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**Language Processing Therapy for children diagnosed  
with a (Central) Auditory Processing Disorder**

**PART TWO**

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SpeechPathology.com presentation**

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## **Relevant Financial Relationship**

Dr. Coen-Cummings is a paid employee of the Cincinnati Children's Hospital and will be referencing her place of employment along with actual case studies.

Dr. Coen-Cummings has a family member who has been diagnosed with ADHD which is covered in the presentation. She is a reviewer for speechpathology.com and Learning By Design, Inc.

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## Course Description

This seminar will summarize the current research's stance on evidence-based treatment strategies for children diagnosed with a (central) auditory processing disorder, and how the overall intervention goal will vary, depending on which discipline is delivering the treatment. The main focus is the DEMONSTRATION (via videos) of clinical application of language processing management goals that improve auditory memory, phonological awareness, auditory skills that impact metalinguistics, & binaural integration skills.

## Learning Outcomes

"After this course, participants will be able to..."

- Describe the evidence-based research as it relates to interventions for language processing.
- List examples of direct intervention goals for improving deficits in specific areas of language processing.
- Describe therapeutic tasks that will improve deficits in areas related to language processing.

- “The concept of CAPD as a unique diagnostic entity that could be assessed and treated in school-aged children continues to engender controversy”.

David A. DeBonis American Journal of Audiology Vol.24 124-136 June 2015

- “Cacace and McFarland (2005) described the current status as stalled

- “Cowan, Rosen and Moore 2009 referred to the auditory processing-related research as ‘stagnated’(p.188); and even proponents of CAPD have admitted that the persistent lack of evidence validating the nature of the disorder and the most appropriate test protocol threatens its viability as a diagnostic entity”

(Bellis,2002; Dawes & Bishop, 2009; DeBonis & Moncrieff, 2008)  
American Journal of Audiology Vol 24. 124-136 June 2015

## Auditory Processing Defined

- Auditory processing is the efficiency and effectiveness by which the central nervous system utilizes auditory information. It encompasses the perceptible processing of auditory information in the central nervous system and the neurobiologic activity that underlies that processing and gives rise to electrophysiologic auditory potentials (ASHA, 2005).

## CAPD defined

CAPD refers to limitations in the ongoing transmission, analysis, organization, transformational, elaboration, storage, retrieval, and use of information contained in audible signals.

Kathy Fahey (Nov. 2004 speechpathology.com)

## CAPD proposed by the Task Force on Central Auditory Processing Consensus Development (ASHA, 1996)

Central Auditory Processes are the auditory system mechanisms and processes responsible for the following behavioral phenomena:

- Sound localization and lateralization
- Auditory discrimination
- Auditory pattern recognition
- Temporal aspects of audition, including temporal resolution, temporal masking, temporal integration, temporal ordering
- Auditory performance decrements with competing acoustic signals
- Auditory performance decrements with degraded acoustic signals

- “Although ASHA agrees that individuals who have CAPD exhibit deficits in processing that are more substantial in the auditory modality, it also admits that sensory processing involves modalities as well as support from cognitive and language systems, making complete modality specificity unlikely”.

De Bonis, 2015...give reference

- “Medwetsky (2011) agreed that pure auditory processing is unlikely, stating that ‘the processing of spoken language entails the intertwining of auditory, cognitive and language mechanisms that are often engaged simultaneously” (p.291).

## Language Processing defined

- Language processing refers to the ability to attach meaning to auditory information and the utilization of mental operations by which we perceive, recognize, understand and remember sounds, words and sentences.

(Chris Dollaghan, Ph.D CCC-S on [www.apraxia-kids.org](http://www.apraxia-kids.org))

## Language processing exists in tandem with auditory processing but is also independent from it

The ASHA Task Force (1996) definition not only specifies the auditory aspects of processing, but it also makes a distinction regarding processing that is not dependent on acoustic signals. This distinction leads to a broader discussion of language processing. Consider the other modes we use to receive, perceive, analyze, store, retrieve, formulate and produce language. For example, we can use sign language to transmit and to comprehend messages. Individuals, who are deaf or hard of hearing, process language without the benefit of an intact auditory system. We "read" paralinguistic cues (facial expressions, body posture, gestures) as we communicate with others and know that such cues sometimes support, but other times do not support the verbal message that we hear. Written language is another way that we process language without direct auditory input. Reading and writing development is certainly facilitated by knowledge of verbal speech and language, but development is possible without verbal input. These examples show that language processing exists in tandem with auditory processing, but also independent from it.

Kathy Fahey (Nov. 2004 [speechpathology.com](http://speechpathology.com))

## Bottom-up vs top-down information processing

- In the 1980s, researchers and theorists debated bottom-up information processing and top-down information processing explanations for language learning. The bottom-up theories emphasize accurate reception and perceptual processing of sensory information prior to its higher level analysis and construction of meaning.
- Top-down models of language processing emphasize the influence of higher order thinking (whole-to-part) over perceptual analysis. Schemes are learned through experiences and are used to make predictions about sensory information.
- Interactive theories of information processing combine the views of bottom-up and top-down processing theories that occur through parallel processing and add the active participation of the learner and the clarity of the linguistic and nonlinguistic information as important characteristics (Nelson, 1998).

Kathy Fahey (Nov. 2004 [speechpathology.com](http://speechpathology.com))

“One of the main questions among professionals working with children with APD is whether the listening difficulties .... Are due to a specific auditory sensory processing deficit (bottom-up problem) or to a cognitive deficit (top-down problem).”

(DeWit et al., 2016)

- Given that much recent literature is suggesting CAPD is multi modal, both ASHA and AAA stated that recommendations should include bottom-up (i.e., auditory training) and top-down (e.g., language intervention, strategy instruction) activities to address the fundamental auditory deficits and related communication difficulties”(DeBonis,2015)

## Conclusion

- At this time, there is insufficient evidence and a lack of consensus to make specific recommendations regarding the most effective treatment of (C)APD.

### Limitations:

- Small sample sizes
- Lower quality research designs (e.g., case study)
- Short treatment periods
- Limited or no control for various nuisance variables such as consistent treatment environments
- Varying definitions of (C)APD
- Varying assessment protocols

## EBP interventions for (C)APD... do they exist?

In a review by Kamhi (2011) of the evidence for auditory processing disorder, states there is little evidence that auditory perceptual impairments are a significant risk factor for language and academic performance and there may be limited evidence that auditory interventions provide any unique benefit to auditory, language or academic outcomes.

They conclude that SLPs should treat children who have been diagnosed with APD the same way they treat children who have been diagnosed with language and learning disabilities.

## So where does this lead the treating SLP?

- Kamhi (2011) encourages clinicians to consider viewing auditory deficits as a processing deficit that may occur with common development language and reading disabilities rather than as a distinct clinical entity.

## Focus on Identifying Students who have general listening deficits

## Websites with typically reliable content to share with parents

### Auditory Processing Disorders:

- ASHA [www.asha.org/public](http://www.asha.org/public)
- National Coalition on Auditory Processing Disorders, Inc. [www.ncapd.org](http://www.ncapd.org)

### Attention Deficit:

- CH.A.D.D. [www.chadd.org](http://www.chadd.org)
- National ADD Assoc: [www.add.org](http://www.add.org)

### Reading/Dyslexia:

- Reading Rockets: [www.readingrockets.org](http://www.readingrockets.org)
- International Dyslexia Assoc.: [www.interdys.org](http://www.interdys.org)
- Roads to Learning: [www.ala.org](http://www.ala.org)

Learning Disabilities: <http://ldaamerica.org/>

Laws/IDEA, etc. <http://www.parentcenterhub.org/repository/idea/>

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## Auditory & Language Processing Disorders Management

- Management is determined by which of the auditory (and/or language processing) deficits that the child is exhibiting (Musiek, Bellis, Chermak, American Journal of Audiology, Dec. 2005)
- It is possible to have a primary and secondary deficit area
- Management should focus on 3 aspects:
  - Changing the learning or communication environment
  - Remediating the auditory deficit itself,
  - Improving the child's learning and listening skills by recruiting higher-order skills to help compensate for the disorder (Bellis, ASHA web page retrieved 9/20/08)

From Bellis, T. CAPD in the Educational Setting, 1996

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## Management Goals cont.

- Learning accommodations such as acoustic room treatment to reduce echoes and background noise, repeating or rephrasing instructions, slowing down the rate of speech, providing visual cues, and/or using assistive listening equipment to amplify and enhance the teacher's voice through a wireless microphone/headset or speakers in the classroom.

## Management Goals

- Lastly, a speech/language pathologist or an audiologist may help the child develop self-help techniques to improve overall communication.

### APD research of the 1990's suggested treatment protocols based upon "sub-profile" categorization

- The sub-profiles were derived from research data that applied factor analysis to audiological (and various multi-disciplinary) test findings, resulting in APD "patterns"
- While these findings are still relevant because they provide "clues" for associated disciplinary evaluation (speech-language pathology, psychology, OT/PT, etc.), **the research now suggests that treatment focus should be deficit-specific and structured by a top-down (Ferre, 2002), or bottom-up framework (Bellis, 2003; Chermak, 2007; Ferre, 2006)**

### Treatment Plan's intentions

Your treatment plan/therapy goals should remain focused on improving the child's deficits (whether auditory, phonological awareness, or language-based) and be driven by evidenced-based practices.

Reference the Language Processing Therapeutic Goals to Improve Active Listening handout (.pdf)

## Order of presentation

- The speechpathology.com PART ONE presentation, addressed improving listening deficits when in the presence of background noise (LTG 1), and you are directed to THAT presentation for this information.
- This PART Two presentation will follow the handout out, beginning with LTG 2, by common symptomology

## Problem Statement 2: Consistent and significant difficulty with auditory memory

This data will often be seen during the SLPs  
CELF-5 administration, and in parent/teacher  
reports in listening questionnaires

## Poor Auditory Memory

- PRIMARY CHARACTERISTICS:
  - Poor auditory memory
  - Poor vocabulary (receptive and expressive)
  - difficulty understanding complex sentences
  - difficulty following directions
  - poor reading comprehension
  - difficulty making necessary word associations to understand jokes, riddles, jargon
  - ask for clarification (“I don’t understand”)
  - Difficulties with categories, labels, multiple-meaning words, negative *wh* questions, antonyms, synonyms, & homonyms

## LTG 2: to improve recall for spoken word lists and sentences

Improvements in this area should aid in better note-taking and holistic understanding of a teacher’s lesson/lecture

## LTG 2: to improve recall for spoken word lists and sentences

STG 2a: increase auditory memory for a 5 or  
more related word string

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## LTG 2: to improve recall for spoken word lists and sentences

STG 2 b: increase auditory memory for a 5 or  
more UNRELATED word string

Following video

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## LTG 2: to improve recall for spoken word lists and sentences

STG 2c: increase strategies used for  
functional memory tasks for recall of digits

## LTG 2: to improve recall for spoken word lists and sentences

STG 2d: increase strategies used for functional  
memory tasks for recall of word lists

Same goal emphasizing chunking, visual  
imagery and LOCATION

## LTG 2: to improve recall for spoken word lists and sentences

STG 2e: increase strategies used for  
functional memory tasks for recall of a  
phoneme series

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## LTG 2: to improve recall for spoken word lists and sentences

STG 2f: increase strategies used for  
functional memory tasks for recall of story  
content using visualization

Following video

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## **LTG 2: to improve recall for spoken word lists and sentences**

STG 2g: increase recall of complex  
grammatical sentences containing  
subordinate clauses

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## **LTG 2: to improve recall for spoken word lists and sentences**

STG 2h: increase recall of complex  
grammatical sentences containing 3 attributes

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## LTG 2: to improve recall for spoken word lists and sentences

STG 2i: increase recall of a short story with 3  
– 5 key components by telling details of  
WHO, WHERE and WHEN

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## LTG 2: to improve recall for spoken word lists and sentences

STG 2j: increase recall of a short story with 3  
– 5 key components by telling details of  
introduction, main idea and conclusion

Video on next slide

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## LTG 2: to improve recall for spoken word lists and sentences

STG 2k: increase recall of a short story with 3  
– 5 key components by verbally providing 3 –  
5 details from the story (in sequence)

## SUMMARY: Auditory Memory Enhancement

- Teach strategies such as chunking or verbal rehearsal (e.g. Earobics 1 or 2 for word (Sam)/phoneme series (Noah): Karloon's Balloons or Calling All Engines, I Spy programs for word lists/following directions when covering text on screen and modifying initially, Thinkin-Things I for auditory ONLY information)
- Teach Imagery techniques: draw key points to stories: Post-It notes of correct # of main points, then open set: retell story based on pictures. Finally “draw” in your mind.

## SUMMARY: to improve visualization techniques

- Use color form-type pictures and stickers to increase memory for a list/series of items:
  - Add one sticker
- Next person, adds another sticker, and points/verbalizes the items in the order placed while LOOKING at the board
- Next, that same person covers the board with a piece of construction paper (no visual cues) and repeats the sequence of the items placed, but pointing to the general location of where that item would be under the construction paper.
- This continues for each person's turn until they are unable to name the list. It is not unusual for kids 10 years and up to be able to recall up to 16 items in a row, using this technique, and this give them a tremendous amount of confidence.
- Discussing how we typically recall numbers of lists (chunking in 3 or 4, like phone numbers) is a good start to this activity.

**Problem Statement 3:  
Phonological awareness skills  
are substantially below age  
appropriate norms.**

## LTG 3: To improve phonological awareness skills

### APD STG (PHONOLOGICAL AWARENESS):

- a. To increase segmentation skills for syllables from 20% to 80% accuracy level.
- b. To increase segmentation skills for phonemes from 20% to 80% accuracy level.
- c. To increase isolation skills for initial, medial and final phonemes from the 50% to 90% level.
- d. To increase deletion skills from the 70% to 90% level for phonemes.
- e. To increase substitution skills of syllables with manipulatives from the 50% to 90% level.
- f. To increase substitution skills of phonemes with manipulatives from the 50% to 90% level.
- g. To increase grapheme knowledge of diphthongs from 25% to 75% upon sight presentations.

## Problem Statement 4: Consistent and significant difficulty with temporal aspects of audition.

This is the training referred to as a bottom up approach, since it's at the most basic element of processing the auditory input, in a sound field environment

## Auditory Training

- Detection
- Discrimination
- Vigilance

### Temporal Gap Detection: leads to identification of pauses in conversation and text

- Ask the child to detect brief gaps inserted within brief bursts of white noise which are progressively shortened.
- Use Apps of background noise generators for stimulus presentation video

## LTG 4: To improve auditory skills

Since the progression should be detection, discrimination then vigilance, we'll begin with:

STG 4d: To increase gap detection

## LTG 4: To improve auditory skills

After detection skills are demonstrated, discrimination can be trained.

STG 4a: To increase frequency discrimination of high vs. low tones

## LTG 4: To improve auditory skills

After detection skills are demonstrated,  
discrimination can be trained.

STG 4b: To increase frequency discrimination  
and labelling of a 3 pitch pattern

## LTG 4: To improve auditory skills

After detection skills are demonstrated,  
discrimination can be trained.

STG 4c: To increase frequency discrimination of  
pitch sweeps

## Auditory Training of Minimal Pairs (use an FM system if available to the better ear) (Christine Sloan)

Discrimination of minimal syllable pairs of stop-consonants and fricatives consonants and short vowels (to reduce temporal cues in aiding consonant discrimination)

voicing pairs; p/b, t/d, k/g; f/v, s/z

- place discrim. Pairs; t/k, p/t, p/k, b/d, b/g, d/g; s/sh, z/v, sh/ch,

## Sloan discrimination tasks continued

Therapy progression includes:

- sound in syllables
- minimal pair WORDS
- minimal pair contrasts of words embedded in sentences

## Computerized minimal pairs

- **Away We Go!: Dog Deals the Deck**
- Can do this with your own minimal pair cards made using Boardmaker, using Sloan's suggested hierarchy of phonemes (typically strident and voicing errors are most common, as they provide less visual cues to the listener).

## Vigilance (sustained attention)

- Listener required to sustain attention to a continuous stream of auditory stimuli (such as environmental sounds, syllables, or words) and respond (e.g. raising hand or tapping table) when a particular target stimulus is heard.
- For preschoolers: think of DUCK DUCK GOOSE! (for older kids, Hippo Hoops on Earobics 2)
- Failure to detect = inattention
- False positives = impulsivity

## **Problem Statement 5: Significant deficit in understanding prosody cues**

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## **Prosody Training should begin with the previously discussed auditory training**

Relates to metalinguistic skills of prosody overlays  
onto speech, so first train the auditory components

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## Metalinguistic Overlays

- Non-speech acoustical cues
  - prosody
  - rhythm
  - stress
  - intonation
  - segmenting

## Metalinguistics cont.

- Prosody typically changes meaning, i.e.

Travelling to new cities can be exciting, but *visiting relatives* can be a nuisance.

*Visiting relatives* can be a nuisance, particularly when they need to be driven everywhere they go.

- Intonation is used to aid in resolving ambiguous sentences, i.e. "Look out the window", "Look out! The window!", or "Look! Out the window."
- Stress combines loudness and durational cues to emphasize the more informative parts of a message.

**LTG 5: To increase comprehension and interpretation of metalinguistic cues in reading tasks and conversational speech**

STG 5a: To increase identification of KEY words (through increase intensity or prolongation acoustical cues) during a reading task or conversation.

**For school-aged children:  
Non-speech acoustical must be taught in  
association with grammatical markers!**

- Increase comprehension of conversation and text by using books on CD. Point out the correspondence between grammatical markers to the speaker's inflection and pauses: commas=breath, period= pause, questions=raise pitch, exclamation=intensity/stress

**LTG 5: To increase comprehension and interpretation of metalinguistic cues in reading tasks and conversational speech**

STG 5b: To increase comprehension of inflectional cues (by raised or lowered pitches) within a reading passage or conversation as they relate to questions, statements or sarcasm.

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**LTG 5: To increase comprehension and interpretation of metalinguistic cues in reading tasks and conversational speech**

STG 5c: To increase gap detection (silence between pure tone bursts) and its metalinguistic meanings while reading aloud.

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**LTG 5: To increase comprehension and interpretation of metalinguistic cues in reading tasks and conversational speech**

STG 5d: To increase application of grammatical markers placed into a text passage devoid of any commas, question marks or exclamation points, based upon the child's gap or pitch detection, while passage is read aloud to them.

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**LTG 5: To increase comprehension and interpretation of metalinguistic cues in reading tasks and conversational speech**

STG 5e: To increase verbal application of pitch and silence corresponding to grammatical markers, while CHILD reads passage aloud.

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**CONTINUED**<sup>™</sup>

**LTG 5: To increase comprehension and interpretation of metalinguistic cues in reading tasks and conversational speech**

STG 5f: To increase verbal application of KEY WORDS (through increased intensity and prolongation) corresponding to grammatical markers, while CHILD reads passage aloud.

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**LTG 5: To increase comprehension and interpretation of metalinguistic cues in reading tasks and conversational speech**

STG 5g: To increase identification and application of silence or pitch cues and their meaning during conversation.

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## Summary: Metalinguistic Overlays

- Non-speech acoustical cues that can change meaning of a message presented auditorily in conversation, or through sentences being read:
  - Prosody & inflectional cues can indicate questions vs. exclamation points vs. periods at the end of a sentence, etc. APPLYING these cues by the reader provides greater fluency to the text being read, and often greater comprehension.
  - Rhythm can completely change word meaning: REcord (object) vs. reCORD (verb)
  - Stress can impact KEY word understanding
  - intonation can indicate sincerity or sarcasm
  - Segmenting can change word meaning: They saw the CARGO on the boat vs. They saw the car go on the boat!

If poor prosody recognition  
 leads to a monotone  
 speaking voice....

We can train it!

## SUMMARY: Prosody

- MANAGEMENT STRATEGIES
- CLASSROOM
  - Placement with “animated” teacher
  - Additional visual cues
  - Pre-teaching new information with emphasis on prosodic cues
- DIRECT INTERVENTIONS
  - Speech and language therapy
    - Prosody training (in therapy or see Fell, Patel and Ferrier program cited at ASHA 2004)
    - Key word extraction
    - Pragmatics

## Problem Statement 6: Receptive/Expressive Language

- Use attention-focusing devices, such as calling a child’s name or use “tag” words to mark key points (first, last, before, after)
- Pre-teach new information, particularly new vocabulary
- Use clear, concise, and explicit language
- Instruction, information & assignments should be given both verbally and in writing
- Use a classroom “buddy” as needed

## LTG 6a: To increase comprehension and usage of figurative language

STG 6a i: To increase comprehension of figurative language phrases (“ Play it by ear”) as evidenced by matching to a semantically similar meaning

## LTG 6a: To increase comprehension and usage of figurative language

- STG6a ii: To increase expression of figurative language phrases by filling in the blank in sentences.

**LTG 6a: To increase comprehension and usage of figurative language**

STG6a iii: To increase expression using figurative language phrases in a short paragraph

**LTG 6b: To increase receptive vocabulary and semantic closure skills.**

STG6b i: TO increase identification of semantic categories of a series of 4-5 related words

**LTG 6b: To increase receptive vocabulary and semantic closure skills.**

STG6b ii: To identify the one “outlier” of a group of 4-5 related words

**LTG 6b: To increase receptive vocabulary and semantic closure skills.**

STG6b iii: To identify 2-3 synonyms of key vocabulary words within a text

**LTG 6b: To increase receptive vocabulary and semantic closure skills.**

STG6b iv: TO identify a noun or verb when given clues from the Expanding Expression Tool (EET)

**LTG 6b: To increase receptive vocabulary and semantic closure skills**

STG6b v: TO provides “clues” based on the EET criteria in order to allow listener to guess the vocabulary word described. (no video)

**LTG 6b: To increase receptive vocabulary and semantic closure skills**

STG6b vi: TO demonstrate inferencing skills from text.

**LTG7: TO increase binaural integration skills.**

STG7a: To increase ability to name objects out of sight by touch of the left hand

**LTG7: TO increase binaural integration skills.**

LTG7b: To increase ability to describe attributes of objects out of sight by touch of the left hand

**LTG7: To increase binaural integration skills**

LTG7c: To increase ability to describe drawings of limited complexity as they relate to a story heard auditorily.

**SLP Treatment strategies involve scaffolding techniques that focus on relating new vocabulary/concepts (taught PRIOR to their introduction in the classroom lesson) to knowledge the child has already acquired.**

**Treatment for Interhemispheric Transfer of Information**

## Interhemispheric Transfer (for binaural integration)

- Name objects out of sight by touch of the left hand and describe their attributes.
- Draw a picture using your left hand (of limited complexity) and describe WHILE drawing: can use matching pictures or build memory by following directions.
- Execute verbal directions presented in LE via FM system, with left side of body (tap your hand on your knee, jump on L foot, snap L fingers, etc.)

## Interhemispheric Transfer of more complex information

- Have the child listen to a chapter of a book on CD or a website, using ear bud “headphones” so that the auditory information is presented ONLY to the weaker ear. The clinician or parent can listen to the passage using the other ear bud, to insure knowledge of the chapter’s content.
- The elementary school-aged child can then be asked to summarize the chapter AFTER THEY HAVE DRAWN PICTURE SEQUENCES WITH LEFT HAND, while the younger child or language-impaired child would answer questions about the content.
- Do this each therapy session, AND at least 3 – 4 times at home (limit to 10 – 15 minutes maximum)

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