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SIMPLE & EFFECTIVE

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Follow Up WINT Analysis: Right, Left and Loudspeaker Conditions

The records for 65 children (5-17 years) were studied to determine if the initial pilot analysis in last month's SET issue was indeed representative of the entire sample of children who took this therapy to improve their speech-in-noise skills.

Some children with both speech and noise directed to the right ear did more poorly after some training than they did initially. For this reason all of the files that I have for children who received the Alternate (ALT) WINT procedure were studied to compare right and left ear scores. This included 22 of the 23 cases from last month's SET issue. Two additional potential cases were eliminated because I could not classify their performance due to variability and one 21 year old from the pilot study was also eliminated because she was an adult. The ALT procedure is part of the WINT program to determine if the two ears are performing equally ($\pm$ 3 errors).

General Information

Of the 65 children on the ALT procedure 37 performed equally for the two ears (they formed the '**R=L**' group). In some cases when the first ALT did not provide a clear classification a second ALT was administered which usually clarified the situation. One would think that, other than chance differences, the two ears should be essentially equal. Indeed, 57% of the sample fell into this category, but having 43% that were not equal appears beyond chance. A group of 20 children had poorer scores in the right ear (RE with a difference of 4 or greater) than the left (called the '**R>L**' group). Greater in this case means a greater number of errors. The third group of 8 children had poorer left ear (LE) scores than right ('**L>R**' group). While the **L>R** sample size is larger than for the pilot study; it is still smaller than desired. Not counting the RE performance for the **R>L** group these subjects had similar WINT patterns as the **R=L** group for the other two conditions (FF, LE).

The mean ages for all three groups were almost identical (**R=L** and **R>L** = 9.4 years and **L>R** = 9.3). Handedness information was available for all but 6 children. Handedness was recorded as either right-handed or not-right-handed (i.e., left or ambidextrous). The **R=L** group was 97% right-handed, **R>L** was 90% right-handed, but the **L>R** was only 57% right handed. This makes me think that language dominance may have some role in these findings.

In addition to the WINT data we also gathered information on pre and post test scores for each child.

Let's start with the WINT data.

Right and Left Ear Errors Equal

R=L

Figure 1 for the **R=L** group (n=37) shows the free field (FF – actually loudspeaker) presentation as well as the RE and LE conditions. In each procedure the speech was set at 62dB HL and noise increased from 50 or 52dB up to 62dB HL. To maintain consistency we used the total for the six sublists from 52 to 62dB (60 words). Usually one ALT procedure was used but a second ALT was given if the first one did not provide a clear answer. If the results were found to be equal (±3 errors); the remainder of the series was given FF.

As you can see for these children, there was a fairly typical FF curve starting with about 17 errors and ending with about 6. The mean performance for the RE begins at the fourth series because that was typically when the first RE ALT was given. The LE starts at the fifth series for the same reason. The RE and LE scores were fairly similar initially with the RE having one more error. It appears that on the second ALT comparison the slight ear difference was reversed. Overall the LE appears to perform slightly better than the RE on the subsequent series.

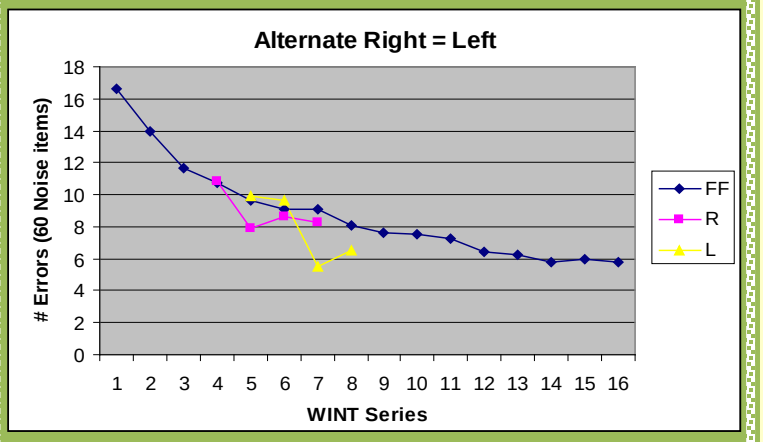

Figure 1

Right Ear Errors Greater than Left

R> L

Figure 2 shows that **R>L** subjects (n=20) for the FF condition started with 16 errors and ended with 6, which is similar to the previous group.

While the LE was roughly equivalent to the previous group the RE was not. Not only was the RE performance poorer than the LE on ALT but continued to perform more poorly than the LE and FF conditions on subsequent trials.

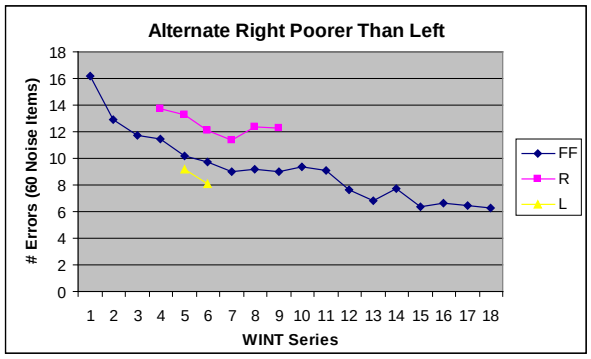

Figure 2

This is what we found so puzzling in the pilot study that we did last month. It appears that overall the RE deficit did not adversely affect the other two conditions. At this point we do not know if the RE deficit is reflected on the SN pretests or retest (which is discussed later).

Left Errors Greater than Right Errors

L> R

As in the earlier sample this smaller **L>R** group performed much like the **R=L** group. However, it is interesting to see in Figure 3 that although initially the left ear was poorer than the right that in time it was equal to the better ear overall. As in last month's issue the data for the RE and LE were so scattered that the data points were moved to close up the spaces. Thus, some of the single ear training was later in the therapy when overall performance was better.

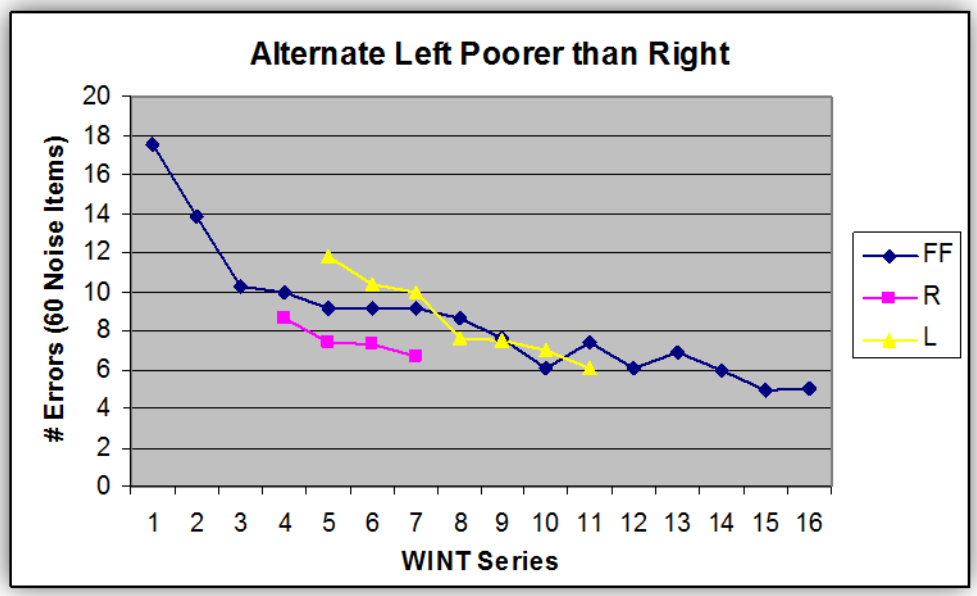

Figure 3

Comparing the Groups on WINT

Table 1 shows the percentage of children in the three groups who improved, stayed the same or got worse on the RE WINT condition. For 2 children the initial errors were few and the therapy trials they had were also few; so a difference of 3 errors in the first case and a difference of 2 in the second case were considered improvement based on these as well as other scores.

For the **R=L** group each of the 37 children improved in FF with training. For the **R>L** there were sufficient data to look at both FF and the RE conditions. Eighty-five % improved and the remaining 15% stayed the same with training. But for the RE condition 25% got worse and 25% stayed the same; as noted before. The **L>R** group had 100% improvement on the FF condition and 75% in the LE condition. The remaining 2 children stayed the same in the LE with training.

Group	Condition	Improved	Same	Poorer
R=L (n=37)	**FF**	100	0	0
R>L (n=20)	**FF**	85	15	0
	RE	50	25	25
L>R (n=8)	**FF**	100	0	0
	LE	75	25	0

Table 1. Performance (%) of children in the 3 groups on the FF, RE and LE conditions who improved, stayed the same or got poorer with therapy.

Further Analyses of the Three Groups

It was of interest to see if the pretest gave a hint of the RE problem or if the retests reflected the same challenge for the RE as on the WINT program. I looked at WRS, the Noise test and SSW pre and post therapy.

R=L Error Group

The group with the most subjects (37 or 57% of the total) is the group that we would logically think of as the ideal group because both ears behaved in a similar fashion in noise. So let us see how they performed on pre and post test for Word Recognition Scores (RE, LE), Speech in Noise (RE, LE) scores and SSW (RC, LC) scores.

	WRS-R	WRS-L	Noise-R	Noise-L
Pre	94.8	91.5	67.2	66.5
Post	96.2	93.5	79.8	78.2
Improved	1.4%	2.0%	12.6%	11.7%

Table 2

Table 2 above shows similar %-correct test and retest scores for WR; likely the improvement was limited because the initial results were quite good. However about 1/3 of the words were in error in noise for both the right and left ears. The two ears were quite similar initially and quite similar on retest. They did improve by about 12% on retest for these Speech-in-Noise conditions which would be expected following the WINT program. Some children had as few as 8 series, for various reasons (e.g., finished therapy, stopped coming for therapy).

	SSW RC	SSW LC
Pre	7.4	13.6
Post	4.7	9.8
Improved	2.7	3.8

Table 3

Table 3 above provides test-retest errors on the SSW; which as you know is a dichotic procedure. The most sensitive conditions are the two competing ones (RC, LC). Because we do not provide dichotic listening or Integration training in the first round of therapy we did not expect too much improvement. The ~3 point difference in each ear seemed like a reasonable amount of improvement. Let us compare these results with those for the other two groups.

R>L Error Group

	WRS-R	WRS-L	Noise-R	Noise-L
Pre	94.6	87.6	65.0	63.7
Post	95.6	93.4	76.1	77.6
Improved	1.0%	5.8%	11.1%	13.9%

Table 4

Table 4 shows the Word Recognition and Noise results for the group of interest in this analysis. The **R>L** error group had 20 subjects which is felt to be a decent sample size for these analyses. RE performance in quiet was comparable to the previous group but the LE improved more than the **R=L** group. You can see that initially that the WDS LE mean score was rather poor for a normally hearing group. Because of this it was not a ceiling-level score so it could be exceeded on retest. Usually the errors that we see on WRS are Decoding errors and with DEC training we generally see this type of improvement. In noise this group achieved about the same level of improvement as the ideal group (~12%). Interestingly but probably not significantly, the LE showed greater improvement than the RE; this is just the opposite of the previous group. So there is perhaps just a slight hint on retest that the RE may not have done as well as the LE.

	SSW RC	SSW LC
Pre	8.0	12.3
Post	5.1	8.7
Improved	2.9	3.6

Table 5

Table 5, above, shows the SSW improvement (# errors) that is almost identical to as the previous group. Both pre and post tests performances were comparable for the two groups on the SSW.

L>R Error Group

	WRS-R	WRS-L	Noise-R	Noise-L
Pre	96	88	69.3	62.7
Post	96	91.5	80.5	78.6
Improved	0	3.5	11.2	15.9

Table 6

Table 6 shows similar pretest differences for WDS as the **R>L** group. The means for this smallest group had poorer scores on the ALT procedure for their LE vs. RE. Judging from their improvement in both RE and LE on WINT; these data resemble the results for the **R=L** group. In fact, while the test and retest differences in noise may not be statistically significant they improved a bit more in the LE than the other two groups.

	SSW RC	SSW LC
Pre	9.9	19.4
Post	7.9	15.5
Improved	2.0	3.9

Table 7

Table 7 shows the initial scores for this group were a bit poorer than for the other two groups, therefore it is not surprising that the post test scores remained a bit poorer than the other groups. I think the main observation is that the amount of improvement was just about the same as the other two groups.

In last month's SET I wondered if the subjects in this group were simply false positives and just performed somewhat more poorly in the LE at first for some unknown reason. This month I still wonder but I am influenced a bit by the high percentage of left or ambidextrous children in the group that there is still a chance that they may be a minor variation of the **R=L** group.

SSW Scores

Finally, I was curious if one of the subgroups was generally more challenged in auditory processing than the others. So, I looked at the pre test Total SSW score as this is the best single indicator of APD on the test. The two big groups had nearly identical mean Total SSW scores: 27.9 for the **R=L** group; 27 for the **R>L** group but 34.3 for the **L>R** error group. It is difficult to say (by eyeballing it) if the last group is significantly different in Total SSW score or not but if they have more APD challenges and differ in handedness then there might be some underlying differences. I am happy to report that Angela has purchased a stats program and will soon be an expert in using it so I suspect that you will see more statistical results in the future.

Summary

The WINT program has proven to be a fine technique for improving speech-in-noise difficulty. I was surprised to see that there was a small subgroup that did not do well in one aspect of the training and that it was generally in the right ear (of all things). This second, more complete survey, supported the pilot observations (that was also independently noted by Angela Loucks) and helped to put the issue in perspective. There were 20 of the 65 children in the right ear deficit group. Ten of them improved as expected, 5 stayed the same with therapy and 5 got worse. The latter group (8%) that shows this deficit did not have a deficit on the FF condition or on the noise retest. Therefore it does not seem to be a generalized problem so it may not be a critical factor. Nevertheless we are presently working on a procedure that may enable the child to improve this RE anomaly.

Our next issue will be devoted to memory training.