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From Assessment to Intervention:
Assessing Functional Auditory Performance, Setting Goals and Example Intervention Tips for Children with Hearing Loss

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Financial Disclosure


- Kit Includes the Guidebook for APT/HI: From Assessment to Intervention with 178 Videos © 2016 Plural Publishing, Inc.

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Nonfinancial:
- Past Founding Director of Clarke Jacksonville (16 years)
- Past membership on special needs boards
- Over 100 Presentations nationally
- Past and present membership in several professionally-related organizations.
I would like to thank Plural Publishing, Inc. for their permission to use much of these videos, figures, and text.

I am stating this here at the beginning so that I don’t need to have the information on the slides.

Learning Outcomes

After this course, participants will be able to:

- Describe an assessment protocol model used successfully for children with hearing loss at Clarke Schools for Hearing and Speech-Jacksonville (a.k.a., Clarke Jacksonville).
- Describe how to assess functional auditory performance, to interpret results, and to develop auditory intervention goals along a continuum of skills using a minimum of four tools.
- List five or more intervention techniques that provide optimal outcomes for listening and spoken language proficiency.
It is essential that practitioners working with individuals with hearing loss: audiologists, aural habilitationists, speech language pathologists, auditory-verbal therapists, educational audiologists, interventionists, etc., have specific roles and should share information across disciplines and work collaboratively to develop optimal listening, communication and literacy skills for ultimate success and an array of options through life for the individual with hearing loss.

Landscape of Deafness Has Changed Dramatically Since the 60's and 70's

- Alan in the 60's
Here Is What We Know Today: ACCESS!

- Newborn infant screening programs: early identification has enabled us to fit amplification technologies and cochlear implants on babies and take advantage of the best possible time for neural plasticity of the brain.
- New hearing aid technology
- New FM technology
- Cochlear Implants: We can now stimulate auditory brain centers that could not be accessed with previous less effective generations of amplification technologies
- New Expertise in intervention techniques

Amelia: 4 Years; Bilateral CI's:
Here is What We Can Expect Today With Appropriate Access and Intervention...Even With Congenital Profound Hearing Loss
Introduction:

Some Basic Information for the Presentation:

What We Also Know Today: few slides
- Access to Quality Acoustic Signal
- Speech Acoustics Needed for Intervention
- “Listening Drives Everything”
- A Comprehensive Intervention Program
- The “3 P’s” (Perceive, Process, Produce)
- The “3 P’s” and Erber’s Levels of Listening
- Listening and Brain Function
- Assessment is Critical to the Process of…
- Acquiring Auditory Perception Skills for
  - Intelligible Speech Production and Oral
  - Language and literacy

Access: Speech Acoustic Information Needed for Intervention
For EXAMPLE

To hear and identify words/language, one must have access to vowel formants and consonant features such as:

- Fundamental Frequency, Fo, for Suprasegmentals and discrimination of voice vs. voiceless distinction
- There are 3 Vowel Formants: Need at least 2 Formants to discriminate between /u/ and /i/
- Hearing up to 1000 HZ for detection of vowels and discrimination of Manner of Production.
- Place of Production requires hearing above 1000HZ. ETC.

Foundations of Listening Development:

"Listening Drives Everything Else!"

A Comprehensive Auditory Speech Program

© S.G. Allen 1986

Figure from: Allen, Susan (2015). Auditory Perception Test for the Hearing Impaired, APT/HI. ©2015 Plural Publishing. Used with Permission

A COMPREHENSIVE EVALUATION Is Critical to Develop an Effective Plan of Intervention

Auditory Evaluation
Speech Evaluation
Language Evaluation

For More Information on ASSESSMENTS Refer to Audiologynline.com
Course #1056 Assessment, by Ashley Garber
Foundations
Foundations of Listening Development

AUDITORY LISTENING TRAINING

Suprasegmentals
Vowel Identification
Consonant Identification
Discrimination of Blends

Word/Phrase Discrimination
Sentence Discrimination
Linguistic Comprehension
Communication Competence

Use of Appropriate Amplification
Use of Audition with/without Background Noise
Use of audition at varying distances
Auditory Memory and sequencing of elements

AUDITORY-BASED SPEECH THERAPY

Suprasegmentals
Phoneme Development
Phoneme Combinations
Blends
Words/Phrases/Sentences
Connected Speech

Plus; Breath Control
Oral-Motor Control
Automaticity
Resonance/Voice Problems
Pitch Control Intonation
Rate/Prosody

Speech Readiness
Speech Memory/Retrieval
Orthographic System
Speech Notebooks/ Carryover Tools
Foundations
Foundations of Listening Development

LANGUAGE DEVELOPMENT

Vocabulary/Semantic Elements
Morphologic/Phonologic
Orthographic
Syntactic Rules
Pragmatic Principles
Aural Receptive
Oral Expressive
Written Receptive
Written Expressive

For More Information on ASSESSMENTS Refer to Audiologyonline.com
Course #1056 Assessment, by Ashley Garber

1. Frontal Lobe
   Reasoning, planning, parts of speech and movement, emotions and problem solving
   a. Broca's area
      (Organization of expressive language)

2. Temporal Lobe
   Reception and Perception of auditory stimuli and memory
   b. Wernicke’s area
      (Perception of auditory signals)

3. Parietal Lobe
   Touch/Pain/Pressure

4. Occipital Lobe
   Vision

Adapted from Janice Egan, A.G.Bell Presentation, Clarke Schools
Foundations of Listening Development

S.G. Allen’s “3 P’s” for Brain Function in Listening:

The following language processes occur in the left hemisphere of the brain:

**Perceive** - Wernicke’s and auditory areas in temporal lobe

**Process** - Cerebral cortex

**Produce** - Broca’s + motor planning areas in the frontal lobe

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THE "3 P’S" OF NORMAL DEVELOPMENT

1. Perception Stage
   - Auditory Perception
   - Learning
   - (Oral Speech & Language)

2. Processing Stage
   - Cognitive Operations:
     - Auditory Processing
     - Speech Programming
     - Language/Cognitive Planning

3. Production Stage
   - Intelligible Speech and Oral Language
Foundations of Listening Development

The 4 Levels of Listening

- The 3 P's & DETECTION
- The 3 P's & DISCRIMINATION
- The 3 P's & IDENTIFICATION
- The 3 P's & COMPREHENSION

Based on work by Norman Erber
Adapted by S.G. Allen to incorporate the 3 P's

Assessment

"You've got to know where you are to know where you are going"
Important Reasons to Assess

1. Determine the problem at that point in time
2. Determine baseline performance data
3. Monitor Treatment Process


I would add for this presentation:
Determine Performance pre/post change in amplification (e.g., cochlear implants)

Developmental Assessment

The professional practitioner needs:

To understand speech perception,
articulation,
and language development

to guide a child to acquire skills

“developmentally.”
Developmental Assessments

- Children with hearing loss identified early (without significant other issues) should be able to follow a “normal pattern of auditory, speech, and language development”

- Consistent and ongoing assessments over time are the key to making this goal a realistic one

Assessment Instruments

~2 yrs~ Preschool Child and Older

**Auditory Perception**
- ESP
- APT/HI
- TAPS
- APAT
- Checklists: Auditory Learning Guide; Sunshine Cottage CASLLS

**Speech**
- GOLDMAN-FRISTOE
- LING PHONETIC LEVEL
- CID PHONETIC EVALUATION
- Arizona Test of Articulation

**Vocabulary and Language**
- PPVT
- AVT
- ROWPVT
- EOWPVT
- PLS
- OWLS
- TOLD-P
- CASL
- CASLLS
- CELF
- TASL
Putting Together A Puzzle: 3 P’s

- Determining why a child is not making progress is like putting together the pieces of a puzzle.
- The Practitioner Needs to ask questions and to look at a variety of possible factors for deficits.
- It is known that associated conditions may affect the listening, speech, language, academics, and quality of life outcomes for individuals with hearing loss.

(Couples, et.al., 2018)

Four Assessment Instruments for Auditory Perception Used In Model

- Early Speech Perception Test (ESP) (Moog & Geers, 2012);
  http://www.cid.edu/professionals/shop/cid-esp-early-speech-perception-test/

- Auditory Perception Test for the Hearing Impaired APT/Hi, Third Edition (Allen, 2015); Guidebook for the APT/Hi: Assessment to Intervention
  https://www.pluralpublishing.com/publication_apthi3e.htm

- Test of Auditory-Perceptual Skills (TAPS-3, 2005) (Gardner, ).

  https://www.stoeltingco.com/auditory-processing-abilities-test-apat.html
Early Speech Perception Test, ESP, Updated 2012 (Moog & Geers)

- Developed to obtain more accurate information about speech discrimination skills with children having limited auditory skills as the child with hearing loss develops verbal abilities.

- Created to be used with young, profoundly hearing-impaired children with limited vocabulary and language skills, and it was created to fit their linguistic, cognitive abilities, and their interests. Sample scoring form online.


APT/HI, Third Edition
To Assess Speech Perception Skills

Auditory Perception Test for the Hearing Impaired

SUSAN C. ALLEN, M.D., M.S., CCC-SLP
Auditory Perception Test for the Hearing Impaired
APT/HI, Third Edition

- Assist Auditory-Verbal Practitioners, Audiologists, Speech-language Pathologists, Teachers, Interventionists, etc., to effectively assess auditory function.
  - Evaluates a hearing impaired student’s ability to decode spoken language through audition.
- Determines targets for individual auditory listening/learning programs by identifying areas of deficiencies with task analysis tasks of specific skills:
  - measures the student’s progress in auditory skills development
  - compares results in auditory performance before/after intervention

It’s not the test itself, but the KINDS of auditory skills that are assessed on this test:

APT/HI assesses 8 major areas: 50 TASKS
of auditory perception continuum of skills:

Auditory Awareness Tasks (e.g., # of beats in speech sound)
Suprasegmental Aspects: DIP (e.g., BAbA vs. bABA)
  • Duration
  • Intensity
  • Pitch
Prosodic Perception Tasks (e.g., Bob fell vs. Dan is jumping)
Vowel Perception Tasks (e.g., boys/bees/bows)
Consonant Perception Tasks (manner, voicing, place) (e.g., moo/two/shoe)
Other Segmental Perception Tasks (e.g., box/fox/socks)
Linguistic Perception Tasks (i.e., tracking sentences verbatim)
Communicative Comprehension Tasks (i.e., no topic, open-set questions)
Why is Assessing Discrete Auditory Skills Important? Because of their inter-relationship with LITERACY

- For Example: Discrete Skills on APT/HI
- PP3-4: Identification of sentences using suprasegmental information and syllabification and concept of word
- CM1-CP2: Identification of initial consonants and rhyming, blending, vocabulary comprehension
- OS4-OS5: Identification of phonemes in different phonemic environments and Phonemic awareness, developmental spelling patterns


APT/HI Auditory-Only Profile
An Auditory/Visual Profile is also included
Right on Track!
Speech Perception Assessment of a Developmental Child

- Consonant Perception Tasks
  (manner, voicing, place) – MVP

- Identification of Words Beginning
- With Consonants Differing In Voicing:

  - CV2: "Coat and Goat"

- Identification of Words Beginning
- With Consonants Differing In Place of
- Production: Madison, 2;7

- CP1: "Boat and Goat"
Consonant Perception Tasks (manner, voicing, place) - MVP

Identification of Words Beginning With Consonants Differing In Place of production: CV2: “Boat and Goat”

Research:

Figure 8
Example student BM.

2 years at receipt of cochlear implant and start of therapy

Percent Correct

May-01
Dec-01
May-03

API/18
2%
0%
96%

GTA
0%
47%
99%

API/18 = Auditory Perceptual Test for the Hearing Impaired
GTA = Goldman-Fristoe Test of Articulation
Research: Test-Retest Reliability and Interrater Reliability

APT/HI-S

*Auditory Perception Test for the Hearing Impaired* for the Spanish-Speaking Population:

Coming Soon!

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Test of Auditory Perception Skills Revised (TAPS 3) (Normed on Hearing Children)

- Used to assess various areas of auditory perceptual skills;
- Revised by Gardner
- TAPS-3 (2005) provides information used to diagnose subjects who have auditory perceptual/processing difficulties which may be related to language problems that interfere with learning.
APAT: Auditory Processing Abilities Test 
(Swain & Long, 2004)

- Nationally standardized, norm-referenced auditory processing battery for use with children ages 5-0 through 12-11.
- May be used in the identification of children who are at risk or who may experiencing Auditory Processing Disorder (APD).
- Developed using a model based on a hierarchy of auditory processing skills that are basic to listening and processing spoken language. These skills range from sensation to memory to cohesion.

https://academictherapy.com/detailATP.tpl?action=search&eqskuData=8353-6

Assessment of Functional Auditory Listening Skills is Critical Because...

“Again, you've got to know where you ARE to know where you are GOING”

BECAUSE…
Assessment of Functional Auditory Listening Skills is Critical Because....

Learning to Listen Drives Everything!

- Auditory Skills
- Speech production
- LANGUAGE!
- Reading
- Academics
- Lifelong Learning
- Ability to live in a Listening-Speaking World

Implications of Assessment for Intervention

- Remediation requires appropriate assessment to identify areas of weaknesses or deficits

- While assessing, look for additional issues that may influence therapy techniques (3 P's) The presence of additional issues affect the ability to perceive, process and produce spoken language

- Assessment is necessary to ensure that the developmental process is occurring, according to developmental milestones and age equivalencies
When Developing an Intervention Plan

- Focus on “red flag” behaviors seen in the evaluation that have impacted a child’s progress: For example...
  - Perceiving:
    - Poor listening posture
    - Poor turn-taking skills
  - Processing:
    - Wait time over 8-10 seconds
    - Lack of Auditory Memory
  - Producing:
    - Inability to combine breath and voice in production (e.g., /fa/) without breathiness carried over to the voiced phoneme
    - Implosion
    - Groping Behaviors
  - Other: Poor pointing and scanning skills

Developing an Intervention Plan:

- TO DEVELOP goals that are developmentally appropriate for the child’s listening, speech intelligibility, vocabulary and language ages,

  - You must know auditory skill development hierarchy

  - Because...."Ages and Stages of Learning to Listen...You can’t Skip a Step” or greater gaps will occur. From experience this is true, for a baby and/or an individual who just received a cochlear implant.
Where Do You Start When the Dots Don’t Connect?

- How does the child respond to the Ling Six Sound Test?
- Does the child have a solid conditioned response?
- How do you establish a good conditioned response?
- Does the child understand the concept of Same vs. Not the Same (Same vs. Different)
- Does the child respond appropriate to Listening vs. Talking

For Example: Where do you Start Before and After a Child is Appropriately Amplified?
Intervention: Example Tips/Techniques

- The Auditory Mode vs Visual
- 4 Levels of Listening for Talking
- Circle of Listening
- Listen, Say, Point

Tip 2: Speech Babble & 4 Levels of Listening for Speech Production

Speech Babble Listening Hierarchy Based on Daniel Ling’s Speech Hierarchy:

- Same Consonant, Same Vowel
- Same Consonant, Different Vowel
- Different Consonant, Same Vowel
- Different Consonant, Different Vowel
Why Speech Babble?

- The auditory sound schema must be perceived and processed and clearly impressed upon the limited hearing child before he can imitate/produce words correctly.

- Practice and repetition are critical for coordinating listening, processing, motor skills, production... (i.e., “All Systems Go.”) Dr. Christina Perigoe

Intervention Tip Two

Auditory Perception for Speech Production Adapted from Dan Ling:  The Four Levels of Listening for Speech Production
Use a language level appropriate for the child to process. If the child does not understand what is said, the speaker should use these steps as needed: first check for attention, then repeat the utterance, then reduce or reword the utterance if necessary for clarification, and/or highlight key words for comprehension. Then repeat the ORIGINAL utterance for immediate reinforcement. Correct production by the speaker/child will then reinforce the listening skills and complete the “loop”. In other words, present the language (i.e., vocabulary and language grammatical structures) through audition first (in 3 different ways) before using additional cues (such as visual.) Also, parents and professionals using the “Circle of Listening” feedback/feedforward loop should implement it at all times to develop maximum auditory and speech skills and not compromise listening too soon with visual or other cuing. Or, giving the answer too soon doesn’t provide opportunities for processing, learning, and retaining.
Jorden: First ABI Child in United States

Case History:
- A twin born premature at 30 weeks
- Hospitalized for 7 months in NICU
- Severe profound mixed hearing loss
- Craniofacial outer, middle and inner ear abnormalities presented with Goldenhar Syndrome
- Auditory Brainstem Implant not approved in the United States
- Consulted with Dr. Vittorio Colletti in Verona, Italy
- Implanted with ABI at 3 years, 3 months of age
- Due to lack of progress, enrolled in Clarke Jacksonville Program in summer of June 2007; age 5
- [http://www.hearingreview.com/issues/articles/2010-08_03.asp](http://www.hearingreview.com/issues/articles/2010-08_03.asp)

Intervention Tip Four

*Listen, then Say, then Point … Why?*  Age 8
Remember the “3 P’s!”

Perceive
Process
Produce

Intervention Tip Five

Intervention Tip Six:

Model for Therapy and Classroom Instruction:

1) Start with the Known (Review)

2) Add New Information

3) Review old information again and pair with new information to imbed in memory and to use/generalize.
Tip Seven: Sounds I Know: SIK

Case Study:
Chase at 3 with Hearing Aids, before CI
Not There Yet: Chase APT/HI, Age 6

Chase
11 Months Post-Implant

- APT/HI (blue bar)
- Auditory Perception
- GFTA (red bar)
- Speech Production

- Positive Correlation
- for improved speech intelligibility
It is not only important for the deaf child to acquire maximum listening skills, to comprehend language, and to produce intelligible speech, but the deaf child must also achieve oral language and literacy to be successfully mainstreamed into neighborhood schools and general education. It is being done and the future looks even brighter with today’s technology and expertise.

I want to thank all of the children, parents, and staff for their permission to use videos to support key points in this presentation and to Plural Publishing for use with their permission.
References and Recommended Readings

Auditory Brainstem Implanted Child: Age 8