

# SSW Reports

- Apraxia and Auditory Training
- What a Day!

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## Apraxia and Phonemic Training - A Case Study Kavita Kaul

Jay entered Middle School in September of 2011 with significant speech intelligibility difficulty. He presented with speech motor apraxia, multiple articulation errors and difficulty with speech sound sequencing. He was unable to produce multisyllabic words, and his speech ability was limited to 2-syllable words at most, in a structured environment. In a natural setting his speech was intelligible only with extensive listener participation. He needed multiple attempts to clarify what he was trying to say. His speech intelligibility was clearer for those who were familiar with his speech or when context of topic was known. Jay also presented with oro-motor apraxia where he was unable to imitate motor movements of the tongue. Tongue tip protrusion, elevation, and extension were very laborious. He gagged whenever he was asked to raise the back of his tongue to produce velar sounds *k* and *g*. His frustration levels were very high and resisted therapy in the 6<sup>th</sup> grade.

Apraxia is a disorder of the brain and nervous system in which a person is unable to perform motor movements when asked (volitionally), even though:

- The request or command is understood
- They are willing to perform the task

- They have the muscles needed to perform the task properly
- The task may have already been learned

In the seventh grade, because of limited progress with traditional articulation therapy, the Phonemic Synthesis Program was introduced, along with other phonemic drills. These recorded programs were presented at full volume via a computer. Therapy was provided in a non-sound proof room with natural environmental distractions present during therapy.

### Summary of therapy sessions and Phonemic Synthesis (PS) Test results:

Jay received rigorous Phonemic Synthesis Training along with phonemic recognition, awareness, and phoneme-to-word association training for a year and a half. Progress on the Phonemic Synthesis Therapy program (lessons 1-15) was assessed periodically using the Phonemic Synthesis Test.

Unlike most children the initial programs were not easy. Lessons 1-4 were repeated twice each. Lesson 8 was administered 4 times. Lesson 9 was administered twice and lesson 10 was repeated 3 times. Lessons 11 and 12 were repeated twice and lesson 13 was repeated 4 times. Interestingly 14 and 15 were presented only 1 time each to reach the completion level. Lesson 15 was administered on 2/10/14. He also participated in phonemic recognition,

awareness, discrimination, and association tasks.

**The initial Phonemic Synthesis Test was administered on 12/3/12:** Jay accurately processed just 5/25 items (NL=23) when the phonemes were presented one at a time to make words. He also had 1 reversal and a self-correction after an extended delay on 'sky'- item 16. These results suggest a pre-first grade skill level quantitatively and qualitatively.

Jay began the Phonemic Synthesis Program with lesson #1 because of his very poor performance on the pretest. On 3/11/13 he had completed 2 sessions of lesson 8. He had quick responses, delays, extreme delays, and required stimulus repetitions due to attention issues. Struggle was apparent on all lessons.

**A speech and language reevaluation was completed on 3/18/2013 for his continued special education eligibility:** Jay had difficulties with oro-motor imitation with evident signs of apraxia. Over the 4-month period he improved his ability to imitate oral movements for th, f, v, sh, and s sounds in spontaneous production. However, volitional production of the sounds with appropriate placement continued to be a struggle. His ability to produce the /th/ sound was labored and somewhat exaggerated; however his sound production was accurate. He had a very hypersensitive gag reflex which made it difficult to produce the velar sounds voluntarily. However, he had no difficulty producing these sounds in spontaneous production. His overall oro-motor skills showed significant improvement with volitional production. At the beginning of 6<sup>th</sup> grade he appeared to have severe difficulty with all these sounds. At the time of this evaluation he was midway through 7<sup>th</sup> grade, he had mild to no struggle while trying to

produce the speech sounds voluntarily. A minimal lisp could be detected to a trained listener which was a result of his oral motor weakness. He had difficulty recognizing, producing, and synthesizing sounds at a phonemic level. Test results:

Peabody Picture Vocabulary Test -4<sup>th</sup> edition: Standard Score 98  
Expressive One Word Picture Vocabulary Test-4<sup>th</sup> edition: Standard Score 95  
Oral and Written Language Scales-2<sup>nd</sup> edition Form-A: Oral Composite Standard Score 80

*[Standard Score based on Mean = 100 & SD = ±15 with normal range = 85-115]*

On the Phonemic Synthesis lesson 13 he completed 29 items on 5/13/13. Out of those he struggled with 15 items. Again he required repetitions, wait times, live voice presentations, and therapist supports to complete task with much struggle to blend sounds.

**2<sup>nd</sup> Phonemic Synthesis Test was administered on 6/13/13:** Live voice presentation was helpful with item 16 'sky'. The quantitative score of 14/25 suggests early first grade ability, and qualitative score of 3 at a pre-first grade skill level. Following a summer break after the 2<sup>nd</sup> test, the Phonemic Synthesis Program resumed in September from Lesson 8. By 11/11/13 Phonemic Synthesis Program lesson 10 was completed for the second time. Again significant struggle with PS tasks with about 50% accurate responses on lesson 10.

**3<sup>rd</sup> Phonemic Synthesis Test was administered on 11/11/13:** The Quantitative score was appropriate for his age with a score of 25/25, however he needed live voice presentations for multiple items which was counted as a qualitative

difference with a score of 11/25 and skill level at an early first grade.

He completed Lesson 15 on 2/10/14. His overall skills had improved significantly. Response accuracy improved with repetitions, quiet rehearsals, and wait time to mentally manipulate and blend the sounds. Automaticity was inconsistent.

**4<sup>th</sup> Phonemic Synthesis Test was administered on 2/17/14:** On Phonemic Synthesis Program lesson 15 completed on 2/10/14. Again, Jay had all of the items correct quantitatively. However he needed 2 presentations of the recording on 5 of the items, with delays on 2 other items. Qualitative score was 18 with a skill level equivalency of 9 years.

Surprisingly, despite extensive training in phoneme blending exercises it was noted that Jay continued to exhibit significant difficulty in all areas of phonemic recognition, discrimination, and phoneme-to-word association tasks. He required maximum therapist help and support to accomplish the task.

Following completion of the Phonemic Synthesis Program Jay continued with phonemic awareness, recognition, discrimination, and association training using both live and recorded voice presentations. He presented with significantly more difficulty with vowels.

Initially on 1/14/13 he was presented the sounds of the Phonemic Recognition Test. Overall he had 40/68 delays, and/or no responses for recognition, phoneme-word association, and discrimination skills. At this time although phonemic drills were provided, emphasis of therapy was on Phonemic Synthesis Program.

On 3/10/14 the Phonemic Recognition Test was re-administered. Again he had 41/68 delays, errors, or no response. At this time therapy focused on phonemic drills only. Two months later 5/12/14 he was able to complete all phonemic recognition tasks for all vowels and consonant sounds with no more than 2 repetitions of the phoneme for accurate recognition. He was able to complete the tasks with improved efficiency.

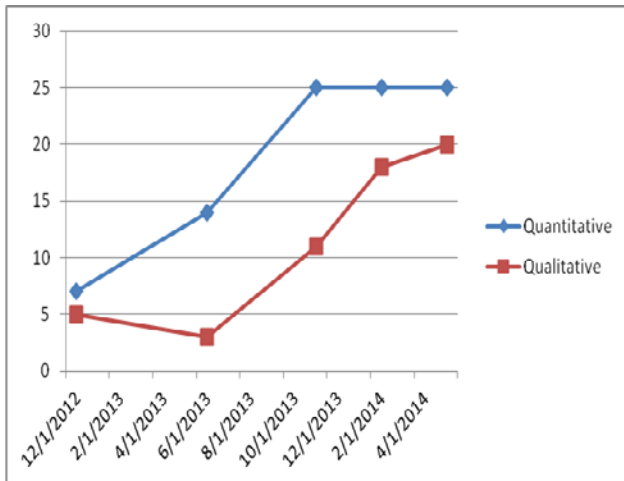
**Most recently the 5<sup>th</sup> Phonemic Synthesis Test was administered on 5/12/14:** Again, Jay's quantitative score was 25/25, but he needed second presentations on 3 items with 2 extreme delays. Qualitative score was 20/25, suggesting an ability level of 11 years.

**In May 2014** speech services were discontinued due to his excellent speech skills, and no difficulty with intelligibility for both familiar and unfamiliar listeners. Jay was able to recognize, identify, and associate sounds to monosyllabic words with minimal errors on the vowels, which he was able to self-correct when presented the second time. His oro-motor skills had improved adequately, and he was able to imitate all lingual movements for speech sound production. No gagging was noted while producing the velar sounds (k and g). He continued to have minimal difficulty with imitation of tongue placement for voiced and voiceless /th/ sounds. However in spontaneous speech both these sounds were produced adequately, which were likely due to his lingering apraxia. The /s/ and /sh/ sounds were minimally distorted but it did not impact intelligibility of his speech. Jay independently and spontaneously was able to say "Rumpelstiltskin" in a natural conversational setting on 5/12/14 with 100% intelligibility on the first try. This was so impressive because in the beginning of 6<sup>th</sup> grade, he was not able to produce multisyllabic words

without extensive modeling, simplifying, and repetition.

When he was dismissed from speech therapy; Jay continued to receive special education services for attention an deficit disorder. He exhibited inconsistent deficits in auditory attention. He benefited from wait times, repetitions, thinking aloud, and quiet rehearsal strategies to improve his accuracy. He exhibited symptoms of lingering apraxia as characterized by inconsistent difficulty in volitionally producing target words or oro-motor movements.

### Summary of Phonemic Synthesis Test results (number correct out of 25)



**Discussion:** Jay’s improvement was substantial over a 1½ year period of therapy. The Phonemic Synthesis program was an important part of the habilitation process. It is most interesting that in addition to the usual benefits of auditory training therapy, it also appeared to alleviate some of his speech apraxia symptoms.

A possible explanation was recently reported in an article in July 2014. Kuhl and her research team believe that during language acquisition babies rehearse the speech mechanics mentally much before they speak

their first word. It appears that repeated phonemic presentations and word associations via the Phonemic Synthesis training program along with phonemic recognition, awareness, and discrimination drills facilitated mental rehearsal of speech motor movements.

### Reference

University of Washington, "Months before their first words, babies' brains rehearse speech mechanics. *ScienceDaily*, 14 July 2014. [www.sciencedaily.com/releases/2014/07/140714152311.htm](http://www.sciencedaily.com/releases/2014/07/140714152311.htm). <http://www.pnas.org/content/early/2014/07/10/1410963111.full.pdf+html>

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### Comment Jack Katz

Kavits’s impressive article rang a bell way back in my brain. About 35 years ago an SLP who worked at a VA Hospital contacted me that she was having success in working with her apraxic patients using the PS program. I couldn’t figure that out till I read Kavita’s mention of the U of Washington study.

Also, I use tongue/lip placement to help my patients on the WINT (speech-in-noise) program, not only to model a challenging word for them but sometimes asking them to put their articulators in the position for the troublesome sound.

People often use quiet rehearsals (QR), even when no sounds are uttered, to help them with figuring out the word (e.g., for PS or WINT). That motor knowledge is just another sense to associate with phonemes. Thanks Kavita, you may have opened up some new approaches for understanding, treating and assisting speech Decoding.

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**I Could Hardly Believe What Happened  
Monday  
Jack Katz**

You might have heard me mumbling under my breath when I saw I had 2 evaluations back-to-back on Monday. Four hours later as I drove home I was elated. What a great day.

My first evaluation with Erin, an 18 year old who was going off as a freshman at an out-of-state university a few days later. I was immediately impressed because she filled out her own case history forms. That is a first for a child who was still in high school. Her reason for requesting the evaluation is that she wanted to find out if she had an AP problem or not. She checked off allergies (pretty typical), but then dizziness (hmmm not so typical or rare) and where it said 'other' she inserted 'migrains'. That was a lot more than I expected. Where she was asked to provide further information she indicated that she had dizziness and migrains about once a week. Then she added that she takes Zolofit for migrains but mostly for anxiety.

The plot was thickening and my curiosity was growing. She had seen a developmental vision specialist for training for an eye disorder and 2 doctors for anxiety (Rx and therapy). I don't remember anyone who checked off 21 items, on my case hx form, out of 44 signs of the CAPD, hearing loss and psychological issues. She checked off every single CAP sign (though she would have no idea what each of the questions was associated with). Another item she checked off was 'tires easily'. Now the picture was becoming clear. A very bright, hardworking youngster who had high expectations for herself but fearful because of her difficulties and the huge amount of work she has to put in. She indicated she has been very sensitive to loud sounds since childhood.

So often people indicate tiring easily because they have to expend so much time and effort

to figure out what was said especially in noise. Often with weak reading and memory skills the demand on them is much greater and taking even more time, energy and brain power. Quite a few of the people I see also have headaches from worry/anxiety because of the pressure they are under.

Erin indicated that she has excellent reading comprehension skills when she can read it slowly. Digesting it carefully or visualizing must be a big help to her.

I received her audiometric data from another audiologist that showed normal puretones, word recognition, tymps and ARTs. So I was ready to go to work.

### **CAP Testing**

On word Recognition in quiet, she got the first 10 words correct but 3 delays in right ear. I often stop after 10 items for little kids who I think will burn out on the easy stuff so I stop at 10 if the audiologist who tested for peripheral function found very good WRSs. But in this case this smart, talented young lady was working too hard on the easy stuff, so I went on to the left ear and did the same. Now we were ready for SN, which she disliked since childhood. She scored 68%, in right ear but also had 9 delays and 4 extreme delays on items that were correct. Unfortunately, we have no norms for qualifiers on this test but it still provides good information. What a struggle for her! I mentioned to her that I appreciated that she would say as much as she heard rather than give no response. So often after that when she had a delay she would tell me what she thought it was at first so I had both. I counted them wrong. The left ear was 60% correct with 4 delays and 1 extreme delay. With 100% WRSs she had significant difference scores of 32 and 40.

Erin amazed me with just 2 errors on the SSW LC condition and no other errors. As you may have guessed she had lots of delays (26) and 4 extreme delays among other qualifiers. She had only 3 significant

indicators on the SSW. Imagine for those who don't bother with qualifiers what they would say about this youngster. 'Oh pretty much normal.'

The last test was Phonemic Synthesis. All items were correct but Erin had 4 delays and 1 extreme delay. The qualitative score was significant (20, NL=22). Thank goodness for the qualifiers.

In going over the data I see this was a super bright person who has gotten this far (a scholarship to a 1<sup>st</sup> rate university). I have to say that this was one of the nicest people I have met. I hope that she will get therapy from someone near her university who does the Buffalo Model therapies. I know that she will zip thru it and be that much more effective with less fatigue and anxiety.

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I hardly had time to recover from Erin when Tom came for his evaluation. Fortunately, I was familiar with his case history and Buffalo Model Questionnaire-Revised. Tom is 14 and has had various kinds of therapy including some auditory training. Whereas, Erin had no special help. The family believes that this included some decoding and speech in noise training. Again he was a very smart child and did well in a private school with a small class size. He is reported to be anxious but he is not thought to tire easily. At this time he is doing well in school but he is struggling to understand the teacher and is very sensitive to background noise.

On the words in quiet he had 100% but had three delays. What was so interesting is that as soon as the words were presented he closed his eyes. Later I asked him why he was closing his eyes and he said so he could concentrate better. It has been a long time since someone with normal hearing and 100% WRS had to close his eyes in order to concentrate. He did the same thing in the left ear and had 3 delays and a score of 96%. SN

was 80% in each ear and the difference score in the right ear was significant.

On the SSW Tom had one condition that was outside of normal limits (2 errors for RNC) plus a total NOE score of 8 that was also significant. He had a significant Order Effect H/L but that was all the Quantitative stuff we had. He had 2 perseverations and 20 delays. Without the 20 delays the results would look rather weak. The final test was PS in which he had a Quantitative score was 23 which is within NL. But the good old Qualitative score was 10 (a far cry from NL of 22). Again saved from disaster. And then there were 4 significant Qualifiers (Xs, Q's and one NF and one O/L).

As it often happens the qualifiers saved the day. I wonder why other test makers don't look at qualifiers. It takes little or no time and adds so much to our understanding.

But why was this such a great day? For one thing these 2 kids were the nicest youngsters. They were so helpful, mature and polite, they laughed at my jokes (I should have been suspicious). In both cases I tried to explain things to the parents. For example, I told Tom's mother that when the teacher was teaching and he did not make sense of a word; during the several moments that it took him to figure out what might have been said the teacher was already far along and he did not know what happened in between. As I was speaking to his mother he was nodding, and let us know that this was the case.

For Erin's mom I was pointing out the problem with noise in the class while the teacher is speaking. Without any request she picked up the story from there to mention that just someone tapping on their desks is enough to mess up a lecture. And when I said that toward the the end of the school day likely her brain is gone. She heartily agreed.

What an interesting and rewarding day!

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