AUDITORY PROCESSING

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WHAT IS IT?

Auditory processing is difficulty integrating information presented orally, hindering the child's ability to follow the sequence and organization of the speaker. Auditory processing has to do with the eighth cranial nerve which is the auditory nerve, or sometimes referred to as the acoustic nerve. It also related to the temporal lobes of the brain. It is the process from which we encode sound, store information, and are then able to retrieve it when it has been presented verbally.

WHAT CAUSES AUDITORY PROCESSING?

Fifty percent of the time we can link auditory processing delays to chronic ear infections during the first two years of life. It can also be linked to prematurity, hospitalization, or trauma during the first two years of life. Fifty percent of time we have no clue as to what has caused the processing delay.

CHARACTERISTICS

Auditory processing characteristics can range from mild to severe and across a whole range of diagnoses and disorders. For instance, the most severe cases of auditory processing are usually associated with the autistic population. Moderate characteristics are many times associated with the ADD and ADHD populations. Mild symptoms are typically seen in children who are in a regular education classroom and are struggling in particular with reading, spelling, and written expression.

Typically children who are more severe demonstrate characteristics very early in age, such as delayed speech production, poor intelligibility of speech, difficulty following directions, difficulty following conversational cues, and sometimes even responding to their name. Children with more moderate characteristics will demonstrate difficulty usually noted between kindergarten through second grade. They will struggle with sound/symbol identification, sequencing of sound, reading fluency, and spelling. Those with more mild symptoms will maintain usually until between fourth to eighth grade. Around fourth grade the child who has been able to maintain and compensate will usually become overwhelmed in fourth grade because of the curriculum shift that occurs. The curriculum becomes very auditorially-based with very little visual information and written expression greatly increases. Written expression is one of the most difficult tasks for children with auditory processing delay. They usually have difficulty with spelling and grammar. They demonstrate difficulty with thought organization. Many times

they are very creative and can verbally demonstrate wonderful detailed stories. However, they have difficulty transferring what they hear in their head to paper.

Ninety percent of the time children with auditory processing delay demonstrate average to above-average intelligence. This creates even more frustration for them within the classroom.

DECODING/FILTERING

This is the #1 symptom of auditory processing. This is the inability to hear fine, phonemic differences, such as [p] and [b] or [t] and [d], etc. This affects the child's ability to encode information. During the first years of life most sound is novel and, therefore, the first time a child hears a word, such as dog, they may hear "gog", and the brain stores it that way. The second time the child hears dog, they hear it as "dog", but the brain recognizes it as another new response and stores it again. Think of the brain as books on a library shelf. There is a picture of a dog, the child knows what a dog is, but they have multiple reference points (sometimes as many as five) stored for the same word. Therefore, we see a slowed processing rate in terms of retrieving the information. This is usually extremely frustrating for the child. They know the answer, but by the time they recall it, the teacher has already moved on to something else. Or, the child may be seen as impulsive and will just say the first thing that pops into their head in an effort to answer the question. This is very typical in a reading situation. A child may know that the letter is an "h" but they say "d".

Due to decoding delays, this is the primary reason that children have difficulty with sound/symbol identification, sequencing of sounds, spelling, reading fluency, and following directions. Decoding is also the #1 reason why many times children are misdiagnosed as ADD or ADHD. The decoding causes the child to be an increased energy cost for listening, especially in a classroom setting. This occurs because the same pathway that is responsible for encoding sound is responsible for filtering background noise. Therefore, the noise in a classroom is much louder than the individual speaker's voice. These can be noises such as an air conditioner, lights, or pages turning in a book. Just like anything else in our human nature where we put out increased energy, we fatigue.

When fatigue occurs one out of three symptoms will occur. The first symptom is characterized as multiple positional changes, distractibility, or talking to their neighbor. A child with this characteristic is many times labeled as a behavior problem or most typically labeled as ADD.

The second characteristic is a child who is labeled as a daydreamer. This child is typically the most at-risk in the classroom for not recognizing the level of energy cost that they are experiencing academically. They are labeled as the "good child". They stay in their seat and look at the teacher; however, the

majority of the information is not going in. Because they are not a behavior problem, many times these children are overlooked.

The final characteristic is the child who is labeled as withdrawn. This is a child where a group of children are playing and they are alone during a party or on the playground. This child prefers to play alone versus in a group.

All three of these symptoms are related to the auditory overload that occurs because of the child's struggles with decoding. Typically we also see a child who has a decoding delay struggle with team sports. The reason is because sports are usually played outside or in a gymnasium where the acoustics are very challenging. There is usually a lot of noise, and the coach is usually across the field in terms of yelling out directions. Again, this has nothing to do with a child's ability in terms of coordination or athletics. It simply has to do with the fact that the energy cost for attending is too great, and they become overwhelmed. They typically do better at individual sports, such as golf or tennis, where the instructional environment is much more contained. A child with a decoding delay might also have difficulty making friendships. Many times they have difficulty with conversations as they cannot pull the information fast enough to respond to their peers. At times, they may seem as if they are off topic. As a result, their peers have difficulty relating to them.

DOMINANT VISUAL LEARNER

Because the eighth cranial nerve and that pathway for encoding information is not as a strong as it should be, the brain compensates and the child becomes a dominant visual learner. Characteristics of a dominant visual learner are rhythm, movement, and visualization. When these three areas are incorporated into the child's academic curriculum, we see learning and processing greatly improve. We see frustration significantly decrease and retention significantly increase. A typical classroom, especially in grade school, is built around more auditory learning, which is through rote repetition. This is the highest level of frustration for the child and the lowest level of retention. We typically see characteristics of auditory processing disappear sometimes in middle school but most definitely in high school and college. It is not that the disorder goes away, but it is simply a change in the academic environment. Again, grade school is very dominant in terms of rote repetition and auditory learning. Sometimes, this still occurs in middle school. However, by high school and college, the child is given the information and told to go and learn it. Therefore, they are able to apply their strengths in learning the information. This is why we typically see a child who may have struggled throughout grade school suddenly begin to do very well in school and excel in great ways.

WHAT THIS LOOKS LIKE IN THE CLASSROOM

In terms of what this looks like in a classroom, the profile would be a child with average to above-average intelligence, may or may not have any other accompanying diagnosis, such as autism, ADD, or speech delay. The child may be in a typical classroom and just be struggling to maintain. Depending on the severity of the delay, they will either have difficulty with pre-reading skills, such as sound/symbol identification. If they do okay in sound/symbol identification, they will most likely have difficulty with blending the sounds as they move into whole word reading. If they are able to maintain and do okay here, they will then typically have a reduced reading fluency affecting their comprehension.

Many times these children struggle a great deal with spelling. This is primarily due to the way that information is taught. Because the pathway that is responsible for encoding sound and filtering background noise is not as strong as it should be, the brain begins to compensate and develop more strengths on the right hemisphere of the brain along the lines of visual learning. Typically a child with auditory processing delay, is referred to as a dominant visual learner or a dominant right brain learner. We typically think of this as children who are very artistic or who enjoy drawing and music. In terms of auditory processing, this does not always have to be true. It can simply be a way for the brain to compensate and develop other avenues for learning. Most of the time spelling is taught through rote repetition. For a dominant visual learner, rote repetition is the lowest level of accuracy for learning and the highest level of frustration. Therefore, a typical scenario would be for a child to have to put in more study time in order to memorize their spelling words, and they may or may not do well on the test. Again, this has nothing to do with intelligence. Many times these children are able to memorize these words for a test. However, even if they are at the highest level of intelligence, they may have difficulty recalling how to spell the words the next day or even a week later. This is primarily related to the method in which spelling is taught. This can be across the board in any academic area.

Because letters and numbers are recognized in the brain as symbols and not a visual picture, they typically can have difficulty with memorization of math facts, remembering steps for long division or multi-number multiplication. Typically, written expression is their greatest struggle. Due to their difficulty with spelling, these children are at a higher energy cost for getting information down on paper. As a result, we typically see difficulty in the area of thought organization. If the child is able to dictate the story, we usually see beautiful creativity. Sometimes computers, because of spell-check and built-in grammar components, can greatly enhance their writing abilities but not always. They typically have to put out more effort in terms of study time than what matches their level of intelligence.

Based on their level of auditory fatigue, we can see any one of three characteristics mentioned above in terms of behavior problems, daydreamer, or withdrawn. Typically, these children will receive scoldings, including “if they would only try harder, they would do better” or “if they would only pay attention more, they would be able to do better”. Many times the teacher will recognize their level of intelligence and will note that their learning curve does not match. In order to change this, we have to focus on their learning strengths and strategies. Test taking, depending on the subject area, many times is a very long process and does not reflect their knowledge base. These children typically do better in hands-on situations, such as science, in which they are able to manipulate and can visually process information.

Another characteristic seen in the classroom is a high level of frustration. As we mentioned earlier, this is not a case of reduced intelligence, but difficulty accessing stored information. The teacher may ask a question and the child will know the answer to the question, but by the time they go through the multiple reference points, recall the information, and then get their hand up, the teacher has most likely moved on to another topic. The other possibility is that the child will be very impulsive with answering questions.

WHAT THIS LOOKS LIKE SOCIALLY

Socially, many times these children have difficulty in terms of peer relations. They may have difficulty with team sports due to the auditory competition. At home, they may have frustration due to difficulty following directions. They will be given a multistep task and will become lost within the task. They will often have difficulty relating to conversations because it is misheard. An example, of this would be the mother will say, “Dad is home” but the child hears it as “Tad is home”. There will be somewhat of a blank look on their face, and then dad walks in the door. The child will then be able to put together the information. Again, because they are constantly looking to their environment to supply the missing holes heard in the information, we see a slower processing speed overall.

Many times parents are very frustrated with these children because they can be labeled as lazy. Parents may feel that the child is not attending to information and is the reason why they are not able to follow through with instructions. In a home situation, these children will typically seek out repetitious activities as a means of calming and organizing. Many times parents will complain that these children zone out in front of the television and seem unreachable. This is also seen with a computer or Game Cube. This is simply the child’s way of going to that level in which they can calm their nervous system as well as reorganize so that they are able to take in more information.

WHAT THIS LOOKS LIKE IN TERMS OF THE NERVOUS SYSTEM

Because the child is at an increased energy cost for listening, many times we see high levels of frustration. Again, this can be misdiagnosed as ADD. There can be an actual change in brain chemistry in terms of the level of frustration and the anxiety-producing behavior that follows. As a result, children may have difficulty self-calming. We may see during a party or a noisy environment, such as a crowded restaurant, their activity level may actually increase or they may become overwhelmed and want to leave the situation. Many times this is due to a hyperacoustic response to sound. This is related to the same neuropathway of the eighth cranial nerve. This is typically seen in those children who had chronic ear infections during the first two years of life. Many times from a social perspective, parents will say that the child was very sensitive to sound, and the child would cover their ears or act scared when they heard a vacuum cleaner, garbage truck, or an airplane. Again, it is because these sounds are much louder than they are to the typical ear. When children demonstrate a hyperacoustic response to sound, this can cause them to fatigue even quicker and become even more overwhelmed in the classroom. Many times they will act out as a means of getting away from the sound or just because they are so overwhelmed by the noise level.

HOW DO WE HELP AS A TEACHER?

The first step for a teacher is to identify the child's learning strengths. This can be done by comparing results when information is presented visually versus verbally. In terms of comparing results, you want to look at the level of attention. Typically when information is presented visually, we see the child is very absorbed in the information that is being presented, and their retention level is usually 80% or above. They can recall this information for long periods of time. When information is presented verbally we usually see the opposite occur. The children will usually become fidgety or may even begin to act out as discussed earlier due to the auditory overload. Their retention is usually below 80%. Even if they learn the information for the test, they are unable to remember it or build on it when other information is presented. Younger children may present as having difficulty with reading, math skills, and reading or writing letters of the alphabet. These are all warning signs, and testing should be recommended.

A parent can help by presenting information at a slower pace, giving frequent repeats of information, or asking the child to repeat information back. In addition, it is recommended that a parent seek out appropriate testing and not be quick to accept a label of ADD or other misdiagnosis that is typically given to these children. Most of all, it is important for the parent to recognize the level of intelligence that the child has and their abilities as well as to seek out ways of enhancing their strengths through learning.

In terms of testing, a full audiometric testing is typically done. Even though hearing is normal, the audiometric evaluation is not looking at their hearing level. Rather, it is looking at things, such as auditory discrimination or how well a child can discriminate single words, sentences, and single sounds when background noise is introduced. It looks at what is called a figure-ground perception in terms of what compensation mechanisms is the child using when increased noise is introduced. A full audiometric evaluation can even identify sounds that the child has the most difficulty hearing, such as words that start with [p] and [b]. This information is very scientific-based for the area of auditory processing and is extremely beneficial in diagnosing the decoding part of it.

The next evaluation that is very helpful is from a speech pathologist. The job of a speech pathologist is to take the information the audiologist has presented and to better define it and look at specific areas, such as decoding, word-finding, and processing speed. Through the use of language testing, the speech pathologist is able to identify learning strengths. These can then be communicated to teachers and parents in terms of learning strategies. Because the child is typically so bright, we see that when we focus on their learning strengths, they begin to learn at the same level as children who are auditory learners and also at the same attention level with lower frustration.

Other beneficial evaluations will rule-out visual processing delays. This can typically be done by a vision therapist or psychologist.

If the auditory processing delay has gone on for a long time, such as for a child who is in the fourth grade or as young as the second grade, it may be necessary to have a full educational evaluation as a means of addressing any academic areas that have been missed or “holes” in their academics.

TREATMENT

There are multiple methods of treatment based on the needs of the child. Some levels of treatment focus on improving internal rhythm and timing by focusing on the temporal lobes of the brain. Other treatments can focus on building a higher endurance for listening to auditory information and filtering background noise. Academic treatment methods focus on the child’s strengths in terms of learning and incorporating these into the classroom and into their actual classroom curriculum. Other areas may focus on the area of reading and learning sound/symbol identification while addressing the decoding delay. The treatment plan can become very clear once the information is received from the audiologist as well as the speech pathologist. It is very important for everyone to work as a team in terms of making the therapy functional at the same time of meeting the needs of the child within the classroom setting.

The primary reason for intervening with auditory processing, especially with the child who falls into the mild to moderate spectrum, is not to be “fix” the symptoms. It is primarily to say that we recognize their level of intelligence and we simply want to show them strategies that they will eventually learn on their own. We want to show them these strategies so that their intelligence will be recognized, their level of frustration will be decreased, and their level of retention will significantly increase.