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REPORTS

SSW Handout & The Temporal Lobe ?

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A HANDOUT EXPLAINING THE SSW TEST

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Several months ago one of us (PJ) felt the need for an information sheet that would help parents to understand what CAP tests were testing and why such testing is important. This was necessitated because parents were often confused and suspicious of an evaluation that they did not know of or understand. It was apparent that the parents wanted something to study or to bring to the attention of a teacher, physician or spouse.

The text of this handout went across the US a few times before it was readied in its present form. It should be noted that this handout refers to the SSW test. With only minor modifications this can be broadened to include other diagnostic procedures. Please use this information freely, if it seems appropriate for your needs. An information sheet such as this is useful:

1) To answer questions before they are asked (saves time and transmits confidence)
2) To encourage participation if the parents have these concerns
3) To provide realistic expectations from the evaluation, and
4) To weed out those who do not want or need these services

Thus far, the information sheet has been very useful. It also serves as an educational vehicle to referral sources who are shown the sheet by the parents. Because the later feedback about the evaluation is typically positive, this can lead to additional referrals. The information sheet is shown below.

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USING THE SSW TEST FOR EVALUATION OF CENTRAL AUDITORY FUNCTION

Children who have problems with reading, spelling, speech, language and/or behavior are often found to have central auditory processing (CAP) difficulties. CAP impairment may be the basis of these problems or may simply complicate the situation.

Central auditory processing refers to how we handle and make use of the information that we hear. Many individuals may have good hearing but do not utilize auditory infomation efficiently or quickly enough to serve the complex demands of every day communication and academic tasks. CAP is not hearing per se, but rather the use to which we are able to put the information that is heard. Therefore, the standard puretone hearing test is not a good measure of central auditory processing. Puretone testing is a measure of how sensitive we are to the presence of sounds and not how effectively we listen under a variety of listening conditions that are less than ideal. Puretone tone testing is a vital procedure in ruling out hearing loss. It is important to test hearing sensitivity because hearing losses and central auditory disorders have many common features and are often difficult to distinguish without proper testing. Despite the similarities in their appearance, the management of the two disabilities is quite different.

To evaluate auditory function (both hearing and CAP) we administer a brief battery of tests. These tests will determine if the client has a hearing loss, a central processing disorder, or both. It is not unusual for both problems to be present although CAP difficulty is much more common than hearing loss alone.

Common symptoms that are noted in those who have auditory system problems are: difficulty in understanding, especially in a noisy enviornment; problems in remembering what was heard; distractibility; poor phonic skills, and confusion. Reading accuracy or reading comprehension, spelling, speech and language ability may also be impaired.

One of the measures that we give to evaluate CAP functions is the Staggered Spondaic Word (SSW) test. This procedure, when supported by other test results can identify a central processing problem and can typically specify one or more of its characteristics. From the test battery, if the results are positive, we are generally able to indicate useful classroom management approaches that are likely to benefit the child and can also suggest various types of therapeutic methods which are appropriate to the child's needs. Our data may also serve as a "baseline" for measuring the youngster's improvement.

Following the audiometric evaluation we should be able to say:

1) whether a hearing or middle ear problem exists and to what extent;
2) whether a central auditory processing problem exists and to what extent
3) whether the character of the CAP disorder appears to be a decoding deficit, a memory-tolerance deficit, an auditory (or auditory-visual) integration deficit or some combination of thses factors.

These types of dysfunctions may help to explain the characteristics that have been noted in your child at school or home. This information will then give us knowledge how to manage or improve the problem.

If you have any questions regarding the procedures, please let us know.

ANTERIOR TEMPORAL vs POSTERIOR TEMPORAL CASES

Jack Katz

INTRODUCTION

Over the years, the SSW REPORTS has looked at Auditory Reception (AR), Non Auditory Reception (NAR) and Corpus Callosum (CC) lesion populations. These were classical categories that I had worked with for many years. The advent of computers has made life more complex in some ways as well as permitting greater precision and detail. This report was derived from the compilation of a database that was introduced to a statistical package.

In the early days of central auditory testing it was thought that dichotic and other sensitized test procedures were able to identify "temporal lobe" lesions (as opposed to frontal, parietal and occipital) without distinction regarding what part of the temporal lobe was involved. The SSW has shown that central tests can identify various regions of the brain (not just the temporal) and that the temporal lobe is not one homogenious system. This article is devoted to the temporal lobe. In the past I did not look at the anterior section of the temporal lobe separately because I didn't have a large enough number of such cases in any one sample. By combining subjects that were studied over a long period of time, we are able to amass sufficient numbers.

THE TEMPORAL LOBE

It is well accepted that the transverse gyrus of Heschl is located on the middle-posterior portion of each superior temporal region and that Heschl's gyrus contains the primary auditory reception centers for the hemisphere. It is less well appreciated what the rest of the temporal lobe contains and its related functions. The auditory cortex (Brodmann's area #22), which is located primarily in the superior temporal gyrus, begins in the posterior region and extends into the middle temporal area. According to Luria (1966), this region is associated with auditory phonemic discrimination (decoding). It suggests the importance of the posterior and middle portions of the superior temporal lobe in understanding what is heard, especially speech.

The hippocampus, an important memory-related structure lies deep and inferiorly along the entire temporal lobe. The anterior temporal lobe narrows and comes to a rounded point at the temporal pole. The anterior temporal lobe contains the amygdala, the anterior portion of the hippocampus and the inferior horn of the lateral ventricle. The amygdala is thought to relate importantly to the hippocampus and is thus associated with memory functions as well as having involvement in behavioral disorders. In addition to these structures, the anterior-mid temporal region contains the terminus of the anterior commissure. The anterior commissure carries auditory information or inhibitory impulses from one temporal lobe to the other.

Efron and his colleagues (1983) have pointed out that cases with anterior temporal lobectomies have difficulty understanding speech-in-noise. These patients were unable to block out background noise or to properly focus in on foreground speech to the exclusion of the background noise.

ASSUMPTIONS

From the foregoing, it should not be surprising to find that damage to different regions of the temporal lobe will show up differently on central tests (or at least on the SSW). To test this hypothesis information from the database were studied. Results for anterior and posterior temporal cases are shown in Table 1. It should be recognized that many of the anterior and posterior cases had mid temporal involvements as well. This fact should narrow any differences between the groups rather than increase them.

ANTERIOR VS POSTERIOR TEMPORAL GROUPS

GROUP	N	AGE	SP AVG		WDS		C-SSW		CES	
			RE	LE	RE	LE	RE	LE	RE	LE
R-Ant Temp (NAR)	12	46	16	20	94	94	1	8	11	14
L-Ant Temp (NAR)	12	40	8	8	94	94	1	5	14	6
R-Post Temp (AR)	11	60	22	24	95	85	5	41	28	60
L-Post Temp (AR)	25	45	12	11	84	87	44	19	42	10

Table 1. Number of Ss, mean age and puretone speech average (SP AVG), word discrimination score (WDS), corrected SSW score (C-SSW), and Competing Environmental Sound (CES) test results for right and left ears.

Table 1 shows considerable differences between the anterior and posterior temporal groups on all 4 measures that were studied. Speech averages(500, 1K, 2K Hz.) also demonstrate poorer scores for the R-hemisphere cases whether anterior temporal or posterior temporal. It is of interest to note that the posterior cases had slightly poorer threshold than the anterior cases for both R and L sided lesions. Post hoc analyses show differences for RE and LE speech averages were each significant ($p<.01$). Further analysis for the R-SP AVG revealed that the R-ARs differed from both L-ant temp and L-post temp in puretone results. The L-speech average was also significant for the pathological groups ($p<.01$). The R and L anterior temporal groups differed significantly as did the R and L posterior groups. In addition, the L-ant temp cases were significantly different from the R-post temp. Thus the present results support Katz and Pack (1975) regarding puretone differences between AR and NAR cases and extends the information to show that R-hemisphere cases tend to have poorer thresholds. This is entirely reasonable as the right hemisphere is considered dominant for music (tones). It is not clear why the AR cases had poorer thresholds except that this region is the direct route to the hemisphere. This AR area is tonotopically organized and if lesioned it might significantly reduce accurate information about certain frequencies or block basic perception.

Similar differences were obtained when comparing these four groups on their WDS results. The RE score was significant ($p<.01$), with the L-AR group differing from each of the other groups. This supports Katz and Pack who noted that AR cases have about 86% WDS in the ear opposite the lesion (84% for the L-AR group).

The WDS results for the LE supported the above and extends our information. In this case the 2 anterior groups differed from each of the posterior groups (as expected), but the L- and R-ARs did not differ from one another. This shows not only the contralateral effect for the R-ARs but that the L-ARs were also depressed ipsilaterally. Thus we can expect typical L-post cases to be depressed bilaterally on WDS (similar to what has been found on C-SSW). For the two AR groups the WDS aged with Katz & Pack showing an average score of 86%.

C-SSW scores for the 4 groups differed significantly for both RE and LE ($p<.01$) when each was analyzed separately. The C-SSW RE error score of 44% for the L-post cases differed significantly from each of the other groups. The other groups did not differ from one another. The C-SSW LE scores were significantly different for all comparisons except when comparing the 2 anterior temporal groups. Both anterior groups demonstrated few errors. This shows again that anterior and posterior temporal disorders reveal themselves very differently on audiometric procedures. It also supports the long used SSW rule RE and LE peaks cannot be employed to designate the affected hemisphere in NAR cases.

The final comparisons involved the CES test. The individual analyses for RE & LE were statistically significant ($p<.01$). For CES in the RE the 2 anterior groups differed from the L-ARs (contralateral peak) but not from the R-ARs (in the ipsilateral ear). This follows the pattern of RE performance for WDS and C-SSW. The CES LE differences showed up for the both anterior temporal groups compared to the R-ARs (contralateral peak). The R-ARs were also significantly different from the L-ARs.

RESPONSE BIAS

By looking at the puretone, WDS, C-SSW and CES scores we can differentiate anterior from posterior temporal lesions. However the SSW has another dimension which can be studied to obtain further verification. That dimension is response bias. See table 2 for what they have to offer.

The largest differences between anterior and posterior cases was found in the Type A results. 38% of the anterior temporal cases had Type A's and only 3% of the posterior cases. The data are even more specific when we look at R- vs L-sided lesions. The R-anterior cases had 58% with Type A's while the L- had only 17%. The one AR with Type A was a right hemisphere case.

RESPONSE BIAS IN ANTERIOR AND POSTERIOR TEMPORAL CASES

GROUP	TYPE A	REVERSALS M#	REVERSALS %Ss	REVERSALS M#Ss[1]	ORDER EFFECT Ant%	ORDER EFFECT Post%	EAR EFFECT Ant%	EAR EFFECT Post%
R-Ant Temp (NAR)	58%	3.4	42%	7.6	17%	0%	17%	0%
L-Ant Temp (NAR)	17%	2.2	50%	4.0	25%	0%	17%	0%
R-Post Temp (AR)	9%	2.5	27%	8.7	9%	55%	9%	18%
L-Post Temp (AR)	0%	2.5	56%	4.1	37%	26%	19%	26%

1 = mean number of reversals for subjects with significant number of reversals

Table 2. Response bias results for anterior and posterior temporal cases. These groups were divided according to involved hemisphere.

The average number of reversals for the 4 groups was quite similar. Mean reversals ranged from 2.2 to 3.4. What appears different is the number of subjects with reversals and thus the mean number of reversals for those who have reversals (R-hem twice L-hem mean reversals).

The R-hemisphere groups had more reversals than the L- when the mean reversals for those having a significant number (<1) was calculated. On the other hand, the L-hemisphere cases had more anterior Order Effects than the R-(not analyzed statistically). The dramatic finding is that only posterior cases had posterior signs and to a great degree for Order Effect. The Ear Effect showed the same trend, but to a lesser degree.

SUMMARY

The present study involved 60 Ss with verified temporal lobe lesions. Twenty-four were classified as anterior temporal (NAR) cases (R-hem = 12, L-hem = 12) and 36 posterior temporal (AR) cases (R-hem = 11, L-hem = 25). While all of the posterior and none of the anterior Ss had involvement of Heschl's gyrus, many from both groups had lesions of the mid temporal region.

In general, poorer test results were obtained for the posterior (AR) than anterior (NAR) cases. This was noted on each of the 4 measures (SP AVG, WDS, C-SSW & CES). The results support previous research which shows that AR cases (as a group) have poorer performance even on standard peripheral tests. Clinically significant differences were noted on the scores for the two central tests (C-SSW & CES).

SSW response bias also tended to differentiate the anterior from posterior cases. Only posterior cases had posterior Order and Ear Effects. Posterior Order Effects were especially prominent among the AR cases. The one instance in which the NARs performed more poorly than the ARs was for the Type A pattern. This may be due to the generally poor (MO or S) SSW scores in the posterior cases that would have masked the Type As.

R- vs. L-hem differences were also noted in this study. The R-hem cases were poorer on the puretone speech averages (a reasonable finding) and they were also poorer than the L-hem cases in the mean number of reversals obtained in those who had a significant number. Half of the L-hem cases had reversals but half the mean number of reversals for the R-hem subjects. A future article will compare anterior temporal cases with frontal and other NAR cases.

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