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Auditory Processing Disorder (APD)

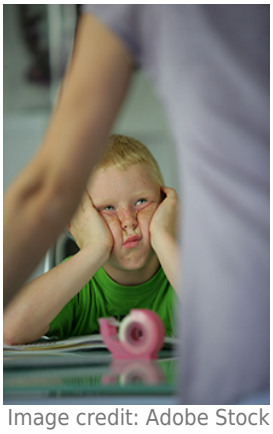


Image credit: Adobe Stock

Summary: Auditory processing disorder (APD) is a condition which affects how people hear the sounds around them. APD makes it more difficult to hear and understand others, especially in noisy situations, even when a hearing test is normal. It can even resemble other conditions such as attention-deficit hyperactivity disorder (ADHD), and cause troubles with learning. It can lead to stress and troubles functioning at school, work and home. Because it is not very well known, many people with APD struggle silently with it. The good news is that there are professionals and interventions that can be done to help APD and function better.

Introduction

Sam is a 10-yo who has troubles paying attention in school. He has been diagnosed with ADHD, but treatment with ADHD medications hasn't really helped. He always needs the instructions repeated in class, and has difficulty focusing in gym class. When alone with the teacher, he tends to understand things, but has troubles with group activities. Music class is tough because he can never understand the lyrics to songs. Since this year, he has a new teacher with an accent, and has been struggling to understand him.
Mary is in her 40's, married with three children. She had a concussion a few years ago, and now struggles to understand when more than one person is speaking at once. Being at home with her family has changed from being enjoyable to exhausting and irritating. She just wishes that everyone could be more quiet. Her husband seems irritable, but denies he is angry with her. Friends seem to react negatively during get-togethers.

What is APD?

Auditory processing disorder (APD) is a condition where someone has normal hearing (i.e. their ears work fine), but the auditory system is not able to process and bring this information to the brain. As a result, the person ends up having trouble understanding what is heard, despite having normal hearing.

Terms

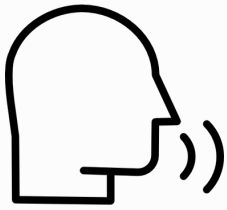
An older term for this is Central Auditory Processing Disorder (CAPD), but because all auditory processing has to occur centrally (i.e. inside the brain), it is repetitive to use the term 'central', and hence the simpler and shorter term "auditory processing disorder (APD)".

What Happens with Normal Auditory Processing vs. APD?

Talking to one another is a skill that most people take for granted, but it actually involves many steps which

include:

Step 1: The speaker talks, which sends their spoken message through the air.



Step 2: The sound goes into the ears of the listener.

Step 3: The message from the ears goes to the brain where the auditory information is processed, and voilà, now the listener understands what the speaker was saying.

In those with auditory processing problems however, the brain is unable to process the sounds and make sense of it. The person struggles to follow everyday speech, especially if there is background noise. It can be too rapid, too distorted, or too masked by noise to follow.

Because so much of our day-to-day communication depends on sound information (spoken language), auditory processing problems can cause significant problems at school, work, home and in relationships.

Normal Development of Auditory Processing

Auditory processing is a normal ability that develops in childhood. In some children, it develops faster than others. However, by age 7, most have similar abilities. Some (C)APD skills continue to develop until late adolescence.

What Causes APD?

Many factors can affect the brain’s ability to process auditory information such as:

1. Genetic factors, i.e. some people inherit auditory processing problems from their parents.
2. Acquired, i.e. it is caused by problems at birth, untreated ear infections that affect hearing, or brain injury (e.g. head injury or concussion).

How Common is APD?

In children/youth

- Approximately 2-3% of school aged children have APD.

In those who have had a traumatic brain injury, it is estimated that 50% may develop symptoms of APD.

Any of the Following?

Do you notice any of the following:

- Difficulties hearing when there is background noise despite normal hearing.
- Difficulty following multi-step, or multiple instructions.
- Difficulty following rapid or accented speech.
- A history of multiple ear infections.
- Delays in reading and spelling noticed in primary school.
- Student who receives grades that are much lower than would be expected, in the fact of (cognitive) testing showing that they have potential to be doing better.

Notice 2 or more of the above symptoms?

- If so, then there may be auditory processing problems… Read on to learn more.

Signs and Symptoms of APD

Symptoms of APD can vary, depending on the type of disorder.
Note that APD is defined as being problems with the auditory system alone. However, if a person has auditory processing difficulties due to other issues in the brain, this is not considered a “true” or “primary” APD. E.g. An adult with head injury can be experiencing post concussion syndrome which involves other sensory disturbances.
Main Symptoms

- May have a history of chronic ear infections.
- May have had speech or language "delays".
- Needs instructions to be repeated.
- Can appear not to hear in noise.
- Difficulty understanding what is heard when there is background noise (more than one person speaking, or other sound distractions).
- Troubles learning and/or paying attention, especially in noisy classrooms and homes.
- Difficulty understanding verbal directions; the more complex the instructions, the more difficulty.
- Mishearing words, confusing similar sounding words.
- Difficulty with the phonics approach to reading.
- Poor speller.
- Difficulty with word problems in math
- Speaks in a monotone, or with reduced inflection.
- Difficulty understanding the lyrics to music.
- Unusually forgetful of routine information.
- Needs extra time to process what is being said.
- On psychological testing, verbal IQ score is often inferior to performance IQ score

Emotional / Behavioural Symptoms

- Can appear to ignore someone speaking to him, especially in noise, or when involved in another activity
- Less focused, more distracted in noisy places
- Unusually bothered by loud or sudden noises
- Upset by noisy environments
- Behaviour improves in quiet settings
- Overly forgetful of routines, memorized information

- Confusion, hurt feelings from social situations if tending to take words literally, or misunderstanding intent of message
- May appear insensitive to tone of voice, or over react to perceived intent
- May be sullen or withdrawn
- Fatigues easily in noisy environments.

Wondering about APD?

Are you wondering about APD?

- If so, then see an audiologist who can do an assessment and diagnosis of APD is appropriate.

An audiologist can:

- Start by looking for excessive wax, ear infections, or hearing loss, and will refer to the family physician or an otolaryngologist for treatment where indicated.
- Do testing for APD. Using special equipment in a soundproof room, the audiologist will test the ability to hear sounds under various conditions.
- For example, how one hears speech in background noise, how one deals with distorted or rapid speech, whether one can focus on one message in one ear while ignoring a different message in the other ear. These tests simulate the stress on a listener's auditory system during daily listening activities. This helps discover the areas in which the listener is having problems. Children under the age of seven are more difficult to assess and cannot be evaluated using these tests, because their brains (including language and auditory processing) are still developing. However, the audiologist will have other ideas.

Audiologists may sometimes suggest other professionals be involved such as:

- Psychiatrist and/or a psychologist
  - They can look for other conditions that might look like APD, or cause similar symptoms, e.g. ADHD. Psychologists can also give assessments for cognitive and educational capacities.
- Speech language pathologist (SLP):
  - SLPs can assess the person's ability to speak and express themself (i.e. expressive language), and their ability to understand (i.e. receptive language).
- Teachers and parents (in the case of a child)
  - Information from teachers and parents is important to identify listening behaviours, learning behaviours, and social skills, medical history, and developmental milestones.

Has there been a head injury? Other professionals might include:

- A physiatrist to help with rehabilitation and concussion symptoms.
- An occupational therapist (OT)

APD and Other Conditions

APD can be seen on its own, but often it can be seen along with other conditions, such as:

• Non-verbal learning disability (NVLD):	APD is more frequent in children who have a diagnosis of non-verbal learning disability (Keller et al., 2006).
• Sound sensitivity disorders,	Examples are finding sounds too loud (hyperacusis) or having difficulty coping with certain sounds such as chewing or pencils tapping (misophonia).
• Concussion or head/brain injury.	Does the person have auditory processing difficulties following a concussion or head injury? • If so, then this is not considered a "true" or "primary" APD; rather, the person has auditory processing problems secondary to their concussion.

• Attention deficit hyperactivity disorder (ADHD):	ADHD and APDs are separate conditions, each of which may occur on their own, as well as together. Figuring out what is ADHD and what is APD can be challenging due to the similarities in symptoms between them, but there are ways to distinguish between the two (Chermak et al., 1999).

Symptoms that May Help Distinguishing between ADHD vs. APD:

ADHD	APDs
Inattentive Distracted easily in most situations. Hyperactive, with need to move constantly, or fidget Impulsive behaviours, e.g. interrupting others, troubles waiting their turn.	Inattention or distractibility is due to difficulty hearing in background noise Difficulties with listening and following oral instructions is due to auditory processing problems In situations without background noise, will be able to focus much better, e.g. quiet situations, one on one situations, etc.

*From Auditory Processing Disorders, from the Minnesota Department of Education, 2003

Different Types of Auditory Processing Disorders

There are different types of auditory processing disorders:

1. Primary auditory processing disorders	Weakness is in the auditory system • Auditory Decoding Deficit, which results from issues with the primary auditory cortex of the left cerebral hemisphere; • Prosodic Deficit, which primarily stems from functional difficulties of the right cerebral hemisphere, • Integration Deficit, which arises from inefficient communication between the two cerebral hemispheres in language processing.
2. Secondary disorders.	Difficulties in language or cognition, specifically • Associative Deficit (previously known as “childhood aphasia”, • Output-Organization Deficit, which is demonstrated by difficulties in planning responses to auditory information in an organized manner.

It is important for the audiologist to identify which type of auditory processing disorder as there are slightly different recommendations depending on the (sub)types.
For example

- FM systems are often thought of as essential for a child with APD.
- But if that child has a Prosodic Deficit, then an FM system will be of little use and thus should not always be recommended.

Suggestions For the Person With APD

General Recommendations

Environmental modifications, i.e. Change the space where the person is listening.

- Make the environment as quiet as possible, especially while instruction is taking place -- this benefits teacher(s) as well. Strategies include:
    - Putting tennis balls on the legs of chairs
    - Closing doors during instruction
    - Turning off computers not being used
    - Turning off excess noise like a radio or TV in the background.

Teach the listener how to communicate when one has APD. Strategies include:

- Move away from sources of noise.
- Look at the person who is talking to you -- seeing their lips can help.
- Have you understood the other person?

    - If not, then ask the other person to repeat or rephrase.

Are you talking to someone with APD?

- For an adult with APD, try to be in the same room when you address them.
- When talking with the listener with APD, make eye contact and face them.
- Meet with the adult listener in a quiet restaurant or shop.

Recommendations for Educators and the Classroom

Allow preferential placement in the classroom.

- Place the student's seat close to the teacher to maximize the teacher's voice.
- Fact:
    - Each time the distance between the speaker and the child is cut in half, the intensity is increased by 6 dB.
    - Conversely, the more you increase the distance between you and the child, the less intensity your voice will have in his ears.
- Place the student away from sources of noise, and close to visual aids (blackboard, etc.)

Reduce background noise

- Reduce surrounding noise as much as possible, as this is better and easier than raising your voice.
- Examples
    - Add pads (or tennis balls sliced in half) to chair legs;
    - Close the classroom door and windows during explanations;
    - Turn off computers or fans that are not in use or move the child's desk away from them;
    - Turn off music or television before talking to the student.
- Not possible to reduce background noise?
    - If so, then move the student away from the noise.

Face the student when talking.

- When you are talking to your student, try to face your student as much as possible so that they can see your lips and be able to use lip reading to help them understand.

Amplify a teacher (or presenter's) voice using a classroom FM system.

- These systems consist of the teacher wearing a microphone, with his/her voice broadcasted over speakers in the classroom. By amplifying the teacher's voice, it makes it easier for the child with APD to hear the teacher and be less overwhelmed by other background noise.
- Research suggests that sound amplification systems in classrooms may benefit all children, not only those with central auditory processing disorder. Young children cannot hear one of every six words the teacher says, due to distractions such as other children talking (due in part to interactive learning approaches that require more participation and group work), computers, the hum of lights, as well as out-of-class distractions.
- The Canadian Association of Speech-Language Pathologists and Audiologists actually recommends that "All Canadian teachers from kindergarten to Grade 3 should wear microphones" and that classrooms should be equipped with surround-sound systems to give every pupil a "front-row seat" when it comes to hearing."

Get the listener's attention before speaking to them.

- Do not just ask a question to the whole class, and then turn to the student, e.g. do not say, "What is the capital of Italy? Jason, do you know the answer?"
- Instead, have an agreed upon cue for Jason to pay attention, e.g. such as standing in front of Jason, which lets him know he should pay attention. Or get Jason's attention verbally first, e.g. "Jason... What is the capital of Italy?"

Is it individual or group work?

- During individual or group work, allow the student to work in a calm and quiet environment (e.g. in a quieter part of the classroom, or even another classroom).

Visual aids

- Write new vocabulary, key words, homework, lesson plan, etc. on the blackboard so that the child can have as many cues as possible to complete the auditory information.
- Are there important tasks, reminders or deadlines?
    - Give the person with APD written instructions, and/or ensure they are using a calendar or agenda.

Repeat and rephrase things.

- Repetition gives the child a chance to hear more of what he or she missed the first time.
- Is the child having trouble understanding?
    - If so, then rephrase statements rather than simply repeat them if the child has difficulty understanding.
    - Keep instructions short and sweet will also make it easier for the child to assimilate the information.
    - Encourage the child to ask for repetition or rephrasing when he or she does not understand.

Talk with melodic Intonation and speech rate

- The child will engage better with a "melodic" voice rather than a monotonous one.
- Consider slowing down the flow of the voice to allow the child to understand the verbal message.

Check at the end to make sure the child understands

- After giving a set of explanations or instructions, check in with the child to see if they understood what has been said.
- Ask them to repeat back what they understand, or encourage them to ask questions.

Don't simply use a big list of preprinted suggestions for APD.

- Ideally speak to a professional knowledgeable about APD to individualize suggestions for your situation. Not all suggestions are appropriate for all types of APD, and some that are recommended for one type could be unhelpful or even detrimental for another, not to mention a burden for speakers, and a lengthy addition to an Individualized Education Program (IEP).

Recommendations for Employees and Workplaces

During meetings, ensure that only one person speaks at a time; arrange that others do not whisper at the same time as the main person speaking.
Arrange for a private office or have your work space in a corner of the room.

Recommendations for Adults

Low gain hearing aids may be helpful, in addition to all the other previously mentioned strategies.

Treatment for APD

In addition to the accommodations and modifications mentioned above, speech-language pathologists (SLP) can also provide therapy and direct interventions for APD.

For More Information

Ontario Association of Speech & Language Pathologists:
www.osla.on.ca

American Academy of Audiology www.audiology.org
American Speech Language Hearing Association:
www.asha.org
Information about APD from the Minnesota Department of Education
http://education.state.mn.us/mdeprod/groups/SpecialEd/documents/Instruction/001567.pdf

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About this Document

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