

Running Head: APD

Auditory Processing Disorder (APD): Identification and Accurate Diagnostic Procedures

Yvonne McMahon

May 19, 2011

Students who have difficulties with auditory processing tasks may be diagnosed with Auditory Processing Disorder (APD). However APD is not one of the 14 federal disability categories outlined in IDEA, therefore a student diagnosed solely with APD would not be eligible for an Individualized Educational Program (IEP). A student with APD would need to exhibit symptoms of one of the 14 qualifying disability categories and demonstrate a negative educational impact resulting from the disability (Virginia Department of Education, 2006).

Because APD can exist in conjunction with attention deficit hyperactivity disorder (ADHD), a student exhibiting ADHD symptoms may qualify for an IEP under the category called Other Health Impairment (OHI) and receive modifications specific to ADHD. Unfortunately the student with both ADHD and APD might not receive special education services specific to underlying APD deficits and that may, consequently, have a negative impact on learning. According to Espy, Molfese, Molfese, & Modglin, (2004; as cited by Sharma, Purdy & Kelly, 2009), “There is objective evidence from a longitudinal study of 109 typically developing children for a link between early auditory processing and later reading ability” (p. 715).

APD is a developmental disorder that may be responsible for a range of sensory processing deficits associated with learning difficulties (DeBonis & Moncrieff, 2008). Because APD may differ in severity from individual to individual and because APD may co-exist with other disabilities, it may be difficult to diagnose APD correctly (Dobrzanski-Palfery & Duff, 2007). Without an accurate diagnosis, children with APD may not receive meaningful and appropriate accommodations to help them cope with APD and, more importantly, they may not develop the necessary compensatory and self-

management strategies to be successful in school. Consequently, children with APD may experience deteriorating motivation and develop low self-esteem along the way (Lowenstein, 2006).

Furthermore, because APD may interfere with several modalities in cognitive processing and language development, a student's ability to progress at grade level may be difficult. (DeBonis & Moncrieff, 2008). An achievement gap between students with APD and their peers may develop if students with APD do not receive the appropriate instruction and interventions (Dobrzanski-Palfery & Duff, 2007). By the time the student with APD reaches middle and high school, he or she may find there are fewer opportunities for remediation and direct instruction as teachers begin to spend more time focusing on advanced placement classes and vocational training (Catone & Brady, 2005).

When APD is correctly identified through reliable screening methods, teachers will have more opportunities to design and develop early intervention strategies using multi-sensory learning alternatives as part of an individualized plan structured for that particular child. When APD is diagnosed and effectively managed, other related disorders including social anxiety disorders, and oppositional defiant disorders may be minimized or resolved as well (Dobrzanski-Pattery & Duff, 2007). A student with APD under these circumstances will have a better opportunity for learning, academic success, and progressing with his or her peers (DeBonis & Mocrieff, 2008).

The purpose of this paper is to acknowledge APD as a distinct learning disability thereby warranting its own disability category under IDEA. Secondly, this paper explains the heterogeneous nature of APD and the likeliness of co-occurring disorders associated with APD. The negative impacts of APD on behavioral, emotional, and social

development are real and should not be underestimated. And thirdly, this paper urges parents, teachers, and school administrators to understand their role in advocating for correct diagnosis of learning disorders in an effort to provide their students with the most effective early intervention programs and elementary school instruction.

Central Auditory Processing and Auditory Processing Disorders (APD)

Auditory processing is a complex communication process responsible for auditory routing, identification, and the process of filing auditory information in the central nervous system (Dobrzanski, et al., 2007). The central auditory system is located beyond the cochlea all the way up to the non-primary cortex and includes the brain stem, thalamus, and cortex (Boatman, 2006; as cited by Dawes, 2009).

The central auditory nervous system develops and matures during the first twelve years of a child's life and the effectiveness of an individual's auditory performance depends on what they do with the sounds and information they hear. Auditory processing is a neural process and is separate from hearing which is a different function that takes place in the auditory system structure of the outer, middle, and inner ear (Moore, 2006).

There is no gold-standard definition or agreement on what APD actually is. Therefore teachers and school administrators should carefully and strategically choose assessment measures to accurately diagnosis APD and other learning disabilities. The United States National Institute on Deafness has described APD as hearing normally but having difficulty using those sounds for speech and language. It is an impairment of speech perception that contributes to language disorders, including Dyslexia and Specific Language Impairment (SLI) (Moore, 2006).

The definition of APD does not include language impairments or general cognitive deficits even though increasingly number of studies reveals that APD may be the root cause of several learning disabilities. APD is a learning disability that can range in varying degrees of significance and can exist independently or may co-occur with other disorders, especially ADHD with or without hyperactivity (Dobrzanski et al., 2007).

Both attention and memory are required for auditory processing and, therefore, auditory processing involves more than just a single modality (ASHA, 2005; as cited by Dawes, 2009). Some research identifies auditory processing as a specific and separate task and therefore identifies APD as a single modality disorder (Katz, 1992; as cited by Dawes & Bishop, 2000).

Breier, Fletcher, Foorman, Klass, and Gray (2003) concluded through their research that APD and ADHD are two distinct disorders based on low correlations on behavioral test scores. Dawes and Bishop (2009) examined research conducted from 1994 through 2006 on APD and its association with ADHD as co-occurring disorders and concluded that, while the two disorders frequently overlap, there was enough evidence to show that some behaviors were associated with one disorder more than the other. Therefore they concluded that there was sufficient evidence to separate the two disorders.

In a 2009 study conducted by Sharma, Purdy, and Kelly, 68 students both suspected of APD or diagnosed with APD were assessed in auditory processing, working and short-term memory language, reading, and attention. According to Sharma et al. (2009), “forty-nine children or 72% were diagnosed with APD based on a comprehensive collection of test scores” (p.710). Furthermore, assessment results were evaluated to

determine if APD, language impairment (LI), and reading disorders (RD) were more prevalent in isolation as a “pure” disorder or in combination as co-occurring disorders.

According to Sharma et al. (2009), “more children had a combination of difficulties (n = 32; 47%) than a “pure” diagnosis of a single disorder” (p. 713). Furthermore, Sharma et al. (2009) concluded, “more than half of the participating children showed comorbidity of APD, LI, and RD. Children presented with a number of different combinations of difficulties, highlighting the importance of assessing language, reading, attention, and memory in addition to auditory processing” (p. 719).

Further studies by Fraser, Goswami, and Ramsden (2010) revealed positive correlation scores between students with LI, RD, and APD. The evidence strongly suggests that APD frequently will have a negative effect on developing language, reading and memory skills. In an effort to identify the prevalence of differential diagnosis of APD especially when commingled with other developmental disorders, Ferguson et al. (2009) conducted a study to determine if students identified with SLI scored differently in academic performance compared to students identified with APD. A group of students from a mainstream school (MS) was tested for comparison purposes as well. The students in the SLI, APD, and MS groups were assessed in reading, grammar, and verbal and nonverbal IQ. Parent surveys identified both the APD group and the SLI group as having similar behavioral profiles. The researchers found that there were no significant difference between the scores of the students with APD and the students with SLI, and that both groups scored significantly lower than the students in the MS school without disabilities. Because the test results were so similar between the two groups, it was suggested that the diagnosis of APD and SLI are often determined based on the referral

route taken and the student's initial evaluation (Tillery, Katz, & Keller, 2000).

Audiologists tend to diagnose students as having APD, speech and language therapists tend to diagnosis students with SLI, and educational psychologists, particularly in private schools, diagnose students with dyslexia (Ferguson et al., 2011).

Children with APD tend to develop symptoms at an early age and continue to experience significant difficulties with auditory tasks throughout their lifetime. Estimates reveal that between 2% and 7% of the population have APD and that it is more likely to be present in males than females by a two to one ratio (Dobrzanski et al., 2011). It is often unclear what causes an individual to develop APD. It is speculated that APD may originate genetically or through environmental causes such as trauma, viral infections, chronic ear infections, lead poisoning, or complications at birth that result in an oxygen deficit. Research shows long-term exposure to noise has a negative impact on auditory processing (Lowenstein, 2006). Because it is a developmental disorder, APD is often difficult to pinpoint how and when it originated.

Most often the first symptom of APD is when a child is having problems hearing sounds correctly and in their entirety, especially when in the presence of competing noise or distractions (Dawes & Bishop, 2009). When a child has APD, the individual does not understand what is being said as well as they should. They may not learn as well as other children and they may only understand portions of what they hear. They may behave as if they understand, but they lose track of the conversation when more than one person is talking, or when they are talking quickly. Background noise or competing distractions have a negative effect on a child with APD as they try to process what is being said.

Conversations with a high emotional content may increase the difficulty of understanding for a child with APD as well (Dobrzanski-Palfery & Duff, 2007).

Children with APD may not process specific information if too much information is given too quickly. For example, offering a child with APD five different breakfast items quickly may evoke a response from the child without them knowing they did not hear all five items, or if they did hear all five items they might not remember them all and they may ask for clarification or for the choices to be repeated. In addition to processing, children with APD may have difficulty with auditory memory either right after the information is presented or after a delay causing deficits in cohesion and the inability to integrate information gathered auditorily (Moore, 2006).

A study by Smoski et al. (1992; as cited by DeBonis & Moncrieff, 2008) found that students diagnosed with APD were reported by parents and teachers to have difficulty listening when compared to their peers without APD and that the most difficulty in listening for these students was in the presence of noise. Other symptoms of APD include mental fatigue, difficulty learning a foreign language, poor memorization, and difficulty with organizational skills. Other behavioral signs of APD may include, talking in short and choppy sentences, delayed responses, using poor grammar, and talking in a loud voice (Muluk & Yaicinkaya, 2010). APD is frequently reflected in lower verbal IQ scores and poor memory skills (Keller, Tiller, & McFadden, 2006).

Acting out behaviors and poor social interactions may be a symptom of APD including being upset with new situations, not spending time interacting with peers, focusing on television, becoming mentally fatigued more easily than peers and an increased lack of motivation on more difficult assignments (Muluk & Yalcinkaya, 2010).

. Frustration and anxiety are often consequences of underachievement, not from a lack of trying, but as a result of a child's APD and its negative effect on learning.

Lowenstein (2006) noted the following:

APD arises as a result of central auditory difficulties that lead to impaired comprehension of communications. There is frequently no loss of hearing ability.

Panic attacks and anxiety are frequently associated with APD, which further add to the individual's sense of frustration when trying to attend to communications (p.61).

In their 2000 study, Meltzer, Gatward, Goodman, and Ford examined 4,100 students with learning disabilities and found that 13% of boys and 10% of girls had psychiatric problems, which is seven times greater than their peers without learning disabilities. And in a 1996 study reported by Gullone, Commins, and King (as cited by Taggart, Cousins, & Williams, 2007), social workers reported a spectrum of emotional and behavioral problems in individuals with learning disabilities and a greater number of fears associated in individuals with learning disabilities when compared to their peers. Other large studies confirm that adolescent children with learning disabilities who do not receive interventions or learn compensatory strategies were statistically more likely to have some type of mental health problem as compared to their peers without learning difficulties. It is clear from the research that children with learning deficits are at greater risk for emotional and behavioral problems if they do not have adequate support systems and if they do not develop appropriate coping skills (Meltzer, 2000; as cited by Taggart et al., 2007).

Effective Diagnostic Procedures

APD is becoming more widely diagnosed in the United States in children with learning disabilities and it is apparent that reliable assessment measures will produce more accurate identification than just relying on expert opinion for identification. (Muluk & Yalcinkaya, 2010). According to Baldry and Hind (2008), professionals approach APD differently and teachers, speech therapists, audiologists, and language therapists do not always understand all of the characteristics of APD. To complicate matters further, there is no one consistent diagnostic procedure used by professionals, which often times lead to inconsistent identification and management of APD. It was also reported that a survey of audiologists in the United Kingdom identified 36 tests that were randomly used to diagnose children who were suspected of having APD (Hind, 2006; as cited by Ferguson et al., 2011).

Differentiating APD from other learning disorders is confusing and complicated. The central nervous system is responsible for sensory processing that is intertwined and supported by other language and cognitive processing, making it difficult to separate APD from other learning disabilities (DeBonis & Moncrieff, 2008). The auditory process is complex, individualized, and diverse, within its many functions (Phillips, 2002; as cited by Dawes & Bishop 2010). Therefore the evidence would indicate that parents, teachers, and administrators would benefit to stay focused and dedicated to reaching a meaningful and correct diagnosis.

Because auditory effectiveness present differently from person to person, the American Speech-Language-Hearing Association (ASHA) (2005; as cited by DeBonis & Moncrieff, 2008) recommended:

Screenings should be multidisciplinary and should begin with assessment of cognitive, psychoeducational, and language skills. Usually around the age of six or seven a child suspected of auditory processing deficits is old enough to be assessed and can sufficiently cooperate with the tester (p. 15).

DeBonis and Moncrieff further wrote, “the ASHA (2005) technical report on APD defines screening as systematic observation of listening behavior and/or performance on tests of auditory function to identify those individuals who are at risk for APD” (p.10).

A diagnosis of APD is determined through a variety of assessments that include filtering out frequency, applying competing noise to the background, and communicating information to both ears at the same time (DeBonsi & Moncriff, 2008).

Typically there are four major behavioral tests used to identify APD, including auditory discrimination tests to determine subtle differences in a variety of sounds. There are dichotic tests, which evaluate a person’s ability to separate or combine sounds presented to both ears at the same time. Another effective diagnostic assessment is the test of auditory pattern of speech that provides information about a student’s effectiveness in identifying cues in speech. A low redundancy test assesses an individual’s ability to screen out background noise and understand rapid speech (DeBonis & Moncrieff, 2008).

When a young child is referred for an evaluation for APD in a school setting, a team should be consulted to determine assessment measures and to collect medical information and behavioral information from the student's parents and teachers. According to the Virginia Department of Education (2006), the best practice approach to completing an assessment should begin and proceed as follows:

- A referral is made for APD.
- Conduct an audiological evaluation by a licensed and experienced audiologist.
- Review medical and developmental records to identify symptoms or characteristics of developing auditory processing weaknesses or a lack of age-appropriate milestones.
- Identify any current medication or allergies that may affect performance.
- Use reputable questionnaires and interviews with parents and teachers regarding the child's attentiveness with or without competing distractions, academic performance compared to peers, and the student's ability to follow instructions especially for those tasks that may require multiple instructions.
- Complete multiple classroom observations with special attention to classroom noise, class size, and seating in relation to the teacher.
- Gather data and analyze auditory components, including attention, memory, discrimination and cohesion of information.

Educational Programming and Compensatory Strategies

A student with APD should receive compensatory interventions and strategies based on a range of cohesive test results for that particular child (Dobrzanski-Palfery & Duff, 2007). Furthermore, the student with APD will benefit from the management of

environmental modifications, compensatory and instructional strategies, and cognitive and self-management skills. The strategies and interventions implemented for a particular student should be an ever-changing process in order to meet specific needs and build on the individual's strength. Assessment and frequent monitoring will provide feedback on the effectiveness of the strategies (National Center for Learning Disabilities, 1999).

Environmental modifications may be helpful in reducing the noise levels in the classroom. These modifications include adding carpet, installing sound-absorbing room dividers, placing curtains on the windows, and adding pads or tennis balls to chair legs and keeping the door closed. Students can be removed from noise in the classroom and be seated near the teacher with their back toward windows and doors (Virginia Department of Education, 2006). Working with students in small groups can keep students with APD on task and improving their attention span. Allowing recess or short periods of time off from listening activities is beneficial as well (Dobrzanski-Palfery & Duff, 2007).

Compensatory and intervention strategies include teaching students how to ask for clarification of directions and the importance of maintaining a neat and organized desk. Having the student repeat and summarize directions will improve understanding and retention, as the student becomes an interactive participant in the learning process. Increasing response time will reduce stress for students with APD who need more time to process the information and formulate a response. Power-point presentations, posters, graphic organizers, scaffolding materials, and other visual instruction will enhance learning as well (Dobrzanski-Palfery & Duff, 2007).

Cognitive strategies are considered a top-down approach designed to improve language, memory, and attention. Because auditory skills are intertwined with attention

and often with language, it is beneficial to strengthen these skills in an attempt to minimize the effects of APD (Lowenstein, 2007). Attention, retention, comprehension and multi task assignments can be improved when modeled by the teacher and practiced by the students to improve academic performance. Direct instruction in reading should focus on using reading materials at the student's cognitive level rather than levels based on age or grade level. Strategies should start early, be generalized over a variety of subjects, and used consistently in the classroom. These strategies include teaching auditory memory enhancement activities like imagery, chunking, and drawing. Students with memory deficits may also benefit from mnemonic training, and learning to preview, analyze, and summarize what they read (Virginia Department of Education, 2006). Computer-assisted technology and keyboarding are effective tools as well. Specifically, research indicates that assistive listening FM devices and auditory trainers can be useful with some students with APD (Dobrzanski-Palfery & Duff, 2007).

Discussion

Students with APD and other disabilities are falling through the cracks in our educational system and are characterized with failing grades, an inability to pass Standards of Learning (SOL) statewide assessments, high drop out rates, and the inability to read at grade level. Without a diagnosis of a learning disability, we often refer to these students as below average or students who are just lacking in motivation. We often think; "if they would just try harder they could do it". However, given the opportunity, a child will choose success over failure.

If we are to provide successful opportunities to students with underlying neural auditory processing disorders that struggle in school everyday, it is imperative that we

find a way to adequately define APD and acknowledge this disorder as an IDEA federal disability category. Professionals, including audiologists, speech-language therapists, and special education teachers, will be better equipped to design IEPs with assistive technology, environmental adaptations, and compensatory and cognitive strategies that will enhance academic opportunities for children with APD.

It is recommended for future research that consistent and federally endorsed screening tools be developed and available to teachers, school psychologists, audiologists, and speech-language therapists to provide a consistent means of identifying students as young as the kindergarten level who may have APD or be at risk for APD. Creating universal red flags in an effort to identify and track potential auditory processing problems in children age six or younger would be beneficial as well.

Furthermore, specificity of case-by-case APD is an essential component to consider when narrowing in on an accurate diagnosis, individual treatment, and effective instruction and adaptations. We need to acknowledge that APD is a developmental disorder that is best identified as early as possible. Early intervention is possible when teachers have screening tools and recognize the warning signs of APD. Understanding the long-term effects of APD on the most vulnerable aspects of learning will allow us to be proactive instead of reactive when, most likely, the student will already be experiencing frustration.

Success builds motivation and confidence. Early intervention for APD and co-occurring disorders holds the key to developing academic potential and a lifetime of learning and success for those individuals with auditory processing disorders.

References

- Baldry, N., & Hind, S. (2008). Auditory processing disorder in children. *Audiological Medicine*, 6, 193-198.
- Boatman D. (2006), Cortical auditory systems: Speech and other complex sounds. *Epilepsy and Behavior*, 8, 494-500.
- Breier J. I., Fletcher J. M., Foorman B.R., Klass P., Gray L.C. (2003). Auditory temporal processing in children with specific reading disability with and without attention deficit/hyperactivity disorder. *Journal of Speech, Language and Hearing Research*, 46, 31-42.
- Catone, W. V., & Brady, S.A. (2005). The inadequacy of individual educational program (IEP) goals for high school students with word-level reading difficulties. *Annals of Dyslexia*, 55, 53-77.
- Dawes, P., & Bishop, D. (2009). Auditory processing disorder in relation to developmental disorders of language, communication and attention: A review and critique. *International Journal of Language & Communication Disorders*, 44, 440-465.
- DeBonis, D. A., & Mociuff D. (2008). Auditory processing disorders: An update for speech-language pathologists. *American Journal of Speech-Language Pathology*, 17, 14-18.
- Dobrzanski-Palfery, T., & Duff, D. (2007). Central auditory processing disorders: Review and case study. *AXON*, 28, 20-62.
- Ferguson M.A., Hall, R.L., Riley, A., Moore, D.R. (2011). Communication, listening, cognitive, and speech perception skills in children with auditory processing disorder (APD) or specific language impairment (SLI). *Journal of Speech, Language, and Hearing Research*, 54, 211-226.
- Fraer, J., Goswami, U., & Ramsden, G.C. (2010). Dyslexia and specific language impairment: the role of phonology and auditory processing. *Scientific Studies of Reading*, 1, 8-29.
- Keller, W.D., Tillery, K.L., & McFadden S.L. (2006). Auditory processing disorder in children diagnosed with nonverbal learning disability. *American Journal of Audiology*, 15, 108-113.

- Lowenstein, L.F. (2007). Research into auditory processing disorder: 2000-2006. *Southern England Psychological Services*. Allington Manor, Allington Lane, Fair Oak, Eastleigh, Hampshire, UK. Ludwig.lowenstein@btinternet.com
- Meltzer, G., Gatward, R., Goodman, R., & Ford, T. (2000). *The mental health of children and adolescents in Great Britain*. London: Office of National Statistics.
- Moore, D. R. (2006). Auditory processing disorder (APD): definition, diagnosis, neural basis, and intervention. *Audiological Medicine*, 4, 4-1.
- Muluk, N.B., Yalcinkaya, F. (2010). Importance of pre-educational and post-educational tests and effect of training on the diagnosis of auditory processing disorders (APDs) in children. *International Advanced Otology*, 3, 386-393.
- National Center for Learning Disabilities. (1999). Visual and auditory processing disorders. Retrieved from: LD Online <http://www.Idonline.org/article/6390>.
- Sharma, M., Purdy, C.S., & Kelly, A.S. (2009). Comorbidity of auditory processing, language, and reading disorders. *Journal of Speech, Language, and Hearing Research*, 52, 706-722.
- Taggart, L., Cousins, W., & Milner, S. (2007). Young people with learning disabilities living in state care: Their emotional, behavioral, and mental health status. *Child Care in Practice*, 13, 401-416.
- Tillery, K.L., Katz, J., Keller, W.D. (2000). Effects of methylphenidate on auditory performance in children with attention and auditory processing disorders. *Journal of Speech, Language & Hearing Research*, 43, 1-9.
- Virginia Department of Education (2006). Students with auditory processing disorders. Retrieved from http://www.doe.Virginia.gov/special_ed/disabilities/speech_lang_pathology_services.pdf.