Problem

Assessing and/or Treating the multiple aspects of an auditory or language processing disorder is a challenge

Semantic Confusion

• Processing
• Auditory processing
• Central auditory processing
• Language processing

Adjunct Problems

“Although abilities such as phonological awareness, attention to and memory for auditory information, auditory synthesis, comprehension and interpretation of auditorily presented information, and similar skills may be reliant on or associated with intact auditory function, they are considered higher order cognitive communicative and/or language related functions and, thus are not included in the definition of (C)APD” (ASHA 2005a)

Continuum of Processing

Adequate Processing Involves Continuum of Skills

• Intact peripheral auditory system – perceive and receive acoustic stimulus
• Intact CANS – transmit through brainstem to upper cortex
• Phonemic knowledge to discriminate aspects of the acoustic stimulus
• Linguistic knowledge to decode message
• Executive function skills to attend, organize, execute behavioral response
Auditory Processing Defined

• Efficiency and effectiveness by which CNS utilizes auditory information (ASHA, 2005a) characterized by ...
• poor performance in one or more of the following skills
  o Sound localization and lateralization
  o Auditory discrimination
  o Auditory pattern recognition
  o Temporal aspects of audition (e.g., temporal integration, discrimination, ordering, masking)
  o Auditory performance in competing acoustic signals (e.g., dichotic)
  o Auditory performance with degraded acoustic signals (ASHA, 2005b)

(Central auditory processing disorders: The role of the audiologist: a = Technical report; b = Position statement)

Definition: Language Processing

• Ability to abstract meaning from an acoustic stimulus (Massaro, 1983)
• Ability to interpret or attach meaning to auditorily received information to then formulate an expressive response (e.g., behavior, gesture, verbal, written) (Richard, 2017, 2001)

APD vs. CAPD?

• Myklebust, 1954 – “auditory disorder” – very broad term
  o Intact peripheral hearing
  o Deficit -ability to listen and meaningfully respond to acoustic stimuli
  o “central deafness” – problem in higher neurological levels of auditory system
  o Auditory agnosia: can’t attend or comprehend auditory input
• Weisenberg & Katz, 1978 – “Central auditory processing”
  o Post-peripheral auditory deficit
  o Difficulty in ability to receive and integrate auditory information
• ASHA 2005 working group – (central) auditory processing disorder (CAPD – synonymous terms)

Consensus Definition of APD?

• Multiple auditory skills encompassed within APD
  o Diagnose by specific deficit skill or global APD?
  o How many auditory skills in deficit = APD?
• Battery of tasks/test for assessment of APD
  o Specific battery not specified
  o Variability among audiologists diagnosing APD
• Lack definitive standard for interpretation of APD test
  o Combination of observed clinical impressions and performance outcomes on assessment tests
  o Recommendation: child perform 2 standard deviations below mean on two or more tests for APD diagnosis
• Issues with specificity and validity of APD assessments
• Need some guidelines for relationship between cognition, language skills, and performance on (CAP) tests (Friberg & McNamara, 2010)

Erroneous Diagnosis of APD?

• Language developmental level influences performance on APD assessment tasks (e.g., directions of dichotic assessment task)
• Referrals from adjunct professional disciplines (e.g., teacher, school psychologist)
  o Observe deficits in listening, auditory comprehension, discrimination for spelling
  o Assessment tasks or screening checklists that resulted in APD
• Failure to recognize global profile of child (e.g., ADHD, ASD, EF)
  o Early APD in conjunction with developmental delays resolved but diagnosis not changed
• Imperative that AUD and SLP work together to determine primary deficits negatively impacting academic and functional performance (McNamara & Richard, 2012)

Treatment on discrete auditory skills = language/academic improvement?

• Evidence-based systematic review (Fey et al., 2011)
  o School-aged children with diagnosed APD
  o Auditory –based treatment
  o Functional outcomes in auditory, language, or academic
• Encountered challenges in conducting research review
  o Lack of standard definition for diagnosis of APD
  o APD co-exists with reading, writing, learning disabilities
  o Intervention programs include both auditory and language aspects
• Most studies exploratory case studies
• Gains in some specific isolated auditory skills, but no functional impact on language or reading measurements
• Failed to provide direction for SLPs responsible for treatment
Treatment efficacy in APD?
- Heterogeneity of APD
  - AP encompasses wide variety of skills
  - Co-morbidity of APD with other spoken & written communication disorders (Sharma, Purdy, & Kelly, 2009)
- Treatment gains across all aspects of APD difficult
- Lack of definitive assessment battery
- Fail to differentiate subtypes within APD
- Treatment will be minimal across all types of APD
- Treatment programs combination of auditory and language
- Difficult to attribute gains to auditory aspects of program
- Confounding variables mitigates against significant results

Goal of Treatment?
- Language / academic deficits rarely resolved through treatment focused only on isolated auditory skills
- APD may be diagnosis, but functional language objectives will yield more functional outcomes
- Goal of intervention – address presenting deficits
- Major deficit in APD is difficulty abstracting encoded linguistic message – involves variety of competencies
- Will improvement in auditory skills have significant impact on functional language?

Management
- Modification of the communicative environment
- Use of compensatory strategies
- Minimizes adverse effect of disorder of client’s life

Remediation
- Formal and informal therapy to develop deficient skills AND
- Teach compensatory strategies
- Designed to reduce or resolve deficit

Management Remediation

Neuroscientific foundations

Remediation for CAPDs
- Auditory skills training: bottom-up therapy
  - based on neural plasticity theory
  - stimulus-driven, adaptive, repetitive
- Teaching strategies: top-down therapy
  - based on neurocognitive theory
  - concept-driven, use metacognitive and metalinguistic strategies

For most CAPDs - will likely use a combination of bottom-up AND top-down therapies

Example Acoustic Skills
- Binaural processing
  - Auditory Localization
  - Speech in Noise
  - Dichotic listening
  - Interhemispheric integration
- Temporal processing
  - Temporal pattern discrimination/recognition
  - Temporal recognition/manipulation of multiple targets
- Auditory Discrimination
  - Frequency related tasks
  - Timing related tasks
**Rationale for Auditory Training (AT)**

- Based on neural plasticity (Hebb, 1948) – ability of CNS to change and adapt in response to internal or external stimulus
- CAP skills represent foundational skills - contribute to success in other skills and interact with other skills
- A skill that can be tested can be trained
- Deficits in foundational skills reduce system efficiency, requiring over-use of higher order central resources
- If deficits in foundational skills are reduced or resolved, “gaps” in higher-level skills are more likely to resolve
- Goal of treatment is to improve CAP skills in order to improve function of client in real-life situations

**Auditory-phonetic training bottom up**

- Binaural processing training
  - Binaural interaction training
    - Dichotic listening training
- Discrimination training
- Temporal processing training
- Multi-modal training
- Phonemic-acoustic training
  - Rhyming
  - Patterning - diadochokinetics

**Improving binaural processing**

- Brainstem level binaural interaction training
  - Localization training
  - Training with competing signals (e.g., speech-in-noise, Tomatis AIT)
  - Training temporal-spatial skills
- Cortical level dichotic listening training
  - Dichotic Interaural Intensity Difference (DIID)
  - Zoo Caper SkyScraper
  - CAPDOTS

**Dichotic listening (DL) training**

- Addresses dichotic listening deficits due to impaired/inefficient communication between right-left hemispheres
  - Researchers theorize maturational delay in myelin development of the corpus callosum in learning disabled
  - Impaired dichotic listening characterized by excessive left ear suppression on dichotic listening tasks
  - Goal: improve interhemispheric communication by increasing score of “poorer” ear to normal-near normal level and to level similar to that of stronger (usually right) ear
  - Programs use words, numbers, animal sounds, sentences presented simultaneously, one or more to each ear
  - Client responds to all targets – binaural integration OR to only one ear’s targets – binaural separation
  - DIID, Zoo Caper, CAPDOTS

**Improving auditory discrimination**

- Designed to improve auditory system’s ability to extract acoustic cues from within speech spectrum
- Targets include CVs/VGs, words, spondees/trochees, multisyllabic words, words in sentences, nonsense and real sentences, connected discourse, nonspeech targets
- Uses adaptive minimal pairs discrimination, identification and recognition training with targets altered to “tax” system
  - Temporal and/or frequency discrimination, recognition in noise
- Computer-assisted programs
  - Fast ForWord
  - Earobics and HearBuilder
  - Customized Learning: Exercises for Aural Rehabilitation (cLEAR)
  - Listening and Communication Enhancement (LACE)

**Discrimination training research**

- Fast ForWord
  - Reported improvement in discrimination skills among groups of students with students with specific language impairment (SLI) and specific learning disability (SLD), but control group peers also improved
  - Reported improvement in AP skills, no change in reading, spelling, spoken language when compared to no training and placebo groups
  - Systematic review on efficacy of Fast ForWord
    - no significant effect from FF on outcome measures
Resources for therapy

- www.linguisystems.com - Differential Processing Training Program – auditory, phonologic and linguistic goals
- www.acousticpioneer.com – dichotic listening and temporal patterning training
- www.clearworks4ears.com – activities that enhance an array of auditory & related skills
- www.brainHQ.com - activities to enhance auditory, visual and thinking/reasoning skills

Computer Applications

- Auditory Discrimination
  - HearBuilder www.hearbuilder.com; www.superduperinc.com
  - Fast ForWord www.scilearn.com
- Temporal Processing
  - Zoo Caper Skyscraper dichotic listening program www.acousticpioneer.com
  - CAPDOTS dichotic listening training www.capdots.com
  - Insane Earplane www.acousticpioneer.com
- Listening Skills
  - www.smartyearapps.com
  - www.hamiguchiapps.com
  - www.interactivemetronome.com

Acoustic Processing – Modifications and Strategies

- Gain visual attention before beginning to present verbal directions
- Position yourself in good light and facing the student
- Eliminate/reduce distracting background noise
- Direct signal enhancement via assistive technology
- Use Clear Speech
- It’s all about improving access to acoustic signal

Effective intervention of CAPDs Summary

- Deficit in skills subserved by CANS
- Can affect academics, communication, well-being and can co-exist with other conditions
- Diagnostic results help define nature and clarify impact of deficit
- Intervention MUST be deficit-specific AND include modifications, compensation, remediation to be effective
- Should reassess skills at periodic intervals to monitor

CAP Therapy research summary

- Studies note improved performance pre- and post AT in specific auditory skill trained (i.e., “if you drill it, it will come”)
- Some evidence of improved phonologic awareness
- Virtually all report improved “hearing” and listening
- Very few reports of generalization of improved auditory-specific processing to academic and/or learning skills (Fey, et al., 2011)
- Some reports of improved language-learning-cognition following use of multi-modal training programs

Continuum of Processing

Auditory Processing
speech-language pathologist

Language Processing

Acoustic / Phonemic Processing

**Language Processing Components**

- **Lower Level Processes**
  - Semantics
  - Syntax
  - Phonology
  - Pragmatics

- **Higher Level Processes**
  - Printed
  - Pragmatics
  - Intentions
  - Presuppositions
  - Conversation Rules
  - Conversation Violations
  - Metalinguistic Awareness
  - Degree of Directness
  - Humor
  - Idioms
  - Polite Forms
  - Figurative Language
  - Knowledge of Grammar
  - Discourse
  - Everyday
  - Printed
  - Instructional

**Phonetic / Phonemic Processing**

- Preliteracy foundation
  - Sound-symbol correspondence
  - Spelling
  - Reading
  - Written Language
- Weak area for this generation
  - Visual learners
  - “Text speak”

**Phonemic Processing Skills**

- Auditory Analysis / Segmentation
- Auditory Attention
- Auditory Association
- Auditory Closure
- Auditory Discrimination
- Auditory Figure Ground
- Auditory Localization
- Auditory Memory
- Auditory Sequential Memory
- Auditory Synthesis / Sound Blending/Closure

**Phonemic Processing Modifications & Strategies**

- Use visual phonics or gestures to represent various auditory sounds
- Play games using visual-motor actions to represent auditory sounds or segments
- Play detective to analyze and segment sound aspects of words
- It’s about structure and quantity of incoming information

**Linguistic Processing**

- Language Foundation for metalinguistic skills
- Ability to comprehend and express ideas through auditory to verbal modality
- Conceptual basis for higher level, more complex language

**Language Processing Skills**

- Labeling
- Stating Functions
- Association
- Categorization
- Antonyms
- Synonyms
- Idioms
- Analogies
- Multiple Meanings
- Stating Attributes
Language Processing Treatment Principles

- Work from multiple modality to one
  - Motor, visual, verbal
  - Visual, verbal
  - Verbal only
- Develop competency in language skill, not one specific task
  - Categorization Example

Language Processing Remediation

- Determine level of language processing development
- Begin at earliest level of difficulty
- Use entire second functional unit for intervention
- Order language goals in cognitive complexity hierarchy
- Start with discrete – work toward integrated
- Think “hierarchy” – level of language difficulty
- Use neuropsychological model to guide goals
- Use compensatory cues and strategies
- Examine therapy materials carefully

Linguistic Processing Modifications & Strategies

- Repetition, rehearsal, restatement, and confirmation of auditory information
- Provide clear, succinct verbal directions
  - Use clear language
- Supplement verbal with visual stimuli
- Play compare contrast games with visual-motor to supplement auditory input
- Use visual cues or prompts for ‘listen’ and ‘do’ to promote careful listening before initiating a task
- It’s all about linguistic clarity

Executive Functions

- Ability to plan, organize, manage, execute response
- Coordinate and integrate the foundation skills from the temporal lobe
- Under frontal lobe, pre-motor, motor cortex control
- Orchestra analogy
- Computer isn’t spooling to the printer

Executive Functions Skills

- Attention
- Inhibition
- Planning and Organizing
- Initiation and Persistence
- Flexibility Self-Regulation
- Goal Selection
- Problem Solving
- Working Memory
- Impulsivity
- Abstract Reasoning
Executive Functions
Modifications & Strategies

• Physical, visual organization in environment
• Use pictures, symbols, words for task sequence/analysis to identify the steps
• Use checklists, chore logs, routines
• Generate a plan of steps BEFORE beginning task
• Role play and practice interactions in various situations
• Prepare student for transitions and distractions

Memory and Recall

• Memory is a process, not fixed thing or singular skill or location
• Nerve cells are signaled to store memory as short term or permanent in long term
• The retrieval process activates dormant neurons to trigger memory; cannot separate memory and retrieval
• Best way to trigger recall is by association

RETRIEVAL

• Highly dependent upon state, time, & context
• Variety of ways we store and retrieve information
• Type of memory determines how it is retrieved

MEMORY PATHWAYS

Explicit

Implicit

Semantic

Episodic

Short term & working memory

5-20 sec.

(7 chunks)

Words, symbols, stories

Locations, events circumstances

Procedural

Physical skills, manipulatives, body-learning

Reflexive

Automated nonconscious learning

Conditioned

Emotional

Steps in Memory Storage Process

Stimulus

Sensory Register

Short Term Memory

Active Processing

Long Term Memory

Conscious & non-conscious stimuli

millions of bits per second

Temporary storage buffer

5-20 seconds

To retain declarative knowledge; must actively process

Explicit memories & implicit learning

Strategies for Memory Skills

• Explicit/Declarative Strategies
  - rhymes, visualization, mnemonics
  - keep chunks below 7 units
  - acronyms (first letter)
  - mind-maps
  - peripherals for visual organization of ideas

• Episodic Strategies
  - “mark” learning with places, circumstances, field trips
  - match learning and testing states
  - practice quizzes
  - theme days, build association contexts

• Procedural Strategies
  - teach with movement – 3 steps for 3 points
  - embed emotion in learning – celebration
  - student presentation in groups
  - make up song, lyrics
  - build working model

• Reflexive Strategies
  - fill in the blanks
  - flash card games
  - rap
COMPENSATORY STRATEGIES

• Word Retrieval

• Memory

RETRIEVAL

• Highly dependent upon state, time, & context

• Variety of ways we store and retrieve information

• Type of memory determines how it is retrieved

Word Retrieval Tasks

• List in category
• States and Capitals
• Conversation
• Timed Tests/Tasks

Teach Compensatory Cueing

Cues for Word Retrieval

• Additional Time
• Stimulus Repetition
• Questions Prompts
• Additional Information
  o Category
  o Description
  o Initial Sound
• Multiple Choice
• Naming

Naming

Additional Information Cues

Question Prompts

Stimulus Repetition

Additional Time
Cassie C.A. = 8.8
Referral: poor short term memory yet strong functional memory skills; strong visual memory; history of MEE, no tubes.

<table>
<thead>
<tr>
<th>Test</th>
<th>Age Eq</th>
<th>Percent</th>
<th>Stand Sc</th>
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<td></td>
<td>Seq Mem</td>
<td>7-7</td>
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Cassie- CAP evaluation
- Low-pass Filtered Speech: below normal each ear
- Time Compressed Speech: below normal each ear
- Dichotic Digits Test: normal each ear
- SSW Test: below normal right ear
- Competing Sentences Test: normal each ear
- Pitch Patterns Sequencing: normal each ear

Cassie
- Difficulty on degraded speech tasks taxing auditory closure
- Greater difficulty on linguistically loaded dichotic task (SSW) with normal scores for digits task
- Good labelling of tonal patterns

Auditory Decoding Deficit

Recommended Modifications & Compensations
- Preferential classroom seating
- Noise abatement at school & home
- Direct signal enhancement via FM system
- Repetition of info as needed
- Adjusted class schedule to minimize auditory overload
- Preteaching new info, especially vocabulary
- Multisensory environment—verbal info supplemented with written/graphic cues

Cassie
Direct Remediation Activities
- Bottom-up auditory training: discrimination training, noise tolerance training, speechreading training
- Top-down therapy: auditory closure, schema induction, attribution and self-advocacy training

Recommended Games/Activities
- Earobics for children (both levels)
- Rhyming, A Rhyme in Time
- Wheel of Fortune
- Sound blending games
- Read my lips
Caleb, 10 years

- School testing indicated auditory processing disorder with difficulty following multi-step directions
- Poor performance on CELF and TAPS
- Student “doesn’t get stuff”
- Receiving SL services

Caleb- CAP evaluation

- Low-pass filtered speech: normal each ear
- Time compressed speech: normal each ear
- Dichotic Digits: normal each ear
- SSW Test: below normal each ear
- Competing Sentences: below normal each ear
- Pitch Patterns Sequencing: normal each ear

Language Evaluation

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<td>Slow &amp; Accurate</td>
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<td>Above 8-3 Above</td>
<td>Scaled 43 35 42</td>
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Caleb

- difficulty on linguistically loaded dichotic tasks (SSW, CST) AND performance difference for filtered words depending upon wordlist used BUT
- NO evidence of primary auditory dysfunction – results consistent with likely language processing deficit – CAPD profile - 2ndary profile

Associative deficit

Caleb- recommendations from Audiologist

Environmental modifications & compensations

- rephrasing and clarification
- avoidance of ambiguous language
- preteaching rules and vocabulary
- waiver of second language requirement
- assess using both language-biased and non language-biased IQ instruments (e.g., TONI)
- books on tape, study guides, and Cliff’s Notes

Direct remediation activities

- Speech-to-print skills training
- Dichotic listening training
- Metalinguistic/metacognitive skills training
- SL Tx for language skills

Useful games/activities

- Password
- Scattergories
- Catch Phrase
- Taboo
- Quizzles (logic puzzles)
- Clever Endeavour
- Plexers (word puzzles)
Caleb

- Language processing profile
  - Secondary Zone – build discrete skills
  - Tertiary Zone – integration, problem solving
  - Word retrieval – maintain accuracy, work on speed

Rachel, 9yrs-4mos

- Referred by neuropsychologist due to failure to thrive academically
- Average intellectual potential
- Grade at time of test: 2.5
  - WIAT reading level: 1.4
  - WIAT written language: 1.8
  - WIAT spelling: 1.7
  - WIAT math: 2.5
  - Phonological segmentation and word finding issues

Rachel – CAP evaluation

- Low-Pass Filtered Speech: normal each ear
- Time compressed Speech: normal each ear
- Dichotic Digits Test: right ear normal, left ear below normal
- SSW Test: right ear normal, left ear below normal
- Competing Sentences Test: right ear normal, left ear below normal
- Pitch Patterns Sequencing: normal mimicking, abnormal labelling

Rachel (9y,4m)- Language Evaluation

Referral: Failure to thrive in educational setting; repeated kindergarten; currently in 2nd grade. Taking Concerta. Slow to respond in testing.

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<td>Seq Mem</td>
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Rachel – Recommendations from Aud

Recommended modifications & compensations
- look or listen
- repeat with associated cue, demonstration, model
- told task demands “up front”
- present information sequentially, preteach
- untimed/extended time tests & assignments
- test answers written in booklets not computerized score sheet
- tape recorder and/or notetaker
- books on tape, study guides, Cliff’s notes
- music while studying

Integration Deficit
Rachel-recommendations from Aud

**Recommended remediation activities**
- Interhemispheric transfer training exercises
- Dichotic listening training
- Verbal rehearsal
- Schema induction
- Attribution and self advocacy training

**Recommended games/activities**
- Name that tune
- Feely bag
- Twister
- UpWords
- Rummikub
- Bopit, Brain Warp, Simon
- Gymnastics
- Piano lessons

Rachel-recommendations from SLP

- Primary zone weak
- Secondary zone – better at discrete language tasks
- Tertiary – integration poor
- Memory poor
- Retrieval – slow and inaccurate
- Compensate for memory and retrieval
- Make sure signal redundant and clear
- Build language foundation
- Work multi-modality to strengthen integration
- Work on functional integrated language tasks

Caroline, 12 yrs-2mos

- New to district – previous CAP report indicated dx of CAPD based upon poor SSW and speech-in-noise scores
- Fast ForWord and ALD had been recommended
- District requested reeval prior to new IEP
- Reported difficulty sustaining attention during social conversations
- SL eval done by private SLP – not available at this testing
- ADD diagnosed at age 10

Caroline – Language Evaluation

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<td>CASL - total</td>
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<td>- Antonyms</td>
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<td>OWLS-Written Expression</td>
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Caroline – CAP evaluation

- **Low-pass filtered speech**: right ear below normal, left ear normal
- **Time compressed w/reverb speech**: normal for each ear
- **Dichotic Digits**: normal for each ear
- **SSW Test**: normal for each ear
- **Competing Sentences Test**: normal for each ear
- **Pitch Patterns Sequencing**: normal for each ear

Caroline

- only poor score is LPFS – RE
- no pattern of auditory processing dysfunction
- reported difficulty in conversations related to a possible language or reported attention problem

**NOT CAPD**
Caroline

• Communication profile consistent with Asperger
• Intervention Suggestions:
  o Social pragmatic
    • Nonverbal cues
    • Discourse
  o Situational strategies
    o Problem-solving /reasoning
    o Fine motor compensation
    o Routines
    o Sensory breaks/movement/exercise during school day
    o Classroom modifications to insure comprehension

Teacher Compensatory Strategies for LPD

• Introduce information using multi-modality approach for sensory stimulation
• Supplement auditory info w/ visual materials
• Introduce new material in context rich associative environment
• Provide cues, prompts, hints to help focus student and facilitate retrieval
• Allow “thinking time” and monitor external pressure when latencies occur

Teacher Strategies (con’t)

• Limit timed activities and performance tasks; provide extra time
• Vary type of responses expected on exams and class discussion
• Shorten length of assignments to promote focus on accuracy rather than efficiency
• Refresh stimuli with repetition, re-phrasing, and expansion clarifications
• Teach with stories and examples to associate main points of auditory information

Student Compensatory Strategies

• Request additional time when needed
• Request cues, prompts, associative info
• Ask specific questions rather than generic
• Apply strategies taught in therapy that work to facilitate retrieval
• Learn to state what you know, then the source of confusion
• Tape record for repetition or permanent record of lecture
• Learn to use rehearsal, paraphrasing, and writing key words to keep processing on track
• Be an active learner, rather than passive
• Be patient; take your time and don’t give up or become frustrated
• Seek out study buddies to check information

Team Work - Collaboration

• Audiologist might complete testing
• Speech-language pathologist must interpret and provide appropriate intervention
• Classroom teacher – literacy / phonic skills
• Listening Skills ?

Thirty great games/books to enhance auditory processing and related skills (Ferre)

Game                    Processing skill taxed
• A Rhyme in Time        sound discrimination, auditory closure
• Battleship             listening, visual patterning, integration
• Blind Man’s Bluff      localization, binaural interaction
• Boggle                 pattern recognition, integration
• Bogit                  integration, vigilance
• Brain Warp             vigilance, integration, problem-solving
• Card games             pattern recognition, sequencing
• Catch Phrase           integration, vocabulary, output
• Clever Endeavour       metalinguistic strategies, critical listening
• Feely Bag              interhemispheric communication
• Ending sound game      auditory discrimination
• Mad Gab                temporal patterning, language
• Marco Polo             localization, binaural interaction
• Musical Chairs         vigilance
• Name that tune         interhemispheric integration
Game processing skills taxed

- Password: vocabulary, linguistic skills
- Plexers: metalinguistic strategies
- Rags to Riches: metalinguistic skills (idioms)
- Read My Lips: lipreading/speechreading
- Red Light-Green light: vigilance, active listening
- Rummikub: pattern recognition, problem solving, integration
- Scattergories: vocabulary building, linguistic strategies
- Scrabble: integration, language, visual patterning
- Simon: auditory-visual patterning
- Simon Says: vigilance, active listening
- Taboo: vocabulary, metalinguistic strategies
- Telephone game: attention, active listening, discrimination
- Twister: integration, critical listening
- UpWords: integration, critical listening
- Wheel of Fortune: auditory closure

**Treatment Recommendations**

- Current research provides little definitive direction for treatment of A/CAPD
- Language disorders common in APD - Evaluate and include language goals with AP treatment
  - Don’t treat auditory deficits in a vacuum
- Use auditory therapies in conjunction with language, communication, and academic goals
- Evaluate top-down/bottom-up skills and check compatibility with child’s learning style and deficit type
- Don’t force-feed academic knowledge “teaching to the test”; stimulate the brain with interesting and challenging activities
- Most listeners with “bottom-up” specific auditory impairment will need top-down teaching to compensate
- Ask the “big three questions”

**Practitioner**

- Apply info from variety of sources
  - Adapt procedures & techniques to meet individual needs
- Be creative in devising solutions
- Beware of “cookbook” approaches; simplistic solution to complex problem

**Practitioner**

- YOU apply the research and YOUR work generates new research questions
- Urgent need for more research on screening and assessment tools as well as treatment efficacy for specific types of CAP/LP problems
- Neither CAP nor LP occur in a vacuum – neither should the assessment and management process

**Summary Treatment Comments**

- CAP – starts auditory only
- LP – starts multiple modality
- CAP – emphasis on acoustic signal
- LP – emphasis on comprehension
- CAP – bottom-up approach to treatment
- LP – top-down approach to treatment

**Challenges and Controversies**

- Definition of auditory processing encompasses a variety of auditory skills (e.g., auditory discrimination, auditory localization, auditory pattern recognition, temporal aspects, etc)
- Language processing skills begin to overlap with auditory phenomena in upper cortex – difficulty to differentiate at that level
- Functional processing skills involve interpretation, synthesis, comprehension, etc. and are considered higher order cognitive communication or language skills
- Treatment on discrete auditory skills improves those specific skills, but research at present does not support functional outcomes that positively impact language and academic performance
- Is goal of treatment efficacy data to show improvement on discrete auditory skills or functional outcomes in abstracting the encoded linguistic message?
Goal-APD/LPD Intervention

- Individual needs ability to abstract meaning from auditory stimulus that is linguistically encoded
- Begins with peripheral auditory system, to central auditory system; subcortical to cortical structures and integration
- Involves continuum of skills (e.g., acoustic, phonetic, linguistic, executive functions)
- Treatment should address discrete auditory and language skills
- Keep data to document efficacy of treatment goals

Research needs

- Well-controlled treatment outcome studies
- Better defined experimental groups for A/CAPD, SLI, SLD
- Efficacy and effectiveness studies for quantifiable outcome measures
- Studies specifically examining AT generalizability to academic/communicative skills
- Improved assessments of AP skills will lead to clearer intervention/training goals

“More subtle forms of language deprival do not show up in such dramatic ways, but may ultimately affect abilities to think abstractly, plan ahead and defer gratification, control attention, and perform higher order analysis and problem solving – the very skills so much at issue in American schools today.”

Jane Healy, Endangered Minds

Summary Continuum in Processing Disorders

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<th>Example Assessment Tasks</th>
<th>Example Intervention Tasks</th>
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REFERENCES