

## 5. Reporting Results

My APD evaluation report provides, case history information, test results and norms, explanations of the findings (i.e., types of APD), and recommendations. The report will be read by school professionals, family members, tutors, counselors and/or physicians. It is the tool to document the evaluation findings for us, and to educate all involved with your client. The below is an example of an APD report.

To better understand my report please read this:

1. I have community audiologists do the basic audiometric testing, a few days before the CAP evaluation.
2. The parent/family member/s sit ~5 feet behind the person and they have a copy of the test items so they can see the types of errors etc. and can help out if the person's speech is not clear etc. Also, if they can take care of any behavior problems.
3. The client gets breaks as needed.
4. The order of testing that I do is, Speech-in-Quiet, Speech-in-Noise, SSW and Phonemic Synthesis.
5. The order of the report does not follow the order of testing. We start with the SSW, then PS and finally SN. This is because I want to make sure that the reader understands the SSW findings, as they may not read on, or if they have their own reading issues etc. they may not remember or process as accurately.
6. When the 3 tests are completed in 45-60 minutes, the family gets a 15-20 minute break while I score the test results, and see which categories are significant.
7. Then all of us sit around the table (the children might play quiet games or whatever).
8. I go through the evaluation and findings and ask if they noticed xxxx, and explain why or what about that. Then I ask for questions.
9. Next I give them handouts regarding what is APD, and we briefly cover the APD categories and what do we do about them (it's mostly about therapy recommended for the client).
10. Then they get the recommendations and I ask them if they have any questions.
11. I tell them that they will get the full report within 2 weeks.
12. The evaluation and conference is completed in 2 hours.
13. Of course, some patients can't handle the full battery in one session. Rarely, a special test battery is needed because of special problems.

**Auditory Processing Service, LLC**

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Evaluation Date: 2/30/2000<sup>bc</sup>

Report Date: 2/30/2000<sup>bc</sup>

Name: Peter

Age: 11

DOB: 12/13/14

Parents: Mom & Dad

Evaluator: Jack Katz, Ph.D.  
CCC-A/SLP Licensed Audiologist

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Peter was seen here for an Auditory Processing Evaluation accompanied by his mother. It was a pleasure working with Peter. His mother was present in the test room and could follow the test stimuli (in written form) and Peter's oral responses. The Phonemic Synthesis test was given through a loud speaker to enable his mother to hear the test stimuli, as well as the Peter's responses.

**REASON FOR EVALUATION**

The case history form indicates that Peter was seen for this evaluation to better understand his academic and other problems.

**CASE HISTORY**

Peter had very early bouts of middle ear fluid and PE tubes when he was still a baby. He was diagnosed with ADHD in Kindergarten, General Anxiety Disorder in 3<sup>rd</sup> grade as well as Autism Spectrum Disorder in 2015. He has had Neurofeedback training off and on in 2000 and other therapies for 3-4 years. Peter has a number of behavioral characteristics that are often associated with APD which include: needs a quiet environment to study, oral reading, responds slowly/delayed, distracted by noise, frequently interrupts others, trouble following directions, and keeping things in proper sequence.

**PROCEDURES**

**Basic Tests** - carried out at another audiology facility (name of that facility).

**Puretone Air- and Bone-Conduction Thresholds:**

*Measurement of hearing threshold sensitivity for tones 250 to 8000 Hz.*

These results show essentially normal hearing thresholds in both ears. Normal hearing for children is 15dB or better. While Peter generally meets that criterion, half of his thresholds were 15dB and there was also a 20dB threshold, so this is not a help to someone with APD. In the 'speech range' of sounds (500 to 2000 Hz) Peter had an average threshold of 12dB in the right ear and 13dB in the left. These were supported by speech thresholds of 10dB in the right ear and 10dB in the left.

**Tympanometry:**

*Measurement of middle ear pressure and compliance with changing pressures in the ear canal.*

These results demonstrated the normal Type-A pattern in both ears indicating no sign of ear obstruction or middle ear fluid at the time of test.

### Acoustic Reflex Thresholds:

Decibel levels at which the middle ear muscle reflexes were elicited for frequencies 500 and 1000 Hz.

Acoustic reflex thresholds were within the expected range. (Peter's thresholds were 95 and 100 dB in each ear for ipsilateral stimulation at 500 and 1000 Hz). This shows normal protection from loud noise in each ear.

### Word Recognition Scores:

Percentage of words correct that were presented at a fairly comfortable loudness level. Recorded single-syllable words are used for this measure.

Normal results (96% in the right ear and 100% in the left) were obtained for word recognition using recorded W-22 words. Thus, for slow, clear speech in quiet with a single target word Peter was accurate in repeating the words that he heard.

**Central Auditory Tests** - carried out at Auditory Processing Service. These tests were presented from the Central Test Battery-CD (Precision Acoustics) that contains the Buffalo Battery tests and were delivered via a Madsen 922 audiometer.

The table below provides a list of the significant factors on our test battery and the AP category with which each is associated.

### Significant Central Test Findings

Test	Measure	Result	NL	APD Category
<b>Staggered Spondaic Word Test (SSW)</b>	Total Errors (NOE)	26	9	Various
	Right Non-Competing	4	1	Various
	Right Competing	4	2	DEC
	Left Competing	12	4	TFM
	Left Non-Competing	6	1	DEC
	Reversals	2	1	ORG
	Ear Effect LH	-14	-5	TFM
	Order Effect HL	4	2	TFM
	Delay	4	1	DEC
	AYR	2	0	TFM
	Extreme Delay	4	0	INT
	SIR	1.15	1	INT
<b>Phonemic Synthesis (PS)</b>	Quantitative Score	18	21	DEC
	Qualitative Score	9	20	DEC
	Delay	8	1	DEC
	Perseveration	2	0	DEC
	Non-Fused	3	0	DEC
	O/L	1	0	DEC
<b>Speech-in-Noise (SN) W-22 words</b>	Right Ear Difference	24	21	TFM
	Inter-aural Difference	10	8	TFM
	Right Ear Noise	76	78	TFM
<b>All 3 Diagnostic Tests</b>	2B3	4	2	INT

DEC = Decoding, TFM = Tolerance-Fading Memory, INT = Integration, ORG = Organization  
Note: For all measures lower scores are better except: SSW Ear Eff, PS Quant/Qual, SN RE Noise

**Staggered Spondaic Word (SSW) Test:**

*Binaural test with different words going to each ear. Some of the words are non-competing (arriving at the two ears at different times) and others are competing (arriving at the two ears at the same time). The patient is to repeat all the words heard. This test provides 20 indicators of APD and most of them suggest specific categories of dysfunction. This test has indicators for each of the four APD categories. (List EC, presentation level 50dB SL)*

Because of the apparent challenge of this test for Peter we stopped after the first half to insure that he would not be fatigued if we continued. It was necessary to double all the values that would closely predict the full test. Quantitatively Peter's Total (NOE) score was significant (see table above). This is the best single indicator of APD on the test battery. It is important to note that Peter had 8 delays and 4 extreme delays. Delays are counted only on items that are completely correct. Thus, in addition to the errors, even when he was correct Peter frequently needed more time to figure out what he had heard. Based on the 11 significant indicators on the SSW test the APD categories that were identified are Decoding (DEC), Tolerance-Fading Memory (TFM), Organization (ORG), and Integration (INT).

**Phonemic Synthesis (PS) Test:** *The patient hears words presented sound-by-sound to both ears. The task is to identify the word that was given (a type of sound-blending task). This 25 item test provides 10 indicators of APD and all of them can be used to classify the difficulty. PS is primarily an indicator of Phonemic (speech-sound) Decoding. (Presentation level 50dB SL)*

Peter obtained a Quantitative score of 18 correct and a Qualitative score of 9 (that takes into account such characteristics as delayed responses). Both of these scores were outside of normal limits for his age. In addition, Peter had 4 types of Qualifiers (significant characteristics) that are associated with APD. This test demonstrated the Decoding (DEC) category.

**Speech-in-Noise (SN) Test:** *Single-syllable recorded word recognition lists are used to evaluate understanding in noise. Each ear is tested separately. The percentage correct in quiet and noise are compared to determine the influence of the noise. Typically, three comparisons are made: Quiet minus Noise for each ear and the difference between the ears. (Modified W-22 words with the speech presentation level 45dB SL and the speech spectrum noise presentation level at 40dB SL).*

To ensure that Peter would be able to contribute full attention to the later tests we discontinued testing each ear after 10 items for the words in quiet. We could do this because his scores were essentially normal and also equivalent to the results on the same test at the Rehab Hospital. Peter's scores in noise were 100% in the right ear and 90% in the left. His scores in noise were 76% correct in the right ear, just below normal limits, however; he also had 5 delays in that ear. Peter's 76% in the left that was just inside of normal limits and he had no delays. The differences between the quiet and noise subtests were 24% for the right ear. The difference score for this ear was outside of normal limits. In addition, the difference between the right and left ears was also significant. This indicates that 2 of Peter's systems for suppressing background noise appear to be affected. Thus, he likely has significant difficulty when listening to speech-in-noise. These are both TFM signs.

## INTERPRETATION

On the central test battery, Peter demonstrated 4 types of APD. There were 8 signs of Decoding (DEC), 6 signs of Tolerance-Fading Memory (TFM), 1 out of 2 signs of Organization (ORG), and 3 out of 4 signs of Integration (INT). In addition, there were 2 general signs of APD that are not specific to any one category.

In the Buffalo Model we compare our findings to the history information provided by the family. The questionnaire that they filled out showed 3 out of 8 (3/8) DEC characteristics, 11/14 TFM, 3/3 ORG, and 2/6 INT. In addition, there were 4/7 other signs that may be related to various types of APD. Thus, the family noted the same categories of behavior that were indicated by the APD tests. This adds support for our findings and interpretations. These categories are described below:

**Decoding (DEC)** refers to the ability to quickly and accurately digest speech. In addition to these listening problems we often see difficulty with phonics, speech articulation, reading accuracy, problems in understanding directions and perhaps other limitations when the child was younger (for younger children the academic challenges may be faced in the future).

**Tolerance-Fading Memory (TFM)** refers to a combination of poor understanding of speech in a background of noise as well as difficulty with short-term auditory memory. In addition to short-term memory and speech-in-noise limitations the child is likely to have reading comprehension difficulty and trouble remembering directions. Expressive language issues are common in this group (spoken, written or both).

**Organization (ORG)** refers not only to the ability to organize ones thoughts etc. but also to maintain proper sequence. In isolation, sequencing limitations present no major academic or communicative difficulties (although problems organizing term papers, expressing ideas in an organized way and spelling reversals are often seen). But ORG is a labor-intensive problem, requiring a great deal of monitoring of both information that is heard or even seen (likely because we say written words/numbers to ourselves) and what the person says and writes. This takes away brain capacity from other important tasks. ORG when combined with other APD problems reduces the person's capacity and increases frustration and confusion.

**Integration (INT)** refers to a wide variety of symptoms and problems that differ from child to child. The basic characteristic appears to be difficulty bringing information together. In some children, it is associated with severe reading or spelling problems. Although INT can be a severe form of APD, often the errors on a dichotic test (e.g., SSW) show relatively fewer errors on parts of the test because the child's limitation is helpful in this special case. Peter did not have the most severe sign of INT, so it might suggest that this is not such a severe category.

## SUMMARY OF FINDINGS

### Basic/Peripheral

Peter had essentially normal puretone hearing for the sounds in the speech range and no obvious indicators of ear dysfunction when seen for hearing testing at Rehab Hospital. His clarity for speech under ideal conditions was normal. Tympanograms and Acoustic Reflex Thresholds were normal as well.

## Central

Peter demonstrated significant findings on the central test battery. The APD indicators provide evidence of Decoding, Tolerance-Fading Memory, Organization, and Integration categories. These factors likely have a combined major impact on Peter's ability to perform in school, especially for quick or otherwise distorted speech or under noisy conditions. These findings are supported by the characteristics noted by Peter's mother on the Buffalo Model Questionnaire.

## RECOMMENDATIONS

Based on this evaluation Peter has four types of APD: DEC, TFM, ORG and INT. The following are recommended to help remediate these challenges:

1. **Phonemic Training Program** is recommended to strengthen Peter's phonemic (speech-sound) decoding skills. This training helps the child in the many skills that require quick and accurate decoding of speech (including important skills used for learning to read well). (A PTP handout was given to Ms. Camp)
2. **Phonemic Synthesis** training is recommended to strengthen his phonemic knowledge and to help Peter learn to be effective in manipulating phonemes and to relate speech-sounds to words. If therapy is not conducted at APS; this program (by Katz & Fletcher) is commercially available from Precision Acoustics 360-892-9367).
3. **Phonemic Analysis** training is the opposite of Phonemic Synthesis and is undertaken after there has been good progress in PS. One takes apart words and breaks them up into the individual speech sounds.
4. **Speech-in-Noise desensitization** training is recommended to improve Peter's ability to pull out the speech of interest from backgrounds of noise. This also improves tolerance for noise while improving listening skills. In order to provide this training at APS we developed the WINT program. Others who do not have benefit of an audiometer can provide similar training with WINT-1 (contact Upstate Advanced Technologies: 585-381-3459 or <gsbusat@frontiernet.net>).
5. **Short-Term Auditory Memory** (STAM) was not directly assessed in our evaluation but suggested in our findings and also in the questionnaire. If this is shown to be so, STAM or working memory problems can be improved by rote memory drills. If Peter is seen for therapy at APS he will be tested for digit, word and working memory, followed by therapy if needed. If not seen here some Speech-Language Pathologists and other professionals can provide this therapy. (See handout)
6. **Dichotic Offset Training** is a procedure that is used to improve binaural listening such as the competing tasks on the SSW test with which Peter had significant scores. If Peter receives therapy at APS it is likely that this training would be provided in the second round, if this problem remains, after other AP issues are improved.
7. **Sequencing** problems can be addressed by rote training, in much the same way as short-term memory. In addition, some Special Educators and Speech-Language Pathologists teach strategies (e.g., lists, routines) and procedures to help an individual to improve organizational skills. We suggest working on memory first and sequencing at a later time. This is because it is difficult learning one of these at a time so working on two hard tasks at the same time is likely to be less productive. (See memory and sequencing handout)

8. **In all APD therapies** it is well, to work from easy to hard. Rushing through them is a mistake because repetition, over time, is critical to changing the way the system works and perceives (but it need not be boring).
9. **Some Classroom Strategies** that would be helpful for Peter when in a classroom situation: a teacher who speaks clearly and usually conducts a quiet classroom. Whenever practical, Peter would benefit from seating close to where the teacher teaches from and facing her. This close proximity to the teacher and being as far away from noise as possible would help address both his weak decoding skills as well as his speech-in-noise issue. Writing new words, key words or difficult words on the board will help Peter get a better grasp of the words that may be incorrectly perceived.
10. **Assistive Listening Device** (ALD a.k.a. HAT) is a system that picks up the teacher's speech from a microphone and brings it to a small hearing device for each ear. Generally, we make this recommendation if APD is moderate or severe and suggests a handicap and frustration for the child that could be ameliorated with an ALD. In this case very serious consideration should be given to providing Peter with this assistance because, in addition his severe processing problems, he has marginally normal hearing, ADHD and other difficulties.

These recommendations may be addressed in three or a combination of ways:

1. At school or at a community facility (hospital or clinic) by Speech-Language Pathologists, Special Educators or others. We will be happy to provide them with the necessary information and communicate with them to gear up for the work and we will be available (by email) if they have problems along the way.
2. If these services are not available/feasible some families can provide services themselves *with support*. This is generally not an ideal solution, but likely much better than not addressing these important issues. We will be happy to provide the family (if appropriate) with the necessary information and communicate with them to gear up for the work and will be available if they have problems along the way.
3. Items 1-6 above can be provided at APS. We generally provide short-term therapy (up to 15 weeks). If further help is needed this can be provided after a 'vacation' period.
4. If some or all of the therapy is provided by the school, clinic or family, it may be desirable for the family and/or therapist to observe a session of Demonstration Therapy at APS to see how the recommended AP techniques are carried out.

Thus, regardless of how you wish to configure Peter's therapy, APS will be glad to assist in any way we can. I hope that this information is helpful to you in understanding Peter's auditory processing issues and how they may be addressed. Please let me know if you have any questions regarding this report or if you would like further assistance.

Jack Katz, Ph.D.  
Audiologist