

# SSW reports

VOL. 6 NO. 4

LEARNING DISABILITIES

NOV. 1984

## REPORTING RESULTS OF SSW & CENTRAL AUDITORY-LANGUAGE PROCESSING TESTS

by

Jay R. Lucker, Ed.D.

Private Practice in  
Audiology & Rehabilitation  
Scarsdale & Ossining, New York

Audiologists are trained to administer and score the SSW and other central auditory-language processing tests. However, we are not trained sufficiently to interpret the results of our CAP test batteries with children, especially to the people who most need the information (school personnel, parents, etc.)

The typical approach employed by audiologists is to utilize the adult model ("site-of-lesion" approach) to interpret and report CAP results with children. Most would agree that a specific site-of-lesion does not exist in learning disabled children with CAP deficits. The interpretations of the SSW test are based on the system I reported in past issues of the SSW REPORTS.

### CASE 1

**BACKGROUND:** OLS age 5-2, had finished her first year of half day nursery school. She was referred for a complete audiological evaluation by her school and pediatrician. She had delayed development of speech and language (including: multiple articulation errors, immature syntactic skills, poor auditory memory, difficulties following verbal commands/directions and a habit of saying "WHAT!" to most auditory messages).

**AUDITORY ACUITY:** Hearing thresholds for pure tones and speech (SRT) were within normal limits for both ears as were middle ear immittance measures. These results would indicate that any CAP deficits found were not due to a hearing impairment/ear problem at the time of testing.

### SUMMARY OF THE TEST RESULTS

#### PURE TONE THRESHOLDS

Frequency	250	500	1000	2000	4000	8000
Right ear	10	5	10	5	10	20
Left ear	10	5	5	5	10	15

#### IMMITTANCE & SPEECH AUDIOMETRY RESULTS

	RE	LE
Compliance:	0.45cc	0.60cc
Shape:	Peaked	Peaked
MEP:	0 daPa	-50 daPa
Ac. Ref.	Normal	Normal
SRT	5 dB HL	5 dB HL
WDS (NU-6):	100%	100%
(at 50 dB HL)		

#### CENTRAL AUDITORY-LANGUAGE PROCESSING

**ABILITIES:** OLS was found to have significant deficits in auditory-language processing: 1) poor attention and focusing abilities (difficulty in focusing or maintaining attention on relevant stimuli). 2) Deficient interpretative skills (She appeared only to be able to decode one small item at a time, becoming overloaded when dealing with longer messages).

It should be remembered that at age 5 years, most auditory-language processing skills are developing. Therefore, the responses obtained on the CAP

tests must be interpreted in this light. Normative data available on CAP tests are primarily for older children. Despite the lack of suitable norms, we can infer that she has significant AP difficulties because of above average Perf. IQ (126 on WPPSI) and seemingly adequate language stimulation in the home. Yet, the patterns of auditory-language development found in OLS are more likely to be found in a much younger child.

**LUCKER AUDITORY PHONEMIC ANALYSIS (LAPA) TEST** (Developed by Jay R. Lucker)  
@35 dB HL (\* = abnormal LAPA score)

Verbal/Quiet

RE = 100% LE = 96%

Picture Pointing/Quiet

RE = 88% LE = 88%

Verbal/Noise (S/N = 0)

RE = 64%\* LE = 72%

Picture Pointing/Noise (S/N = 0)

RE = 60%\* LE = 64%

**SSW TEST**

8 CNs: (REF) 7-7-4-3 (LEF) 6-12-8-7

R-SSW = C-SSW:

RNC=35 RC=38 LC=40 LNC=22

Lucker Type 2 Pattern

Response Bias:

Ear: 21/33 Order: 32/22

Type A: None

Reversals: None

**PITCH PATTERN PERCEPTION**

Hummed/Sung = Could not follow directions, able to do two patterns but inconsistent (discontinued test).

**CASE 2**

**BACKGROUND:** DY, age 9-5, was in a regular fourth grade. She was identified as language learning disabled by the COH. Her WISC-R Performance IQ was normal (101) but her Verbal IQ was below normal (79), yielding a significant discrepancy. DY was found to be a poor reader (1st grade level) with problems in decoding, sound recognition, spelling, writing, as well as math and language arts. She often reversed word and letter order. The speech-language evaluation revealed syntactic and word order errors, problems in auditory

memory and articulation, especially in repeating what she heard, yet her auditory discrimination (Wepman Test) was not as poor as one might expect. Many of these observations were noted in school as well as at home. Because this was near the end of the school year, the COH was considering either retention in fourth grade or placement in a special school. DY was referred for an audiological evaluation because she'd never had a thorough hearing assessment (even for the initial COH diagnosis).

**AUDITORY ACUITY:** Hearing thresholds were normal, as were middle ear immittance measures. These results indicate that any auditory-language processing deficits would not be due to a hearing or ear problem.

**CENTRAL AUDITORY-LANGUAGE PROCESSING ABILITIES:** DY revealed significant deficits in auditory-language processing related to: 1) distractibility and maintaining appropriate attention; and 2) breakdown in those processes related to integrating sound and symbol relationships.

**CONCLUSIONS & RECOMMENDATIONS:** DY revealed a specific auditory-language deficit related to a breakdown in sound-symbol integration. This deficit could be expected to interfere with development of reading and spelling, and other abilities in which visual imagery and auditory-linguistic skills must be integrated.

Classroom and home management should not be difficult if DY is required to utilize only one modality. She will profit if visual approaches to learning are stressed first, then only auditory approaches to the same material and finally integration of both the auditory and visual (a-v) approaches.

Because of these deficits, specific remediation should be considered. DY would profit from methods utilizing her visual strengths to monitor and overcome her a-v integration deficits. Later, strategies to improve a-v integration should be worked on.

SUMMARY OF THE TEST RESULTS

PURE TONE THRESHOLDS AND SRTs:

0 dB HL for both ears at all frequencies

IMMITTANCE AND WDS RESULTS

	RE	LE
Compliance:	0.75cc	1.20cc
Shape:	Peaked	Peaked
MEP:	0 daPa	0 daPa
Ac. Ref.:	Absent	Absent
WDS (NU-6):	96%	100%

LUCKER AUDITORY PHONEMIC ANALYSIS (LAPA) TEST @ 30 dB HL (\* = abnormal LAPA score)

Verbal/Quiet: 100% both ears  
Picture Pointing/ Quiet:  
RE = 88% LE = 100%  
Verbal/Noise (S/N=0):  
RE = 84% LE = 84%  
Picture Pointing/Noise (S/N=0):  
RE = 60%\* LE = 68%\*  
Verbal/Competing Message (MCR=0)  
RE = 64%\* LE = 60%\*  
Picture Pointing/Competing Message (MCR=0):  
RE = 40%\* LE = 40%\*

SSW TEST

8 CNs: (REF) 0-1-3-1 (LEF) 0-10-2-0  
R-SSW: RNC=0 RC=8 LC=32 LNC=2  
C-SSW: RNC=-4 RC=4 LC=32 LNC=2  
Lucker Type 1 Pattern  
Response Bias:  
Ear = 5/12 Order = 11/6  
Type A Pattern  
Reversals = 0

COMPETING SENTENCES (WILLEFORD)

RE = 100% LE = 90%

SIMULTANEOUS SENTENCES (based on WILLEFORD) \* = abnormal

RE = 60%\* LE = 30%\*

PITCH PATTERN PERCEPTION (Presented diotically)

Hummed/Sung = 100%  
Saying/Verbal Response = 70%  
(abnormal)

CASE 2 (Continued)

DY 10 Yr. Old Girl - 1 Year Follow Up

In addition to her previous ser-

vices, DY receives individual remedial services with me 1 hour per week.

AUDITORY ACUITY: DY still reveals normal hearing and middle ear immittance functioning for both ears.

CENTRAL AUDITORY-LANGUAGE PROCESSING

ABILITIES: Interestingly, DY demonstrated some improvements on the central auditory-language tests but not as much as one would expect based upon the significant improvements noted in academic areas and during remedial work. It is felt that the central auditory language testing is revealing that the deficit areas required for accurate sound-symbol processing still break down when novel and unpracticed tasks are employed. Yet, as discussed below, many of the deficits noted in actual everyday and academic functioning are not as severe or as overtly evident as they were last year.

DY does show significant improvement in the areas of attention and distractibility. The test results one year after the initial testing revealed that competing messages no longer cause the severe breakdown for DY. However, when required to integrate sound-symbol information and tune out distraction while attending, there is still weakness as she is thrown by the competition.

CONCLUSIONS & RECOMMENDATIONS:

Significant improvement has been noted during our remedial work. DY is able to employ her visual strengths to use little words in big words to improve reading (encoding/decoding) and spelling. She is also able to approach a reading or writing task in an organized thought-out manner utilizing our WH-Strateg successfully. She is much better able to focus upon what is meaningful and relative and tune out irrelevant/distracting information whether auditory or visual or even linguistic.

It is interesting to note the improvements in school and at home. DY's mother reports that DY shows a greater interest in reading and school work, has many more friends and social activities than before, and feels good about her

elf. The school notes that overall academic achievement has increased. Reading is at the third grade level (two years growth) with instructional reading at the fourth grade level. DY is able to take third grade reading material in academic areas (eg. social studies) and read for meaning and write reports and take tests more accurately and appropriately for her age and grade (now fifth grade). Her math is still weak but progressing. Spelling has improved (greatly) DY is able to function and compete with her classmates in regular class (albeit in the lowest spelling group).

It is recommended that the program be continued next year with assistance in resource, speech-language and audiology.

RESULTS OF THE RETESTS

PURE TONE THRESHOLDS AND SRTs:  
 0 dBHL across frequencies for both ears  
 WDS (NU-6) = 100% for both ears

IMMITTANCE MEASURES:

	RE	LE
Compliance:	0.45cc	0.60cc
Shape:	Peaked	Peaked
MEP:	0 daPa	0 daPa
Ac. Ref.	absent	absent

CAPPA TEST @ 30 dBHL (\* = abnormal score)

Verbal & Picture Pointing/Quiet:	RE = 100%	LE = 100%
Verbal/Noise (S/N=0):	RE = 88%	LE = 84%
Picture Pointing/Noise (S/N=0):	RE = 72%*	LE = 76%
Verbal/Competing Message (MCR=0):	RE = 72%*	LE = 72%*
Picture Pointing/Competing Message (MCR=0):	RE = 52%*	LE = 60%*

SSW TEST

SCNs: (REF) 0-0-1-0 (LEF) 0-8-0-0  
 R-SSW = C-SSW:  
 RNC=0 RC=0 LC=22 LNC=0  
 Lucker Type 1 Pattern

Response Bias:  
 Ear = 1/8 Order = 8/1  
 Type A Pattern  
 Reversals = 1

CES TEST (standard method):  
 Right ear = 0 (error score)  
 Left ear = 0 (error score)  
 (Lucker Modification; no pictures): 20% for each ear

COMPETING SENTENCES  
 100% for both ears

SIMULTANEOUS SENTENCES: (\* = abnormal)  
 RE = 70%\* LE = 50%\*

\* \* \* \* \*

WHAT CHARACTERISTICS OF SSW ITEMS ARE DIFFICULT FOR LD CHILDREN?

Floyd Rudmin  
 Queen's University  
 Kingston, Ontario

At the 1978 SSW Study Group in Toronto, I presented a study comparing the SSW performance of a group of LD children against that of a group of normal controls. There I reported and interpreted Pearson correlation coefficients. The Pearson r is very sensitive to skewed data because outlier values have an excessive influence on the squaring computations. In the 1982 report, I tried to reduce such distortion by eliminating an item (#20) from the analysis because it was missed by an unusually large number of children. Less extremely skewed data were retained.

In this present written report of that study, no items are eliminated, but the Spearman correlation is used rather than the Pearson. The Spearman correlation is a rank-order, non-parametric statistic that is not distorted by outlier values. Thus the present report is both more conservative and more representative of the children's SSW performance than was the earlier oral report.

Subjects were 23 LD children (from Katz, Harder, and Lohnes, 1977) and 23 normal controls (from the National Sample),

matched for sex and age to within 1 month. Mean age was 9-3, ranging from 7-0 to 11-7. In each group, 19 were male, 4 female.

**Design** was to search among characteristics of the SSW spondaic words for significant predictors of a difference in performance between the two groups. The predictor variables were of three types:

**Alignment Variables** included measures of the amount (in msec) by which the competing monosyllable (CM) led or lagged behind the CM in the other channel. These were measured at several alignment points: word onset, word offset, word center, and sonorancy onset, offset, and center. (Sonorancy refers to voicing with an open vocal tract, so that in "stairs" (#1), /st/ is pre-sonorant, /air/ is sonorant, and /s/ is post-sonorant.) Alignment predictors also included the msec of each CM that were in fact not competing at onset, offset, in total, and as a proportion of the item duration.

**Phonetic Variables** included acoustic measures (in msec) of the CM's pre-sonorancy and post-sonorancy duration, as well as of the total word duration and the duration of the pause separating the competing from the non-competing monosyllable of each spondee. Phonemic predictors also included whether or not the CM started or ended with a plosive, a fricative, a nasal, or a liquid phoneme, and whether or not the same phoneme started or ended both CMs, as does the /l/ in day-light/lunch-time.

**Linguistic Variables** included 4 measures of word familiarity, 2 measures of the semantic linkage of the mono-syllables of each spondee, 2 measures of the word discrimination difficulty of the competing monosyllables, 2 measures of the semantic attractiveness of the foil response, and a measure of the meaningfulness of the recombination of the second CM with the first.

**Results** show which of the descriptive variables were significant predictors ( $p=.05$ ) of performance differences bet-

ween the LD and normal children on the SSW EC test. First (lead) and second (lag) spondees were analyzed separately. Correlations of the descriptive variables with the difference scores (normals' errors minus LDs' errors) appear in brackets.

#### FIRST SPONDEE

PREDICTORS	INTERPRETATIONS
CM Word Duration (+.27)	As the CM gets longer, LDs tend to err less. Normals are unaffected.
Liquid Onset (-.36)	If the CM starts with /l/, both groups tend to err, LDs more than normal.
Plosive Offset (-.36)	If the CM ends with a plosive, both tend to err. LDs more than normals.
Foil Strength (-.30)	As the foil becomes more attractive, both tend to err, LDs more than normal.
CM Recombinations (+.33)	As the CM recombinations become meaningless, both tend to err, LDs more so.

#### SECOND SPONDEE

PREDICTORS	INTERPRETATIONS
Word Center Alignment (-.30)	As the CM leads the other channel at word center, LDs tend to err. Normals are unaffected.
Frication Onset (+.26)	If the CM starts with a fricative, LDs err less. Normals are unaffected.

In a multivariate correlational analysis there is the possibility that two or more significant correlations represent different aspects of the same underlying factor. Cluster analysis (a non-parametric factor analysis) of the predictor variables was used to search for such a possibility. Only the phonetic variables of liquid onset and plosive offset were found to be inter-related. By coincidence, CMs starting with liquids also end with plosives (light

Amherst, NY 14226  
4226 Ridge Lea Rd.  
SSW REPORTS

land, lamp). So those 2 variables should be considered as a single predictor.

#### Discussion

Thus, the LDs seem to be abnormally disrupted in the lead ear by 1) short CMs, 2) with liquid onsets and plosive offsets, and by 3) attractive foil items and 4) meaningless CM recombinations. In the lag ear, LDs are abnormally disrupted by 5) too early a presentation of the CM relative to the lead channel and by 6) CMs starting with phonemes other than fricatives.

Findings 1, 2, 5, and 6 would concur with those who argue that LD children have difficulty processing transient, rapid auditory stimuli. Findings 3 and 4 would suggest that the semantic coherence of the message plays a critical role with LD children. Further, it would seem that semantic processing is not just a forward, linear, word-to-word process, but more like a semantic reverberation, with forward and backward, near and distal semantic combinations

contributing to processing.

Two hypotheses suggest themselves. It appears that LD children suffer an acoustic phonetic processing deficit, an inability to grasp the sounds fast enough. This either leads to a reliance on semantic processing as a compensation strategy, or alternatively, it results in a release of the semantic processes from their forward, word-to-word linkages, to allow meaningfulness to become jeopardized. By the first model, semantic processes are salvaging meaningfulness and should be encouraged. By the second model, they are threatening meaningfulness and should be restricted.

Of course, a correlational study on a small sample, such as this, requires replication before it can be taken very seriously. Also, the worth of the 2 hypotheses should be explicitly examined by further studies. But it is apparent that an item analysis of the SSW does reveal functional differences between normal and abnormal populations that might not be noted by traditional scoring and interpretation.