Hearing is considered a foundation for the general education of all children.

- Classrooms are auditory verbal -60-70% of instruction is auditory
- Academic and instruction is presented with the assumption that the child can hear, attend and understand voice
- High correlation between auditory, language and reading disorders
- Flexer, 1994 “On any given day, 30% of kindergarten and first graders were not hearing enough to perceive the word-sound distinctions that underline the development of academic competence”

**SIMILAR BEHAVIORS**

- Johnny isn’t listening?
  - Distracted (ADD)-visual/auditory?
  - Decreased hearing in background noise (APD)
- He is a poor auditory learner
  - Poor memory/focus
- He can’t follow multi-step directions
  - Memory, distracted, understand instructions?
IMPROVE TREATMENT? DIFFERENTIALLY DIAGNOSE!

- Evaluate/identify deficit areas
- Review test results (psychoeducational/SLP)
- Watch the students and their behavior
- Be specific – what is the student doing?
- Do not say “Did you hear me?”
  – Ask: “What did I just say?”
  – Disney-see vs do

AUDITORY PROCESSING DISORDERS

CAPD=APD

CHANGES IN APD DIAGNOSIS

- CAPD/APD same disorder
- Diagnosis is deficit specific, not general APD
- Neuroplasticity of the brain improves our ability to use interventions to change the brain function, not just accommodate
- Multi disciplinary approach is critical
- New treatment options - Computer based
APD DEFINITION
BY SUZANNE FOLEY

APD = Ear to the Brain

**Does the Child hear?**
- CAT = CAT
- **CATCH = CAT**

APD Testing DOES NOT test meaning, interpretation or analysis that is evident in reading, writing or oral expression.

APD = Clarity

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AUDITORY VS. LANGUAGE

**TOP DOWN = LANGUAGE**
- Knowledge of language/interpretation
- Meaning of sounds
- Affects reading, communication and learning.

**PRELINGUISTIC MEANING**
- Phonological awareness
- Auditory discrimination

**BOTTOM UP = APD**
- Acoustic information before linguistic interpretation
- Detection/Clarity
- Auditory signal from ear to brain

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APD IN SCHOOLS

- **Treatment for significant APD will not come from school** - needs more intensive intervention - private therapy, CBAT, etc.
- APD does not qualify as OHI for 504
- (9 states: AK, AZ, CA, HI, ID, MT, NV OR, WA)
- Add suggestions to Communication disorder IEP with SLP
- Commonly misdiagnosed with Language Processing and Attention issues
UMBRELLA ISSUES

• Auditory, language, reading and writing skills affected by:
  – Executive Function
  – Memory
  – Attention
  – Cognition
  – Working Memory
  – Sensory integration

CAUSES/CASE HISTORY

• Can’t learn foreign language or vocabulary words
• Articulation-errors longer than normal
• Delayed language development
• History of chronic otitis media
• Jaundice

**60% of APD is delay in auditory development- Right ear Advantage****

SCREENING FOR APD

• Case history
• Questionnaires (see PB works)
• Screening tests: DSTP-Linguisystems, SCAN, TAPS-3
• Other evaluations (SLP/Psych)
• Student Behaviors
SLP TESTS USED AS APD SCREENING

- TAPS-3= auditory memory-digits vs words
- LAC/Pat-Phonological awareness
- Language tests with no visual subtests-recalling sentences
- Listening behaviors
- Auditory discrimination-no great test
- Lower receptive language than expressive

PSYCHO-EDUCATIONAL TESTS AS SCREENING FOR APD

- Digit Memory
- Word/Sentence Memory
- Lower verbal IQ than performance
- IQ = Language Loaded
- Non verbal IQ test

PRESCHOOL AGE

- Children in speech and language
- Therapy issues-home programming
  - Auditory, visual and motor
- Screenings for SIN-can do 3-6ys old
- PSI/Goldman Fristoe Auditory Discrimination
- Implement strategies
- Continue monitoring of pre-reading skills
- Test at age six
DIAGNOSIS OF APD

- Can the child participate/respond?
- What will the evaluation add to treatment?
- Must be made by audiologist
- Can co-exist with other conditions
- Rule out hearing loss and other conditions
- Age of diagnosis 6 and over. Screenings from 3-5 yrs old.
- No gold standard of testing
- 60% of all APD children will outgrow condition
- Purpose of diagnosis should be for remediation options
- Incidence is 3-5% of school age population
- Higher ratio of males to females
- DEFICIT SPECIFIC

APD SKILLS

- BINAURAL INTEGRATION
- TEMPORAL PROCESSING
- AUDITORY CLOSURE/DISCRIMINATION
- DICHOTIC SKILLS
  – BINAURAL INTEGRATION
  – BINAURAL SEPARATION
List of APD tests on PB works

APD SKILLS BY BEHAVIORS
BINAURAL INTERACTION
• Cannot tell where sound is coming from
• Localization/lateralization
• Watch for unilateral hearing loss
• Not common
• Occurs at the brainstem level
• Tests: Spondee fusion/Masking Level Difference

AUDITORY CLOSURE/DISCRIMINATION
• Cannot fill in the blanks of what is not heard clearly
• Affected by poor acoustics, rapid speakers
• Consistent with receptive language
• Appear to be hearing-impaired.
• Tests: Monaural low redundancy tests:
  • Filtered words, Auditory figure Ground, SSI-ICM, Time Compressed Speech Tests

DICHTOTIC SKILLS
• 60% of APD have this time of deficit
• Due to developmental delay in auditory skills
• Will improve through age 12
• Right ear advantage/left ear weakness
• Typically clumsy, poor verbal to motor tasks
• Overwhelmed in noise
• Evaluate short term auditory memory
• Binaural Integration—both ears work together
  • Binaural Separation—directed listening
• Phone examples
TEMPORAL PROCESSING

- Cannot hear timing changes in speech
- Misunderstand voice changes with sarcasm, humor and questions
- Slow processors
- Cannot rhyme: ABC’s example.
- Pragmatic language issues
- Tests: Duration Pattern Test, Pitch Pattern Test

TREATMENT OPTIONS

**SHOULD BE DEFICIT SPECIFIC**

Improving Signal Quality: Accommodation-Bottom up
- Environmental Controls
- Classroom and Home strategies
- Assistive Listening Devices-FM systems
- CBAT
- Traditional therapy-School/Private SLP
  - Review behaviors and options for auditory training
  - Add movement to your sessions

Enhancing Language Resources: Remediation-Top Down
- Educational Programming
- Traditional therapy
- Reading programs
- Compensatory Strategies

ATTENTION DEFICIT

TYPES OF ADD/ADHD
- ADHD-HI: Hyperactive/Impulsive
- ADHD-I: Inattentive (higher incidence in girls)
- ADHD-Combined

APD SKILLS
- Auditory closure
- Temporal-cuing
- Dichotic
- Binaural integration
- Binaural separation
COMMON CHARACTERISTICS OF APD AND ADHD

- Decreased focus in noise
- Academic underachievement
- Familial pattern to disorder
- Low self esteem
- Reading or academic problems
- Says ‘Huh’ or demonstrates poor listening skills

DIFFERENTIAL DIAGNOSIS

- Look at behaviors—can’t follow multiple directions? Have them repeat directions for accuracy.
- Rule out APD or identify specific type of APD and related behaviors
- Tests of ADHD as controversial as those for APD
- Behavioral checklists/standardized testing for ADD
- Evaluate other evaluations
- APD: Lower verbal IQ, lower receptive language
- ADD: weak executive function/working memory
  - Look at TAPS-3 reversed number memory
  - Psychoeducational evaluations
  - Response patterns in ADD/APD: 5 correct/5 incorrect
  - Unusual error patterns in testing
- ADD inattentive type most similar to APD

DIFFERENT BEHAVIORS

**ADD**
- Physical anomalies: Sleep/wake cycles, bladder/bowel control, alcohol/drugs
- Distracted by different stimuli: visual, tactile, smell, auditory
- Off topic conversations
- NOT modality specific

**APD**
- Exhausted from listening
- Distracted by auditory information
- Misheard word for off topic
- Modality specific to auditory
DIFFERENT BEHAVIORS

ADD
• Academic performance is inconsistent/lack of retention
• Forgets assignments
• Good on homework, not tests-spelling words Thurs pm, not Friday test
• Fidgety behaviors/always moving/disruptive (ADHD)

APD
• Slow development of academic performance-delays
• Difficulty learning through auditory channel.
• No behavior problems

DIRECT THERAPY
DIFFERENT APPROACHES

ADD
• Decrease impulsive responses -improve self control
• Reduce all distractions
• Shorter treatment sessions
• Use of reinforcement - POSITIVE-reinforce the behavior you want
• Behavioral counseling

APD
• Improve self advocacy to ask for repetition
• Improve timeliness of responses (fast responses)
• Reduce Noise
• Use of reinforcement for increased self esteem
• Communication counseling

MEDICATION TREATMENT
FOR ADD/ADHD

Medication is prescribed in 88% of children diagnosed with ADD/ADHD
Studies show medication NOT helpful for APD
Several medications available for different types of attention
Dosage makes a difference!
Medication is only PART of treatment
Behavior modification is critical!
Counseling-ADD/ADHD coaches
Optional treatments – diet, bio (neuro) feedback – page 36
ADD RESOURCES

- ADD/ADHD Behavior management
- Teaching Teens with ADD and ADHD – Chris Dendy, M.S.
- “The Parent-Teacher ADHD Handbook”
- Parent training
- Additudemag.com – free newsletters via email
- Chadd.org
- ADDitude – homework strategies

LANGUAGE PROCESSING

- “A Language Processing problem is difficulty with accessing acquired language abilities (i.e., vocabulary) and efficiently integrating those skills to formulate more complex thoughts and responses.” - G. Richards
- No consistent definition
- Occurs on top of language/vocabulary acquisition (PPVT)
- Measured by output
- Can lead to reading, spelling, written expression and splintered academics
- Top down processing follows a developmental sequence.
- What meaning is attached to auditory signal
- “Wh” questions
LANGUAGE PROCESSING

- Higher level thinking and reasoning skills
- Last language skill developed- d/c K-6
- Listening Comprehension
- Idioms-Figurative Language
- Multiple meanings
- Attributes/functions
- Inferences
- Memory
- Word Finding

BEHAVIORAL ASPECTS OF LPD

- Problems with following directions (can repeat back information accurately)
- Problems understanding stories or concepts (main idea)
- Trouble “getting to the point” or answering questions with the appropriate information
- Difficulty naming objects or people (without visual)
- Difficulty knowing what to expect based on information they are given (thinking and reasoning)

TESTING FOR LPD

Rule out APD- confirm the clarity of the signal- can the student repeat the information accurately but not follow direction-Oliver

Reduce visual stimuli in language tests
- TAPS-3- Test of Auditory Perceptual Skills- Auditory Comprehension/Reasoning
- Listening Comprehension Test-2- Elementary and Adolescent
- TOPS- Test of Problem Solving- Elementary and Secondary
- TOWL- Test of Written Language
- Language Processing Test-3
- Word Test-3- Elementary and Word Test-2 Adolescent
- Test of Word Finding 2
AUDITORY MEMORY

MEMORY IMPACT ON ACADEMIC SUCCESS

- Difficulties with...
- Recalling learned material
- Recalling social information
- Recalling reading rules
- Integration new information with existing information (algebra)
- Watch phonological awareness and reading

GENERAL AUDITORY MEMORY

- Training in phonological awareness can improve short term auditory memory BUT must use phonological articulation features (how phonemes feel-Lips)
- Severe digit span deficit linked with dyslexia
- Short term auditory memory highly correlated with phonological awareness and then to working memory
AUDITORY MEMORY EXPECTATION PER AGE (ROWE ET AL. 2004) PB WORKS

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Numbers</th>
<th>Sentence Length</th>
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</thead>
<tbody>
<tr>
<td>4-5</td>
<td>4 digits</td>
<td>7-8 words</td>
</tr>
<tr>
<td>5-6</td>
<td>4 digits</td>
<td>9 words</td>
</tr>
<tr>
<td>6-7</td>
<td>4 digits</td>
<td>10 words</td>
</tr>
<tr>
<td>7-8</td>
<td>4 digits</td>
<td>11 words</td>
</tr>
<tr>
<td>8-9</td>
<td>4 digits</td>
<td>13 words</td>
</tr>
<tr>
<td>9-10</td>
<td>4 digits</td>
<td>13 words</td>
</tr>
<tr>
<td>10-11</td>
<td>5 digits</td>
<td>14 words</td>
</tr>
<tr>
<td>11-12</td>
<td>5 digits</td>
<td>14 words</td>
</tr>
</tbody>
</table>

HOW TO EVALUATE AUDITORY MEMORY

• ADD to your battery of tests!!
• Taps-3
• Phonological memory and awareness tasks
• Phonological awareness and auditory memory highly correlated
• Language tests with word and sentence memory
• Psychological tests: digit and word memory
• Several types of memory: Short/Long term, working, visual

SHORT TERM AUDITORY MEMORY

• Brief retention, new information (released, forgotten).
• Affects acquisition of new vocabulary
• Trouble with chunking information
• Cannot register information quickly
• Cannot make attention and memory work together
• Test # forward or digit memory, word memory or phonological memory
LONG TERM MEMORY DEFICITS

• The warehouse for preserving knowledge, skills and life experiences
• Critical for accessing previously learned information and for learning and retaining new information
• Cannot file information as pairs
• Difficulty following procedures
• Inability to remember rules as patterns (sound/letter correlation)
• Story recall on psychological tests

WORKING MEMORY

• Plays a role in early vocabulary development
• Two parts of WM
  1. phonological memory (STM)
     Decoding/spelling
     Evaluate non word repetition
  2. functional memory
     Listening comprehension
     Reading comprehension

SUGGESTIONS FOR ALL STUDENTS WITH APD, LD, ADD, LPD, MEMORY DEFICITS
KEY POINT

FOR ALL STUDENTS WITH LD/LPD/ADD/APD

Help our students learn to ask this question?

“What can I do right now to change the environment, myself or the message to improve my ability to listen and understand?”

STUDENT ADVOCACY

• To establish workable strategies for a student
• Teach student scripts on how to ask for repetition in class or during social interactions
• “Sophie Factor” – Find a friend in each class
• Active listening—whole body listening
• Listen for key words (because, either, first, however)
• Test taking strategies

SCHOOL SUGGESTIONS

**SLP Role: Teacher training/education/resource
Goal: Improve access and retention of auditory information
• Classroom/Environment changes-acoustics/FM
• Strategies for improved communication
• Academic Plan Changes-IEP goals
• Teaching style—accents/organization
• Specific to skill deficit area
**TEACHING STYLE**

**TRAIN TEACHERS!**

- Speak slower, not louder
- Multi-sensory instruction-visual/tactile/auditory
- Give multiple choice option in responding
- Ask student to repeat what they heard: “What did I say?”
- Get student’s attention
- Use simple instructions: Multi step directions and expectations of auditory memory.

www.omnie.ocali.org -handouts

**TECHNOLOGY IN CLASSROOM**

**ALL STUDENTS WITH ADD/LD/APD**

- Smart Pens https://store.livescribe.com/catalog/product/view/id/699/category/78/
- Smart Boards- can record
- Speech to Text
- Ereaders/books on Tape
- Learning Ally-narrated textbooks
- Parent portals/Teacher websites
- Online document storage
- Software for webbing/writing
- Read,Write, Gold software
- http://www.callscotland.org.uk/information/

**GENERAL CLASSROOM ACCOMMODATIONS**

- Improve access and retention of auditory information
- Books on tape along while reading
- Repetition of information/rephrase
- Quiet test environment (and resource)
- Foreign language waiver/substitute
- Decreased work load-temporary
- Support increased responsibility
- Extra set of textbooks/online for preteaching
- Pre-teach vocabulary (Aztec/Incan)
- Deficit specific if known: Integration-no read/write
- Teacher Style-dynamic vs organized
TREATMENT OPTIONS FOR AUDITORY PROCESSING

AUDITORY TRAINING BASICS

- Auditory training changes central auditory performance
- Frequent, intense, and challenging auditory training = most significant improvement in auditory skills
- Evidence suggests that maximum benefit requires 45-90 minutes/day for several weeks (Bells)-can mean home programming
- Wide variety of approaches and techniques

DIRECT THERAPY

AUDITORY CLOSURE/DISCRIMINATION ACTIVITIES

- “The itsy bitsy ____”
- “The dog buried his ____ in the yard.”
- “ba__ball”
- Wheel of Fortune®/Hangman/Telephone
- Goldman Fristoe Test of Auditory Discrimination
- Minimal Pairs

Progress to adding noise of varying levels
TEMPORAL PROCESSING

- Improve the ability to hear the acoustic contour of speech related to stress, intonation and rhythm of language
- Sarcasm, humor, questions
- Prosodic difficulties affect social/pragmatic language, phonological processing, music perception and non verbal communication.
- Temporal Patterning Training-FIRST
- Prosody Training-NEXT

DICHTOTIC THERAPY-60%

- No direct SLP treatment
- Therapy: Add right/left movement
- Verbal to motor tasks-see list of activities
  - Brain gym/Gym teacher
  - https://www.youtube.com/watch?v=ukuVdn-opc8&feature=youtu.be
- Twister, Simon Says, Red Light/Green
- Sports with left to ride/midline activity
- Practice looking and/or writing
- Evaluate and treat short term auditory memory

Technology Options for APD

- Computer Based Auditory Training (CBAT)
- Apps
- Assistive Technology in Classroom-FM systems
- Low gain hearing aids
- Classroom Technology
CBAT BASICS
• 6 week increments
• Under headphones-less than $19.99
• External volume control on headphones
• 4 to 5 days a week with a break for 30 min each day.
• Monitor progress
• Use reinforcement
• Home programming I/O in therapy
• Fast ForWord (severe APD/Receptive Language)
• Hear Builders (superduperinc.com)
• Brain HQ-adolescents and adults

APPS
PB WORKS
• http://www.hamaguchiapps.com/
• Acoustic Pioneer-eval: Feather Squadron
  https://acousticpioneer.com/auditorytraininggames.html
• Super Duper Inc.
• APPS Wheel
• Ultimate Hangman
• Popplet Lite/Popplet ($4.99)
• Minimal Pairs
• Karen Anderson-Success for Hearing Loss
  • www.soenabletechcenter.com
    – Auditory Processing Studio, Workout

EXTRA RESOURCES
• http://www.bal-a-vis-x.com/  Bal-a-vis-x
• Brain HQ-post science: brainhq.com
  – Adolescents/adults
  https://secure.brainhq.com/neuro&neuro-overrideexisting-B-1555#axis/progression/3/0/0
• Reading Rockets-mind mapping tools
• Story, Grammar, Marker from Mind Wing Concepts ($194.95)
• Expanding Expression Tool (EET)
  • https://youtu.be/Wr8EXe2N5CU
APD RESOURCES

- http://omnie.ecfll.org/dish.php?test=dish_tab_min Resources under APD
- Differential Processing Training Program
  - Kerry Winger-Lingulysystems
- Terri Bellis: Assessment and Management of CAPD in Educational Settings textbook

TREATMENT OPTIONS FOR LANGUAGE PROCESSING

HIGHER LEVEL VOCABULARY

- Emotions-envy, despair, etc (Drew)
- Clever Endeavour, Plexers, Taboo, Apples to Apples
- Descriptive words-without visual representation-Apples to Apples-elegant
- Give relevant examples-movies, etc.
- Use visual/video when possible
- Use vocabulary resources-make it multi sensory
- Test instructions:
  - Beer’s Inferences
WORD FINDING

- The most educationally significant communication disorder.
- Under-diagnosed and under-treated
- Poor expressive language vs receptive
- Word Finding Checklist
- Help series for Word Finding (linguisystems)
- Word Burst/Taboo/Word Finding app
- Diane Germane-Word Finding Program
- Teachers give choice for response/cues/extra time
- Stuck for Words:
  
TREATMENT OPTIONS

Linguisystems

- Language Processing Treatment Activities
- Help series
- Spotlight book series—Listening Comprehension and Reasoning and Problem Solving

Visualizing and Verbalizing—Lbell

- Multi-sensory “wh” tools
- Expanded Expression Test (EET) www.expandingexpression.com
- Story, Grammar, Marker www.mindwingconcepts.com

LPD RESOURCES

- Guide for Teachers and Parents, Woodbine House, Bethesda, MD. (Great practical advice for parents and teachers who work with children of all skill level)
  - https://www.vocabulary.com/lists/388511
- Splingo—nouns/verbs/adj- 3 years to 4th grade
- Reading Camp
  - www.havefunteaching.com
- Superduperinc.com “What would” apps
TREATMENT FOR SHORT TERM AUDITORY MEMORY

- Directed listening-list for repeated words in story
- Practice Listening and writing information
- Play telephone game
- Teach strategies and try them (trial and error)
- Software-Hear Builders-Auditory memory
- Home programming: Give parents suggestions
- Use sub-vocal rehearsal as a strategy
- Turn taking practice
- Drill with familiar words in categories first and go to unrelated words
- Use nonsense words and then known words
- phonological Memory

LONG TERM MEMORY REMEDIATIONS

- Physically rehearsing (parallel parking)
- Write information down
- Draw diagrams/pictures
- Give it an experience
- Repeated exposure
- Use music and tempo with repeated exposure

WORKING MEMORY REMEDIATION

- Use visual and auditory first and reduce visual
- Memory/concentration game-auditory only
- Use nonword stimuli in memory game
- Provide delay in stimuli Highlight important
- Give multi step directions
- Add game changers “after, before, instead of”
- Practice memory in reverse
- Start with one syllable words and add two syllable
- Review main points at appropriate breaks
- Identify key words and ideas in auditory and written
- Use symbol imagery to improve visualization
- Add to picture using “wh” questions
- Have them make picture physically
MEMORY APPS/RESOURCES

- Hear Builders-Auditory Memory
- Strategies-see page in PB works
- “Ready Set Remember” Mense, Debney, Druce
- Richards, G. Source for Executive Function.

TEACHER SUGGESTIONS FOR MEMORY

- Be aware of expectations
- Call on student first
- Use manipulatives
- Pause before important information or give cue before speaking
- Use visual information to aid memory: visual information increases memory by 20%.
- Increase exposure to low frequency words

REFERENCES AVAILABLE UPON REQUEST

Suzanne M. Foley, M.S., CCC-A
Audiologist
7440 N. Shadeland Ave. Suite 115
Indianapolis, IN 46250
317-573-4445
foleyaudiology@gmail.com