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Simple & Effective

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Inside This Issue

Words- in- Noise Training 1 (WINT- 1) and Unilateral Challenges

The last issue of SET dealt with Words-in-Noise Training (WINT). It highlighted WINT-3 which has been used for 40 years in various forms to help those who have speech-in-noise (SN) issues. It is primarily a vehicle to improve understanding (therefore works better when we are also working on Decoding issues) and also improves distraction and tolerance problems. Generally, WINT is given though a loudspeaker or through earphones - both of which are typically binaural procedures.

In the last year or so I had my two-channel WINT-3 CD combined onto a single channel. That is, both the speech and noise (8 speaker babble) are on the same channel. For this therapy the noise is gradually increased with WINT-1 as we usually do with an audiometer, to enable the therapy with just a CD player. Thus the parents of children that I will not be seeing for therapy, can provide the therapy themselves or to have an SLP or other professional who does not have benefit of an audiometer to offer this service.

This will be our second topic of the February SET issue. The first topic is unilateral problems with understanding speech in noise.

The Unilateral Speech- in- Noise Issue

I am rather new to this topic so I may change my approach or thoughts as I gain more experience. But here is what I know and what I think I know; or at least wonder about. This is a fascinating topic and appears potentially quite important.

We are much more aware of unilateral SN issues than e.g., unilateral Decoding problems, no doubt because we test each ear separately for SN. I must say that in the WINT therapy we often do not see the same unilateral problem as on the standard pretest for a number of reasons (I suspect). Twenty-five items on the SN test (CTB-CD) may not provide a sufficiently reliable score for each ear because of the relatively small number of items. Also the specific words on one list may be more difficult for a particular child than another list for the other ear. Also fatigue or learning might play a role in the score and thus suggest the first or second ear to be the poorer one. My guess is that we are more likely to get a correct assessment of the specific ear with the therapy materials because there are 60 or 70 words per ear at different signal-to-noise ratios (SNR). In addition, we usually alternate ears so if fatigue or learning sets in it will affect both ears. If we are unsure if the ears differ using the Alternate (Alt) method (described in the previous issue) we can run it again and have another 60 or 70 word samples per ear. (Of course you can recheck the test findings, as well, but probably will not get as large a sample of words.)

When we find a difference between ears we often work on the poorer one to see if we can improve it. When using an audiometer (with WINT-3) both channels can be directed to the poorer ear and the noise adjusted accordingly (as you would with a typical binaural presentation).

I have yet to collect much data but I feel quite sure that typically the *right ear* is the person's *poorer* one in noise. How can that be you ask? We know that the left ear is typically poorer for dichotic listening and likely for Decoding as well (as the right ear is favored because it *faces* the left auditory cortex where decoding and oral language are primarily located). In the few cases on whom I have checked this out I found that the left ear was the poorer on the Phonemic Synthesis therapy program if I alternated between ears, but the right ear was poorer for SN.

Therapy for improving the poorer ear on WINT- 3

Usually I can fit in as many as five or 6 WINT series, to address the difference between ears, over the 14 sessions of therapy. Generally, I get free field (FF) baseline data for 3 series (1 series per session) and then do the Alt procedure.

- If they differ e.g., with 15 errors in one ear and 8 in the other then it looks like one ear is poorer.
- If you are unsure you can do another Alt the next session or wait one or two sessions and try again. (See Vol. 2 #1 for Alt procedure details.)
- If this confirms your suspicion then some consecutive sessions could be devoted to the poorer ear.
- If things improve and the error score is close to that of the last FF scores; then you can go back to FF on the next series.

If it turns out that those with right-ear problems for SN are the same people who have left-ear deficits for Decoding, then we have a strange puzzle. I have a good guess for why this might be the case. Decoding is primarily a contralateral function (right ear most directly connected to the left auditory cortex) but I suspect that SN is an ipsilateral process. Efron et al. (1983) hypothesized that there is a pathway in each hemisphere from the anterior temporal region (that is associated with severe SN disorders) to the auditory cortex (of the temporal lobe; likely on the same side of the brain) and then down the efferent pathways to the periphery. So if there was a left hemisphere malfunction it would affect the left ear for suppression of noise and the right ear for decoding of speech.

If you have the WINT-3 program, that just came out, it would be interesting to see how a right ear deficit on the

Alternating Right and Left Ears for Phonemic Synthesis Therapy Program

- If it remains the same or gets worse then the plan is not so clear. Please read on.

Alternate ears for every 2 words on the PS lesson to see if one ear appears less accurate

WINT- 3 Results: Bilaterally Symmetrical Cases vs. Unilateral Weakness Cases

Bilaterally Symmetrical Cases

Let's start with what we would predict if everyone was equal in both ears on WINT. Figure 1 shows data for the 12 (out of 24) cases that followed the bilaterally symmetrical pattern. To accommodate my computer graphics program that does not understand spaces in the data; the last free field (FF) score was repeated to fill in the blanks. That is, because of right and left ear series intervening, the last FF score (e.g., 8) was repeated to fill in the FF curve. The right-only data start at the fourth series because almost all of the individuals were tested first with the right ear at that time. The left-only condition starts at the fifth series because the Alt procedure is give to the right and then left the first time. Because there were very few data points for right and left curves, the later scores were moved up to follow the previous data point.

The pattern of improvement for the FF condition is quite similar to the data for all of the children who have taken the WINT program (see Katz, 2009). You will notice in Figure 1 that the first right ear mean and the first left ear mean are about the same (one point apart). The second data point for each has about the same ear relationship. For this reason most cases had just one or two Alt procedures and it was determined that the ears were about equal. The fact that the second/third right and left ear means appear better than the FF scores; in part, may be a function of moving some single ear data to follow the first point.

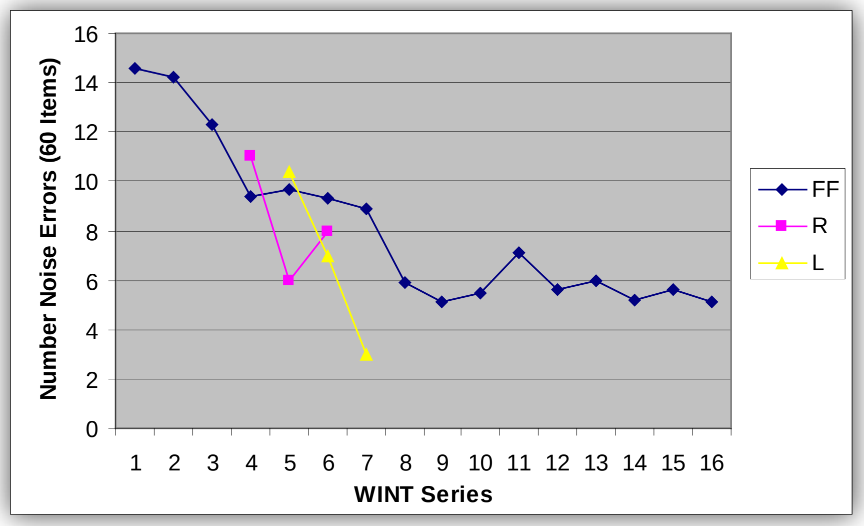

Figure 1. The WINT-3 results for 12 young people 6 to 21 years of age who had similar results for the right-only and left-only conditions.

Unilateral Weakness Cases

The following two figures display data for those who appeared to have one ear poorer than the other. The first of these figures, Figure 2, shows data for 10 children who were thought to have a poorer right ear performance on one or two Alt procedures.

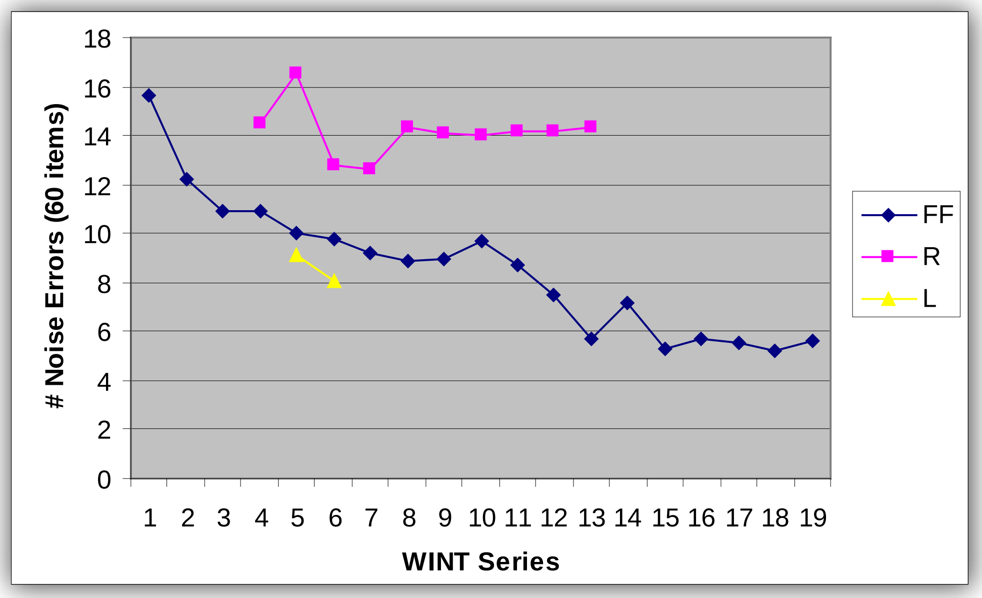

Figure 2. The WINT-3 results for 10 children 6 to 14 years of age who had poorer results for the right-only than the left-only conditions.

As you can see from Figure 2 the general pattern for the FF conditions is roughly the same as for those who were quite similar for both ears. It looks like it took some extra FF sessions to show the best scores for this group compared to Figure 1. However they ended at the same place. It will be interesting, as we gather more data, to see if it takes longer for the right ear deficit children to achieve their goals.

But the striking feature in figure 2 is the big difference between the right and left ears and then to see that the right ear did not improve over time. This puzzled me. The important thing is to see that the FF data improved and it looks as if the left ear data tended to improve (although we only had data for 2 sessions). Mean right ear data can be misleading because in this case 5 children improved, three remained the same and 2 had poorer scores. It is for the latter 5 subjects in this group that I am trying out a new approach to see if we can improve on these results. So far I have very little data. We also do not know how these data relate to pre and post SN tests. I should have some more information on these matters in the next few months. (Continued on the next page)

Figure 3 has just 2 cases (ages 7 and 17). For these children the left-only condition appeared to be poorer than the right-only. It is hard to make inferences from 2 cases, so only the glaring signs will be mentioned. The FF curve can be ignored not only because of the few subjects but also the middle portion was made up of filled in data.

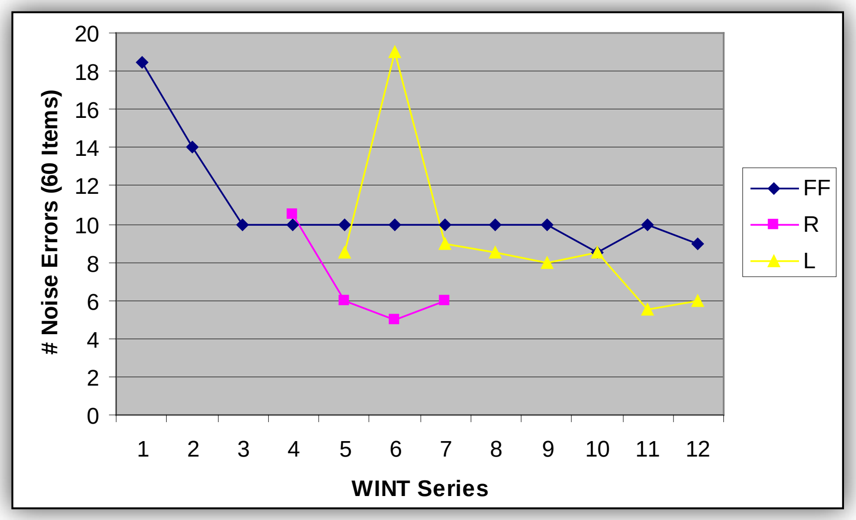

Figure 3. The WINT-3 results for 2 children 7 and 17 years of age who had poorer results for the left-only than for right-only conditions.

Initially the right ear was slightly poorer than the left which is similar to the right-equal-left group. But the mean for this group shows a dramatically poorer performance for the second score in the left ear. This is perhaps misleading as one child's score went from 9 to 30 for the second series in the left ear and the other child had no change. This accounts for the huge spike for the left ear. After this, the left-only score improved much like the FF score for the later series. I suspect that this group is much like the first group's (right-equal-left) performance if we exclude the one big difference. This might suggest that we have only 2 groups: the large group would be those who have equal right and left ears plus those relatively few children that look like the LE might be worse who actually perform like the right- equal-left group in the long run. The other group has a right ear deficit in SN compared to the left ear. Half of them performed like the large group but the other half with training show no gains or got worse in the right ear.

Interestingly in 5 of the 6 instances in the above figures the earphone conditions appear better than the FF condition. That might be a real but small factor. The earphone conditions may be generally easier than FF because the information is processed directly from the ears with little effort and also some ambient noise may be reduced because of the phones. When the central auditory nervous system must get each ear to focus in on the speech coming from the loudspeaker (or free field) this requires more skill which might not be too good in some with SN problems. This would suggest that the preferred presentation should be the loudspeaker condition.

Because we have only recently begun treating the poorer ear we have little data on the those who do not seem to respond as well in one ear. It leaves us with questions that should be resolved with more experience and a new procedure that we have recently introduced. How does the poorer right ear group compare with the other children in the pretest quiet and noise conditions in each ear; how do they compare with the post tests; what is handedness of both groups; do those in the right ear group who showed improvement differ from the others in that group or from the larger group that did fine in both ears and FF.

In summary, WINT results in the last SET issue are comparable to the results for 24 subjects who were studied here to better understand unilateral deficits. The right-only deficit group means differed from the means for the right-equal-left group and the left-only group. The right-only showed poorer results in the right ear and, as a group, it remained essentially unchanged. However half of the subject in the right-only group improved much like the other subjects. But the other half remained unchanged or their scores were poorer at the end of training. Further study is needed to understand the problem better and to determine if a technique that was devised will help improve the right ear score.

Stay tuned.

WINT-1

Words-in-Noise Training 1 (WINT-1) was constructed from the WINT-3 therapy materials to enable those who do not have an audiometer to provide speech-in-noise training. The same 600 words that appear on the WINT-3 program were used. A total of 80 words are given in each series. Ten words are in quiet and each additional 10 words are advanced in 2-dB steps from a +12dB SNR to a 0dB SNR. Scoring is the same (i.e., errors and delays) as for WINT-3 but flexibility in administration is reduced because the speech and noise are premixed and accurate level and SNR adjustments cannot be made.

Nevertheless, WINT-1 provides an effective tool for improving speech-in-noise skills and reducing noise distractions as well as hypersensitivity; perhaps to a lesser extent. WINT-1 is appropriate for all but the most severe cases. Even those with cochlear implants, hearing loss or hyperacousis may be accommodated when a +12 SNR is too great. A half-series starting with a +22dB to +14dB SNR is available on the CD.

As discussed above for WINT-3, presentation of WINT-1 through a loudspeaker is likely the most beneficial approach (rather than via headphones). This requires more effort and attention and, in part, may be responsible for our finding in parent/teacher assessments that the children typically have moderate improvement in attention following the Buffalo Model training.

Reference

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Katz, J. (2009). Therapy for Auditory processing Disorders: Simple, Effective Procedures. Denver: Educational Audiology Association, Figure 6-3.