The SLP’s Role in the Assessment and Treatment of Auditory Processing Deficits within a Framework of New Terminology: A New Perspective

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Overview

• Status of APD
• ASHA Definition of APD
• AP terminology used by SLPS
• Suggested new terminology
• Treatment for APD
• Considerations for establishing a definitive role in assessment, diagnosis and treatment
Current Dilemma

• SLPs don’t diagnose but asked to assess
• Limitations of current test batteries for processing problems
• Limitations of current receptive language test batteries
• Disagreement and controversy persists on the nature of auditory versus language processing
Status of APD

• Diagnosed by audiologists
• ASHA document 2005
• Consensus Conference on the Diagnosis of APD in School-Aged Children document of 2000
• Controversial topic
• Disagreement on how best to identify children at risk
• Disagreement of how to differentiate APD from other similar disorders/behavior profiles
• Disagreement on how to intervene
• Where does the SLP fit in?
ASHA Definition  
(ASHA, 2005a,b)

• Is a deficit in the perceptual processing of auditory stimuli, and the neurobiological activity that underlies that processing, and gives rise to the electrophysiologic evoked potentials

• Cannot be attributed to higher-order language, cognitive, or related confounds (e.g. language disorder, language processing disorder, autism)
Effects of APD (Bellis, 2010)

• May lead to or be associated with difficulties in higher-order language, learning, and communication function; but the relationship is far from simple

• May co-exist with, but is not the result of, dysfunction in other modalities
Consensus Conference
(Jerger and Musiek, 2000)

“The reality of auditory processing disorders in children can no longer be doubted. There is mounting evidence that, in spite of normal hearing sensitivity, a fundamental deficit in the processing of auditory information may underlie problems in understanding speech in the presence of background noise, in understanding degraded speech, in following spoken instructions, or in discriminating and identifying speech sounds” (p. 467).
Current Dilemma for the SLP

• No clear role for assessment and diagnosis
• Frequently asked to screen and assess
• Limitations of recommended standardized instruments
• Confusion with terminology (e.g. auditory _____)
• No standardized assessment battery
Skills Assessed by Traditional Language Batteries

- Receptive and expressive vocabulary
- Receptive and expressive use of syntax, grammar, semantics, morphology, and pragmatics
Auditory-Linguistic Skills Assessed by SLPs

- Auditory memory
- Word discrimination
- Auditory conceptualization
- Auditory closure
- Auditory synthesis
- Auditory association
- Auditory comprehension
- Understanding and following directions
- Phonemic awareness
Provocative Question

If the aforementioned *auditory* skills (e.g. auditory memory, auditory comprehension etc) are not included in a traditional language battery and not a part of a (central) auditory processing assessment (ASHA, 2005; Bellis, 2010) in what domain do they lie and how they are best described and assessed?
State of Uncertainty

DeBonis & Moncrieff (2008):

“Speech-language pathologists (SLPs) are affected by this current state of uncertainty because their professional responsibilities include screening for APD, making appropriate referrals, and providing intervention strategies”
So......What Do We Call It

• Receptive language disorder?
• Language comprehension disorder?
• Auditory comprehension disorder?
• Language processing disorder?
Considerations for New Terminology

Medwetsky (2006): Spoken Language Processing

“The ability to process spoken language involves the engagement of auditory processing, cognition, and, language mechanisms. By understanding how spoken language is transformed from the acoustic signal, and, ultimately processed and retained, we can understand how specific processing deficits can be manifested.”
AAA (2010)

“The processing of auditory information within the central nervous system is quite complex, involving both serial and parallel processing with other sensory and/or higher order brain structures and systems (e.g. language, attention, and executive control).”
Considerations for New Terminology
Sharma (2009) Comorbidity of Auditory Processing, Language and Reading Disorders

“Language impairment and reading disorders commonly co-occur with APD. Attention and memory are linked to performance on some auditory processing tasks but only explain a small amount of variance in scores. Comprehensive assessment across a range of areas is required to characterize the difficulties experienced by children with APD.”
Research assessed the co-morbidity of auditory processing disorders, language impairment and reading disorders in school-aged children.

68 children with suspected of having APD, ages 7-12 (44 boys, 24 girls) with an IQ Nonverbal >80 (TONI)

Tested:

- **Auditory** → FPT, DDT, RGDT, 500 Hz MLD, low redundancy speech
- **Language** → CELF-4
- **Reading** → Wheldall Assessment of Reading Passages, Queensland University Inventory of Literacy
- **Attention** → Integrated Visual and Auditory Continuous Performance Test (IVA)

Sharma, et. al., (2009). JSLHR, 52, 706-722
Results

• Results indicated that:
  – 72% of the children had APD based on the test results
  – 25% of the children had difficulty with FPT
  – 22% of the children had difficulty with FPT and RE deficits on DDT
  – 47% of the children had problems in all 3 areas- APD, LI, RD

• More children had APD-RD or APD-LI than any one condition alone

Sharma, et. al., (2009). JSLHR, 52, 706-722
Conclusion

• Half of the children had problems in all three areas:
  – CAPD,
  – Language Impairment (LI)
  – Reading Disability (RD)

• LI & RD commonly occur with APD

• Comprehensive assessment across a range of skills is needed to determine full capabilities of children with APD

Sharma, et. al., (2009). JSLHR, 52, 706-722
Conclusion Continued...

• Most of the children had more than one disorder than those who had just one disorder alone.

• Attention and memory are linked to performance on some auditory processing tasks, but only explain a small amount of variance in scores.

Sharma, et. al., (2009). JSLHR, 52, 706-722
Sharma, et. al. 2009

- They found that on the CELF-4, most children with CAPD showed difficulty on:
  - following directions
  - recalling sentences
  - formulation of sentence
  - forward number repetition (representing a memory task)

Sharma, et. al., (2009). JSLHR, 52, 706-722
Sharma, et. al. 2009

- 76% of APD had LI according to criteria [language scores below the 10th percentile, SS=80]
- 77% had poor reading accuracy and fluency
- 65% had problems on reading accuracy, fluency and phonological awareness

Sharma, et. al., (2009). JSLHR, 52, 706-722
Other Studies

• APD can co-exist with LI
  – Benasich, Thomas, & Leppanen, 2002
  – McArthur & Bishop, 2004 a, b
  – Tallal & Stark, 1981
  – Wible, Nicol, & Kraus, 2005

• But Bishop et al (99), Rosen (99), (09) found no difficulty on auditory tasks in children with specific LI

  Sharma, et. al., (2009). JSLHR, 52, 706-722
Other Studies

- People with auditory, language processing and/or reading disabilities are heterogeneous
  - Aram & Nation, 1980
  - Bellis, 2007
  - Ramus, et. al., 2003
  - Reed & Baker, 2005

- Comorbidity exists
  - King, et. al., 2003
  - Walker, Shinn, Cranford, Givens & Holbert, 2002

Sharma, et. al., (2009). JSLHR, 52, 706-722
Evidence Suggests……..

• The processing of input information through the auditory modality engages and is dependent upon other systems within the central nervous system.

• The systems include:
  1) Attention
  2) Language
  3) Cognition

• All frequently assessed by SLPs
New Framework For:

- Terminology
- Assessment
- Diagnosis
Better Reflects:

- Current science
- Scope of practice of the SLP
- Continuum of processing skills
- The role of the SLP in processing disorders
Current Assessment
Limitation

There does not exist a recommended standardized test battery that can effectively provide specific information on the auditory-linguistic-cognitive-cognitive skills that comprise what have traditionally been referred to as APD.
What We Need:

• **Terminology**: Language that means the same to all of us. A Language that describes behavior in children and can be linked to functional outcomes
What We Need:

- **Assessment**: Recommended assessment battery for use by SLPs for assessing and quantifying deficits in skill areas of immediate auditory memory, auditory association, auditory closure, etc.

  1) Establishes continuity amongst SLPs
  2) Establishes continuity when working on a multidisciplinary team
  3) Provides objective data for treatment efficacy
  4) Assist in test development for refining assessment tools and procedures
What We Need:

• **Diagnosis:** A description that adequately reflects a child’s skill deficit(s).
  1) Spoken language processing
  2) Auditory linguistic processing
  3) Specific auditory-linguistic impairment
Management and Treatments

Regardless of the nature of the processing deficit, most persons who have difficulty with the comprehension of spoken language will profit both from procedures that enhance the acoustic signal and from procedures that increase the scope and control of central resources, particularly language resources.

Bellis, 2010
Management and Treatments

Given our current understanding of language disorders and of central auditory processing, techniques that facilitate language competence are likely to improve the auditory processing of language and vice versa (Bellis, 2009).
Management and Treatments

• There are three general areas one focuses on when doing treatment for APD.

• Bellis (ASHA, 2009) talks about:
  – Changing the learning or communication environment
  – Recruiting higher order skills to help compensate for the disorder, and
  – Remediation of the auditory processing deficit.
AAA Practice Guidelines

“While the level of evidence approach is useful, it should be understood that this model was developed primarily for biostatistical treatments and epidemiologic studies, a somewhat different context than most studies relevant to audiology. Moreover, the model rates group studies as superior to individual case studies, however, this does not account for the fact that the results of group studies reflect “average” performance and might not directly apply to any particular individual.
In fact, case studies and retrospective studies (which are classified as level 3 or 4 evidence) can often provide clinicians with evidence appropriate for a particular individual’s profile and intervention (Barlow & Hersen, 1984). A more pragmatic approach to evaluating evidence would be to not dismiss evidence simply because it is at a lower level and conversely not to automatically accept Evidence as infallible simply because it is assigned a higher level of evidence.” (Chermak, 2009)
Central Auditory Processing (CAPD)

• CAPD is a multifaceted problem
  – A team approach is needed to best serve the individual and his/her family

• CAPD must be diagnosed by an audiologist
  – However, it is suggested that other professionals be involved in the broad assessment of the functional deficits experienced in the individual with CAPD and in planning intervention strategies needed to minimize those deficits

AAA, 2010
Therapy

• With the documented potential of a variety of auditory training procedures to enhance auditory processes, the opportunity now exists to change the brain
  – Changing the individuals auditory behavior through a variety of multidisciplinary approaches which target specific auditory deficits

• Therapy should be customized to meet the clients profile (age, cognition, language, intellectual capacity, comorbid conditions), and functional deficits, which involves a combination of bottom-up and top-down approaches
Therapy

In addition to auditory training, management of acoustic conditions (e.g., classroom acoustics) and signals (e.g., through high fidelity listening devices), coupled with educational, cognitive, language, metacognitive, and metalinguistic strategies can reduce auditory deficits and lead to more effective listening, communication, and learning.

AAA, 2010
Observation

• Direct observation compliments and supplements the case history interview and may allow the audiologist the opportunity to uncover the answers to other important questions:
  – How does the individual perform in group settings?
  – What are the effects of the apparent auditory problems on the individual’s communication abilities?
  – How does behavior change in noise?

AAA, 2010
Observation

The answers to these types of questions can inform the audiologist’s selection of tests for inclusion in the test battery, and provide a foundation for intervention planning.

AAA, 2010
Candidates for CAPD Testing

• Evaluation for CAPD may be indicated for individuals with listening and related complaints:
  – Learning problems
  – Reading problems
  – Dyslexia, etc.

• Spanning the age range from young children to elderly adults

AAA, 2010
Candidates for CAPD Testing

- Populations with any neurologic disease, disorder or insult that affects auditory areas of the central nervous system and who exhibit concomitant auditory symptoms
  - Those with a history of hyperbilirubinemia
  - Seizure disorders involving the auditory cortex
  - Multiple sclerosis and other neurodegenerative disease
  - Traumatic brain injury
  - Space occupying lesions

AAA, 2010
Treatment

• Understanding the linkages between brain organization and its dysfunction and resulting auditory behaviors is useful to the development of targeted, therapeutic approaches.

• Given the potential impact of CAPD on listening, communication and academic success, broad and comprehensive intervention involving a **multidisciplinary team** typically is required to maximize treatment effectiveness.

AAA, 2010
Multidisciplinary Team Assessment

- Intervention for individuals experiencing communicative or academic difficulty should be undertaken by a multidisciplinary team, which may include audiologists, speech-language pathologists, educators, psychologists, parents and others.
- The specific composition of the team is therefore dependent on the nature of the dysfunction and the individual’s complaints.
- Effectiveness and efficacy of CAPD intervention should not be gauged by academic outcomes or improved social skills only.

AAA, 2010
Specific Treatment Options

- Personal FM Systems
- Modifications of speech/Compensatory strategies
- Individual therapy
- Computer assisted programs

AAA, 2010
FM Systems

• It is generally agreed that the use of FM units has increased a child’s discrimination skills and ability to hear in classrooms and in a noisy situations.

• There have been many studies that have shown the efficacy of using FM systems on youngsters who are not hearing impaired.

• The following reports and research findings support the use of FM technology in both the classroom and as personal units.
The Use of Sound-Field Amplification System Provides a Teacher with an Opportunity To:

- improve academic achievement for students
- decrease distractibility and increase on-task behavior
- increase attention to verbal instruction and activities and improve understanding
- decrease number of requests for repetition
- decrease frequency of need for verbal reinforcers to facilitate test performance
- decrease test-taking time
- improve spelling ability under degraded listening conditions
- increase sentence recognition ability
- improve listening test scores
- increase language growth
- improve student voicing when speaking
The Use of Sound-Field Amplification System Provides a Teacher with an Opportunity To:

- increase student length of utterance
- increase confidence when speaking
- increase preference by teachers and students for sound-field amplification in the classroom
- improve ease of listening and teaching
- increase mobility for teachers
- reduce special education referral rate
- increase in seating options for students with hearing loss
- cost-effective means of enhancing the listening and learning environment
- reduce vocal strain and fatigue for teachers
A Three Year Study of Sound Field FM Amplification Revealed the Following Results:

- The proportion of students requiring special services decreased after 3 years with amplified classrooms
- Amplified kindergarten classes scored significantly higher on listening, language, and word analysis tests than did children in unamplified classrooms
- Amplified classrooms had better on-task behaviors than students in unamplified classrooms

(Osborn, Graves, & VonderEmbse, 1989)
Earobics

• Earobics, (Earobics.com) has been a mainstay for SLPs working to develop auditory phonological processing skills.

• Earobics is a multisensory reading intervention solution designed to support at-risk readers and foster a safe and achievement-orientated learning environment.

• Earobics includes interactive software, guided instruction, student resources, teachers guides, correlations and assessments, customized professional development, and school-to-home connections.
Evidence Studies for Earobics

• At least three studies have examined the benefits of Earobics compared to a control group that received no treatment (Hayes, Warrier, Nicol, Zecker, & Kraus, 2003; Russo et al., 2005; Warrier, Johnson, Hayes, Nicol, & Kraus, 2004).

• Results of each study confirmed significant benefits received by the experimental (treatment) group relative to the control group.

• It seems apparent that the intensity and frequency of treatment are perhaps the most important variables influencing treatment outcomes.
Evidence Studies

• Treatment evidence is found in Neuroscience Journals
• No question that AT is highly useful in CAPD as seen in these articles
• “The sheer abundance of neuroscience literature that supports the concept of AT for problems with auditory function and related issues is over whelming”.
• The basic science is extremely strong

Frank Musiek
Evidence Studies

- Agnew, Dorn, & Eden, 2004
- Cohen, Hodson, O’Hara, Boyle, Durram, McCartney, et al., 2005
- Gillam, Crofford, Gale, & Hoffman, 2001
- Gillam, Loeb, Hoffman, Bohman, Champlin, Thibodeau, et al., 2008
- Tallal, Miller, Bedi, Byma, Wang, Nagarajan, et al., 1996
- Alexander & Frost, 1982
- Jirsa, 1992
- Hayes, Warrier, Nicol, Zecker, & Kraus, 2003
- Kujala, Karma, Ceponiene, Belitz, Turkkila, Tervaniemi, & Naatanen, 2001
- Moore, Rosenberg, & Coleman, 2005
- Russo, Nicol, Zecker, Hayes, & Kraus, 2005
- Temple, Deutsch, Poldrack, Miller, Tallal, & Merzenich, 2003
- Warrier, Johnson, Hayes, Nicol, & Kraus, 2004
- Katz et al., 1984
- Devenyi, 1989
Evidence Studies

- Working with APD more than 50 years
- Saw relationship between APD and reading problems in children esp. phonemic synthesis
- Skills improved as did oral reading
- Results of Phonemic Synthesis Training (Katz, 2009) provides data from:
  1) Monitoring the therapy performance
  2) Test and retest of original test gathering
  3) Parent /teacher ratings of change in the areas of concern

Jack Katz
Experts

Teri Bellis

• The Science is strong with evidence for Auditory training to benefit individuals with CAPD
  – Jack Katz
  – Frank Musiek
  – Gail Chermak
Does Treatment Work?

- Many studies, i.e., Gillam, et al., (2009) which did not show benefits of any one program over the other in final outcome, nevertheless, did demonstrate that the programs understudy produced some reasonable outcomes.

- A distinction should be made when tackling such a goal of evaluating treatments to a heterogenous and dynamic group. It cannot stand up to the same rigorous standards as an investigational drug study, where dosage and titrates are strictly controlled.

- Another distinction should be made between learners and nonlearners. There are those who will not benefit regardless of the treatment used.
Who Does Treatment?

• Audiologists most frequently partner with speech language pathologists in the screening, assessment and intervention for CAPD since SLPS are the professionals whose assessment of the cognitive-communicative and language abilities associated with CAPD.

• Following a CAP evaluation, an SLP can explore the impact of auditory processing-related deficits on language processing.

AAA, 2010
Who Does Treatment?

- A speech-language evaluation may suggest central auditory processing deficits, resulting in referral for a CAP evaluation.
- “SLPs are also best prepared to provide a number of interventions”

AAA, 2010
Conclusion

There is much work to do ahead in deciphering just what the nature of APD is in a particular child—since no two children are alike—and to determine which programs are more appropriate for each child and to define the nature of the processing disorder. We have a long journey ahead in determining what works and for whom.
Concluding Remarks

SLPs must have a definitive role in the assessment, diagnosis and treatment of auditory-linguistic-cognitive processing disorders.
Considerations

1) The development of a specific diagnostic category that is based on a framework of the processing of skills that are assessed and treated by the practicing SLP.

2) The development of a universal standardized screening and assessment battery that can allow for continuity and consistency among those SLPs assessing and treating children with auditory-linguistic-cognitive processing disorders.
Considerations

3) That the reality of auditory processing disorders in children can no longer be doubted and the effects of the deficits affect higher order listening, language, cognition and learning.

4) That auditory processing disorders differ from auditory-linguistic-cognitive disorders.

5) The expertise of the SLP in assessing and diagnosing auditory-linguistic-cognitive processing disorders can be valuable in the treatment and management of this population of school-aged children.
Considerations

6) The development of universal guidelines for SLPs in the assessment, diagnosis and treatment of processing disorders would be beneficial to practicing clinicians.

7) That treatment for processing disorders is valid and effective and must be frequent and intensive as well as broad and comprehensive in order to address the potential impact the disorder may have on overall listening, communication, and academic functioning (DeBonis & Moncreiff, 2008).
Questions & Comments