

Assessing and Treating Auditory Processing Disorders in Kids: Practical Approaches

“Partnering to Succeed”

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Current controversies in APD:

- No standard definition used qualify the diagnosis of auditory processing disorders (APD) (Bellis, 2004)
- Controversy regarding who can diagnose APD, how to diagnose APD, and what tests to use (Bellis, 2004)
- Controversy regarding whether to define APD based on a cluster of behaviors or performance on a test battery with no agreement on the theory behind APD (Friel-Patti, 1999)

Current controversies in APD:

- In order to be classified in the Diagnostic and Statistical Manual of Mental Disorders (DSM), it must be defined to be mutually exclusive, exhaustive, and result in clinical impairment (Friel-Patti, 1999)
- APD does not meet the criteria for inclusion (Keith, 1999)

Evidence for APD as a disorder?

“...the quality and quantity of scientific evidence is sufficient to support the existence of APD as a diagnostic entity to guide the diagnosis and assessment of the disorder and to inform the development of more customized, deficit focused treatment and management plans”

ASHA, 2005

The role of the audiologist...

- The audiologist is the professional to identify and APD in children (ASHA, 2005)
- “Owning” the auditory system
 - Control over test stimuli
 - Control over test environment
 - Knowledge of the auditory system
- Audiology as “essential”
- Part of an interdisciplinary/multidisciplinary team

Some thoughts to frame this

- presentation:
Disorder of the auditory system,
on the same continuum as
hearing loss
- Complex issues: Can separate
APD from other related
disorders and also identify
areas of overlap
- Low incidence disorder

Some thoughts to frame this presentation:

- Requires an interdisciplinary assessment
- Just as with any other auditory disorder, there's no "cure" at this point
- Clinical significance and statistical significance are not synonymous
- Current and future knowledge of auditory development and psychoacoustics will likely change the face of APD assessment and the ability to link to management issues

Developing a practical approach to
address some of the controversies

A starting point...

Considerations and biases

- Not every audiologist needs to assess APD...however, every audiologist needs to know about how to screen and facilitate appropriate referrals
 - Back to key points:
 - Low incidence population
 - Audiologists “owning” the auditory system and being “essential”
- The “audience”
 - APD diagnosis related to the educational setting
 - APD diagnosis as part of a “medical model”

Roles of the Central Auditory Nervous System

- “Processing” rapid signals
- Gating
- Alerting to incoming information
- Communication between the two hemispheres of the brain
- Coordinating or “teaming” between the two ears--they work as a unit

Role of the Central Auditory System

- ...To establish a representation of the speech signal that is then available for perceptual or linguistic elaboration (Phillips, 1998)

Central Auditory Processes Are Mechanisms and Processes Responsible for the Following Behaviors:

- Sound localization
 - Early behavior
 - Role in hearing in background noise
- Auditory discrimination
 - Gross and fine differences in sounds, including phonemes

Central Auditory Processes Are Mechanisms and Processes Responsible for the Following Behaviors (con't):

- Temporal aspects of audition, including:
 - Temporal resolution, temporal masking,
 - Temporal integration, and temporal ordering
- Timing is important in terms of reading, auditory memory, sequencing, etc.

Central Auditory Processes Are Mechanisms and Processes Responsible for the Following Behaviors: (Con't)

- Auditory performance decrements with competing acoustic signals
 - Listening in the presence of background noise
- Auditory performance decrements with degraded acoustic signal
 - Speakers that speak a dialect which differs from that of the listener

(ASHA, 1996)

Functional behaviors

- Note that for the most part, the types of questions that arise in children are NOT site of lesion but functional
- Requires “authentic assessment”
 - Children’s Auditory Performance Scale (CHAPs) (Educational Audiology Association...edaud.org)
 - Screening Inventory for Targeting Educational (edaud.org)

The image shows two overlapping forms from the Educational Audiology Association. The top form is the CHAPs (Children's Auditory Performance Scale) and the bottom form is the Screening Inventory for Targeting Educational. Both forms are yellowed and contain various sections for data entry, including checkboxes and tables.

CHAPs
Children's Auditory Performance Scale
Educational Audiology Association, Inc. 2000

SCREENING INVENTORY FOR TARGETING EDUCATIONAL

Auditory Processing Disorders (APD)

- “What we do with what we hear” (Katz)
- An auditory processing disorder (APD) is defined as a deficit in the processing of information in the auditory modality (Jerger and Musiek, 2000)
- Observed deficiency in one or more behaviors noted in the ASHA consensus statement

Auditory Processing Disorders Defined:

A breakdown in auditory abilities resulting in diminished learning (e.g. comprehension) through hearing, even though *peripheral hearing sensitivity* is normal

Need for an Interdisciplinary perspective:

Relevant listener variables to be considered in the diagnostic assessment of APD

- Attention
- Auditory neuropathy
- Fatigue
- Hearing sensitivity
- Intellectual and developmental age
- And, the ever popular question—how does this relate to listening skills on the autism spectrum disorder?

Relevant listener variables to be considered in the diagnostic assessment of APD

- Medications
- Motivation
- Motor skills
- Native language, language experience, language age
- Visual acuity

(Jerger and Musiek, 2000)

A decision making approach to
frame a practical approach to APD

Assessment begins with screening at time of request for appointment

- In call to set up appointment, establish the following:
 - Age of the child (most literature suggests age 7 is earliest age for formal APD assessment)
 - Value of earlier assessment if parent has concerns—role of the audiologist
 - Tremendous variability in listening behavior for younger children
 - Auditory system development issues

Pre-appointment screening

- In call to set up appointment, establish the following:
 - Cognitive ability of the child
 - Criteria of normal cognitive abilities
 - Performance/verbal split
 - Criteria for learning disabilities (scatter)
 - Language bias of IQ testing
 - Referral source

Pre-appointment screening

- In call to set up appointment, establish the following:
 - Other diagnoses
 - Autism spectrum disorders
 - Growing population
 - Role of the audiologist
 - Diagnosed as “APD” by others
 - Opportunity to set the record straight

Pre-assessment screening

- In call to set up appointment, establish the following:
 - Other assessments that have been completed
 - Value of having those assessments in hand

Authentic assessment

- Screening tools completed by school personnel
 - SIFTER
 - CHAPs
 - Fisher's Auditory Problems Checklist
- Available on line and through the Educational Audiology Association

At this point, you can administer screening and...

- Determine not necessary and make referral (SLP, psychological, etc.)
 - Well connected network...strong basis for cross referrals
- Determine further assessment is indicated and provide it yourself or refer to an audiologist who does this testing

Critical point

- The audiogram does not tell the entire story
- Speech in noise difficulties, as an example
 - BKB-SIN test, available from Etymotic Research

Case history indicators

- Significant history of middle ear pathology
 - Long term implications
 - Ear-brain connection
 - “Binaural hearing” studies by Hall and Grose
 - Question of delay vs. development
 - Aggressive approach to addressing OME
 - Ongoing monitoring of hearing and listening skills

Case history indicators

- Scatter on standardized tests
- Difficulty with reading and spelling
- Positive family history (“cerebral morphologic abnormalities”)
- Question of hearing loss (“huh, what?”)
- Significant speech/language history
- Hypersensitivity/unusual reaction to sudden/loud sounds

Test materials available for behavioral APD assessment in children:

- A significant number of tests available
- Normative data...psychometrically sound
- Building a test battery...based on skill areas?
- Linguistic loading—varying linguistic demands addresses a number of concerns in assessment
- No cookbook

Options soon to be available

- SCAN-III
 - Pearson Publishing, Spring 2009
 - Update of current SCAN with addition of tests, screening vs. diagnostic portions, and developing new normative data
- LiSN-S
 - Listening in Spatialized Noise—Sentences Test
 - Available from Phonak, Spring, 2009
 - Speech in noise OR APD?
 - Strong to determine issues with listening in background noise
 - Easy to administer

Behavior observation is critical

- What behaviors does child demonstrate in testing?
- What strategies does he/she demonstrate?

Electrophysiologic assessment

- Pro:
 - By-passes language processing
 - Specific focus on the auditory system (no issues with motivation)
 - May be unique measure of system and improvement
- Con:
 - Lacks functional link-speculative
 - “Disease model”
 - May not be specific enough to address issues on the “cellular level”
 - Cost/benefit

Otoacoustic emissions

- Potential benefit in addressing the efferent auditory system--not much known about this, minimal ability to isolate this pathway behaviorally
- One aspect of the future of APD
- Contralateral suppression of emissions protocol
 - “Gating mechanism”--how the brain controls the ear (Lauter, 2000)

Electrophysiologic assessment

- Suggested as a crucial part of the test battery in the Bruton conference
- Issues of cost, information to be obtained, and philosophical approach

Questions of value of electrophysiology in the “functional listening skill world”?

- Biological Marker of Auditory Processing: BioMARK or BioMAP
 - http://www.soc.northwestern.edu/brainvolts/projects/documents/BioMARK_9.8.08.pdf
 - Speech syllables used to assess “neurological processing of sound” with brainstem evoked responses
 - Can monitor progress with aural rehabilitation

Issues of co-morbidity

Assumptions made that behaviors are similar between APD and ADD and they cannot be differentiated in terms of clinical observations

Behavioral Symptoms that Differentiate ADHD vs. CAPD*

ADHD

CAPD

Inattentive

Difficulty hearing in background noise

Distracted

Difficulty following oral instructions

Hyperactive

Poor listening skills

Fidgety or restless

Academic difficulties

Hasty or impulsive

Poor auditory association skills

Interrupts or intrudes

Distracted

Inattentive

Chermak et al (1998)

More on APD and ADD/ADHD

- An exclusive set of behaviors are indicated that differentiate APD and ADHD of the predominantly inattentive type
- Four behaviors--inattention, academic difficulties, asking for things to be repeated, and poor listening skills--were ranked as most significant, however there were no overlap between the two groups

Chermak et al, 2002

The value of defining CAPD

- Trying to pin down a specific definition may be futile
- What one understands about CAPD, as is true with any clinical disorder, influences what one “does about it”
- Observation, assessment, management (Sloan, 1998)

Management Myth

- The problem needs to be cured in order for the treatment to have value...
 - Hearing loss as a model...
 - Options for audiology involvement range from referral to providing treatment
- The conclusion is that since there's no "cure", there's nothing that can be done about APD

Linking assessment to rehabilitation and management

- Environmental modifications
- Compensatory strategies
- Direct intervention

Common theme

- Processing auditory information is both a “bottom up” (e.g. how information gets from ear to brain) and “top down” (e.g. how information is used once it gets to the brain) event
- If “bottom up” is compromised by hearing loss or auditory processing disorder, greater reliance on top down skills.
 - Problematic if person has cognitive or language issues that may also compromise top down OR if the language introduced is novel, the message lacks predictability or redundancy, etc.
 - Interaction with these factors and the listening environment

Addressing APD in the context of the school

- District's "philosophy" on classifying APD—in most states, not an educationally handicapping condition that is recognized
- Impact of deficits on school performance
- Synergy with educational audiologist in the district
- Credibility

Modifying the environment

- Classroom acoustics
- Considerations to benefit all children
- Preferential seating has no impact acoustically
- How is background noise minimized and signal-to-noise ratio enhanced

One approach: FM technology

- FM is not necessary the primary or only recommendation to address APD
- Benefits of sound field amplification for ALL has been well documented, much less documentations for use with personal FM technology for children with APD

Research shows...

- Significant improvement of speech understanding in noisy situations
- Children are self-motivated to wear the FM system
- Teachers, parents and children report that FM is easy to handle, increases attention and concentration, enhances understanding, improves academic performance
- Auditory memory is improved with FM use
- Electrophysiology: Late evoked potentials, P2 and P3, emerge after use of FM indicating brain change/maturation
- Wearers develop better speech discrimination in noise – even when not wearing the device
- Increased frequency discrimination ability after FM use

Hoen et al (2008), Friederichs (2005), Arweiler (2005), Röhrli (2007), Smart (2008)

Assumptions

- High risk listeners require an enhanced SNR due to a disorder that impacts the auditory system, examples of which include multiple sclerosis, traumatic brain injury, auditory processing disorder, etc.
- Unilateral hearing loss and fluctuant hearing loss also require attention—have documented peripheral hearing loss AND are considered “high risk” listeners
- Receive some benefit from sound-field system, however does not provide the type of benefit needed to optimize the environment and provide an auditory “scaffold” for other skills

The NEW Dynamic FM system for those with normal or near-to- normal hearing

iSense Micro & iSense Classic

with inspiro



iSense is compatible
with all existing
Phonak transmitters

iSense Micro

- Lightweight
- Ergonomic design
- Flexible and secure
- Small in size
- 6 colors
- 312 battery



New technology outpacing the life of older technology (or what's so special about this next new thing?)

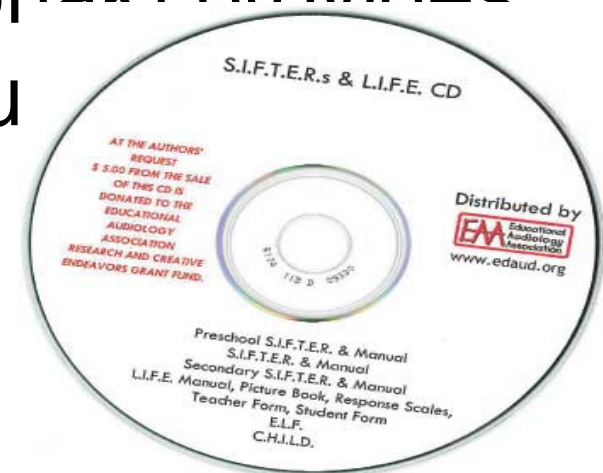
- iSense has Phonak's Dynamic FM platform
 - iSense adapts volume automatically - based on the level of background noise
 - iSense's output stays within safe limits – at all times

Considerations with FM technology

Verification of the system is highly recommended...a number of protocols for doing so, including the ASHA guidelines for Fitting and Monitoring FM systems (2002)

Validation of FM fitting

- Authentic assessment
 - Specific observations
 - Use of a questionnaire such as the Listening Inventory for Education (LIFE) (Anderson and Smaldino, 1998) (<http://www.edaud.org/store>)
- FM Successware 4.0 (Phonak) provides for DataLogging—can be used for verification and validation



Some compensatory approaches:

- Teacher strategy development (or how audiology becomes essential):
 - Impact of rate of speech on comprehension
 - Understand signal-to-noise-ratio and facilitate ways to enhance it
 - Concept of “clear speech”: tenants that contribute to effectively presenting oral information
- The role of the speaker in communication/comprehension
 - The “evangelical” model
 - The “lunch menu” man
- Auditory fatigue
- Use of visual and other modality cues
- Assist child in recognizing “easy” and “difficult” listening situations

Direct treatment approaches: What's new?

- Key words: Adaptive and challenging
- Capitalize on neuroplasticity
- Aural rehab. Programs
 - Speech in Noise
 - LACE (available from Neurotone.com)
 - Dichotic listening
 - DIID
 - ARIA

Direct therapy approaches

- A number available
- Controversies and overgeneralizations
- The “promise” of psychoacoustic approaches
 - May drive both assessment and management
 - Dichotic listening approach described by Moncrieff

Prevention of APD

- Using what we know about auditory development to build a better auditory system
 - Reading to children
 - Rhyming games/nursery rhymes
 - Aggressive follow-up with otitis media

Conclusions

- Audiologists have expertise in hearing and listening to address this population
- Audiologists have skills and tools to assess and manage APD
- Network of professionals
- Providing competent services to those who need them
- Not a “new” disorder