PROCESSING SKILLS: AUDITORY, SPOKEN LANGUAGE AND INFORMATION AND THE ROLE OF THE SLP

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DISCLOSURES

- Dr. Ross-Swain is the co-editor of: Auditory Processing Disorders: Assessment, Management and Treatment; author of The Auditory Processing Abilities Test (APAT) and co-author of The Listening Inventory (TLI).

INTRODUCTION

- History of APD
- Definitions and descriptions of APD
- Behaviors associated with APD
- Systems affecting APD
- A new model of for processing
- Assessing APD by SLPs
**HISTORICAL BACKGROUND**

- APD was first identified separate from other disorders in the 1950s
- Helmer Mykelbust, 1954, recognized that children behaved as if they had a hearing loss problem but had normal hearing; termed a disorder of auditory perception: auditory perception deficits
- In 1950s Bocca and Calearo and colleagues published “site of lesion” papers involving passed filtered speech. This site-of-lesion testing expanded to examining processing related problems in children

**HISTORICAL BACKGROUND**

- 1977: Central auditory dysfunction was conceptualized as a disorder of taking in and using auditory information resulting in learning disabilities and language disorders
- Following 1977 APD became controversial; was it a disorder or a reflection of a language disorder manifested when stimuli were presented auditorially (Norma Rees).
- APD continues to be controversial as many proponents of language processing assert that most language processing, even through the auditory modality, involves little information gleaned from the auditory signal.

**HISTORICAL BACKGROUND**

- These professionals note that spoken language processing consists of higher level cognitive-language mechanisms that are applied to the incoming acoustic signal.
- There is disagreement within the professions as to what comprises a central auditory processing disorder
- For example, Musiek, Bellis and others identify auditory processing as being specific to the central auditory system pathway. The emphasis is on modality specific deficits.
**HISTORICAL BACKGROUND**
- Bruton Conference in 2000 concluded a disorder APD is a disorder specific to the auditory modality
- Jack Katz, in functional terms, states: Auditory processing is “What you do with what you hear”. More than the central auditory system

**SO WHAT IS AUDITORY PROCESSING?????**
- We are working towards a definition of APD
- To develop a definition of APD we must first understand the *nature* of auditory processing and its deficits

**ABOUT THE NATURE OF APD**
- To understand the nature of auditory processing requires knowledge and understanding of:
  - Auditory neuroscience
  - General neuroscience as it relates to cognition, memory, learning and sensory systems
  - Neuropsychology
  - Language, learning and communication
**QUESTION: IS IT “PURE” AUDITORY PROCESSING**

- Bottom up: Influence of auditory processing mechanisms on spoken language processing
- Top-down: Cognitive-linguistic influences on auditory processing

**WHAT DOES CURRENT RESEARCH SAY?**

- Auditory processing does not exist as a sole entity but influences/is influenced by other mechanisms
- Banai et al. (2009) found a direct relationship between subcortical auditory processing of speech stimuli and phonological/reading skills
- Poor cABR responses demonstrated poor phonological awareness skills
- Temporal precise processing resulted in good reading skills

**WHAT DOES CURRENT RESEARCH SAY?**

- Banai et al. (2005); Johnson et al. (2007): 1/3 of LD children had abnormal speech ABR responses
- Thus, CAPD is not just a reflection of a language disorder when stimuli are presented auditorily but there is an actual deficit of the auditory nervous system
- Also, 2/3 of LD children do not have an auditory brainstem deficit. Reflects their heterogeneity.
A WORKING DEFINITION

- Children and adults with auditory processing disorder (APD) are a heterogeneous group of people who have difficulty using auditory information to communicate and learn. APD is a set of problems that occurs in different listening tasks. It is a deficit in the processing of auditory input which may be exacerbated in unfavorable acoustic environments and is associated with difficulty listening, speech-language understanding, language development and learning (Jerger & Musiek, 2000).

BUT HOW IS THE SIGNAL PROCESSED?

- The signal remains in the auditory domain for 150-175 msec. At this time the brain stops processing the acoustic parameters.
- The signal enters phonetic domain.
- Enters the phonemic/lexical domain/representations.
- Medwetsky (2015): Any behavioral testing is automatically influenced by cognitive-linguistic mechanisms.
- As SLPs we should take a broader view of this area and consider processing as a number of skills in order to examine spoken language processing (Medwetsky, 2015).

OVERVIEW OF MEDWETSKY’S MODEL

- Developed to examine the underlying processes, breakdowns, and interventions in the context of what the listener faces in daily situations.
- The basic premise of this model is that auditory processing of spoken language involves dynamic, interactive processes that include:
  - Auditory processes
  - Cognitive mechanisms (attention, memory sequencing)
  - Language
  - Central Executive System (Pre-frontal cortex)
  - Arousal Level (Reticular system)
  - Emotional (Limbic system)
  - Speechreading.
Medwetsky’s Model

- AP
- SLP
- IP/COG
- ES

Luckner’s Model (2016)

- Auditory Information Processing

Six Primary Systems Involved in Processing Auditory Information

- Auditory system—the source and carrier of the signal
- Cognitive system—formation of concepts and memory
- Language system—knowledge of language and linguistic rules
- Attention—attending to what is heard
- Behavioral and emotional system—behavioral responses to input
- Sensory system—sensory regulator
Auditory processing disorders come from one or more of six systems:
- Auditory
- Cognitive
- Language
- Behavioral/Executive
- Emotional
- Sensory

In some cases, the problem is with the integration of these six systems.

When thinking about processing consider this:
We can't see processing we only see behaviors. In considering what the behaviors mean we have to consider the expansive model of processing.

General Behaviors seen in Processing Disorders:
- Frequently saying "huh" or "what"
- Misunderstanding or misinterpreting what is being said
- Needs information to be repeated or rephrased
- Is easily distracted
- Has difficulty following verbal directions
- Has difficulty following conversations
- Has difficulty listening with background noise
- Mishears words; confuses words
- Has poor immediate memory skills
- Has difficulty retaining information
- Has difficulty "getting started" with open-ended questions
GENERAL BEHAVIORS SEEN IN PROCESSING DISORDERS:

- Has difficulty organizing and expressing thoughts or ideas
- Has difficulty “getting to the point” in conversations
- Uses vague language
- Difficulty getting puns or jokes
- Has difficulty reading and responding to social cues
- Has difficulty remembering directions
- Has difficulty with spatial and temporal concepts
- Difficulty accessing readily available vocabulary
- Mispronouncing words
- Poor reading and spelling skills
- More…..

BEHAVIORS WARRANTING OBSERVATION IN THE CLASSROOM:

- Ability to follow age level appropriate directions
- The child’s response when he/she can’t follow directions
- Does the child “tune out” or daydream and under what conditions
- Can the child follow and participate in class discussions
- Is the child distractible? What distracts the child?
- Does the child need to have verbal directions repeated, segmented, rephrased? What is the difference when given with visual support and 1:1?
- What happens to the child’s listening ability when there is background noise?

BEHAVIORS WARRANTING OBSERVATION IN THE CLASSROOM:

- Is the child able to complete work independently? How much support is needed for the child to complete tasks that are intended to be performed independently?
- Does the child appear to fatigue from listening? What happens when the child fatigues?
- Is the child able to consistently and successfully perform routine classroom procedures?
- Does the child listen better earlier in the day than later in the day?
- Does the child appear to forget what has just been said?
- Does the child appear to have a short attention span?
- What are the acoustic conditions of the classroom that may be contributing to the child’s listening skills?
EDUCATIONAL IMPLICATIONS
- Difficulty with immediate memory in the classroom
- Difficulty retaining and retrieving information
- Difficulty with auditory working memory
- Difficulty learning to read and spell
- Difficulty with reading comprehension
- Difficulty learning through the auditory modality
- Difficulty understanding new concepts

EDUCATIONAL IMPLICATIONS
- Difficulty with reading retention and comprehension
- Difficulty with overall learning
- A decline in self-esteem and confidence
- Avoidance of school work/homework hassles
- Overall disinterest in learning

ROLE OF THE SLP
- Understand the relationship of processing to learning, literacy and social skills
- Know when a child’s problems call for more than just tutoring
- Collaborate with other professionals
- Educate other professionals on our role in assessing and treating APD
- Provide comprehensive assessments
- Analyze response behaviors; gather quantitative and qualitative data
- Consider all of the systems involved in a child’s processing
- Determine what are primary processing problems and what may be secondary
WHY SHOULD KIDS BE REFERRED FOR A PROCESSING ASSESSMENT BY THE SLP
- Research demonstrates the link between language and learning
- Research demonstrates written language development requires the prior mastery of auditory processing skills
- Learning is dependent on mastery of all processing skills
- SLPs are trained in understanding and investigating the auditory, language processing link to classroom learning
- SLPs are trained in observing behaviors and understanding what behaviors can potentially mean to a child’s academic and social success

PROCESSING ASSESSMENTS: WHAT SKILLS ARE ASSESSED?
- Auditory discrimination: sound and word
- Auditory figure-ground
- Auditory Association
- Immediate auditory memory
- Auditory working memory

PROCESSING ASSESSMENTS: WHAT SKILLS ARE ASSESSED?
- Auditory conceptualization
- Auditory comprehension
- Understanding and following directions
- Auditory reasoning
- Phonological processing
**Behavioral Considerations When Testing**
- Auditory Latency
- Auditory fatigue (endurance)
- Auditory overload
- Auditory intrusion

**A Suggested Battery for Assessing Processing Skills in Children**
- Auditory Skills Assessment (ASA)
- The Lindamood Auditory Conceptualization Test—Third Edition (LACT-3)
- RESCA-E
- The Token Test for Children-2
- The Auditory Processing Abilities Test (APAT)
- The Test of Auditory Processing Skills—Third Edition
- The SCAN-C; SCAN-A
- The Comprehensive Test of Phonological Processing (CTOPP)
- The Listening Inventory
- The Gray Oral Reading Test-5
- The Wide Range Assessment of Memory and Learning (WRAML)

**Collaborating with Others**
- SLP evaluation results
- Neuropsychological evaluation results
- Educational evaluation results
- Teacher inventories
- Parent inventories
- Medical reports
SUMMARY THOUGHTS
- The SLP plays a key role in the assessment of processing skill weaknesses
- The SLP can identify specific skill weaknesses
- The SLP can determine how specific skill weaknesses are affecting a child’s functional abilities
- The SLP can determine what therapeutic interventions can be effective in strengthening skill weaknesses
- The SLP can collaborate with other professionals to determine what other interventions, modifications or accommodations will be helpful
- The SLP can advocate for the child in order to maximize a child’s potential for success

Q & A