

# Central Auditory Processing Disabilities: The Psycholinguistic Approach Revisited

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## Assumptions And Surprises

I had the distinct pleasure of presenting a paper on Central Auditory Processing Disabilities (CAPD) at the 36th Annual International Learning Disabilities Association of America Conference in Atlanta, GA. While preparing, I assumed (assumption #1) that because of the vast amount of information available today, pulling together a coherent presentation would be easy. Thus, I was quite surprised (surprise # 1) to find that "good" information on CAPD was not easily available, not in college texts used in teacher preparation courses and not on the Internet. More surprising was that most of what I found was conflicting and confusing.

I had also assumed (assumption # 2) that with so much information available today people would know and understand this disability. Therefore, I was further surprised (surprise # 2) by the amount of interest in this topic at the conference. My presentation room was "packed to the rafters." That is how I discovered that one of the least discussed learning disabilities is auditory dysfunctioning, sometimes called central processing problems (Curtis & Tullia, 1991). In my presentation, I did a simulation so the audience could experience what it is like to have an auditory disability. I then discussed what behaviors may indicate auditory difficulties; then I defined auditory modality; next I discussed the types of auditory disabilities and how they function from a psycholinguistic point of view; and finally I offered a brief informal test (Hooper, 1998). I will cover the same topics in this article and I will add some useful strategies under each topic.

## Simulation

Since we are discussing the auditory channel of learning, and this presentation is visually based, I cannot create an auditory disabilities simulation, but you can. Please read all the instructions, put down this article and do the following:

1. Turn on your radio and raise the volume so you can hear it in another room.
2. Turn on your stereo and play a favorite CD or cassette and raise the volume so you can hear it in another room.
3. Turn on your television to any program and raise the volume so you can hear it in another room.

*NOTE: If you have more than one of any of these items in your home, turn them all on, but to different stations and channels.*

Now that you have created all that noise, sit down and spend 10 minutes in conversation with someone in your home. As you converse, note how you are feeling and what you are thinking.

OK-STOP reading and go do the experiment.

## Results

I am a college professor teaching in the areas of elementary education and special education. In my course on learning disabilities, here is a sample of what my students feel and think during the experiment I described above. How does it match yours?

After a while I felt like screaming;  
I was very angry because I couldn't concentrate;  
I wanted you to slow down, speak more clearly and distinctly;  
I felt myself getting more and more tired as the time passed;  
I just gave up trying;  
I became very "antsy" and couldn't sit still any longer;  
I stopped listening and let my mind wander to other things;  
All I could think of was going home.

How close were your thoughts and feelings? Did you notice that many of the reactions may look like hyperactivity, inattention, behavior problems, laziness or like a student who doesn't listen?

## What Is The Auditory Modality?

We know that the diagnosis of auditory disabilities can be made only after audiologists eliminate hearing problems (Lyon, 1995) and an examination by a qualified speech-language pathologist for perception of speech, receptive language and expressive language. However, since one way to learn is through the auditory channel, or modality, testing beyond audiology must occur. By third grade, 70% of classroom work involves auditory learning, although only 30% of the students are auditory learners (Vitale, 1982). After selecting the sounds needed (by using auditory figure-ground), sounds enter the ear and proceed up the auditory nerve to the brain. The part of the brain that processes auditory stimuli decides what the stimulus is (auditory discrimination). The brain then compares the stimulus with what is in memory (association) and gives it meaning (auditory memory, sequential). The brain then sends signals back to the body so the muscles can act on what was heard (expression). The child can then speak, write, or act out what was heard. Thus, the information is received (decoded), understood, organized and sequenced (associated), and expressed (encoded) unless there is a "short circuit." The "short circuit," however, can exist in one or more of the decoding, association, or expression areas. In diagnosis and educational planning, it is imperative to know which one(s) are affected.

*Decoding:* If a "short circuit" exists in the decoding area, the message that is heard will not be heard in the way it was

said. Problems in decoding will result in problems in association and expression as well.

*Association:* If the "short circuit" is in the association area, the message may have been decoded correctly, but it will not be organized or remembered. Problems in association will result in problems in expression as well.

*Expression:* If the "short circuit" exists in the encoding area, the message may have been decoded, organized and remembered, but it cannot be expressed clearly (Learner, 1997). The assessment of decoding, association and encoding ability, and the subsequent teaching methods are the heart of the diagnostic-prescriptive approach to teaching.

### **Symptoms And Behaviors**

As demonstrated in the simulation above, children with auditory central processing disabilities may be misdiagnosed as hyperactive or inattentive. Consequently, they can be labeled lazy or unmotivated. Because the child is usually tired from the effort to sort out sounds, parents can also be chastised for not making sure their child gets enough rest. Furthermore, children with auditory central processing disabilities can be mistaken for hard of hearing. Behaviors exhibited by these children may include:

- not understanding what they heard;
  - having a poor receptive vocabulary;
  - not being able to identify sounds correctly;
  - turning one ear towards you when you speak;
  - not seeming to listen;
  - not hearing differences in similar sounds, e.g., /m/ and /n/;
  - tiring easily;
  - hearing a word, but not being able to give two or three more with the same sound;
  - misinterpreting tone volume, inflection and speed of a message;
  - being bothered by low-level noises;
  - not selecting important items from what is heard;
  - exhibiting ADHD symptoms:
  - having a short attention span and/or anxiety;
  - having poor language skills for their developmental age;
  - having poor reading skills for their developmental age.
- Children with auditory central processing disabilities may also exhibit the following:
- not remembering what they memorized;
  - thinking mostly in concrete terms;
  - responding slowly;
  - needing extra time to process information;
  - not being able to classify objects;
  - not being able to ask a clear, direct question;
  - frequently asking for repetition of instructions;
  - their responses may not relate to the question;
  - using gestures instead of words;
  - misunderstanding the multiple meanings of words;
  - not recalling what was heard in the present;
  - forgetting what they knew yesterday;

- seem to be unable to follow directions;
- not speaking clearly;
- not doing rote sequences, e.g., the alphabet;
- not being able to do any rapid drills;
- knowing the sounds, but unable to blend into words;
- being unable to smoothly pronounce the syllables of words;
- not recognizing the same sounds in different words;
- not using decoding skills to read;
- responding grammatically incorrectly, e.g., using the wrong verb tenses, suffixes or plural endings;
- not hearing the errors they make or errors made by others.

- Finally, children with auditory central processing disabilities may also exhibit the following:
- having difficulty completing simple sentences;
  - having difficulty responding to riddles;
  - not responding accurately or taking a long time to respond to directions;
  - not being able to carry out instructions;
  - not being able to repeat and/or write what they heard (Kaval, 1981);
  - not being able complete a word when only a part of it is heard;
  - being unable to identify a song they know when only part of it is heard;
  - being unable to blend sounds into words;
  - having difficulty writing simple sentences;
  - having difficulty drawing a simple picture of what is heard;
  - having difficulty pantomiming what is heard;
  - having difficulty repeating what is heard.

### **What Are The Problems?**

If hearing is normal, the problems may be neurological. Problems in the neurological area mean that the auditory nervous system is not guiding the signals appropriately and difficulties can occur in decoding (decoding), association (memory) and/or encoding (expression). As described above, the symptoms and behaviors in the first section may indicate disabilities of decoding; the symptoms and behaviors in the second section may indicate disabilities of association; and the symptoms and behaviors in the third section may indicate disabilities of encoding. A complete assessment must be made in all three areas because teaching strategies differ from one area to another (Johnson & Myklebust, 1967).

### **Defining Central Auditory Processing**

In order to define Central Auditory Processing, I will further explain the three psycholinguistic areas: decoding, association and encoding.

*Auditory decoding* is the ability to receive stimuli through:  
*auditory attention* — paying attention to what is being heard;  
*auditory discrimination* — the ability to distinguish one sound from another; and *auditory figure-ground* — the ability to separate a sound from all other background sounds. Other terms used in place of decoding are auditory perception or auditory reception.

Auditory association is the ability to remember, sequence or bring closure to auditory stimuli received. *Auditory memory* is the ability to remember what one hears for *short-term &/or long-term* periods of time. Short-term memory is used carry out a direction just spoken, whereas long-term memory is used to recall and perform a function learned long ago. *Sequential memory* is the ability to recall something in a sequence. For example, recalling or performing several directions in the order they were given. *Auditory closure* is the ability to synthesize or blend sounds into words as well as the ability to anticipate and complete auditory oral or written messages.

Auditory encoding is the ability to write, speak, draw or act out what is heard. Another term used in place of encoding is auditory expression.

Auditory Central Processing is thus an umbrella term that includes the following processes:

Receptive

- auditory decoding
- auditory discrimination
- auditory perception
- auditory figure-ground

Associative

- auditory memory — short- or long-term
- auditory sequencing memory
- auditory sound synthesis (closure)
- auditory-vocal automatic [automaticity]

Expressive

- auditory-vocal [hear and repeat]
- auditory motor [hear and do]

Therefore, Central Auditory Processing can be defined as the auditory decoding, auditory association and auditory expression skills used in the acquisition and expression of information (Lerner, 1997). This definition is based on the psycholinguistic approach to learning disabilities.

Psycholinguistics are the mental processes underlying learning and language. In the 1940s, 1950s, and part of the 1960s, the psycholinguistic approach was at its height. It fell into disuse because of the educational methods that accompanied it. Once tests revealed areas of weakness, methods were devised to strengthen them. Research into this approach demonstrated that strengthening an area of weakness was not effective in terms of learning and language achievement. Children were not learning. Thus, the entire method was traded for one that focused only on subject matter problems and basic skills teaching. In the 1990s, this approach was joined by one that proclaimed children need only memorize and practice strategies (like before, during and after reading strategies), and apply these strategies to their work. In this way, learning and language would occur.

Today, there is a movement back to the psycholinguistic approach, but with *one major difference*. Teaching strategies are not designed to strengthen areas of weakness, but are designed to utilize the strengths in learning and language. We learn through four channels of learning called modalities. these are auditory, visual, tactile (touch through small muscles) and kinesthetic (through large muscles). Thus, an approach that uses all modalities of learning would compensate the area of weakness AND

utilize the strengths to promote equal access to information whereby learning and language would occur. I talk about a multisensory approach as a way to allow "equal access to information" for all learners. "Equal access" is the major goal of teaching. It is a variation of the idea that when a child does not learn the way we teach, we must teach the way the child learns. Does this guarantee equal outcome? NO. No, because what a child does with information once it is offered in ways he/she can receive it will vary with any number of environmental circumstances.

**Subtypes Of Central Auditory Processing: Receptive**

In this section, I will address each area of CAPD.

Auditory Decoding and Auditory Discrimination

Auditory decoding is the ability to hear separate sounds and auditory discrimination is the ability to hear the differences between sounds. They are dependent upon the process of auditory attending.

Some tests for these subtypes are:

- Wepman Auditory Discrimination Test;
- Boston University Speech Sound Picture Discrimination Test;
- Filtered Word Test (in earphone, hears a word with distorted consonants and clear vowels).

Some useful strategies involve:

- teaching sounds multisensorily through the see, hear, trace, say (sometimes known as the VATK) method.

Auditory Perception

Auditory perception is the ability to receive and understand sounds. This subtype involves the processes of attention, decoding and discrimination.

Some useful strategies are:

- use one-concept phrases and questions;
- use visual cues;
- use multisensory learning;
- give more time to process questions or information;
- provide written questions to process before asking questions;
- use short sentences and simple directions;
- permit short answers;
- develop pupil's responsiveness: e.g., have a student imitate simple actions in a story that was read aloud, or play charades.

Auditory Figure-Ground

Auditory figure-ground is the ability to bring to the foreground a perceptual configuration (like a word when listening) so that it will stand out clearly from all background stimuli. It involves the use of all processes discussed so far. Some tests used here are the Speech-in-Noise Test and the Auditory Selection Attention Test.

Some possible strategies may be:

- control classroom noise levels;
- use visuals in all work;
- use note takers; give lecture notes copy;
- ear muffs; ear plugs;
- study carrels;

- keep instructions short and clear or give in writing, and cue the student's attention first;
- Parallel talk-auditorize, "What did you hear me say?";
- provide a "listening" buddy;
- give extra process time;
- use flash cards, TV, VCRs, maps, drawings;
- use guided imagery and "mental movies."

**Subtypes of Central Auditory Processing: Associative**  
Auditory Memory: Short-term, Long-term and Sequential

Memory is defined as the ability to record, store or retrieve information learned auditorially a short time ago, a long time ago or learned in sequence. It relies on all the processes described above. If information is not decoded correctly, auditory memory problems will result.

Some useful strategies may be:

- teach visually;
- write what you say on the chalkboard or on paper;
- ask, "What did you hear me say?";
- divide tasks into small units;
- give directions fully, slowly, ask for feedback;
- use meaningful material;
- use concept pictures, objects, etc.;
- give attention cues: "Be ready to listen;"
- allow process time;
- use visual imagery (picture the work);
- recall the function of an object: e.g., "you write with it," for pencil.

Auditory Closure and Synthesis

Auditory closure is defined as the ability to blend sounds together (sound synthesis) to form words. It too involves all the processes described above. If a child cannot receive the sounds or cannot remember them, closure and synthesis disabilities will result.

Some useful strategies may be:

- present sounds for the child to blend that form a word in the same lesson, e.g., /o/ /d/ /g/ dog;
- say sounds purely /b/ not /ba/;
- pronounce the whole word, then say the individual sounds slowly;
- allow process time;
- use the VARK multisensory tracing method;
- for syntax errors, construct incorrect sentences or stories and allow the students to visually locate the errors.

Auditory-vocal Automatic [Automaticity]

Auditory-vocal automatic is defined as the ability to use correct and automatic grammatical and syntactic responses. It is the ability to use language automatically. It involves the use of the above decoding and associative processes.

Some useful strategies may be:

- model correct structures of grammatical expressions
- use visual clues
- drill activities, e.g., sight vocabulary
- allow process time

- choral reading
- dramatics

**Subtypes of Central Auditory Processing: Expressive**  
Auditory Vocal Expression

Auditory vocal expressive is the ability to draw relationships from what is heard and to respond verbally. It uses all the previously covered processes.

Some useful strategies may be:

- use concept questions, "what does the table look like?";
- use color cues;
- use visual cues;
- give process and response time;
- use short sentences;
- teach concrete before abstract.

Auditory Motor Expression

Auditory motor expression is defined as the ability to express what is heard in speech, writing, drawing or pantomime. It involves all previous processes.

Some useful strategies may be:

- check auditory perception and association areas; if weakness occur, use the strategies suggested;
- use concept questions, what does the table look like?;
- use color cues;
- use visual, tactile and kinesthetic cues and strategies;
- give process and response time;
- teach concrete before abstract.

Auditory Central Processing: An Informal Assessment©

Instructions: Check yes if the student did well and no if the student did not do well.

Auditory Decoding

1. Recognizes environmental noises
  - a. Have the student sit at a desk or table. Go behind the student's back and do the following. After each, ask the student, "What did you hear?"
 

-clap your hands two times	-snap your fingers
-click your tongue	-open a window
-bounce a ball	yes_____ no_____
  - b. Ask the student to describe all the noises heard in and out of the room (Examples may be the buzz of the florescent lights, birds singing.)
 

	yes_____ no_____
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2. Understands Directions
  - a. Give any set of directions that the student must carry out. Start with one direction and work up to six.
 

	yes_____ no_____
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3. Understands Differences In Sounds
  - a. Sitting beside the student, facing the same way, give the student pairs of words, e.g., Dan-Dan; pan-rum. Ask which words sound exactly alike and which do not. (NOTE: if the student turns an ear to you)
 

	yes_____ no_____
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### Auditory Association

#### 1. Imitation

- a. Say a word. Ask the student to tell you what he hears. If the student cannot repeat what you said, have him write or act out the word.  
yes\_\_\_\_\_ no\_\_\_\_\_
- b. Ask the student to retell a story you just told. Keep the story simple and note if the student retells it in sequence.  
yes\_\_\_\_\_ no\_\_\_\_\_
- c. Ask the student to retell some event that took place last week (long-term memory).  
yes\_\_\_\_\_ no\_\_\_\_\_

### Auditory Closure

- a. Blend sound into words. Say phonetic words by the separate sounds and ask the student to tell you the word. For example, say the sounds/c/ /a/ /t/. The student must say "cat."  
can do\_\_\_\_\_ cannot do\_\_\_\_\_

### Auditory Expression

- a. Students must write, speak, draw and act out some auditory input from you.  
can do\_\_\_\_\_ cannot do\_\_\_\_\_

Using the scoring sheet in Appendix A, assess each area: Auditory Decoding, Auditory Association, Auditory Closure, and Auditory Expression. If the student missed most or all of the items in a section, there is an indication of disability in that area. Remember, if the disabilities are at the decoding level, disabilities in association, closure and expression will follow. If the disabilities are at the association or closure level, disabilities in expression will follow.

Use this information to decide which strategies will provide "equal access" to information and a means of expressing what information is learned. Also, arrange for formal testing and a full educational plan in the I.E.P. for the student.

### Conclusion

You should now have a picture of the student's auditory strengths and weaknesses. It is recommended that all subject matter be taught through strengths while using the areas of weakness. Decoding, association, encoding and closure skills exist in all modalities of learning. For example, they exist in the auditory, visual, tactile (touch) and kinesthetic (large muscle) modalities. In the auditory areas of weakness, teach all subject matter through multisensory methodology to include all modalities in the learning. This approach not only provides "equal access" to all information through the modalities of strength, but also utilizes the modality of weakness to possibly prevent further deterioration. Although one cannot guarantee "equal outcomes," "equal access" provides students with what they need to achieve success, should they choose to do so.

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### - Appendix A -

#### Auditory Central Processing: An Informal Assessment© Scoring Sheet

Instructions: Transcribe scores to this sheet

#### Auditory Decoding

- 1. Recognizes environmental noises
  - a. Noises behind back yes\_\_\_\_\_ no\_\_\_\_\_
  - b. Noises heard in and out of the room yes\_\_\_\_\_ no\_\_\_\_\_
- 2. Understands Directions
  - a. Carries out directions
    - 1 direction yes\_\_\_\_\_ no\_\_\_\_\_
    - 2 directions yes\_\_\_\_\_ no\_\_\_\_\_
    - 3 directions yes\_\_\_\_\_ no\_\_\_\_\_
    - 4 directions yes\_\_\_\_\_ no\_\_\_\_\_
    - 5 directions yes\_\_\_\_\_ no\_\_\_\_\_
    - 6 directions yes\_\_\_\_\_ no\_\_\_\_\_
- 3. Understands Differences In Sounds
  - a. Sound discrimination yes\_\_\_\_\_ no\_\_\_\_\_

#### Auditory Association

- 1. Imitation
  - a. Oral repetition yes\_\_\_\_\_ no\_\_\_\_\_
  - b. Retell a story in sequence yes\_\_\_\_\_ no\_\_\_\_\_
  - c. Retell event yes\_\_\_\_\_ no\_\_\_\_\_

#### Auditory Closure

- a. Blend sound into words  
Can Do\_\_\_\_\_ Cannot Do\_\_\_\_\_

#### Auditory Expression

- a. Write, speak, draw, and act out some auditory input from you.  
Can Do\_\_\_\_\_ Cannot Do\_\_\_\_\_