Evaluating Auditory/ Listening Disorders: Audiologists and Speech/Language Pathologists Working Together

Lois Kam Heymann MA, CCC/SLP, lheymann@chchearing.org
Rebecca F Kooper AuD, CCC/Aud, Rebecca.Kooper@gmail.com
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The Problem

• My child, “George”, has difficulty following directions and oral instruction in the classroom. He says “huh” and “what” often at home and at school. He needs to have directions repeated more than once. His teacher (neuropsychologist, speech language pathologist, pediatrician and great aunt) says he probably has an auditory processing disorder.

• Is this true?

• Do you REALLY know?

• If true, what are we going to do about it?
Traditional approach

• Auditory processing evaluation
• Often no other evaluation has been completed (although literature supports evaluations by other professionals, especially the speech language pathologist).
• If speech language evaluation was completed, usually includes language skills (CELF or CASL) and speech testing (Goldman-Fristoe).
• Rarely are auditory based language tests administered.
“George” passes the APD tests

- Now what???
- Do nothing- tell them he passed.
- Recommend preferential seating (and what happens when everyone in the class needs preferential seating???)
- Recommend evaluation for attention issues

**THIS IS NOT HELPING “GEORGE”. How can we help him?**
Differential diagnosis

• Where is the breakdown?
Listening in and out of the classroom

- Need to identify all components of listening
- Can only be done by speech language pathologists and audiologists working together.
Building Blocks of Auditory-Listening-Language Processing

Oral Cohesion
Following oral directions • Answering oral questions • Identifying main idea

Phonological Segmentation
Auditory Figure-Ground

Phonological Blending
Auditory Phoneme Discrimination
Supra-Segmentals (temporal)

Auditory Memory
Auditory closure

Auditory Sequential Memory
Binaural Integration Separation (dichotic)

Auditory Attention
Auditory vs Language processing

- Processing the auditory signal
- Processing the information imparted in that signal.
SLP and Audiologists working together.

- Auditory processing tests require only a repetition of what is presented. The direction is to “repeat the word(s) or to repeat the sentence”. There is no requirement to analyze what is said and to answer a question. This is a higher level of processing that is not typically assessed in an auditory processing evaluation. Since today’s results do not explain why V requires visual cues to process information in the classroom, more in-depth listening/language testing is recommended. This evaluation should probe how V uses her auditory skills to receive and act upon auditory/linguistic information.
What is Auditory Processing?

• ASHA definition
  • Will have difficulty in one or more of the following skills
    – localization/lateralization
    – Auditory discrimination
    – Auditory pattern recognition
    – Temporal aspects of audition (timing)
      • Temporal resolution
      • Temporal integration
      • Temporal ordering
    – Auditory performance decrements w/ competing stimuli
    – Auditory performance decrements w/ degraded acoustic signals
Auditory processing tests

• Assessed by using a battery of tests- usually around 5 to 6 tests.
• Each test should assess a different process
  – Dichotic tasks
  – Degraded signal
  – Temporal processing
  – Speech-in-noise
  – Phonemic synthesis***
  – Auditory attention
• Electrophysiological testing
Dichotic Tests

- Dichotic Digits
- Competing Words (SCAN3)
- Competing Sentence (SCAN3)
- SSW
Temporal Processing

Tests

• Frequency pattern sequence****
  – Verbal vs Hummed

• Duration pattern

• Gap detection tests
  – Gap In Noise
  – Random Gap Detection test
Degraded signal Tests- assesses auditory closure

- Low-pass filtered
- Time compressed
- Speech-in-noise
Speech in noise tests

- Auditory figure ground subtest of the SCAN C
- Speech in Noise
Looking for patterns: Probe a little further

• If there is a problem with dichotic digits- competing words
• If there is a problem with speech-in-noise: auditory figure ground
• If there is a problem with frequency pattern-duration pattern
• If there is a reading decoding problem- phonemic synthesis
Results

• Look for a pattern
  – Dichotic digits vs competing words
  – Speech in noise vs auditory figure ground
  – From SLP eval to APD eval

• Don’t need 20 tests to diagnose an auditory processing disorder.

• Lack of a pattern is indicative of a more global disorder
  – Attention
  – Cognitive
• Limits to APD eval
  – Don’t test discrimination
  – Don’t test memory
  – Need to be aware of attention
  – Some pass but have listening problems not assessed in this evaluation
  – Minimal age- 7 years
Process

• Information packet
  – Background info
  – Checklist (parent and teacher)
  – If special ed, psych, SLP and other relevant info (IEP)
  – If general education, any reports

• Audiological
  – Pure tone/ speech audiometry
  – Immittance:
    • tymps
    • Reflexes, ipsi and contra
  – OAEs
Audiologists

• Must realize that auditory processing is not the sole factor impacting auditory learning.
SLPs

• Need to understand how auditory skills impact the development of language skills
• SLP Listening/Language Processing evaluation
  – Why SLP evaluation after audiological evaluation and before APD evaluation?
  – Listening tests
    • AB nonsense word list
      – Listening alone (discrimination)
    • TAPS
      – Word discrimination
      – Phonological- segmentation/ blending
      – Memory
        » Numbers
        » Words
        » Sentences
      – Auditory comprehension
        » Read a paragraph and answer questions.
    – Auditory reasoning
SLP eval (3 hours)

- APAT (Auditory Processing Abilities test)
  - Cued recall
  - Semantic relationships
  - Content Memory
    - Immediate
    - Delayed
  - Following auditory directions.
Basic Battery

- PPVT
- EVT
  - Labeling vs synonyms
- Test of Narrative language
Deep Testing

• Further exploration based on previous findings
• If language problem
  – Is there an auditory basis or language basis
• If problem with following directions on APAT
  – Administer CELF -4: Concepts and Following Directions
• If auditory comprehension is poor on TAPS, administer Auditory comprehension on CELP-4, test of language comprehension
• Problem with knowledge- give CELF 4 categories
• Auditory sequential memory- administer subtest on CELF 4 Familiar sequences.
• If synonyms are poor, administer CASL: word knowledge
• If pragmatics are poor, give CASL: pragmatic testing
• Social skills problems may have an auditory basis
Putting it all together

• Auditory processing
• SLP
• Look for consistent patterns together.
• Review qualitative and quantitative results
  – Qualitative
    • Delays in response, off topic, inattentive, sensory defensive vs sensory seeking, what strategies does child use (quiet rehearsal)
Difference is in the analysis

• Analyze results looking for what area and level where the breakdown occurs
• Audiologist writes errors and analyzes for patterns.
• Differential diagnosis
  – Good top down (reasoning)
  – Poor bottom up (memory, discrim, noise)
    • Good top down does OK until 3rd grade
      – Break down occurs because the classroom lessons become more
        » Lengthy
        » Complex
        » Auditory
      – Less visual, less repetition, need to take notes while listening, more interactive listening (classroom discussion)
## Summary of test results (Ex)

<table>
<thead>
<tr>
<th>TESTS</th>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Auditory Processing tests by Audiologist</strong></td>
<td></td>
</tr>
<tr>
<td>Dichotic Digits</td>
<td></td>
</tr>
<tr>
<td>Pitch Patterns</td>
<td></td>
</tr>
<tr>
<td>Filter Words</td>
<td></td>
</tr>
<tr>
<td>Auditory Figure-Ground (SCAN 3)</td>
<td></td>
</tr>
<tr>
<td>Gap Detection</td>
<td></td>
</tr>
<tr>
<td>Competing Sentences (SCAN 3)</td>
<td></td>
</tr>
<tr>
<td>ACPT</td>
<td></td>
</tr>
</tbody>
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| Language/Listening tests by Speech/Language Pathologist             |         |
| Peabody Picture Vocabulary                                         |         |
| Expressive Vocabulary Test                                          |         |
| TAPS subtests                                                       |         |
| • Word Discrimination                                              |         |
| • Phonological Segmentation                                        |         |
| • Phonological Blending                                            |         |
| • Number Memory Forward                                            |         |
| • Number Memory Reversed                                           |         |
| • Word Memory                                                       |         |
| • Sentence Memory                                                   |         |
| • Auditory Comprehension                                           |         |
| • Auditory Reasoning                                                |         |
CASE #1- Chase

- 18 years old
- Was previously diagnosed with borderline ADD from second grade until HS for medication was prescribed.
- In second grade, entered a school for children with learning disabilities.
- Musical, a good athlete
- Had tutoring in order to achieve academically
- Struggled in school
- In HS, went into general education, however was in a private, small class setting.
- When he turned 17, stopped medication for ADD.
- Went to college and dropped out after first semester.
APD eval

• Referred to center after the first semester in college.
• Normal hearing
• APD eval-
  – Dichotic digits- WNL
  – Freq pattern- WNL
  – Gap detection- WNL
  – Filtered words- WNL
  – Competing sentences- WNL
Listening/Language Evaluation

- Attention- good
- Auditory memory- below age appropriate norms
- Auditory sequential memory- (difficulty with months of the year, following directions)
- Phoneme discrimination- Difficulty with short vowels in words.
- Poor auditory comprehension for paragraphs.
- Receptive and Expressive Vocabulary- below (esp for synonyms)
- Narrative language- difficulty telling a story in a concise way with good structure.
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Phonological Segmentation
Phonological Blending

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- Supra-Segmentals (temporal)

Auditory Sequential Memory
- Auditory Closure
- Binaural Integration Separation (dichotic)

Auditory Attention
Chase

- Dx- Poor auditory memory and discrimination skills which adversely impact language processing.
  - Comprehension negatively impacted by
    1. Inability to discriminate words correctly
    2. Poor vocabulary impacts the comprehension of information
    3. Poor auditory memory inhibits his ability to hold onto new and lengthy information presented auditorily which affects his social interaction and academic skills.
An example of an integrated treatment plan

- Auditory comprehension of paragraphs
- Auditory memory
- Discrimination
- Vocabulary

Narration
Therapy Plan for Chase

• Reinforced no need for medication for ADD.
• Auditory Memory
  – Re-auditorization of long sentences within a paragraph
  – Writing to dictation
• Auditory discrimination for short vowels in words
• Vocabulary expansion through listening and reading
  – Synonyms
  – Categorization
  – Multiple meanings
Case #2 Sophie

• 10 year old
• Complaint: She seemed so bright but her teacher felt she wasn’t understanding the lessons.
• Starting to have difficulties in informal conversation with groups of friends.
• According to mother (who is a speech language pathologist)
  – At home, Sophie asks for repetition of auditory information and often reverses sounds when using a multi-syllabic word.
  – Questioned ability to hear in noise.
Building Blocks of Auditory-Listening-Language Processing

Oral Cohesion
- Following oral directions
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Phonological Segmentation

Phonological Blending

Auditory Memory
- Auditory Figure-Ground
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Auditory Attention
APD eval

• Hearing – WNL
• Dichotic digits-  R WNL, L Below
• Auditory Figure ground of SCAN 3- Below
• Competing sentences of SCAN 3- significant right ear advantage.
• Frequency Pattern- WNL
• Filtered words- below
• GIN- Within normal limits
Diagnosis

- Auditory weaknesses in
  - Auditory closure
  - Binaural integration (left ear deficit)
  - Speech in noise

- Listening/language weaknesses
  - Auditory memory (sequential)
  - Phonological blending/segmentation
  - Auditory cohesion
Listening/Language Evaluation

• Attention- good
• Auditory memory- borderline
• Auditory sequential memory-borderline
• Phonological blending/segmentation- below
• Auditory comprehension for paragraphs- good
• Auditory reasoning (cohesion)- below
• Receptive and Expressive Vocabulary- WNL
An example of an integrated treatment plan
Recommendations

• Preferential seating
• FM
• Auditory figure ground training
• Left ear only stimulation
  – DIID
• Auditory closure
  – Vocabulary
• Phonological training
• Auditory memory
#3 Conrad

- 5 ½ years of age
- Complaint: Poor conversational skills, asks for repetition of auditory directions, can only follow one step directions.
- History of middle ear infections.
Building Blocks of Auditory-Listening-Language Processing

Oral Cohesion
- Following oral directions
- Answering oral questions
- Identifying main idea

Phonological Segmentation
- Auditory Figure-Ground
- Auditory Phoneme Discrimination
- Supra-Segmentals (temporal)

Phonological Blending
- Auditory Memory
- Auditory Sequential Memory
- Binaural Integration Separation (dichotic)

Auditory Attention
Evaluation

• Too young for comprehensive auditory processing evaluation
• Hearing WNL
• Administered screening portion of SCAN 3 to determine if he may be at risk for auditory processing disorder.
  – Figure ground- just below age expected norms.
  – Competing Words-WNL
Listening/Language Evaluation

- Attention- questionable
- Auditory memory (recalling sentences)- poor
- Auditory sequential memory-poor
- auditory content memory- poor
- Receptive and Expressive Vocabulary- low average
An example of an integrated treatment plan

- Auditory memory
- Auditory figure ground
- Aud sequential memory
- Word knowledge
- Auditory comprehension
Recommendations

• Preferential seating
• Auditory figure ground training
• Auditory memory
  – Following directions
• Auditory comprehension
• Word knowledge
• Consider full APD evaluation at age 7 if progress is not seen with therapy.
Differential diagnosis and targeted therapy are the keys to listening success.