TOPICS IN
Central Auditory Processing

Vol. 1 No. 1 Spring 2016

IN THIS ISSUE:

FREE OF CHARGE

What you can expect from TiCAP and how you can contribute

SSW Reports was around for 38 years. I think it served a useful purpose when very few people knew how to use the SSW and to get all the information it could provide. Now we are in the 21st century and most of us are well educated about the SSW, so we think it is time to move on. In the 70s I read a book by a Futurist who predicted that in the future we would not have so many big newspapers and magazines. Rather we would have smaller publications that served particular niches. He was right based on what we see today. Big publications are giving way to smaller ones and blogs. *Topics in CAP* was developed for those of us who work in the area of CAP/D and love doing it.

In addition, *Topics in CAP* has been developed to fit the busy schedules that we have today and to provide a variety of information in each issue; to enable the reader to keep up with developments in CAP (in a quick, easy to read, manner). It will have 4, one page, columns that provide an important literature article, research results, case studies, clinical insights, and opinions. We hope you will find it useful and interesting. For some topics you may want more information, which the author may include in the second section of each issue. This, 'Free of Charge' section can include details, explanations, tables and figures.

One column will give a person's opinion about an issue of importance to CAP or at least important to the writer. A second column will be 'The Article of the Quarter' a review of an important recent article. The third column will provide clinical information, a research study, or a case study that would be of interest to the readership. The fourth column is 'Other'. It could be anything that is related to CAP or even to one of the other column types mentioned. 'Free of Charge (FoC)' comes after the 4 columns. It can have material related to the single page articles or something that a subscriber includes. In this issue I have added FoC a revised form of Phonemic Error Analysis (PEA) and a user manual. This is a most helpful form especially for those who do therapy or recommend the Buffalo Model Decoding procedures.

Six of us will edit the online publication: Kavita Kaul, Kim Tillery, Mike Webb, Wayne Wilson and Tom Zalewski. TiCAP will come out 4 times a year. We are especially interested in your comments, cases studies, clinical observations and research findings as they added so much to *SSW Reports*.

If you have colleagues who you think would be interested in the TiCAP publication; please ask them to contact Kim Tillery kltillery@gmail.com to sign up.

Jack Katz, Ph. D.
Auditory Processing Service
Prairie Village, KS

[For Phonemic Error Analysis and Manual see Free of Charge pg 7]

Auditory Training and CAPD

Does auditory training (AT) benefit children with central auditory processing disorder (CAPD)? Before you answer "yes, of course it does", you may want to consider a recent study by Loo et al. (2016).

Loo et al. (2016) indicate that the AT literature for CAPD is promising, but has many limitations. Problems include unclear criteria for diagnosing CAPD, inadequate use of control groups, inconsistent AT, failure to assess listening behaviors outside the laboratory, and the use of similar materials for training and assessment. Therefore, Loo et al. carried out a randomized controlled trial (RCT) of a computer based auditory training (CBAT) program for children diagnosed with CAPD.

Loo et al. recruited 39 children aged 7 to 11 years who demonstrated CAPD. They all passed pure-tone audiometry and a test of nonverbal intelligence but failed at least two tests of central auditory processing.

The control group (n=19) received listening and educational strategies for school and home over a 3-month period. The intervention group (n=20) received this plus a CBAT program that included four computer games completed at home for 30 minutes/day, 5-days/week, over the same 3-month period. Three of the games involved speech-in-noise training for speech understanding, discrimination of fine phonetic detail, and keyword extraction. The fourth game involved dichotic speech training for directed attention.

All children were assessed at baseline and immediately after intervention using a test of their ability to use spatial and/or speaker cues to process speech in noise, a measure their teachers' opinions of their listening skills in the classroom, and a measure their parents' opinions of their pragmatic language use.

Loo et al. found that those who had undergone the CBAT showed significant improvements in their speech-in-noise, listening and pragmatic results. Furthermore, their improved speech-in-noise performance both correlated with their improved classroom listening skills and was maintained on reassessment 3 months post-intervention. No improvements were found in the control group.

So, does auditory training benefit children with CAPD? This study adds some high level (RCT) evidence to support that for many children with CAPD the answer is yes.

Wayne J. Wilson, Ph. D.
School of Health and Rehabilitation Sciences
The University of Queensland 4072, Australia

Reference

Loo, J.H., et al. (2016). Auditory training effects on the listening skills of children with auditory processing disorder. Ear Hear, 37(1), 38-47.

CAP Test Expertise Helps Decipher Unique Test Responses

A 12-year-old female presents with normal peripheral hearing and negative results on a comprehensive psychological evaluation. She also demonstrated normal test results on the first two CAP tests. She had breaks after the peripheral hearing assessment and after the second CAP test.

The third CAP test was the SSW: although 20 items are delivered first to the right ear alternating with 20 items delivered to the left ear, the child consistently omitted the third word. That is, regardless if right-ear-first or left-ear-first she omitted the third (competing) word. The chart below illustrates the child's response pattern.

of each item. The child returned two weeks later and had only four total errors out of 160 words on the SSW test. The child demonstrated normal auditory processing after also having a passing score on a 4th APD test!

It is not clear why she just omitted the 3rd word. Fatigue you say? This is possible – although she had breaks and her response mode was identical for all 20 items. Usually we notice more errors toward the 2nd half of the test when attention and fatigue are involved. What a unique case! We don't know why she gave bizarre responses, but experience told me for many reasons 'this ain't right' and what to do.

	RNC	RC	LC	LNC		LNC	LC	RC	RNC
1	up	stairs	down	town	2	out	side	in	law
			X					X	
3	day	light	lunch	time	4	wash	tub	black	board
			X					X	

RC & LC: right & left competing; LNC & RNC: left & right noncompeting; X= omission

This error pattern was seen for the first half of the SSW. Testing was then discontinued and the child was rescheduled to return in two weeks. Why? The performance indicated profound LC and RC error patterns – suggesting 2 or 3 types of APDs: Decoding (RC errors) and/or Auditory Memory (LC errors). In 20 years I had never seen such a response. How could there be such a severe RC score when the child has no clinical symptoms of Decoding? Yes, LC could be an auditory memory issue, even though the psychological evaluation showed normal working memory. I was suspicious of such a 'clean' response pattern, only omissions on the 3rd word

Kim L. Tillery, Ph. D.

Professer and Chair, Communicative Disorders Department

State University College at Fredonia

Permission granted by Canada Audiology to publish this excerpt written by Kim Tillery, June 2015 issue. http://canadianaudiologist.ca/issue/volume-2-issue-4-2015

Effectiveness of Auditory Processing Training with Children Diagnosed with Auditory Processing Disorders

This study is based on 20 children who received auditory processing training from one of the authors (Kavita Kaul). The other author (Jay Lucker) completed all the statistical analyses to study the effectiveness of auditory processing training.

Pre-and post-treatment scores were compared statistically. The tests and treatment batteries were the same for all children although treatment procedures were modified and customized for each child. The length of therapy depended on the child's age and severity of the APD etc. Evaluation and therapy procedures were based on the Buffalo Model.

Seventeen different scores were obtained and compared before and after therapy using the battery of tests listed below.

a) Speech Recognition in Quiet and Noise, b) SSW, c) Dichotic Listening Measures, d)

Phonemic Synthesis, e) Phoneme Recognition, f) Phoneme-Word Association Test. Additionally the Buffalo Model Questionnaire was completed by parents before and after therapy. The results from this questionnaire were also compared.

The therapy included phonemic synthesis, phonemic awareness and recognition, auditory attention, whole body active participation and listening training, endurance for auditory listening, short-term and working memory/organization, dichotic and monaural listening, selective ear listening training, speech in noise for individual ears, ear separation listening, auditory ear lateralization, and auditory processing integration training. Therapy was provided using recorded stimuli with controlled volume settings via the audiometer or through an iPad. Live voice was used to provide additional visual cues, only when recorded voice was difficult to process and understand.

Results of the statistical analyses in this study indicated significant improvements in auditory processing following therapy for 12 of the 17 measures used (right ear Speech in Noise, right ear Quiet/Noise Difference, all SSW measures except for SIR, both Phonemic Synthesis Test measures, Phoneme Recognition and Word Association Test). Also a trend towards significance was found for two additional measures (right and left ear Speech in Quiet measures). Typically, parents reported noticeable improvements in listening, auditory processing, learning, academic performance, and social communication interactions based on the Buffalo Model Questionnaire results.

This provides evidence that auditory processing training can positively impact auditory processing abilities in children and direct treatment services are effective in improving auditory processing skills.

Kavita N. Kaul M.S., CCC-SLP/A
Clinician Private Practice, Richmond, VA

Jay R. Lucker, Professor
Dept. Com. Sci. & Dis., Howard University, Washington, DC

Free of Charge

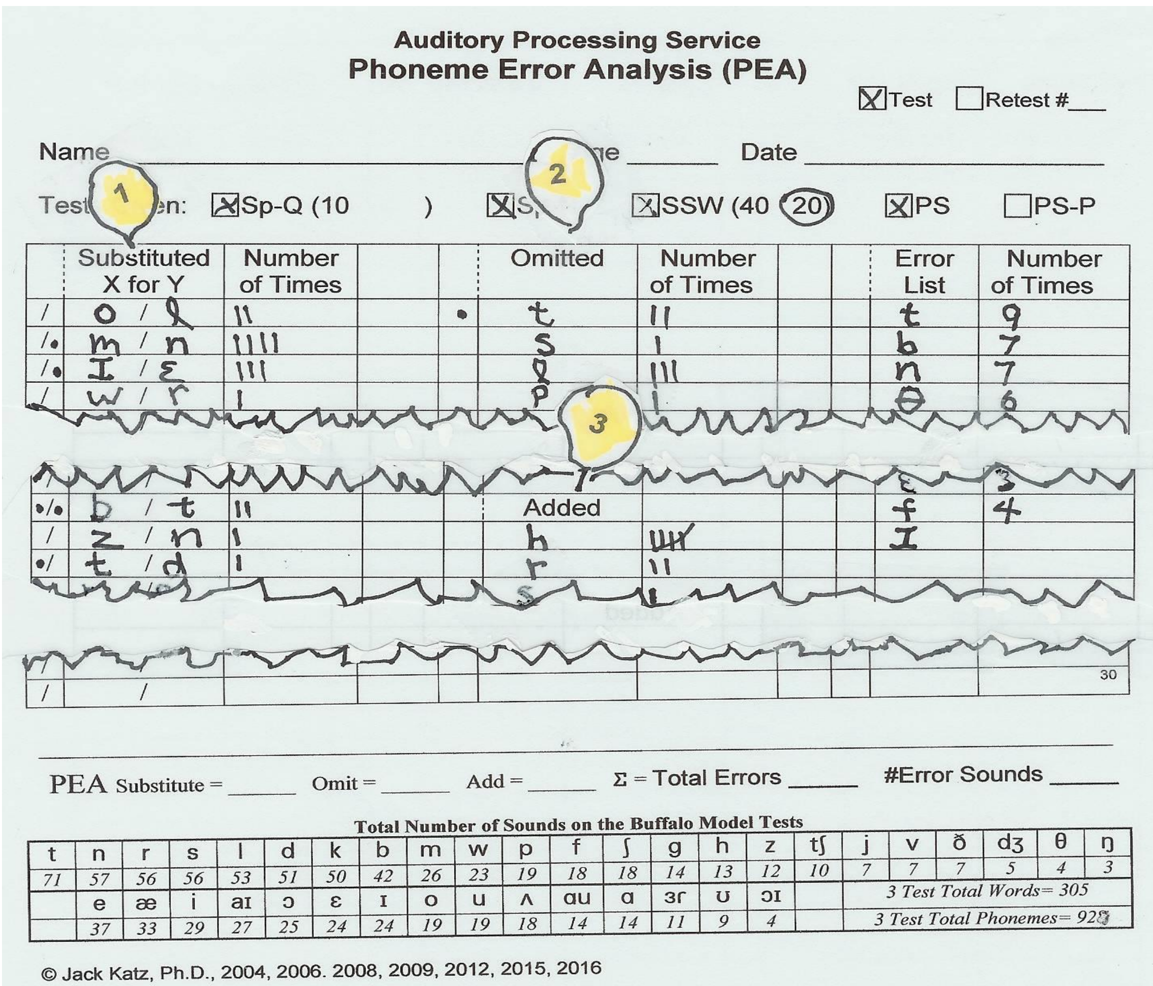
Phonemic Error Analysis (PEA)
Information Sheet

Jack Katz, Ph.D.

Phonemic Error Analysis (PEA) form is used to analyze phonemic errors on the 3 Buffalo Model tests (i.e., SSW, Phonemic Synthesis and Speech-in-Quiet + Speech-in-Noise). PEA information is valuable in preparing for the Phonemic Training Program (PTP), throughout it, and afterwards. It gives us an insightful measure of Decoding (DEC) improvement (both quantitatively and qualitatively). It tells us what sounds are most often in error and what kind of errors they are (e.g., substituting /k/ for /p/). In addition to the error word count from the 3 tests it provides a phonemic count as well.

The PEA Form

The form has 3 sections (see Figure 1). At top is the identification section. In addition to the usual information there is room to show whether it is an initial test or which retest. There is a section to enter the raw data and related information and finally a table of the 38 phonemes on the Buffalo Model tests and how often they appear on the tests.



Auditory Processing Service
Phoneme Error Analysis (PEA)

☒ Test ☐ Retest #___

Name ______ Age ______ Date ______

Tests Given: ☒ Sp-Q (10) ☒ S... ☒ SSW (40 (20)) ☒ PS ☐ PS-P

	Substituted X for Y	Number of Times			Omitted	Number of Times			Error List	Number of Times
/	o / l	ll		•	t	ll			t	9
/•	m / n	llll			s	l			b	7
/•	I / ε	lll			l	lll			n	7
/	w / r	l			p	l			θ	6
•/•	b / t	ll			Added				f	4
/	z / n	l			h	~~llll~~			I	
•/	t / d	l			r	ll				
/	/									

PEA Substitute = ______ Omit = ______ Add = ______ Σ = Total Errors ______ #Error Sounds ______

Total Number of Sounds on the Buffalo Model Tests

t	n	r	s	l	d	k	b	m	w	p	f	ʃ	g	h	z	tʃ	j	v	ð	dʒ	θ	ŋ
71	57	56	56	53	51	50	42	26	23	19	18	18	14	13	12	10	7	7	7	5	4	3
	e	æ	i	aɪ	ɔ	ε	ɪ	o	u	ʌ	au	ɑ	ɜr	ʊ	ɔɪ		3 Test Total Words= 305					
	37	33	29	27	25	24	24	19	19	18	14	14	11	9	4		3 Test Total Phonemes= 92[illegible]					

Figure 1. PEA form showing the 3 places where phonemic errors are inputted.

The next section is where the raw data are entered, listed and summed.

Above the main table is a list of the Buffalo Model Tests. In my practice, we have Word Recognition Scores (WRS) before doing central testing; we have a very good idea of the person's performance in quiet. So if the person is having a hard time with this easiest test and if the first 10 words are consistent with the previous testing we can cut this test short to save the person's brain power for the more challenging tasks. If not similar then we do all 25. To understand the significance of the findings it is proper to show e.g., that only 10 items were given, by circling the 10. The same is true for the noise test (but I like to give at least 20 items per ear). The 40 items of the SSW are generally administered but in 5 years olds only 20 are given. Also young children or others for whom this will take too much time or energy only 20 items are given. For the Phonemic Synthesis test generally all 25 items are given, but it may be cut short, if too difficult. Therefore, any of these variations should be shown so that the abbreviated list of items can be taken into account. The total number of errors provides the overall view of phonemic errors.

Entering the Data

#1 shows where the phonemic substitutions are entered. While each substitution is counted as one phonemic error it provides information about the sound that was missed and the sound that was mistaken for it. This usually this suggests that neither sound was very strong. Word omissions do not provide phonemic information. Thus, when we encounter this type of error on the Phonemic Synthesis or Speech in Quiet-Noise tests it is useful to extract more information. You might ask for a guess, and if not, what sounds did you hear etc. On the SSW a person may use the spondee to figure out what was missed. If there is at least one sound in common with the target word it would be useful to count the error sounds as substituted/omitted or added phonemes. But if the word makes sense with the other word of the spondee (or is a nonsense word) the phonemes might be counted. When a person makes the same substitution error, more than once, it reinforces the likelihood of that specific confusion. Even the reversed substitution (e.g., /m/ vs. /n/) or omission/addition errors also provide support for the weakness of a particular sound.

Many individuals with APD hear a vowel before, or sometimes after, /l/. Therefore, we're particularly careful to spot these so they can be remediated. The first word of the WRS list is 'owl'. When people say 'oh' (/o/) for that word it is scored as O/L in the substitution column and /ɑu/ omitted. The substitution is more obvious for the word 'child' in PS. When the person says /tʃ αɪ o d/, the O/L substitution is clear. An /ʊ/ is frequently added to the /l/ sound so that would be an addition. However, if it is substituted for the vowel before /l/ then it's a substitution (e.g.,'bull' for 'ball').

#2 shows where we input the omission errors. We are not surprised when these are the quieter-higher pitched sounds of the language (e.g., /p, t, k, θ/) often at the end of a word. Not surprisingly omissions are also seen in consonant blends (e.g., boo/blue).

#3 shows sounds that the person added. This is frequently seen with /h, r, b/ among many others.

What Phonemic Errors to Count

Errors on the Buffalo Model tests are shown by the writing out the word, especially when there is not more than one pronunciation (e.g., 'read' a book or I already 'read' the book). In such a case you could write 'red'. If not you can use phonic symbols (e.g., for long-o show a dash above it) or phonetics. Usually when I have a mixture of these methods; I show phonetics with slashes (e.g., /bot/ if not 'boat' or bōt).

Do not count a presumably guessed word on the SSW test that makes sense but is nothing like the actual word. With spondees the person might know there was another word but has no idea what it was. If the person says 'key board' for 'key chain' this appears as a pure guess because it makes some sense but has no relation to the actual word. This should not be counted as a phonemic error. However, if there is at least one sound that is appropriate you might consider the error phonemic and surely if there are 2 sounds that were correct. For example, 'key game' for 'key chain' is likely a phonemic error. On the other 2 tests we don't have this bias so most errors would be phonemic. PEA is not an exact science, but it is so very helpful. Two people may score some errors somewhat differently but over the 927 phonemes this is a rather small difference.

Quantifying the Various Types of Errors

When we have gathered as much data as practical/useful; it is time to find out how many substitution errors, omission errors and addition errors there were. [FYI, when therapy begins I try to complete the tests that were not completed before and add this information to my original tally in a different color.] Because each of the 2 phonemes per substitution represents one error we count each pair as one and then total how many times substitutions occurred. This tally is entered below the table where it says "**PEA** substitute". Do the same for omitted sounds to determine the total number of times they occurred. Finally the number of added phoneme errors is entered below. When those 3 numbers are summed we enter the total number of (phoneme) errors.

Calculating the Total Errors for the Various Phonemes

In the last 2 columns on the right side of the table there is a phonemic **Error List** and **Number of Times.** Add up the number of times each phoneme appears in this table (all 3 types combined including both the missed and substituted sounds) and enter the total for each sound noted on the PEA form. I usually start with the phonemes that appear to have the most errors. Show the phoneme in the Error List and enter the total in the adjacent Number of Times column. If there are 30 or fewer phonemes they will fit into the table and if there are more; you can enter them right below these columns or fit them in nearby. When you know the number of error sounds; enter it in the total **#Error Sounds** below.

What Are the Little Columns Before #s 1, 2, 3 in Figure 1?
When we enter the total for each sound in the right-hand column ('Number of Times'), we want to be sure that we counted each phoneme (and just once) on the PEA form. For this reason there is room to show that the phoneme was counted. It is simple for #s 2 and 3 as there is just one phoneme. But for substitutions there are 2 phonemes so we enter the left phoneme on the left side of the slash and the right phoneme on the other side. The example below shows that the /l/ was counted first with the dot. When /o/ is tallied the dot will be entered on the left side.

/ •	O / L

The Interesting Table at the Bottom of the Form
You are likely asking; what's that interesting table at the bottom of the PEA form? It's to give you insight for how often each phoneme appears on the 3 tests. The top 2 rows deal with the consonants and the bottom 2 are for the vowels. You can also see which phonemes we have on the tests and their ipa symbols.

The table tells you how many words are on the 3 test and how many phonemes. A child that you tested had 9 /t/ errors and 3 /θ/ errors. The /t/ appeared on the tests 71 times vs. /θ/ just 4 times. So relatively speaking the person is likely having a much greater problem with the /θ/.

Some Analyses of Test Data Pre and Post Therapy
To compare test and retest phoneme errors we can use the total PEA (combining the 3 types). This is a way to assess phonemic improvement. We can also compare the person's number of initial errors to others by using Table 2. To analyze results obtained over a number of tests see Table 3. You can get an idea how this person's results compare with the children I have seen.

Severity	Range
Mild	20-48
Moderate	49-62
Severe	63-152

Table 2. Range of Total PEA errors from mild to severe based on data for 114 patients aged 5-21 years.

Table 3 shows the mean Total PEA errors which enable an analysis of improvement from the baseline scores for those with mild, moderate and severe number of errors. The children with the fewest errors improved the least presumably because they had the shortest way to go and had the lowest percent of improvement (38%). The moderate group had a greater number of Total PEA errors (and 45.5% improvement). The severe group had the most room for improvement and showed the greatest amount of improvement (with 51.2%). If you do it, it will come;-)

Severity	Pre Test	Post R-1	Difference
Mild	37.0	22.9	14.1
Moderate	55.4	30.2	25.2
Severe	85.3	41.6	43.7

Table 3. PEA scores before and after therapy for 114 patients based on the 3 tests.

Table 4 shows the relatively mild influence of age on the PEA Pretest scores, a slightly smaller range for the post-test PEA. The difference between initial test and Round-1 retest is negligible across age. It is impressive that the average improvement in PEA is over 50% after the first round of therapy.

Age	Age Range	PEA Pre	PEA Post	Difference	% Improve
Youngest	5-8	67.0	37.9	29.1	56.6
Middle	8-11	62.3	33.8	28.5	54.3
Oldest	11-21	51.4	26.2	25.2	51.0

Table 4. Looking at the same data based on age.

Figure 2 below shows a PEA form that can be copied and used with patients.

Summary

The Phonemic Error Analysis is based on the specific phonemic errors and confusions that a person had on the 3 Buffalo Model tests. PEA provides data which we can use in dealing with those who have Decoding challenges. 1. Most importantly it permits the clinician to plan an effective order of presentation of phonemes on the Phonemic Training Program. 2. It also enables us to estimate the person's phonemic severity based on the number of PEA errors. 3. It gives us a general idea of about how much improvement others with similar scores have performed after PTP and PS training. 4. Having a baseline score we can monitor phonemic decoding progress on retests.

Auditory Processing Service
Phoneme Error Analysis (PEA)

☐Test ☐Retest #___

Name ______________________________ Age ______ Date ____________________

Tests Given: ☐Sp-Q (10) ☐Sp-N ☐SSW (40 20) ☐PS ☐PS-P

	Substituted X for Y	Number of Times			Omitted	Number of Times			Error List	Number of Times
/	/									
/	/									
/	/									
/	/									
/	/									
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/	/									
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/	/									
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/	/									
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/	/									30

PEA Substitute = ______ Omit = ______ Add = ______ Σ = Total Errors _____ #Error Sounds _____

Total Number of Sounds on the Buffalo Model Tests

t	n	r	s	l	d	k	b	m	w	p	f	ʃ	g	h	z	tʃ	j	v	ð	dʒ	θ	ŋ
71	*57*	*56*	*56*	*53*	*51*	*50*	*42*	*26*	*23*	*19*	*18*	*18*	*14*	*13*	*12*	*10*	*7*	*7*	*7*	*5*	*4*	*3*
	e	æ	i	aɪ	ɔ	ɛ	ɪ	o	u	ʌ	ɑu	ɑ	ɜr	ʊ	ɔɪ		*3 Test Total Words= 305*					
	37	*33*	*29*	*27*	*25*	*24*	*24*	*19*	*19*	*18*	*14*	*14*	*11*	*9*	*4*		*3 Test Total Phonemes= 927*					

Auditory Training and CAPD

This section is for the reader who wants to know a bit more about the Loo et al. (2016) study.

Loo et al. conducted their study in Singapore where Loo works as an academic at the National University Singapore.

The 39 children recruited into Loo et al's study came from 55 consecutive cases of newly diagnosed children with APD. These children had been identified by clinical staff at the Centre for Hearing Intervention and Language Development (CHILD) in Singapore. Each child: 1) was attending a mainstream school, 2) was referred for evaluation of listening difficulties, 3) had normal peripheral hearing assessment in both ears (pure tone audiometry, speech discrimination in quiet, tympanometry and acoustic reflexes), 4) had failed in both ears (using a 2 SD criterion) on two or more, but not all, behavioral tests in a battery consisting of frequency patterns, duration patterns, random gap detection test, masking level difference and dichotic digits, 5) had a normal nonverbal intelligence quotient (IQ) score of more than 85, 6) showed no evidence of autism, and 7) had no frank neurological conditions such as a brain tumor or head injury.

The full assessment completed by all children in the study included the auditory processing tests described above, the Test of Nonverbal Intelligence-3rd Edition (TONI-3), the Clinical Evaluation of Language Fundamentals-Fourth UK Edition (CELF-4 UK), the Test of Auditory Perceptual Skills-Revised (TAPS-R), and the Phonological Assessment Battery (PhAB). The raw scores of TONI-3, CELF-4, TAPS-R, and PhAB were converted into standard scores with scores of 85 and below considered as abnormally low.

The 39 children were randomly assigned to a control group (n=19) or an intervention group (n=20). The control group received what the authors called a "current standard treatment" for children diagnosed with APD. This treatment included listening strategies (such as preferential sitting) and educational strategies (such as provision of lecture notes or pre-teaching of new concepts/vocabulary) applied at school and/or at home over a 3-month period. The intervention group received this same standard treatment plus a CBAT program. This program included four games completed at home for 30 minutes/day, 5-days/week, over the same 3-month period. Three of these games involved speech-in-noise training that aimed to improve speech understanding, discrimination of fine phonetic detail, and keyword extraction in the presence of various types of background noises. The fourth game involved dichotic speech training aimed at improving directed attention. All games were presented using adaptive procedures in a child-friendly format with visual feedback.

Loo et al. used three outcome measures to assess their 39 participating children at baseline and immediately after intervention. The first was the Listening in Spatialized Noise – Sentences (LiSN-S) test. This measures a person's ability to use spatial and/or speaker cues to process speech in noise. The second was the Children's

Auditory Training and CAPD (cont'd)

Auditory Performance Scale (CHAPS). This measures the teacher's opinion of a child's listening skills in the classroom. The third was the pragmatic profile of the Clinical Evaluation of Language Fundamental-4 (CELF-4). This measures parental opinion of a child's pragmatic language use.

There were no significant differences in any baseline measure between the two groups and all children completed the study. Five of the 20 children in the CBAT group had some incomplete or missing data resulting in the need to replace faulty computers during the training). The remaining 15 children in the CBAT group trained for a median of 27 hours (range 9 to 30 hours) and on average completed more than 80% of the targeted training sessions for each listening game.

By using a series of repeated measures ANOVA analyses to compare the before and after results for the control and intervention groups, Loo et al. found that the children with CAPD who had undergone the CBAT showed significant improvements in their speech-in-noise (LiSN-S), listening (CHAPS) and pragmatic (CELF-4) results. The effect sizes for these improvements ranged from 0.76 to 1.7. Furthermore, their improved speech-in-noise performance both correlated with their improved classroom listening skills and was maintained on reassessment at 3 months post-intervention. It was also noted that baseline language and cognitive assessments did not predict better training outcome. No improvements were found in the control group.

In conclusion, Loo et al. stated that their 12-week-long 5-day/week training with speech stimuli ranging from single words to complex sentences in the presence of competing stimuli under different conditions of spatial separation (thus resembling real-life listening conditions) led to improved speech-in-noise perception in tests that was reflected in improved functional listening in children with APD. They also noted that additional research is required to tailor AT to the individualized needs of listeners.

Wayne J. Wilson, Ph. D.
School of Health and Rehabilitation Sciences
The University of Queensland 4072, Australia

Reference

Loo, J.H., et al. (2016). Auditory training effects on the listening skills of children with auditory processing disorder. Ear Hear, 37(1), 38-47.

CAP Test Expertise Helps Decipher Unique Test Responses

Have you ever seen anything like this? Do you have any thoughts or questions? Would you have handled it differently?

When we see unusual results there may be many possibilities. Experience helps a lot to know what to do and in these cases and to make an accurate diagnoses. Things can go wrong when we test someone. For example when testing, we have had equipment failures (e.g., a broken cord), presentation errors (e.g., presenting to wrong ear or HL) and 1000 other possible reasons. In this case, the first two tests along with the history information and psychological testing indicated that there were no major APD problems, surely not as profound as the initial SSW results would suggest.

The responses to the following questions can or could have clarified some issues in this case.

1. Why was the child referred?
2. Were there behavioral signs that would have suggested APD? If so what?
3. Were there psychological signs of frustration, sadness?
4. What is the child's handedness? Some left handers or ambidextrous individuals have bilateral peaks when right handers would have many more left competing peaks. Of course not as dramatic as this.
5. Were behavioral differences seen in the child on the 2 occasions?

You may have thought of non-organic/functional problems. We try not to consider that cause, early on because that is too easy. Unfortunately, such a conclusion, especially if in error, would withhold the needed help and could be very damaging to the person.

Kim L. Tillery, Ph. D.

Professer and Chair, Communicative Disorders Department

State University College at Fredonia