Should Children with Auditory Processing Disorders Receive Services in Schools?

Jay R. Lucker
Howard University

Abstract

Many children with problems learning in school can have educational deficits due to underlying auditory processing disorders (APD). For these children, they can be identified as having auditory learning disabilities. Furthermore, auditory learning disabilities is identified as a specific learning disability (SLD) in the IDEA. Educators and professionals accessing children for learning problems often do not understand or accept that there are such things as auditory processing deficits or APD. This paper presents a tutorial discussion of what are APDs, how they can affect children in schools, and how they should be assessed.

Should Children with Auditory Processing Disorders Receive Services in Schools?

Often children are seen in schools described as having difficulties learning in class when material is presented verbally. Teachers may complain of difficulties for these children in following verbal directions, understanding what is said, or, in general, difficulties listening. Some of these children have difficulties listening because of primary problems with attention and what is often referred to as executive functioning. However, many of these children have excellent auditory attention abilities, but have difficulties taking in and "processing" what they hear, a factor called an auditory processing disorder or APD.

When a child is identified as having problems learning, and testing reveals that the child has an APD, often school teams determining eligibility for the child to receive special education services under IDEA refuse to classify the child as being eligible because these teams cannot find an appropriate category or "label" by which to identify the child as meeting the criteria for special education services. The problem often faced by school district teams is one of the following. First, they do not see the term "auditory processing disorder" or APD in the IDEA and, thus, do not define the child as having an APD and, therefore, an educational disability. Second, the team as a whole or team members do not believe that there is such a thing as an auditory processing disorder, so a child cannot be identified as having an educational problem due to APD issues. Third, the team may not understand what an appropriate assessment is for a child with listening problems in order to identify whether that child has APD and to differentiate it from other problems, such as attention disorders like ADHD. Often, the problem with the eligibility team not being able to recommend services for children with APD is that they do not really understand what auditory processing disorders are and how to appropriately identify such disorders. The following paper discusses various factors in order to help the reader have a better

understanding of what are auditory processing disorders, how we need to access APD and differentiate APD problems from other problems, and where in the IDEA APD is and has always been a recognized educational disability.

APD and the IDEA

The Individuals with Disabilities Education Act or IDEA (1990, 1997, 2004) was passed to support children who were not being provided with a free and appropriate education because of some specific educational disabilities. Many of these disabilities are medically or physically based such as vision problems (e.g., blind), hearing problems (e.g., deaf), and physical handicaps such as a child diagnosed with cerebral palsy. Others are based on some specific issues such as specific language impairment or SLI, or specific learning disability or SLD.

For some educators and other professionals assessing and working with children having learning problems, the specific category of auditory processing disorder or APD is confusing or they do not believe there really are such problems. However, understanding what APDs are can help professionals identify that such disorders are and have always been identified in the IDEA. Thus, we need to better understand what APDs are and then see where in the IDEA such specific disorders are identified.

What Are APDs Really All About?

At present, the professionals and professional organizations which look into auditory processing disorders have defined APD as a disorder specific to the auditory system in which the person has normal hearing but cannot successfully use information that person hears (American Academy of Audiology, 2010; Bellis, 2011; Working Group on Auditory Processing Disorders, 2005a) . This focus can be called an audiocentric approach focusing on the *"A"* in APD. In contrast, APD is really a problem in processing which focuses on the *"P"* rather than the *"A."* Thus, in order to understand what APDs are really all about, one must understand what is involved in the processing of information we hear.

In order to focus our understanding of processing in APD, this author takes a developmental approach. As such, consider yourself as a young infant brought into this world filled with sensory stimuli bombarding you, including bombarding your auditory system. As a young infant, you do not have the knowledge of vocabulary and the "symbols" we use to represent the things in our environment (called the words we use to express things). Furthermore, you have not yet extracted sufficient "linguistic information" in order to realize the rules that govern the use of words (semantics), word structure and grammar (morphology), sentence structure (syntax), and the social uses of language in communicative situations (language pragmatics). You merely are hearing and learning to extract from what you hear what is going to be significant or important to eventually lead to the development of the symbols which we can manipulate in thinking and for language structure and communication.

Consider that you are an infant in the living room of your house with your mother, and you hear some new auditory message. It has a specific pitch or frequency, a certain volume or intensity, and the auditory part of this message lasts a specific length of time with the same sound repeated for a total of five repetitions with a specific quiet interval of time between each of these five sounds, and this interval of quiet is the same between each of the new "sounds" you hear. You extract that the sounds you hear are a "pattern" called an auditory event. Additionally, you realize that this auditory pattern is different from all of the auditory patterns you have heard so far in your short life. Suddenly, your mother gets up, walks over to a place which you later will learn is called "the door," and sounds come out of her mouth (which you later will learn is "speaking"). To your surprise, the door also makes this "speaking sound," and your mother opens the door and there is another thing on the other side of the door which you later will learn is a person.

Now, imagine if this happens over and over again with the same auditory event just prior to your mother "answering the door." You think about what you have heard and realize that when that specific auditory or acoustic pattern is heard, it means that your mother will "answer the door." As time goes on, you realize that factors such as the ones described hear occur for every meaningful acoustic pattern in your life, not just someone knocking at the front door.

Then, one day, you hear five knocks of the same frequency as the "knocking on the door," but of a much louder intensity and, although they last for the same length of time as the "knocking on the door," the time interval between the "knocks" is much longer. You scan your "auditory memory," and you realize this is *not* the same pattern as "mommy is going to answer the door." Instead, mommy calls out to daddy working in the basement, "what's with all the banging?" Thus, you have learned to discriminate and distinguish one pattern of knocks (knocking on the door) as being similar (same pitch) but different (louder and with longer pauses between the knocks) from the other (daddy hammering in the basement). You have processed the auditory message or you have done auditory processing. Let's consider what was involved.

What is first involved is your ability to hear. Second, your ability to remember and then match similar auditory patterns and store that information related to what you saw and noticed happening in response to that auditory pattern. You learned that a similar but different auditory pattern meant something very different from the first. Overtime, you learned to figure out what the differences are in the two auditory patterns and come to understand these differences even if you do not have the language to explain what the differences are. You have the auditory and cognitive capabilities to think through and learn to make judgments about the auditory events in your listening experiences. Thus, auditory processing exists and is a separate factor from language and language processing. Auditory processing, as the above examples demonstrate, involved your hearing and auditory system as well as your cognitive system in making decisions about the auditory pattern and in remembering that pattern and being able to compare it with other previously learned patterns. Many children cannot make sense out of the auditory events they experience in their learning environments and, thus, they have auditory processing disorders or APD.

Whereas the above examples used non-verbal auditory patterns (knocking and banging), in school the auditory information children receive most is verbal information or spoken language. During the course of listening to a lesson presented by a teacher, new words, unfamiliar words and differences in the way words may be pronounced are heard and processed, and the auditory processing issues faced by children is to get these spoken language auditory patterns into the brain where the cognitive decision making and the language "systems" can make sense out of the information and the child can learn. Auditory processing of spoken language involves the ability to differentiate between the primary speech messages one hears and all of the other sounds, noises, and competing verbal messages that can be present in the typical classroom setting. It involves the child being able to take in and make sense out of the phonological information in the spoken messages from which the language system is able to make sense of the words, and the auditory system's abilities to differentiate between phonological information that changes meaning in words vs. phonological information that does not change meaning in words. To better understand this last statement, consider the following example.

School children in this example have three teachers. One is from the New York City (NYC) metropolitan area, one is from a typical mid-west town, and the other is from what we sometime refer to as the "deep south." All of them say to the class the word, "can." The person from NYC would say that word with what is sometimes called a "flat a" sound. The person from the mid-west might say it the way we expect to hear it, while the person from the south has changed the pure vowel, "a," into a diphthong. The child's auditory system would hear these differences and should process they are different. The child's language system would indicate the word, "can," was spoken three times but the word, itself, was not different, so each person meant "you are able to do that because you 'can' do it". Previous experiences hearing people speaking from different parts of the country with what we call different regional accents or dialects indicate to the cognitive system that the three speakers are from three very different locations, but they are saying the exact same word. A deficit in auditory processing could lead a child to think that the three words were totally different words having different linguistic meanings. Language deficits would only mean that regardless of whether the child heard the word spoken with a "flat a" or a diphthong, the child does not understand the meaning of the word. Cognitive deficits could mean that the child does not know what to make of the three different pronunciations, so the child ignores what each teacher said appearing to be lost and without understanding of the spoken messages. Thus, as the reader can see, it is not easy to differentiate a child with an APD from a child with a language deficit or cognitive limitations unless we assess the child to make such distinctions. The evaluation processes is discussed later.

APD as Defined in the IDEA

Understanding auditory processing as it was described and help one see that problems or deficits with auditory processing (and, thus, APD) can lead to learning difficulties. If we were to define APD, one could state that auditory processing disorders are disorders in understanding spoken language which is not due to primary language or cognitive

deficits. Additionally, the cause of the disorder in understanding spoken language would be an imperfect ability to listen in the absence of primary attention or hearing problems. Also, when a professional identifies APD, one of the diagnoses provided is a disorder of auditory perception (ICD-9-CM code 388.40) (American Medical Association, 2011). Thus, APD can also be called a perceptual disorder.

If one were to read the definition in the original education of handicapped children's law, PL94-142 (EAHCA, 1975), the original IDEA (1990), and all of the reauthorizations and modifications of IDEA (1997, 2004) one would find that the definition of a disorder in understanding spoken language due to an imperfect ability to listen that may also be called a perceptual disorder is directly cited from the definition of a specific learning disability or SLD. Thus, an APD is an SLD when a child is found to have problems learning in the educational setting and the primary reason is an inability to successfully process spoken language or verbal information and there are no language deficits, attention disorders, or cognitive problems present.

Do APDs Really Exist?

For some professionals and educators, they do not believe there is a separate disorder called and APD. For them, APD is nothing more than a fancy word for a language disorder. Thus, a child who passes the language testing but has problems "listening" and learning does not have APD and a child who is said to have APD must have language problems and, thus, be treated with language based services. This is not true. The following should help the reader better understanding APD.

The processing of auditory information, as described above, involves the processing of auditory or acoustic patterns prior to these patterns gaining linguistic meaning and prior to our cognitive systems thinking about and making decisions about the acoustic patterns heard. There are only three primary factors that lead to acoustic patterns. These factors are: pitch or frequency, volume/loudness or intensity, and time or the temporal factors such as those discussed earlier in this paper. Pitch can change which consonant we hear. Intensity can tell us someone is upset at us or just asking us to do something. Time can change the whole meaning of words and sentences. The following are examples of each of these three auditory factors.

Acoustic research has identified that rising pitch after vowels vs. falling pitch after vowels is related to the change in the consonant following the vowel related to what we call the "place of articulation." Thus, for one pitch change we might be producing the consonant "p" and for a different pitch change, the consonant /t/. Thus, the change in pitch has a great influence on which phoneme we hear. Therefore, deficits in processing at this level can lead to auditory phonemic processing problems and affect the learning of phonics and, thus, reading and spelling.

Intensity changes can lead to our cognitive system making changes in the interpretation of messages on an emotional level. A soft spoken message might be interpreted as sweet, kind, and caring. In contrast, a loud message, even the same message as before, would be

interpreted as coming from someone who is angry or upset. Additionally, intensity is an important auditory cue to indicate urgency and emergency in various situations.

Time (temporal characteristics of the auditory message) changes word meaning and sentence meaning. For example, it is the pause or lack of pause between the "n" and "h" of the words "green" and "house" that will lead to our language systems interpreting whether we live in a house painted green (a green house) or we are growing flowers in the house made of glass (a greenhouse). A joke that I sometimes use in teaching students to interpret such changes is to ask them "What do you put on a hotdog?" I ask this of two or three students getting responses such as "mustard," "ketchup," "relish," etc., and then I ask the next student, "What do you put on a hot dog?" Typically, the student, whether a child, adolescent or adult will say something else like, "chile," or "onions;" I respond, "Well, I'd put cold water on a hot dog," and the class may take some time and, hopefully, get the joke and laugh. What the reader must remember is that when we listen, we don't have the visual "space" to be seen between words like "hot" and "dog" to tell if I am talking about something we can eat or a dog that is overheated. Thus, it is our auditory processing systems that must "put in the space" or identify there is no space so that our language and cognitive systems can interpret the message appropriately.

Another example of how time can change the meaning of spoken utterances can occur at the sentence level. Imagine hearing a person say the following four words, "look," "out," "the," "door." If the time between each word is equal, the sentence will be heard as, "Look out the door," and I will go see what is on the other side of the door. However, if the time between the "t" of "out" and the "th" of "the" is much longer than between the other two words, then I will get away from that door as fast as possible because I would have interpreted this auditory pattern of the spoken message as being, "Look out! The door!" Thus, our auditory processing system is critically important in our learning and understanding of language and of information in general.

In reviewing what has been written in this section, hopefully the reader will understand that auditory processing does exist, and there are students in school who have deficits in processing what they hear that affects their understanding of spoken language and, thus, can lead to learning disabilities. The question then arises, "How do we assess auditory processing disorders and differentiate between APD, language problems, and cognitive limitations.

Assessing Auditory Processing

As with any assessment, we must be sure that what we say we are assessing is what we are really assessing. This seems like a simple statement, but consider that many of the evaluations used by professionals for assessing children for specific learning disabilities do not control for confounding variables that could be the real, underlying factors accounting for the presenting problem or failure on tests. For example, the verbal comprehension parts of IQ measures, such as the WISC-IV, are language based tasks. Thus, a child with a language disorder could be seen to have very deficient verbal comprehension abilities and, thus, be classified as cognitively limited rather than

language impaired. Additionally, language tests often have strong cognitive components that can lead to students with limited cognitive abilities being misclassified as being language impaired rather than having cognitive disorders. What most professionals and educators do not understand is that both language tests and verbal comprehension tests are presented live voice, orally, to students in uncontrolled auditory modes. That is, the professional presenting the questions and instructions to the student does *not* have control of or know what is the exact intensity level in decibels at which the person is speaking, does not know the exact rate of speaking which can affect timing between words, sentences and, even, phonemes in words, and does not know whether the listener has normal hearing. Only sometimes does the speech-language pathologist screen a student prior to testing to insure that the student's hearing is normal on the day of the evaluation. Often, hearing is evaluated days, weeks, or even months before any verbal testing is accomplished, and hearing in children can fluctuate, especially due to middle ear problems, allergies, upper respiratory deficits, and other factors.

What is important to remember is that deficits in auditory processing can greatly impact language based tests such as those administered by speech-language pathologists, psychologists, and educational evaluators. Therefore, a child with a primary APD problem can fail verbal IQ measures, verbally presented language tests, and verbally presented academic achievement tests.

When looking at tests to evaluate auditory processing, from the discussion in this paper, the reader should identify that auditory processing is much more than just phonological awareness. Additionally, auditory processing is totally different from auditory attention. Auditory attention deficits are typically due to some underlying attention, self-regulation, or executive functioning problem. Yet, one psychological evaluation (the Woodcock-Johnson – Third Edition (NU) Tests of Cognition or WJ-III-Cog) (Woodcock, McGrew, Mather, 2001) has a section called "auditory processing." Only two subtests make up this section. One is a measure of phoneme blending (i.e., one and only one aspect of phonological processing). The other is a measure of auditory attention, (i.e., a measure of attention using verbal information). Thus, a child could pass the phonological processing subtest and fail miserably on the attention test and be diagnosed by the psychologist as having an auditory processing deficit.

Neither of these subtests of the WJ-III-Cog are administered at a standardized, calibrated, intensity level. The psychologist does not take out some calibration measuring device to determine the exact decibel level for setting the volume control of the player for the listener or at which to say the test items when they are presented verbally. Additionally, if earphones are used, the psychologist does not know whether the two ear phones are presenting equally intense auditory signals to each individual ear. Any change in the auditory message (being too loud or too low, or an imbalance between the volume levels in the two ears) could affect performance on any listening task and lead to the child failing the test. Therefore, failure on the auditory processing part of the WJ-III-Cog, for example, does not mean a child has auditory processing deficits or APD.

Another test used by psychologists and speech-language pathologists is a test called the Test of Auditory Processing Skills – Third Edition or TAPS-3 (Martin & Brownell, 2005). This test could be broken down into three sections: phoneme based subtests, memory subtests, and language-cognitive subtests. The following is a discussion of each of these parts of the TAPS-3 demonstrating that the test is not at all an assessment of auditory processing skills regardless of its name.

The three subtests of the TAPS-3 that deal with phonemic information involve sound discrimination, phonological blending, and phonological segmentation. The sound discrimination subtest asks the child to identify if two words spoken by the evaluator to the child are the same or different. However, the words are presented orally with no controls over the auditory pattern for any word presented. That is, the presenter could speak one word loudly and the second word softly, which would make the two words differ on an auditory level, or the presenter could say the vowel in one word slightly different from the vowel in the second word which would also make the two words different on an auditory basis. Yet, if these two words were, "house – house," the only correct answer is "They are the same" even if the volume level or "ou" vowels were different. When asked why they are the same, even the developers of the TAPS-3 might say, "Because they mean the same thing," indicating their linguistic meaning has not changed. In contrast, "cat" and "rat" would be different even though they rhyme, they have the same vowel, then both end with "t" and they are both animals. It is the fact that "cat" and "rat" mean different things, or are different "labels" for different word meanings that make them different just as the different auditory presentations for "house" did not make them linguistically different. As such, this subtest on TAPS-3 is a test of language discrimination and not auditory discrimination.

As for the blending and segmentation tasks, since they are presented live voice, there are many acoustic variables that could affect the outcomes of these subtests that are not controlled as confounding variables. For example, if the phonemes are spoken with a regional dialect different from that which is common to the student taking the test, the auditory message would be very different than if the speaker were of the same regional dialect as the student. Yet, this is not considered on the TAPS-3. However, we could state that the blending and segmentation subtests might be the only two subtests from this section of the TAPS-3 that have anything to do with auditory processing and assessment of APD. However, just as the criticism was raised for the WJ-III-Cog, only one of the subtests on that test focused on blending, phonological processing is only one component of auditory processing. Thus, a child with excellent phonological processing and very poor processing in other auditory system domains can pass the WJ-III-Cog and TAPS-3 phonological subtests and be considered having normal auditory processing rather than having a severe APD affecting other areas of auditory processing and, thus, learning.

The second part of the TAPS-3 involves memory. Memory has nothing to do with auditory processing. Actually, it is after auditory signal is processed and is "translated" into some "internal" symbol (usually linguistic) that it is placed into memory. Thus, memory is a thinking/decision making or cognitive process along with a linguistic process. As such, a student with language or cognitive deficits (such as an executive

functioning problem) can fail the memory parts of the TAPS-3, but because it is called the Test of *AUDITORY PROCESSING* skills, the evaluator will diagnose the child as having APD.

The last two subtests of the TAPS-3 are Auditory Comprehension and Auditory Reasoning. Reasoning by its definition is a cognitively based process. Additionally, the Auditory Reasoning subtest asks the child to make cognitive decisions about linguistically based messages, not auditory based messages. Thus, this subtest is a test of language reasoning and should be called a measure of language processing or language reasoning and not auditory reasoning.

The subtest called Auditory Comprehension does not ask the child to make any decisions about his/her comprehension of any *auditory* messages. The child is asked to make decisions about the language aspects of the short stories presented. Thus, this is a test of language comprehension.

When looking over tests like the TAPS-3 or the Auditory Processing Abilities Test (APAT) (Ross-Swain & Long, 2009), it is obvious that these are tests of language and cognition and not tests of auditory processing. Additionally, all the subtests used for scoring and diagnosis are presented orally (i.e., live voice) with no controls provided for auditory variables that can affect such tests. Thus, one should never accept as a diagnosis APD when tests like the WJ-III-Cog, TAPS-3, APAT, or other language based tests are used in making the diagnosis. It is true that the phonological sections of each of these tests does tap into one aspect of APD, phonological processing, however, this can also be said that the WISC-IV Verbal Comprehension subtests tap into aspects of language, but they would never be considered diagnostic assessments of a child's language abilities, and language tests such as the CELF-4 (Semel, Wiig, and Secord, 2003) and CASL (Carrow-Woolfolk, 1999) ask children to make decisions, but no one would consider them as tests of cognitive processing.

When we consider looking specifically at a student's auditory processing abilities, we need to insure that the tests control for language variables and cognitive variables as well as all of the auditory variables that can be controlled. Formal tests specifically of auditory processing all have the auditory signals used presented via pre-recorded materials. Thus, every student administered tests of auditory processing is administered the same audio-recording and the audio-recordings are typically presented via earphones that have been calibrated to some level that should be stated in the report from the professional presenting the auditory processing tests. Additionally, just prior to the testing for auditory processing, the evaluator should rule out a hearing loss or other hearing problem that could affect the outcomes and be confounding variables that would lead to failure on the auditory processing tests.

Typically, auditory processing tests are administered by audiologists. The professional associations to which audiologists are affiliated (American Speech-Language-Hearing Assocaition and the American Academy of Audiology) have strong positions that auditory processing testing and diagnosis of APD must be made by an audiologist

(American Academy of Audiology, 2010; Working Group on Auditory Processing Disorders, 2005b). The author of this paper only states the following. The professional who is doing the auditory processing testing must first rule out hearing loss or account for the hearing loss as part of the analysis and interpretation of the test findings; the evaluator must use pre-recorded material for all tests, must have a baseline measure for each of the cognitive and linguistic components used in the test battery to insure that the student is able to do the tasks involved in each test, must have objective measures to help differentiate between APD and probable attention, self-regulation, or executive functioning problems, and must know how to relate the APD results to educational and learning issues for students. When all of these factors are met, then an appropriate assessment of auditory processing can be made.

Conclusions

The bottom line is that students who have difficulties listening and learning through their auditory systems may have auditory processing deficits or APD. There is a need to assess all variables under controlled conditions to rule out possible attention/executive functioning problems, cognitive deficits, language problems, or auditory based processing problems as the underling factor accounting for a student's learning problems. When attention and executive functioning are found to be normal, when cognitive abilities are normal, when there are no language deficits, but the child fails auditory processing tests administered under the controlled conditions as discussed in this paper, we have a student with an auditory learning disability. And, if that student is having learning problems in school, then the auditory learning disability is a specific learning disability which, under IDEA, makes the student eligible for special education services. Therefore, the question posed at the beginning of this paper, "Should Children with APD receive school services?" is answered as follows, "Yes, when the auditory learning disability has led to a specific educational problem."

References

American Academy of Audiology (2010). American Academy of Audiology clinical practice guidelines: Diagnosis, treatment, and management of children and adults with central auditory processing disorder. Retrieved on-line at: http://www.audiology.org/resources/documentlibrary/Documents/CAPD%20Guideline%208-2010.pdf

American Medical Association (2011). ICD-9-CM – for Hospitals, Volumes 1, 2, and 3. Washington, DC: The author.

Bellis, T.J. (2011). Understanding auditory processing disorders in children. Retrieved on-line: http://www.asha.org/public/hearing/disorders/understand-apd-child.htm

Carrow-Woolfolk, Elizabeth (1999). Comprehensive Assessment of Spoken Language (CASL). Circle Pines, MN: American Guidance Service, Inc.

EAHCA (1975). The Education of All Handicapped Children Act. (Pub. L. No. 94-142).

IDEA (1990). Individuals with Disabilities Education Act. (Pub. L. No. 101-476, 104 Stat.1142).

IDEA (1997). Individuals with Disabilities Education Act. (Pub. L. No. 105-17, 111 Stat. 37).
IDEA (2004). Individuals with Disabilities Education Act. (Pub. L. No. 108-446, 118 Stat. 2647).
Martin, Nancy A., and Brownell, Rick (2005) Test of Auditory Processing Skills, Third Edition (TAPS-3). Novato, CA: Academic Therapy Publications.
Ross-Swain, Deborah, and Long, Nancy (2009). Auditory Processing Abilities Test (APAT). Novato, CA: Academic Therapies Publications.
Semel, Eleanor, Wiig, Elizabeth, Secord, Wayne A. (2003). Clinical Evaluation of Language Fundamentals – Fourth Edition (CELF-4). Upper Saddle River, NJ: Pearson Publications.
Woodcock, Richard W., McGrew, Kevin S., and Mather, Nancy (2001). Woodcock-Johnson III (NU) Tests of Cognitive Abilities. Rolling Meadowns, IL: Riverside Publishing. Working Group on Auditory Processing Disorders (2005a). (Central) auditory processing disorders: Technical Report. Retrieved on-line at: http://www.asha.org/docs/html/TR2005-00043.html
Working Group on Auditory Processing Disorders (2005b). (Central) auditory processing disorders – The role of the audiologist. Retrieved on-line at: http://www.asha.org/docs/html/PS2005-00114.html

About the Author

Dr. Jay R. Lucker, Ed.D., CCC-A/SLP is an associate professor in the Department of Communication Sciences and Disorders at Howard Univerisity, Washington, DC. He is also a certified and licensed audiologist and speech-language pathologist specializing in assessment and treatment of auditory processing disorders and language processing deficits. He can be contacted as follows:
Mail to:
Dr. Jay R. Lucker
P.O. Box 4177
Colesville, MD 20914-4177
Phone: 301-254-8583
Email: apddrj@verizon.net