

Auditory Processing Disorder

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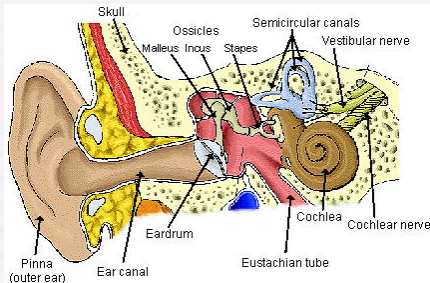


Auditory processing is not only what we hear, it is *how we process and use* the information that we hear.

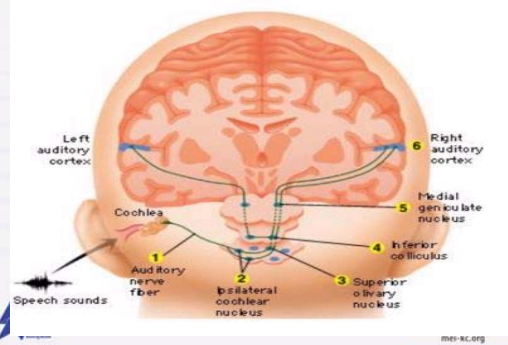
Auditory Processing Disorder (APD) occurs when a listener does not effectively process auditory information.



Hearing



Central Auditory System



Auditory Processing

Central auditory processing involves the following:

- Sound localization and lateralization
- Auditory discrimination
- Auditory pattern recognition
- Temporal (timing) aspects of audition
 - Temporal resolution
 - Temporal masking
 - Temporal integration
 - Temporal ordering
- Auditory performance with competing acoustic signals
- Auditory performance with degraded acoustic signals



Characteristics of APD

- difficulty understanding speech in background noise
- misunderstanding messages
- responding inconsistently or inappropriately
- frequently asking that information be repeated
- difficulty attending and avoiding distraction
- difficulty following complex auditory directions
- difficulty with sound localization
- reading, spelling and learning problems
- reduced musical and singing skills



Categories of APD

- **Decoding** - ability to quickly and accurately process speech
- **Tolerance Fading Memory** - understanding speech in noise and short-term auditory memory
- **Organization** - maintaining proper sequence of information
- **Integration** - bringing information together, across modalities and processing centers



Decoding

- Definition
- Associated Communication and Academic Problems
 - Delayed responses
 - Word finding
 - Developing clear speech
 - Understanding what is said, receptive language
 - Phonics, spelling, oral reading / word accuracy
 - Grammatical morphemes
 - Articulation



Tolerance – Fading Memory

- Definition
- Associated Communication and Academic Problems
 - Understanding when noise or competing signals are present
 - Anxiety
 - Easily distracted
 - Reading comprehension difficulties
 - Expressive language
 - Short term auditory memory difficulties



Organization

- Definition
- Associated Communication and Academic Problems
 - Reversals
 - Messy, regularly lose things
 - Reduced spelling skills
 - Difficulty organizing ideas or thoughts

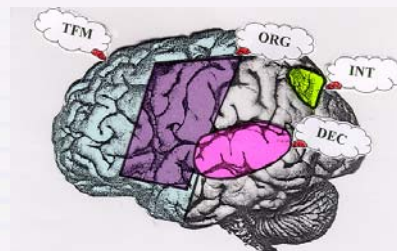


Integration

- Definition
- Associated Communication and Academic Problems
 - Auditory - Visual Integration problems
 - Extremely long delays
 - Dyslexia
 - Severe reading and spelling difficulties



4 Categories of APD



APD Categories

- Why should we use categories?
 - To understand how APD is relating to listener's issues
 - To explain APD more easily to parents, teachers and therapists
 - To develop a therapy program
 - To suggest appropriate environmental modifications



How APD is diagnosed

- Referral
- Case History / Medical History
 - Degenerative processes such as multiple sclerosis
 - Seizure disorders
 - Head trauma
 - Cerebrovascular accidents
 - Metabolic disorders
 - Cerebromorphological abnormalities
 - Neuro-maturational Delays, often secondary to auditory deprivation
 - Age related changes in CANS function
 - Family History



Hearing Evaluation

- Diagnostic Audiological Evaluation
 - Immittance
 - Air, Bone, Speech in quiet, Speech in noise
 - Otoacoustic Emissions



APD Test Batteries require the following types of tests:

- Auditory Discrimination Tests
 - Assess ability to discriminate stimuli that differ in frequency, intensity and/or temporal characteristics
- Auditory Pattern Recognition Tests
- Dichotic Tests
 - Assess ability to separate or integrate differing auditory stimuli presented to each ear simultaneously
- Monaural low-redundancy speech Tests
 - Assess recognition of degraded speech stimuli presented to one ear at a time



MEI's APD Evaluation (age 7+)

- Buffalo Model Questionnaire
- Staggered Spondaic Word (SSW) Test
- Phonemic Synthesis Test
- SCAN 3 (adult or child version)



Buffalo Model Questionnaire

- Questionnaire completed by parents and/or teachers, therapists or caregivers
- 48 questions that may be indicators of APD
 - Each indicator is suggestive of an APD category
- Useful to compare history and test findings, to explain the potential role of APD and to show improvement with therapy



SSW Staggered Spondaic Word (SSW) Test

- Binaural test with different words going to each ear
- Administration:
 - 40 items
 - Approximately 7.5 minutes to complete
 - Norms for ages 6 to 60
 - Counterbalanced
- Normative data is available for total errors, response bias and qualifiers



Phonemic Synthesis Test

- Sound Blending Test
- Administration:
 - 25 test items
- Norms for quantitative and qualitative scores for each age group



SCAN - 3

- SCAN-3 (Child and Adult versions)
 - Filtered Words
 - Auditory Figure Ground
 - Competing Words
 - Competing Sentences
 - Time Compressed Sentences
 - Random Gap Detection
 - Ear Advantage



Behavioral / Qualitative Errors

- Delay
- Extreme Delay
- Perseveration
- Quiet Rehearsal
- Smush
- Quick



Other Evaluations

- Medical Evaluation
- Speech / Language Evaluation
- Psycho-Educational Evaluation
 - Cognitive and IQ testing



APD Evaluation

(4-7 years old)

- Auditory Skills Assessment
 - 3 main sections
- SCAN 3 C – screening
- SSW – Half list



Results → Therapy

- Diagnosis is made
- Specific APD deficits are determined



Current Research supporting APD Therapy

- Alonso et al. (2009)
 - Recorded behavioral and electrophysiological (P300) responses pre and post therapy
 - Results: 72.4% had normal APD tests after auditory training
- Hayes et al. (2003)
 - Assessed plasticity of perception and neural encoding of speech sounds in learning disabled children using speech evoked ABR's
 - Results: Improved cortical representation of speech in quiet and in noise after training



Treatment of APD

- Direct Auditory Training
 - Purpose: to maximize neuroplasticity and improve auditory performance by changing the way the brain processes auditory information
- Environmental Modifications
 - Purpose: to improve access to information that is presented auditorily
- Compensation Strategies
 - Purpose: to strengthen central resources (language, attention, etc) and teach responsibility for active listening participation



Auditory Training Therapy

- Wide variety of activities that can be computer based, home based or involve direct therapy with a therapist
- Overview of MEI's program:
 - Approx 14 – 50 minute sessions
 - Followed by retest
 - Can be billed to some insurance companies



Tenets of Buffalo Model Therapy

- Working from easy to a little bit harder
- Vary the tasks during a session and to avoid too much work in one session
- Remediate the basic issues first to more easily remediate the associated issues
- Parents/Partners are invited to sit in on therapy



Therapy – Decoding (DEC)

- Phonemic Training Program (PTP)
 - Teach the sounds of English individually
- Phonemic Synthesis (PS)
 - Sound blending program
- Other:
 - Sound Check
 - Same vs. Different



Therapy – Tolerance Fading Memory (TFM)

- Words in Noise Training (WINT)
 - Speech in noise training
- Short-Term Auditory Memory (STAM)
 - Short-term memory training for digits, words & working memory



Therapy – Organization

- Sequencing
 - Follows the same procedures as STAM but focusing on sequencing
- Auditory Directive Training



Therapy - Integration

- Dichotic Offset Training (DOT)
 - gradually increasing overlap of right and left competing words



Other Therapies

- Localization Training
- Earobics
- Hearbuilders
- Rhyming Games
- Auditory Vigilance Training
- Prosodic pattern training



More Therapies!

- Apps
 - Sound Match
 - Voices
 - ABC Pocket Phonics
- Brain Fitness Programs
 - Posit Science
 - Lumosity
- Games
 - Marco Polo
 - Simon Says
 - Twister
 - Bopit
 - Simon
 - Pictionary
 - Video games

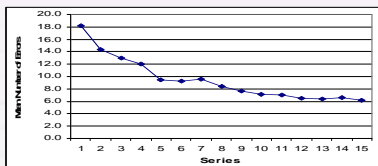


Outcomes of Buffalo Model Therapy

- Therapy – are skills maintained?
- Phonemic Synthesis
 - Quantitative errors decrease to 4 at retest from 11 at initial evaluation
- Speech in Noise
 - Ear difference initially results in equal performance after therapy
- STAM
 - Consistent improvements for digits, words and working memory



Results – Speech in noise



Typical pattern of progress on various speech-in-noise programs for children seen for therapy at Auditory Processing Service over the past 6 years.

(n= 60, ages 5-16 years with a mean of 8.8 years)



Environmental modifications

- Get attention before speaking
- Use slow and clear speech
- Use gestures
- Look and Listen
- Preferential seating, reduction in classroom noise
- FM system
- Pre-teach new concepts and vocabulary
- Written notes given before lecture
- Written instructions
- Ask for verification
- Please show an example of the 'finished product' if there is a new task to do



Compensation Strategies

- Strengthen central resources such as language, problem-solving, memory, attention and other cognitive skills
 - Chunking, mnemonics, paraphrasing
 - Deriving word meaning from context
 - Inferential reasoning, critical thinking
- Teach responsibility for active listening and problem solving techniques
- Self Advocacy Training



Keep in mind...

- Therapy can be completed with patients with hearing loss
- ADD, Autism and Low IQ are not contra-indications to therapy
- Age and general cognitive decline can play a big part in auditory processing



Cases

- AC
- KM
- BB



Questions?

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