmental-Discrimination/Association (over age 2)

**Low Goal:** Discriminate between long versus intermittent speech (1 of 2).

**High Goal:** Discriminate between 1 of 4 words/phrases/sentences that differ in length/intonation.

**Mastery:** Identify 8/10 presentations in a closed set using 3 different closed sets of stimuli
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<td><strong>Low Goal:</strong></td>
<td>1-2 m</td>
<td>1-3 m</td>
<td>1-4 m</td>
</tr>
<tr>
<td><strong>High Goal:</strong></td>
<td>1-3 m</td>
<td>4-6 m</td>
<td>7-13 m</td>
</tr>
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</table>
Auditory Level 3: Segmental-Association/Identification

- Speech Sound Difference in Isolation
- Vowel and Consonant Difference in Same Length Words
- Vowel Only Difference in Words
- Consonant Only Difference in Words
Timelines-Auditory Level 3 (under age 2)

Level 3: Segmental Association/Identification

Goal: Identify 10 - 15 familiar words

Emerging: 6 months post-implant

Red Flag: 9 months post-implant
Auditory Level 3: Segmental-Association/Identification (over age 2)

**Low Goal:** Identify 1 of 2 monosyllabic words that differ by large vowel and consonant contrasts.

**High Goal:** Identify 1 of 12 words that differ by vowels and consonants.

**Mastery:** Identifies correct target word 12/15 presentations in a closed set using 3 different closed set of stimuli
Timeline Auditory Level 3

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<td>Low Goal:</td>
<td>2-5 m</td>
<td>4-6 m</td>
</tr>
<tr>
<td>High Goal:</td>
<td>3-6 m</td>
<td>7-9 m</td>
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</table>
Auditory Level 4: Identification

- One Key Word in Sentence Context
- Two Key Words in Sentence Context
- Three Key Words in Sentence Context
- Four+ Key Words in Sentence Context
Auditory Level 4: Identification

Low Goal: Identify 1 key word in a short sentence context given a choice of 3 key words.

High Goal: Identify 4 to 4+ key words in a longer sentence context given a contained set.

Mastery: Follow 12/15 directives
Timelines Auditory Level 4

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</thead>
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<td>Low Goal:</td>
<td>4-8 m</td>
<td>7-9 m</td>
</tr>
<tr>
<td>High Goal:</td>
<td>9-15m</td>
<td>10-23 m</td>
</tr>
</tbody>
</table>
Auditory Level 5A:
Processing/Comprehension
• Advanced Vocabulary Development
• Auditory Word-Play Association
• Answer Simple Questions
• Understand Sentences Containing Details and Elements
• Answer Simple Questions About Short Paragraph
SECRET SQUARE

Ask your best questions—the better your questions the faster you win!

One player secretly hides a chip under a square. The other players ask questions and remove squares . . . until the only one left is the secret square!

Includes 96 squares—the game is different every time you play!

Designed for kids and parents to play together!

No waiting—every player plays on every turn!

Which Square Hides the Chip?

Ages 4 & Up • 2-4 Players • NO READING REQUIRED
Auditory Level 5A: Processing/Comprehension

**Low Goal:** Identify 1 of 6 objects/pictures when presented with description or function.

**High Goal:** Answer simple who, where, and what doing questions when presented with a 5-sentence paragraph about a picture.

**Mastery:** *low*-identify 8/10 objects  
*high*-answer 4/6 varying questions from 4 different stories
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<tbody>
<tr>
<td><strong>Low Goal:</strong></td>
<td>12-16 m</td>
<td>14-20 m</td>
<td>na</td>
</tr>
<tr>
<td><strong>High Goal:</strong></td>
<td>14-26 m</td>
<td>16-33 m</td>
<td>na</td>
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</table>
Auditory Level 5B: Processing/Comprehension

- Answer Complex Questions
- Answer Complex Questions about Paragraph
- Sequence With/Without Visual Support
- Increase Cognitive Language Skills
- Follow Conversation With Familiar Topic
- Follow Open-Ended Conversation
Level 5B Increase Cognitive Language Skills

- Infer
- Interpret and Paraphrase
- Problem Solve
- Identify Missing Information
- Define and Explain
- Cause and Effect/Predicting
- Identify Main and Supporting Ideas about a Story
- Humor
- Figurative Language
INTRODUCING INFERENCE

Marilyn M. Toomey
Illustrated by Will Harney

Read each of these sentences and answer the questions asking what happened.

1. "Mom," said Kenny. "Look at this!" She turned around and saw Kenny holding his report card. She asked, "What did Kenny receive on this report card?" What did Kenny receive on this report card?

2. One day, Mary and her friends made their way to the dark woods near their house. They walked along the path and suddenly heard strange noises. Mary's friends were scared, but she was curious. She asked, "What were you all running away from?" What were they all running away from?

3. Johnny walked in the sitting room with his mother. He pointed to the box on the table and said, "What's inside?" She asked, "What was in the box on the table?" What was in the box on the table?

4. John saw the dog and told him "Stop!" as he passed by. The dog looked at him and said, "What did John see and what did he say?" What did John see and what did he say?

5. Mrs. Johnson was in the kitchen. She asked, "How do you know it's the right time?" The clock said, "What time is it?" What time is it?

6. The four men walked in the dark, looking for the answers to the clues. They asked, "What were they looking for?" They were looking for the answers to the clues.

7. The lights came on and the men saw the clues. They asked, "What did they see?" They saw the clues.

8. While the men walked in the dark, they were looking for the clues. They asked, "What were they doing?" They were looking for the clues.

9. "Mom," said Kenny. "Look at this!" She turned around and saw Kenny holding his report card. She asked, "What did Kenny receive on this report card?" What did Kenny receive on this report card?

10. "Mom," said Kenny. "Look at this!" She turned around and saw Kenny holding his report card. She asked, "What did Kenny receive on this report card?" What did Kenny receive on this report card?
Auditory Level 5B: Processing/Comprehension

Low Goal: Sequence a 4-part picture story presented to child auditorily given 4 pictures that do not have a visual order.

High Goal: Listen to 2 – 3 sentences and infer meaning.

Mastery: low-sequence 6 different stories high-correctly infer from 8/10 presentations
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<tbody>
<tr>
<td><strong>Low Goal:</strong></td>
<td>16-24 m</td>
<td>18-30 m</td>
<td>na</td>
</tr>
<tr>
<td><strong>High Goal:</strong></td>
<td>24-36 m</td>
<td>30-36+ m</td>
<td>na</td>
</tr>
</tbody>
</table>
Auditory/Receptive Language

Year 1: awareness, attaching meaning to routine, familiar vocabulary, starting to follow simple directions

- “open the door”
- “Show me your eyes”
- “Where is mommy?”
- “Time to go bye-bye”
- “Get your shoes and give them to daddy”
Auditory/Receptive Language

Year 2: building auditory memory, following multi-step directions, beginning develop simple processing/comprehension skills (answering questions, identifying by description)

- “Get me an apple, banana and an orange”

- “Time to eat, turn off the TV and go wash your hands”

- “What is daddy doing?” “Where did your sister go?”

- “What is something to eat that is yellow, long and you peal it?”
Auditory/Receptive Language

Year 3: has “surface structure” language (vocabulary, auditory memory, simple processing) and developing “deep structure”-advanced processing/comprehension (verbal reasoning skills, chunks of information, complex questions)

- “Mom was baking a cake and smoke started coming out of the oven, what happened?”
- Answering questions about a story-retain/recall
- “Why is the little girl sad?”
12 Essential Strategies

1. Acoustic highlighting
2. Auditory sandwich
3. Check for comprehension
4. Ask what they heard
5. Parent (or other) as model
6. Repetition
7. Rephrase
8. Pause/wait time
9. Expand
10. Extend
11. Clarification
12. Sabotage
12 Essential Strategies

1. **Acoustic highlighting**: a sound or a sound in a word, word or phrase is slightly emphasized (highlighted) to draw child’s attention to it. Can be used in any spoken language throughout the world.

2. **Auditory sandwich**: gives the child three chances to listen: listen alone, 2. listen with support, listen alone. Supports can include point/gesture, show a picture/toy/object, speech read or sign.
3. **Check for comprehension**: ask child specific questions about information presented.

4. **Ask what they heard**: have child repeat. Particularly useful when checking auditory memory or auditory discrimination.

5. **Parent (or other) as a model**: to provide appropriate response for child; after modeled then child is given chance to respond.
6. **Repetition**: use if child does not understand or misses part of something. DO NOT OVERUSE.

7. **Rephrase**: say it a different way or at a simpler level.

8. **Pause/wait time**: pausing and waiting with anticipation encourages a child to listen and follow through with a task rather than waiting for the speaker to repeat. Some children require longer auditory processing time. Also used when encouraging a child to spontaneously verbalize.
9. **Expand:** response to child in which word order is the same and utterance is made longer and/or grammatically correct. Recast into adult syntactic form.

10. **Extend:** respond to child’s utterance in conversational way, providing a bit of new information that is related to what the child had to say.

11. **Clarification:** skill to teach child; child learns to self-advocate when breakdowns in communication occur; requests specific information rather than “I didn’t hear you”, “say it again”.
12. **Sabotage**: two ways

- adult creates a problem or makes a mistake to block a goal of the child, thereby creating a context in which the child needs to communicate if he/she wants to overcome the difficulty and proceed with the activity

- adult makes a mistake to give child opportunity to identify and correct the mistake
Conclusion on Hierarchy, Goals and MED-EL Timelines

- Determine factors that may impact expectations for developing listening and verbal language
- Based on these factors can project outcomes, focus on therapy and techniques to be used- one size does not fit all
- Use monitoring tools, hierarchy of skill development to determine if child making appropriate progress expected
- If not, red flags, re-assess all areas and address
- Do not set expectations to low
Ways to Monitor Auditory Development

LittlEARS® Auditory Questionnaire (LEAQ)
Auditory Skills Checklist
AuSpLan
LittlEARS® Auditory Questionnaire

1. Normed

2. Acceptable for reimbursement
Can be used to...

1) Initially assess the status of skills development

2) Over time document progress
If used over a longer period of time, the results may be entered in the Progress Assessment Form.
How to use LittLEARS Auditory Questionnaire?

A Parent-friendly questionnaire that can be used to reassess every 3-6 months

A very popular tool used by professionals in Early Intervention!
Reliability?

“Studies show that parent evaluation is a suitable method to assess development in early childhood and to reflect the children’s everyday behavior.”

(Bates et al, 1988)

LittlEARS Auditory Questionnaire
Objectivity of the LittlEARS Auditory Questionnaire

Scores were compared:

1) Parents completing the questionnaire under professional guidance versus completing the questionnaire alone.

Results: no significant differences
Objectivity of the LittlEARS Auditory Questionnaire

Scores were compared:

2) Gender differences: Boys versus girls

Results: No significant differences
Implementing the LittlEARS Auditory Questionnaire

Parents are asked…

1) Read the instructions thoroughly
2) If the behavior has been observed at least once, answer “yes.” If not, answer “no.”

Questionnaire may be completed in a variety of settings i.e. home, therapy or school
Implementing the LittlEARS Questionnaire

If the parents find it difficult to respond “spontaneously,”

they may take it home to complete when the child is in a familiar environment
Implementing the LittlEARS Auditory Questionnaire

Why?

Some children with hearing loss can develop additional skills throughout the questionnaire

Addresses the possibility of “swiss cheese” auditory skills
The items marked “yes” are added and entered in the appropriate box in the questionnaire.

The sum total score is compared with the critical values in the table on the back of the LittLEARS Progress Assessment.

This comparison facilitates the discussion of the current developmental status of the child’s auditory behavior.
Interpretation and Critical Values

Plot the hearing age in months and the sum on the chart

1) The blue area indicates that the child is in a critical stage in auditory development

2) Between the blue and the arc is an area of concern

3) On the arc or above is considered normal

4) Study showed that children who had received a cochlear implant under age 2 on average completed all items LEAQ by 16 months post implant
A mother brought her older child with hearing loss to a weekly auditory-verbal therapy session. Using the LittlEARS Auditory Questionnaire, the mother plotted the auditory skills development of her second child at the age of 7 months and the child scored in the normal range.

Four months later, the mother again completed the LittlEARS Auditory Questionnaire and the score indicated a hearing loss.

- A comprehensive audiological assessment was completed which indicated profound hearing loss.
Developing Goals and Instruction

Sample Auditory Skill:

Does your child look for a speaker he/she cannot see? (sister crying in the other room)

1) Discuss other ways to identify this skill
2) Write a goal for an IFSP or IEP
3) Explicit instruction for promoting this auditory skill
Developing Goals and Instruction

Does your child respond with alarm when hearing an angry voice? (Becomes sad and starts crying)

1) Discuss other ways to identify this skill
2) Write a goal for an IFSP or IEP
3) Explicit instruction for promoting this auditory skill
Does your child produce the right sound to a toy? (“vroom” with a car, “moo” with a cow)

1) Discuss other ways to identify this skill
2) Write a goal for an IFSP or IEP
3) Explicit instruction for promoting this auditory skill
LittlEARS Auditory Questionnaire

Any questions about the LittlEARS Auditory Questionnaire?
Auditory Skills Checklist

— Developed by Nancy S. Caleffe-Schenck
Auditory Skills Checklist

Purpose:

1) Establish auditory goals

2) Track progress made in auditory areas related to spoken communication
Auditory Skills Checklist

To track progress, check the appropriate answer for each item.

Skills should be noted if the child responded using auditory cues only, without any visual information such as speech reading or sign language.
New scoring

Verbal scoring (i.e., Never observed, Observed once, Observed greater than 3 times)

and

Number scoring (i.e., 0, 1, 2, 3, 4, 5) for total score of 77
Scoring

Intrasubject design

Are comparing child’s score to his/her previous score to determine progress
Scoring

Auditory skills develop in a hierarchal order (Awareness to Processing/Comprehension)

Questions
1 to 7 address Awareness
8-12 address Discrimination
13-17 address Identification
18-27 address Comprehension

Given this context you can talk to parents about the progress the child is making with regards to auditory levels of development
Auditory Skills Checklist-scoring example

Goal: Auditory Memory of Nursery Rhymes or songs: Child recites salient parts of a nursery rhyme or song.

None 0
Intonation 1
Actions 2
Keywords 3
Most or all words 4
Auditory Skills Checklist

Additional space is provided to note details such as whether responses were prompted or occurred spontaneously.
Developing Goals and Instruction

Sample Auditory Skill - Indication of onset vs. offset of sound: Child is able to indicate when sounds stop and start. Child moves a toy while the adult is vocalizing, stopping when the adult’s voice stops or plays musical chairs appropriately.

1) Discuss other ways to identify this skill
2) Write a goal for an IFSP or IEP
3) Explicit instruction for promoting this auditory skill
Developing Goals and Instruction

Sample Auditory Skill- Self-monitoring of speech using auditory model: Child modifies his/her speech to more closely match an adult model. Examples: Child lowers pitch of voice after listening to adult produce a lower-pitched sound, approximates articulation (such as producing “mmm” in response to hearing “moo”), or modifies speech from “pour” to “more” to match a spoken cue. Acquisition of this skill indicates that the child is able to use audition to improve speech production.
Developing Goals and Instruction

Sample Auditory Skill- Self-monitoring of speech using auditory model

1) Discuss other ways to identify this skill
2) Write a goal for an IFSP or IEP
3) Explicit instruction for promoting this auditory skill
Developing Goals and Instruction

Sample Auditory Skill- Auditory memory of digits: Child repeats numbers or letters in sequential order, such as “3-6-2-7” or “b-d-t-r”

1) Discuss other ways to identify this skill
2) Write a goal for an IFSP or IEP
3) Explicit instruction for promoting this auditory skill
Developing Goals and Instruction

Sample Auditory Skill- Use of electronic sound sources: Child is able to understand a message from an electronic sound source, such as a recording, loudspeaker or radio. This does not include systems coupled to the speech processor, such as FM systems. Example: Child understands the message from a school loudspeaker or repeats a phrase from the soundtrack of a video.

1) Discuss other ways to identify this skill
2) Write a goal for an IFSP or IEP
3) Explicit instruction for promoting this auditory skill
Sample Auditory Skill- Understands in background noise: Child comprehends primary speaker in the presence of background of noise or competing messages, such as in a crowded waiting room, a noisy restaurant or while music is playing in the therapy room.

1) Discuss other ways to identify this skill
2) Write a goal for an IFSP or IEP
3) Explicit instruction for promoting this auditory skill
Auditory Skills Checklist

The Auditory Skills Checklist is frequently used as a “teaching tool” for parents
1) parents of the child with hearing loss
2) professionals who have a student with hearing loss in their classroom for the first time
Any questions about the Auditory Skills Checklist?
Case Studies
Audience participation
Task:

1. Identify child’s auditory skill level using AuSpLan, LittlEARS Auditory Questionnaire and Auditory Skills Checklist

2. Is child making progress that would be expected yes/no?

3. Develop auditory goals and any other recommendations
Conclusion

• Determine factors that may impact expectations for developing listening and verbal language

• Based on these factors can project outcomes, focus on therapy and techniques to be used - one size does not fit all

• Use monitoring tools, hierarchy of skill development to determine if child making appropriate progress expected

• If not, red flags, re-assess all areas and address

• Do not set expectations too low

• Set appropriate goals
MaryKay Therres
marykay.therres@medel.com

Virgi Mills
virgi.mills@medel.com