

AUDITORY PROCESSING AND AUTISM

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As printed in the Defeat Autism Now (DAN) Program October 2000

Auditory processing, auditory perception, and central auditory processing are synonymous. Auditory processing is 'what you do with what you hear'. The ear and brain work together. In other words, the actual hearing mechanism can be normal, but the perception of what was heard, may not.

Many parents of autistic children are told or realize that their child does not seem to perceive or process auditory information accurately. The standard hearing test indicates that their hearing is normal, but they continue to respond by over-reacting to sound, tuning out sound, or by 'hearing' sound inaccurately (answer questions inappropriately, hear or say only parts of words, remember only one direction at a time, confuse speech sounds, are unsure of where sound is coming from, etc.).

Children with auditory processing issues have difficulty in comprehending, integrating, and remembering auditory information. They may have problems attending to auditory signals when background sounds are too distracting. They have difficulty staying on task especially when language is too difficult. One does not need to be autistic to have these problems. However, autism does compound the problems.

When evaluating a Central Auditory Processing Disorder, an audiologist must look at a number of core issues. First, a hearing loss must be ruled out. Additionally, sound sensitivity issues need to be addressed. If a child is hypersensitive to sound, typically this issue is related to the physical mechanism of the ear. Dr. Berard's Auditory Integration Training is the remediation method of choice. It is important that the audiological testing done addresses the measurements of the hearing threshold levels (audiogram), and the acoustic reflex muscle in the middle ear cavity.

If sound sensitivity is not an issue, then more focus should be placed on how the child uses sound. The audiologist should evaluate how the signal is presented to the child (Can they tolerate little beeps but not speech sounds? Can they attend better with warble tones versus simple beeps?). Next they will evaluate the environment (Do they listen better in quiet situations or noisy situations? Do they listen better to a soft voice or a loud voice? Will they comprehend single word utterances better than whole phrases or sentences?). Next the responses are evaluated (Did they process with only one ear versus two ears? Did they perceive only the high frequency information or low frequency information? Did they process only the first part of what was said or the whole word?). Finally, the audiologist looks at the strategies used by the child to respond to sound input (Did they ignore it? Did they over-react? Did they respond to the whole request or only to a portion of the request? What did the child respond to?) Ultimately the audiologist must use all of these factors when evaluating auditory processing.

The autistic child presents a unique situation because their autistic behaviors often stem from an under or over reactive system. For some children, by helping them with their perception of sound, many autistic-like behaviors lessen, especially when combined with other therapy modalities. One of the main concerns with auditory processing involves the processing of information in a teaching-learning environment. Many children approach a learning task confused or unaware of how to proceed. They do not seem to know how to listen, how to learn, or what to do. The autistic child's auditory processing issues go beyond the teaching-learning environment. It impacts their every waking (and sometimes sleeping) moment.

These skills typically need to be taught. Very often these skills should be taught after the appropriate sound based therapies have been incorporated into

their therapy regimen. Summarizing my 1999 DAN Conference Program article on Sound Based Therapies, Auditory Integration Training should be considered first when hypersensitivity is present. And therefore, it is most important that the determination be made using the appropriate diagnostic testing. Secondly, the Tomatis® Method should be considered to enhance the general auditory perceptual connections. This method incorporates air and bone conduction transmission of sound and works on creating a balance within the body. Vestibular, oral motor, proprioceptive, behavioral, and emotional issues are also stimulated. Once the body has created a better balance, then ‘fine tuning’ issues such as sequencing, memory, time delays, phonemic awareness, localization, etc. can be addressed through therapies such as Fast ForWord®, Lindamood Bell®, Earobics®, and Away We Go®.

These ‘fine tuning’ issues are based upon the hierarchy of auditory perception. Norman Erber created this hierarchy when evaluating hard of hearing and deaf children. It applies to all areas of auditory perception. The four levels are: 1. Auditory Awareness, 2. Auditory Localization, 3. Auditory Discrimination, and 4. Auditory Comprehension.

The first level, **Auditory Awareness**, is the most basic one. A child needs to know that a sound is present and that it has meaning to them. Many autistic children have learned to tune out (or shut out) sound because it is too confusing to them. Others will respond to sound some of the time but not all of the time because of the situation they are in. Children need to learn that all sound is important and all sound has meaning. They need to learn to listen to sound, attend to sound, and respond to sound. This may seem very simple but for some autistic children, this skill does not exist or is very weak. It is important to start with this skill therapeutically after the appropriate above named therapies are initiated or if the child just has weak processing skills. If this skill is not developed first, other higher order skills will become splinter skills instead of useful skills.

The second level of auditory perception is **Auditory Localization**. This is the ability to know where sound is coming from and how to use the information. Many children are not sure if they hear a sound on their right or left side, in front or in back of them. If the child does not know where to locate a sound, by the time they have tuned into the speaker, they typically miss out on the first part of the message. They may only retain the last part of what they heard. In a reverberant room, they will tend to act more confused because sound is bouncing all around the room. In order to attend, the child must be able to know where to focus his attention. It should not be an assumption that the child can localize to a sound, simply because they are able to turn their head to that sound. The response must be quick and accurate. Sometimes certain pitch frequencies are easier to localize to than others.

The third level of auditory perception is **Auditory Discrimination**. This includes gross and fine sound discriminations. Gross sound discrimination includes hearing and identifying differences between very different sounds such as a dog’s bark and a cow’s moo. Fine sound discrimination includes sounds that are very similar sounding such as a loud jet rumble and a thunder roll; or the difference between two speech sounds such as fa/va. Fine sound discrimination also includes hearing differences such as hi/lo, fast/slow, near/far contrasts. Many autistic children can identify sounds but have difficulty with contrasting them. Others can discriminate gross sound differences but not fine sound differences. Still others can discriminate some sounds on command but not freely in the regular listening world.

The fourth and final level of auditory perception is **Auditory Comprehension**. This includes utilizing all the smaller pieces of auditory information in order to make sense of what was heard. Most people assume this means speech sounds, which are important, however, there are many other subtle sounds that most people take for granted, such as sounds for safety (ambulance sirens, cars approaching while walking down the street, a fast approaching object like a ball thrown

inappropriately, etc.). The autistic child may not know how to use these safety sounds because they may not be aware of them, be able to tolerate listening to the sound, know where to locate them, or how to discriminate between them. They do not have appropriate comprehension about the meaning of the sound. Their response to the situation would, therefore, be inappropriate. This also pertains to verbal communication. If they do not know someone is specifically speaking to them, and/or can't locate the speaker immediately, and/or have difficulty discriminating the information heard, then comprehension is beyond their capability unless presented at their level. This might require obtaining their attention by holding their face and localizing them to the speaker, using words or sentences that are not said too quickly and with clear enunciation, and guiding them through the comprehension task.

Having identified the four levels of auditory perception, the next step is to address the development of skills in those areas. First, one must consider the level of functioning of the person. Certainly if sound sensitivity is present, Dr. Berard's Auditory Integration Training should be considered so that sound can be comfortable and worth tuning in to. When sound sensitivity is not an issue but the child demonstrates weakness with attention, focusing, following directions, vestibular issues, oral motor issues, or receptive **and** expressive language skills, the Tomatis Method should be considered to create better balance. This method has tremendous impact on the whole body's functioning but especially with how sound is perceived.

Once the baseline skills have been established, then the following ideas and activities can be attempted to develop the 'fine tuning' skills.

For Auditory Awareness

1. Use recorded sounds with correlating picture cards. (These can be created by the parents to help with the better understanding of the child's environment or you can purchase programs that have these general sounds and pictures already together.) First, the pictures should be

identified. Then the sounds introduced. Finally, the picture and sound should be combined. This may be a fast activity for some but for others, this may take a long time and require many repetitions to get accurate responses.

2. Once the sounds have been recognized and associated with the pictures, games such as Sound Lotto's can be played.
3. For reinforcement, the sounds can be imitated.
4. As the child begins to be aware of the sounds, the sounds can then be divided into categories such as people sounds, household sounds, vehicle sounds, etc.
5. Other sounds can be introduced such as favorite toys or noisemakers always watching for the child's response.

For Auditory Localization

1. Play games that have the child search for sounds after they become aware of the various sounds around them. Start with a small area such as a living room. Have someone hide behind a couch calling the child's name. Have the child come and find that person. Take turns and let the child be the one to call someone else's name if appropriate.
2. Later, an object that makes a sound can be hidden and a game to find the noisy object can be created. Start with easy situations, then start to hide the object in more difficult locations.
3. Move to the outside and see if sounds can be identified such as a train approaching and then help the child locate where the train is coming from. Be careful of past knowledge of a sound and its impact on the current situation such as familiarity with a 5:30 train always coming from the West.
4. Put a blindfold on or cover the child in a blanket and let them tell you what sound they hear and where they are hearing it from.

For Auditory Discrimination:

The list of activities for discrimination can be broken down into gross and fine sound discrimination activities. Additionally each of these areas can be broken down further into categories such as high and low, fast and slow, loud and soft,

same and different, etc. The activities could go on for pages so only a few activities will be discussed here. It is important to stress that some of these activities are well beyond entry levels for discrimination tasks so should only be attempted when appropriate.

1. Use rhythm activities that include clapping of hands, or rhythm sticks to develop “beats” moving fast and slow. Use songs that have only fast or only slow or a combination of fast and slow rhythms.
2. Practice with the parent’s or child’s voice. Read sentences and have the child tell if the sentence was said loudly or softly. Have them repeat it loudly or softly. This activity can be turned into a game. For example, the child gets to put a chip in a cup marked “loud” if it is a loud sound and “soft” if it is a soft sound and then count which cup has the most chips.
3. The concept of same and different can be introduced with speech sounds, such as /ba/, /ba/; or /se/, /se/; or /ba/, /ka/; or /me/, /se/. Columns of same/different sounds can be made for the child to visualize as well as discriminate auditorily. Consonant and vowel discrimination should be introduced separately because for some autistic children, depending upon their hearing threshold levels and speech discrimination skills, they may process one better than the other.
4. Rhyming activities are great ways to perceive similarities and differences between words. For the older or more advanced child, pictures and nursery rhymes are good ways to enhance advanced rhyming skills.
5. Listening and discriminating inflection and pitch changes is a more advanced skill that helps develop differences between feelings such as happy, sad, angry, surprised, etc. Pictures, sentences, dramatic representations are a few ways to approach this.

For Auditory Comprehension:

There are many programs on the market that can be used, once the child has reached this level. Programs should be found that include: following directions, both simple and complex, answering questions, paraphrasing (what was heard); and

commenting on what was heard. If such programs cannot be found, then find one taught with a reading approach and turn it into an auditory/listening task requiring the of answering questions, following directions, etc. This level involves finding the meaning of sound that is heard.

Auditory Processing is a complex skill. It takes knowledge of the auditory system to know where one’s weakness occurs. The correct entry level for intervention is extremely important because if a skill is learned, one that is too high functioning, that skill becomes a ‘splinter skill’. This means that the child has the skill but can’t use it when needed. For example, if the child can only process two beats together or two sounds at a time, then care must be taken before teaching them more than a two word utterance. They may be able to repeat the sounds some of the time but until they can process three sound combinations, they most likely will not be able to say a three word utterance with meaning, fluency, and appropriately.

When appropriately introduced, the development of auditory skills can be accomplished. Some children accomplish this faster than others. Those that accomplish it faster are the ones who develop better speech and language skills. Even when the development of speech and language has begun, attention to auditory processing weaknesses should be monitored.

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