Canadian Audiologist

The Official Publication of the Canadian Academy of Audiology

Three Aspects of Speech-in-Noise Training

Published May 14th, 2015

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Speech-in-Noise (SN) is a common problem for those who have a hearing loss and/or an auditory processing disorder (APD). Most of my clinical experience is with those who have APD or APD plus hearing loss (as in my own case). I thought you might be interested in hearing about auditory training for SN problems especially for APD, although these procedures are the same that I use for those with hearing loss or both problems (with some variations as needed).

Therapy for Speech-in-Noise

I use the Words-in-Noise Training (WINT) program[1,2] to improve a person's skills and to help desensitize their reaction to background noise. This program has 600 words on one channel and 8 talker babble on the other. The WINT-3 CD is used with an audiometer so that the levels for speech and noise can be adjusted as needed. WINT can be presented through one or two loud speakers or through an ear phone/s. The words are divided into 10 word sub-lists. The task starts with speech in quiet (one sub-list) and generally followed by another sub-list for each of the noise levels up to 0dB SNR in 2-dB steps. When a person makes errors we have a number of procedures that are effective in improving their performance. It can be as simple as replaying the item, modeling the word, replaying the item without noise, or repeating the process as needed. These simple procedures are very effective depending on the word, the noise level, the person's ability.

The results for large groups of children have been impressive. In one sample the average child began with almost 18 errors initially and after an average of 13 sessions (a total of just 3.25 hours of therapy on SN) had 6 errors. For the SN concerns that the family noted initially on a questionnaire, the parents were asked to rate any change (positive or negative) by the end of the first round of therapy. For 'Understand Speech-in-Noise' 47% indicated Great improvement, 42% *Moderate* and 10% *Slight*. For 'Distracted by Noise' 30% indicated *Great* improvement, 54% *Moderate*, 14% *Slight* and 1% *No Change*.

Generally speaking, those with both mild peripheral plus APD problems improved pretty much as those with just APD. However, one elderly person who had a severe hearing loss in the middle and high frequencies had made good progress in the past, returned for more training when her WRS became very poor and, of course, it was even worse in noise. In this round of therapy we were not able to use the usual WINT program because she would get almost nothing correct. We are putting most of our effort on improving her decoding of speech in quiet before doing very much with SN. However, we are now successfully using a SN technique called "H-and-Friends."

H-and-Friends (HaF)

On WINT, as expected, people improve first on the items with less noise. But at the end of a round of therapy there were still some errors on certain sounds more than others. Surprisingly, we found that so many of the remaining errors were on the /h/ and the three voiceless plosives /p, t, k/.

In addition, these so called HaF sounds were most often substituted for one another (that's what made them *associates or friends*). It is amazing that these 4 sounds account for one-third of the total errors (for all 38 phonemes)! One factor, I suppose, is that that these plosives are faint and quick so that would make them especially difficult to understand in noise. Because they are voiceless plosives they may tend to be more easily confused with one another. What about the /h/? My best guess is that the /h/ sounds like noise so it's harder to detect and /h/ is often erroneously added to the beginnings of words in those with a history of early otitis media.[3]

This challenge led to a remedial 'H-and-Friends' procedure. It starts with 15 vowels or syllables (e.g., long and short vowels and vowel-consonant combinations). These 15 syllables are practiced live voice (auditory only) with a fairly low level of the WINT noise to begin with, or no noise, depending on the person's skill. The person repeats what was said. Then the person is told that the /h/ will be said before each syllable and to repeat the syllable or word (e.g., to the long-A, a /h/ is added so the therapist says 'hay'). The next task is a little harder. There will be a /h/ or no /h/ before the same syllables. The next task is a /p/ sound before each and the following list is /p/ or no /p/. At the next session /t/ and /k/ are trained in the same way. In the last two sessions different pairs or combinations are contrasted. By the end all four sounds have been trained and discriminated from one another. In some cases the benefits have not shown up on WINT after all 4 HaF sessions. In such cases some or all of the four presentations are given again.

In a recent sample of 10 children who had HaF training versus 10 who did not we found the HaF kids started with an average of three more HaF errors and two more other phonemic errors. Both groups did well because WINT has been shown to be an effective therapy, but those who had HaF training had two fewer HaF errors and three fewer on the other phonemic errors than those not HaF trained (Figure 1). This encouraged us not only to continue HaF but are now working on /p, t, k/ in the final position. We think the benefit will be important to the individuals in life situations, but can only make a miniscule difference on the few remaining WINT errors.

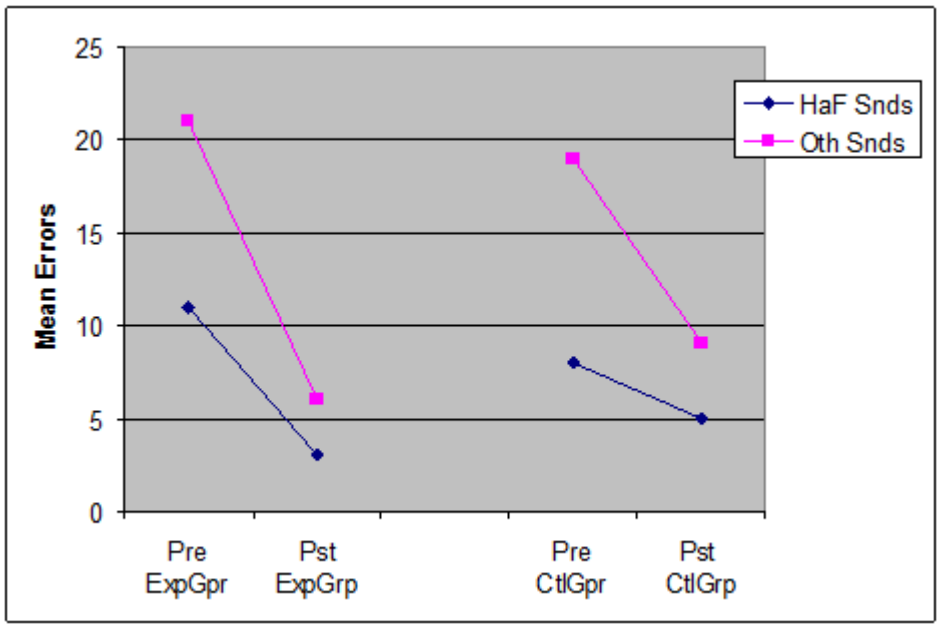

Figure 1. Initial errors on WINT (Pre) and the final errors (Pst) for 2 groups of 10 children. The Experimental Group (ExpGrp) received between 4 to 8 sessions of HaF training in addition to WINT. The Control Group (CtlGrp) received just the WINT program. HaF sounds are /h, p, t, k/ and Other (Oth) refers to the errors for the other 34 phonemes.

An Audiologist's Self-Therapy

With my early life history of middle ear problems and APD, I have improved in processing over the years. Actually, I believe that the therapy that I give others helps me at the same time. But, in my early 70s I began to notice incorrect reception of words (again) much like the children and adults with whom I work with. By this time I also had a moderate sensory/neural loss in the high frequencies. Unfortunately, there was no one to give me therapy, so I tried the *Posit Science* program over the Internet. That program was very helpful and kept me going for a number of years until age effects began to show up again in my auditory processing. I finally decided to try giving myself WINT therapy.

When friends heard this; the first thing out of their mouths was, "That's not fair." (As if I would cheat myself.) But, to insure that my knowledge of the words, in general, would not give me a big advantage; my criterion for a correct response was that I had to be able to identify each of the sounds in the word. I made several other changes in the procedures. Instead of going from one group of sub-lists to the next across the 600 words, I repeated the same 60 words in noise each session until I mastered them. For that first list I started with 22 errors (compared to 18 for the average child). It took me 9 sessions to finish that first sub-list with 6 errors! (Recall that the average number of sessions in one round of therapy for the children is 13.) I wondered how I would do on the next 60 words. I was delighted to see what a vast difference when I started the next sub-list with just 8 errors and in 3 sessions ended with 3. The rest of the training was generally pretty easy with similar results having 1 to 4 sessions on the other lists.

Now I am 81 years old and my processing is going downhill again. The same WINT items are once more misunderstood (e.g., 'him/end'). I will have to redo the therapy program for myself and I wonder if further aging will reduce my ability to jump back or if the training that I had will accelerate progress.

References

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Posit Science Program:
http://www.brainhq.com/?lead_id=bing-search-text-home-Brand_(US_CAN_UK_AUS_SAF_NZ)&utm_source=bing&utm_medium=cpc&utm_campaign=Brand%20(US%2FCAN%2FUK%2FAUS%2FSAF%2FNZ%2FIN)&utm_term=posit%20science