XXW...er...um...SSSS ah! Ess Ess Wubble-u-Test NEWSLETTER

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INTRODUCTION: Aphasia has been a topic of research interest since 1861 when it was first identified by P. Broca. Despite this, many unanswered questions remain, including questions relating to the very nature of aphasia itself. In an attempt to answer questions relating to auditory comprehension deficits in aphasia, research has fallen basically into three areas: auditory perception and discrimination, auditory retention, and language comprehension (Brookshire). While none of these areas may be able to provide a total explanation, there is sufficient evidence to support the need for continued investigation of more basic auditory processing skills as at least a contributing factor.

PERFORMANCE OF ADULT APHASICS ON SSW AND CES

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RESEARCH QUESTIONS: The present study attempted to examine central auditory processing function in aphasia on a test battery consisting of the SSW, CES, and The Assessment of Aphasia and Related Disorders (Boston). The following questions were addressed: 1) Do aphasics perform differently than normals on these tests? 2) What response biases are demonstrated by aphasics? 3) What pattern of performance is demonstrated by aphasics on both the SSW and CES? 4) Are there any correlations between central auditory tests and specific language subtests on the Boston?

PROCEDURE: Ten aphasics and ten normals were selected who met the following requirements: 16-60 years; no greater than 30 dB hearing thresholds; minimum of 6th grade education; and no history of drug abuse. In addition, aphasics were at least one year post onset and were screened for ability to complete the tasks. Subjects were not restricted according to aphasia type. Each subject was given the above mentioned tests in a random order. Tests were scored according to the directions of each test.

RESULTS: Analysis of the data collected showed that aphasics' performance was significantly poorer than normals on the C-SSW total score as well as on all four condition scores. All aphasic subjects demonstrated at least one type of response bias. Significant differences were found for Ear Effect and Order Effect. No normal subject demonstrated any reversals, while all aphasics demonstrated reversals.

These results indicate that the normals' performance was consistent with current normative data, with aphasics' performance being significantly poorer than normal on the SSW.

Aphasics performed more poorly than normals on the CES for each ear. Since, at the time of this study, no normative data for the CES were available, anything over a 5% error (the maximum error score in the normal group) was considered to be a poor score.

A significant number of correlations between the Boston and the SSW and CES tests were found, however, because of the small number of subjects used, the results can only be considered as tendencies. It is interesting to note that the poor left ear scores (LC & LNC) on the SSW showed the greatest number of correlations with specific language tasks. The Word Repetition Subtest on the Boston correlated significantly with the SSW-Total score, 3 of 4 condition scores, and all 3 response biases. Repetition of words did not correlate with the LNC score. Looking at the CES and the Boston scores, poor left ear performance on the CES correlated with auditory comprehension, reading, and writing. Poor right ear performance

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correlated with overall severity of aphasia, naming, and oral reading. Paraphasic errors correlated with both right and left ear performance on the CES.

DISCUSSION: These results seem to lend support to the "lesion effect" model offered by Schulhoff and Goodglass. According to this model, a lesion effect is caused by a degrading of the signal and occurs regardless of whether the stimuli are verbal or non-verbal. Accordingly, if a lesion effect is demonstrated, one would expect that the verbal signal going to the left hemisphere via contralateral auditory pathways would be degraded or extinguished since the signal would be degraded at both the primary sensory and association levels. The verbal signal going first to the right hemisphere and then relayed to the left hemisphere via the corpus callosum, is only degraded at the auditory association level. On a non-verbal task, left ear scores reflecting the stimuli being relayed directly to the non-injured hemisphere would be near-normal. However, right ear scores would still be poorer since the signal goes first to the damaged L hemisphere. In a right dominant hemisphere subject with right hemisphere injury, opposite results would be anticipated. For Subjects 1, 2, 5, and 7 (see Table), the results are consistent with this model indicating L hemisphere damage which was supported by neurological studies. Subjects 9 and 10 showed results consistent with a R hemisphere lesion, according to the lesion effect model. This was documented for Subject 9. Subject 10 did not have a confirmed R lesion, but his medical history was suggestive of possible R hemisphere involvement. While no conclusive statements can be made for the remaining 4 Subjects, several explanations can be offered. Subject 4 demonstrated normal performance on both tests. His aphasia was also quite mild and the tasks may not have been difficult enough to show central auditory dysfunction. Subject 3 showed equal ear performance on the SSW. This is possibly due to L-AR plus corpus callosum involvement resulting in a bilateral pattern. Subject 6 showed a LE advantage of the SSW with bilaterally poor CES scores. While this patient had been diagnosed as aphasic, he demonstrated a very unusual speech pattern and some dysarthria was questioned. Possible R hemisphere damage would explain the CES scores. Subject 8 had a mild C-SSW score bilaterally but a mildly reduced CES score in the LE. The latter finding is unexplained.

TABLE

	NORMALS				APHASICS			
	SSW		CES		SSW		CES	
S	RE	LE	RE	LE	RE	LE	RE	LE
1	0	5	0	0	64	30	30	5
2	0	0	5	5	25	19	10	5
3	2	0	0	0	41	42	20	5
4	0	1	5	5	1	0	5	5
5	1	1	0	0	82	19	65	10
6	0	0	0	0	8	5	20	20
7	0	0	5	5	63	54	15	0
8	0	0	0	0	11	11	0	10
9	0	2	0	5	7	48	25	35
10	0	6	5	5	14	58	45	50

In summary, it is felt that while unanswered questions remain, the obtained data tend to support a lesion effect theory. The implication is that the signal is being degraded at a lower level, before it reaches the association area. If the aphasic is receiving a distorted message, the task of overall comprehension is that much more difficult. A test battery such as this may eventually be useful in the evaluation of aphasia. In addition, the CES, which is largely experimental at this time, seems to be an effective test when used in conjunction with the SSW for determining hemisphere involvement.

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CASE STUDY

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Mr. A. is a 55 year old male who suffered a CVA with resulting non-fluent aphasia. The patient was given a battery of tests which included pure tone and speech testing, SSW, CES, and The Assessment of Aphasia and Related Disorders. The following findings were obtained.

PURE TONE AND SPEECH TESTING: Mr. A. demonstrated a precipitous high frequency loss in the RE with normal hearing sensitivity in the speech range. He had a gradually sloping mild-moderate loss in the LE. Speech discrimination, using the W-22 word list, was 76% in the RE and 62% in the LE.

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TESTING APHASICS

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Aphasics are a select population and can present a number of complications when testing with the SSW according to the conventional method of administration. These problems are significant enough that they should be considered before testing aphasics or before evaluating the merits of research.

Subject selection should be done with caution. Severely involved or global aphasics would not be appropriate for this test since these patients probably would not have the prerequisite language skills to understand the demands of the task, or to give meaningful responses through any response modality.

While fluent or Wernicke's aphasics can be tested, they present certain problems as well. Giving instructions may be more time consuming due to auditory comprehension problems. These patients typically have many paraphasic errors, (i.e. the production of unintended phonemes, syllables, words or phrases) in their speech, especially on repetition tasks. In more severely involved patients, paraphasic errors might be present on all test items, or the paraphasic distortion might be so severe that speech output is jargon. This would make scoring very difficult.

Non-fluent or Broca's aphasics present yet another problem. Phonemic substitutions are prevalent in their speech and such errors would be common on test item responses as well. These phonemic substitutions are the result of motor programming involvement. However, any substitutions on the SSW might be considered an error. As a result, many of these patients would be categorized as moderate or severe on the SSW, indicating an involvement of the AR center. This is quite misleading as these patients reflect a verbal output problem rather than an AR deficit. In these instances radiologic and neurologic test results would be incompatible with the SSW results with regard to site of lesion. Patients with severe apraxia of speech, who have no verbal output, also generate profiles similar to those who have involvement of the AR center. Again, SSW results would appear incompatible with other methods of determining site of lesion.

The above problems are inherent in any study using aphasics. Therefore, research should explicitly state how subjects were selected and how these problems were accommodated. Without this information, it is difficult to evaluate the outcome of any research, and even more difficult to compare results across studies, yet this information is frequently omitted in the literature. It would also be helpful for the audiologist administering the SSW to have prior access to the results of the aphasic testing done by the speech pathologist, so that the audiologist might better anticipate potential problems and have additional insight into the interpretation of the SSW results. This situation is an excellent opportunity for professional cooperation.

In view of the above problems mentioned, one final consideration might be to offer aphasics an alternate means of responding on the SSW, such as a card sorting task. One suggestion would be to present on separate cards, pictures of the four monosyllables comprising each test item along with two foils, and instructing the patient to "put the words down as you hear them." In doing this, one must remember that the task has been modified by providing both auditory and visual cues, as well as by providing a closed set of response choices. It will be interesting to see how the conventional method of test administration correlates with this modified method.

If correlational studies show that test validity is maintained, this method of test administration would have several advantages. It gives patients an opportunity to demonstrate reversals, as these are sometimes obscured by moderate or severe scores on the SSW. It would also allow the patient to respond more immediately, thereby, lessening the chance of the patient forgetting part of the stimulus. Many of the apraxic and non-fluent aphasics are so distracted by their struggle to initiate the sequence, that the remainder of the sequence is forgotten.

As in many cases more questions are raised before the sought-after answers are found. However, this appears to be a viable avenue of continued investigation.

LOCALIZING LESIONS OF APHASICS: THE SSW AND BOSTON TESTS

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INTRODUCTION: The purpose of this study was two-fold; 1) To compare the SSW test with the Boston Diagnostic Aphasia Examination to determine the applicability of the former test in supplying localizing data for cerebral site of lesions, and 2) to investigate the relationship between the measurement of auditory processing skills in aphasic population by the SSW and the Boston Diagnostic Aphasic Examination.

SUBJECT SELECTION: ten adults, 7 males and 3 females, with a mean age of 43 years, were included in this study. All presented with a history of cerebral pathology due to one of the following: 1) CVA; 2) A-V malformation, 3) cerebral trauma, or 4) infectious diseases. The mean months post onset for the group was 14.3. All Ss had normal hearing sensitivity within 25dB HTL and WDS of no less than 30% in each ear.

From this group of subjects, a subgroup of five adults was selected. All subjects in the subgroup were receiving treatment for aphasia. The mean months post onset for the subgroup was 10 at the initiation of therapy.

RESULTS AND DISCUSSION: The localization data were organized in a four-fold table to test for signifance of changes between anterior-posterior identification of lesions as indicated by the Boston and SSW tests. No significant difference was found between them in the probability for identification of anterior vs. posterior lesions.

Analysis of intraindividual results indicated consistency in identification of site of lesion for 80% of the cases studied. The greatest agreement between the two tests was found for lesions involving Wernicke's area of the temporal lobe, in which there was complete correspondence. This evidence is support for the premise that the SSW is ideally sensitive to disorders of the auditory cortex. There was also good agreement for lesions involving Broca's area, in which a bimodal profile of SSW results were observed based on severity of involvement. For those patients who showed mild aphasic symptoms (overall PICA ≥ 80%tile), identification of solely motor involvement was demonstrated. Patients who presented moderate aphasic symptoms (overall PICA ≤ 60%tile) were identified as having a lesion of the motor area as well as involvement of the AR area. This effect was apparently due to either the patient's inability to phonemically encode the required response which had been correctly comprehended auditorily, or to the more general involvement of auditory processing skills which is concomitant with cerebral infarcts that are more massive than in circumscribed area of the inferior frontal convolution and extended posteriorly to involve additional areas.

The two cases of disagreement between the SSW and Boston Examination involved posterior lesions not including the auditory reception area. One patient presented primarily word finding and reading comprehension difficulties and was identified as having an anterior lesion by the SSW. While not corresponding to the lesion seemingly responsible for the presenting symptoms at the time of testing, it is suggested that such information be used as a basis for further investigating the patient's case history to determine if a previous cerebral insult had occurred and which, in some cases may effect the diagnosis of the present characteristics. The second case exhibited a conduction aphasia as determined by the Boston Examination and was identified as having an anterior lesion by the SSW. Inasmuch as repetition difficulty is a primary diagnostic characteristic of this type of aphasia, the identification of a lesion in the motor cortex with intact auditory comprehension is consistent with the presenting symptoms of conduction aphasia on an imitative task. Consideration of other phenomena, e.g. literal and verbal paraphasia, which the SSW does not take into account, seem necessary in these cases to correctly identify the site of lesion.

As a measure of auditory processing skills, the SSW was found to exhibit a strong, moderate correlation ($r = -.70$) with the auditory comprehension scores from the Boston Diagnostic Aphasia Examination. As an instrument designed primarily to detect AR disorders, and with the demonstrated relationship to at least one format currently utilized in testing for auditory comprehension deficits, it appears that the SSW is well suited for use as a measure of recovery in auditory processing skills following treatment. Further research is necessary to

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study the association between results of the SSW and other comprehension instruments which utilize different formats than the Boston Examination. However, when used in this way, the SSW can provide a supplement to the limited sources of auditory comprehension batteries currently available to the clinician.

The SSW appears to be a viable instrument for the aphasiologist's diagnostic battery for determination of site of lesion. While its utilization is not recommended for testing with all aphasic patients, especially the severely involved (PICA ≤ 30%tile) or easily frustrated, it seems that with continued application, interpretation of test profiles may yield significant information to aid in diagnosis of aphasic patients. A comparison of the subgroups pre and post therapy findings on the SSW revealed what was considered significant changes in the Response Bias on all subjects tested. It is believed that the SSW can be used as an instrument for quantifying improvement through the use of an auditory processing task following treatment.

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<u>SSW & CES TEST RESULTS</u>: Raw SSW results are as follows:

RNC	RC	LC	LNC
5	8	60	35

Using C-SSW scores the following was obtained:

T = -4	N
E = -18	O
C = -19/+22	O-Mi
Comb =	O-Mi

A type A pattern was demonstrated with an LC peak. A significant H/L Order Effect was shown.

On the CES, the patients' scores were: RE = 25%, LE = 35%, M error = 30%.

<u>DISCUSSION</u>: According to the lesion effect theory, looking at both the SSW and CES scores this patient has a R-hemisphere lesion as was shown by poorer LE scores on both tests.

This case is interesting in that the patient had a very definite moderately involved aphasia, and one would normally suspect a L-hemisphere lesion. This was, further, a L-handed individual with L-sided paralysis. The medical and neurologic work-up confirmed the presence of a R-hemisphere lesion, with no evidence of bilateral involvement. The only conclusion, therefore, was that this is a rare case of an individual in which the R-hemisphere was dominant for speech and language. The SSW and CES, when used together, were quite reliable in this case in identifying the right hemisphere involvement.

A CASE OF SEVERE MEMORY LOSS MONITORED ON THE SSW TEST

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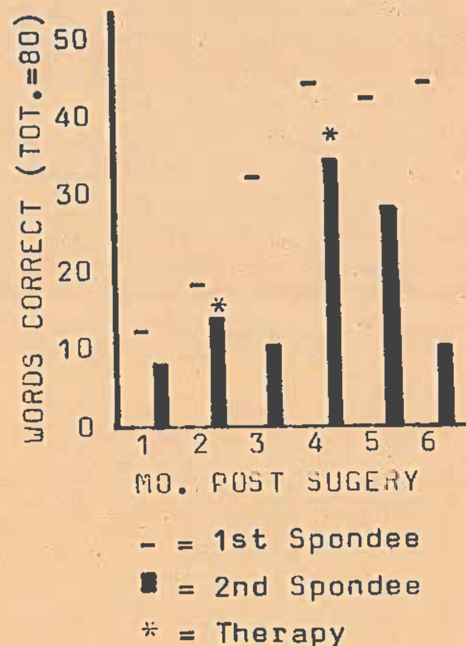
A 47 year old man developed focal seizures Dec. 1973. They involved the R-side of his body along with the smell of burning paper. By April 1974 the seizures were worse and he experienced transient aphasia. Pneumoencephalograms indicated a L-temporal lobe tumor (although brain scans, EEG's and spinal fluid proteins missed it). Arteriograms were inconclusive. In May the tumor was removed as well as 6cm of the temporal lobe.

One month following surgery he showed marked impairment in communication (PICA = 24th percentile compared to other aphasic pts). He had great difficulty in recalling the names of people and objects. His spontaneous verbal production consisted of single words.

A language comprehension program was then instituted (Kushner & Winitz, <u>JSHD</u>, 1977) for a period of 1-mo, a 1-mo period of no-therapy (NTh), a final month of therapy (Th) and then 2 consecutive mos of NTh. The pt was tested on the PICA and the SSW each month to monitor progress. PICA went from the baseline of 24 to 44, 44, 65, and 72 by the 5th month post operatively.

The SSW TEC was <u>S</u> for each of the 6 tests, however there was a significant Order Effect L/H on 5 of them. The figure below shows 2 patterns of recovery. The 1st spondee seems to follow the general trend of the PICA results with improvement over time without particular correspondence to the Th. However, the 2nd spondee reflected Th very closely.



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You can see that the 1st spondee increases from 11 and asymptotes between 40-45 words correct. The 2nd spondee begins with 8 wds right and with 1 mo of Th advances by 6 words. During the next mo of NTh some of the previous improvement is lost. The 2nd mo of Th brings the greatest advance to a score of 33 but this improvement falters a bit after a mo without Th and is almost back to the pre-therapy baseline after 2 mo without language Th. The 4th monosyllable was even more responsive with 4 words correct for baseline, then 8, 4, 20, 17 and finally 4 again.

This case seems to illustrate the dynamics and responsiveness of the SSW. OBSERVATIONS: 1) Diagnostically, most of the temporal lobe was removed surgically. Thus, it is not surprising that he had the Order L/H which is associated with the posterior temporal region. The Order Effect was not offset in this case by the absence of the anterior temporal lobe.
2) In this case the 1st and 2nd spondees appear to be tapping different aspects of the recovery process. Perhaps we could hazard a guess that the improvement on the 2nd spondee is due to the training/stimulation of the remaining posterior temporal structure.
3) The recovery that was demonstrated on the 2nd spondee of the SSW items did not appear to be lasting at least within the confines of this study. That is after 2 mo without Th the 4th monosyllable that had shown great improvement (from 10% correct to 50% correct) returned to the original baseline.

OH - MA - GA

The next 3 workshops will be in Akron, OH, Dec. 11-13; Boston, MA, Jan. 8-10 and Atlanta, GA, Feb. 19-21.

ADVANCED WORKSHOP POSSIBLE FOR JAN. IN NJ

COMMENT ON: TESTING APHASICS (page 3)

The observations of these speech pathologists are quite significant as they have each carried out studies using the SSW with aphasic patients. It would be interesting to compare just how much leaway we do give to an aphasic/apraxic patient. Julia Lukas and Ora Eschenheimer have used the 4 words of the item plus one foil written out clearly on cards for an aphasic patient to use. I have added a second foil. For example for item #1 use: up, stairs, down, town, as well as tooth and brush from #21. This has worked out quite well for patients with expressive difficulties. Yes, we need to find out how this response mode helps/confuses the diagnosis.

j.k.

-APPRECIATION-

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