

AUDITORY PROCESSING
AUDITORY MEMORY
LANGUAGE PROCESSING
ATTENTION DEFICIT

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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

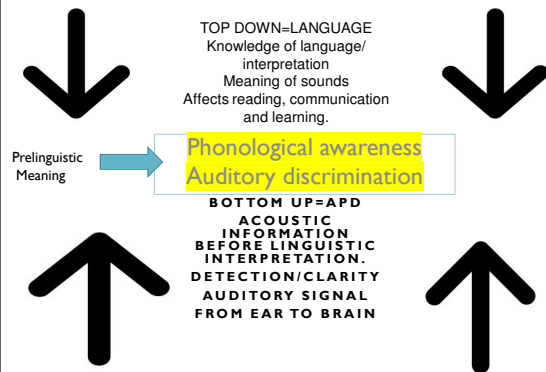
Or

CATCH = CAT

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

APD=Clarity

AUDITORY VS. LANGUAGE



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-Linguistics, 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
- Remove visual and language aspect of testing (tones, no visual, numbers)
- 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

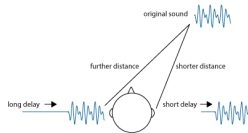
APD SKILLS

- 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

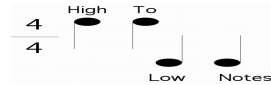
DICHOTIC SKILLS

- 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

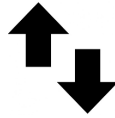


TREATMENT OPTIONS

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-timing
- 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 | APD |
|---|---------------------------------------|
| • Physical anomalies: Sleep/wake cycles, bladder/bowel control, alcohol/drugs | • Exhausted from listening |
| • Distracted by different stimuli: visual, tactile, smell, auditory | • Distracted by auditory information. |
| • Off topic conversations | • Misheard word for off topic |
| • NOT modality specific | • 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

LANGUAGE PROCESSING

- “A Language Processing problem is difficulty with accessing acquired language abilities (ie: 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 clarify 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
(CROWE ET AL. 2004) PB WORKS**

Age	Numbers	Sentence Length (words)
4-5	4 digits	7-8 words
5-6	4 digits	9 words
6-7	4 digits	10 words
7-8	4 digits	11 words
8-9	4 digits	13 words
9-10	4 digits	13 words
10-11	5 digits	14 words
11-12	5 digits	14 words

**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 WWM
 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

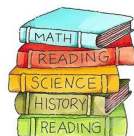
- To establish workable strategies for a student
- Teach student scripts on how to ask for repetition in class or during social interactions
- “Sophie Factor” – Find a friend in each class
- Active listening-whole body listening
- Listen for key words (because, either, first, however)
- Test taking strategies

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

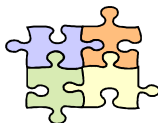
- Auditory training changes central auditory performance
- Frequent, intense, and challenging auditory training = most significant improvement in auditory skills
- Evidence suggests that maximum benefit requires 45-90 minutes/day for several weeks (Bellis)-can mean home programming
- Wide variety of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



DIRECT THERAPY AUDITORY CLOSURE/DISCRIMINATION ACTIVITIES

- "The itzy 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

DICHOTIC 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 right/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.virtualspeechcenter.com
 - Auditory Processing Studio, Workout

EXTRA RESOURCES

- <http://www.bal-a-vis-x.com/> Bal-a-vis-x
- Brain HQ-posit science: brainhq.com
 - Adolescents/adults
 - <https://secure.brainhq.com/?neu=t&neu-override=existing-B-1565#train/attention/3/0/0>
- Reading Rockets-mind mapping tools
- Story, Grammar, Marker from Mind Wing Concepts (\$194.95)
- Expanding Expression Tool (EET)
<http://www.northernspeech.com/early-intervention-language-and-speech/eet-expanding-expression-tool-kitmdash2nd-edition/>
- <https://youtu.be/Wr8EXEzNSCU>

APD RESOURCES

- Bellis, T. (2002) *When the Brain Can't Hear*, Pocket Books. (A Book for Parents)
- Foli, Karen (2002) *Like Sound Through Water*, Atria Books, New York.
- http://omnieocali.org/dash.php?cat=dash_tab_mn Resources under APD
- Differential Processing Training Program
 - Kerry Winget-Linguistics
- Terri Bellis: Assessment and Management of CAPD in Educational Settings textbook
- Kelly, Dorothy (1999). *Central Auditory Processing Disorder: Strategies for Use with Children and Adolescents*. Psychological Corp.

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

- Richard, G. (2000). *The Source for processing disorders*. Rock Island, IL. Linguisystems.
- *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.spellingcity.com/science-vocabulary/html>
- <https://www.vocabulary.com/lists/388513>
- Spingo –nouns/verbs/adj- 3 years to 4 th 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

- <http://langwitches.org/blog/2011/08/21/blooms-taxonomy-and-ipad-apps/>
- 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

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