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THE PERFORMANCE OF LEARNING DISABLED CHILDREN ON THE SSW TEST

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Over a five year period (1977-1982), 49 children were tested, and a profile of their diagnostic studies was prepared. The 49 children included were referred consecutively to Gallaudet College Audiology Clinic by Howard University Child Development Center, i.e., no preselection or random selection of the subjects was made- a total of 49 children were referred, and all 49 were included in the subject population. All children received a six-week multidisciplinary study. The profile data tabulated provided information relative to the detection of Central Auditory Processing problems through Differential Diagnosis and the effect of these problems upon the child's overall academic performance.

The six-week diagnostic evaluation was completed by a multidisciplinary team. The team was composed of physicians available in the specialties of pediatrics, neurology, psychiatry, opthamology, genetics, orthopedics, neurosurgery,physiatry, radiology, otolaryngology, and metabolism. Specialists in related disciplines included psychologists, social service personnel, child development specialists, public health nurses, speech pathologists, and licensed practical nurses. The complete study included a home visit and school visit to appraise and evaluate the child's total enviornment.

Profile data revealed that of the 49 children sixteen (33%) had repeated a grade before referral was made. General information data identified a population of 49 black children ranging in age from 7 to 11 years. 35 (71%) were male and 14 (29%) were female. Range of grade placement was from kindergarten to fifth grade for 47 (96%) subjects and 2 (4%) children were in ungraded settings.

The source of referral was from school personnel (teacher, principal, counsellor) (42%); 25% were referred by parents, relatives or family friends; 19% by physicians (usually pediatricians); 13% by agencies or clinics and 2% were referred through other sources.

Number and percentages for Major Referral Reason were numerous and results are delineated in the chart below. Each subject was listed for each applicable category (e.g., "Academic Delay" is the total of 3 other entries).

The final diagnosis was summarized at the end of the six-week diagnostic study for each child. The following chart illustrates diagnostic data compiled.

All children were evaluated with a Central Auditory Nervous

Major Reason for Referral	No.	%
Academic Delay	41	85
Emot./Behav. Prob.	27	56
Acad. Delay/Behav. Prob.	21	44
Academic Delay (ONLY)	19	40
Emot./Behav. Prob. (ONLY)	6	13
Comm. Prob./Speech Delay	5	10
Hearing Problem (ONLY)	3	6
Acad./Behav./Comm. Prob.	2	4
Other	2	4

Diagnosis	No.	%
Specific Learning Disab.	49	100
-vis. process. prob.	11	23
-aud. process. prob.	2	4
-aud.& vis. proc. prob.	36	73
Emot. Dis. (Primary)	19	40
Emot. Dis. (Secondary)	19	40
Speech/Lang./Comm.Dis.	13	27
Medical Disorder	13	27
Aud. Dis. (Conductive)	4	8
Mental Retardation (Mild)	1	2

System (CANS) test battery (which included the tests from what is commonly referred to as the Willeford Battery, the SSW test and time compressed speech) and 100% were reported as having processing difficulties as evidenced by poor scores on one or more of the tests in the CANS test battery. 45 of the 49 children had some type of diagnostically useful information on the SSW test. The HUCDC multidisciplinary team reported that 77% of the 49 children tested either had auditory processing problems alone or had both auditory and visual processing problems in combination. Again, referring to the chart, 19 (40%) were diagnosed as having a Primary Emotional Disorder and 19 (40%) were diagnosed as having a Secondary Emotional Disorder. A majority of the children tended to show signs of some type of emotionality throughout the diagnostic evaluation.

The evaluation of Academic Achievement revealed academic delay which ranged from four years or more to one year below grade expectations. The devastating effects upon learning (referring to the basic subject areas of reading,spelling and math) is evident. 21 (43%) children demonstrated a 1 year lag in academic achievement; 13 (27%) demonstrated a 2 year lag; 4 (8%) demonstrated a 3 year lag; and 3 (6%) demonstrated a 4+ year lag academically; 8 (16%) demonstrated no lag at all. In only a few cases, in spite of learning problems, children were able to compensate and perform at grade level.

CANS tests appear to be potentially strong diagnostic tools for the learning disabled population. With an understanding of the nature of the group, we can now look at the SSW test to determine how well it corroborates the findings of the multidisciplinary team.

The performance of the children in our group on the SSW was compared to the data obtained from the National Sample (NS) for the right non-competing (RNC), right competing (RC), left competing (LC), left non-competing (LNC) and total (T) corrected SSW (C-SSW) (Katz, Johnson and White, 1981) means and SDs.

In terms of the response biases (RB) a significant Order and Ear Effect were considered to be present when there was a difference of ten. This criterion was suggested

by Katz (1981). A significantly large number of reversals were considered to be 10 or more regardless of age. This criterion was suggested by Lucker (1981). If a Type A pattern occurred simultaneously with any Ear or Order Effects, the Ear and Order Effects were considered to be invalid (Katz, 1978). Lucker's diagnostic interpretation of the SSW-gram was used with our group. He has classified the various patterns into 4 categories: 1) Pattern 1 is a single peak in the LC condition regardless of patient handedness; this category has been subdivided into Pattern 1a in which the peak exceeds adult norms and 1b in which the peak exceeds adult and children's norms; 2) Pattern 2 is the double peak configuration (relatively equal peaks in the RC and LC conditions); 3) Pattern 3 is the configuration associated with normal results; 4) Pattern 4 is present when there is a peak in the RC condition.

PATTERN	PEAK	LUCKER	HUCD
1a	LE	14%	6%
1b	LE	48%	51%
2	Both	16%	24%
3	None	21%	15%
4	RE	1%	4%
		100%	100%

Table 1 presents the data for the group for the RNC, RC, LC, and LNC test conditions, and compares the means to the data from the NS. In the RNC condition only the 10 year old group exceeded the cutoff limit. For the RC condition the cutoff limits (mean +1 standard deviation) was equalled or exceeded by all age groups, except the 9 year old group. For the LC condition the cutoff limit was equalled or exceeded by all age groups. For the LNC condition, the cutoff was equalled by the 9 year old group and exceeded by the 8 year old group. Looking at the data another way, we observe that of the 49 children tested, 10 exceeded the cutoff limit for the RNC condition, 21 for the RC condition, 30 for the LC condition and 15 exceeded the cutoff limit for the LNC condition. In terms of yielding diagnostically useful in- formation, it would appear that the LC and RC conditions are the most sensitive. Of the 49 children, 35 exceeded the limits for one or more conditions, yielding a hit rate of 71%.

TABLE 1
MEANS FOR C-SSW CONDITION SCORE FOR HUCD GROUP COMPARED TO CONDITION SCORES OBTAINED FROM THE NATIONAL SAMPLE

CONDITION	7YR	8YR	9YR	10YR	11YR
RNC					
HUCD MEAN	6%	0%	-1%	5%	1%
NS CUTOFF	8%	4%	4%	4%	4%
RC					
HUCD MEAN	28%	13%	9%	12%	9%
NS MEAN	10%	6%	5%	5%	1%
NS +1 SD	17%	13%	10%	10%	4%
LC					
HUCD MEAN	46%	29%	21%	17%	15%
NS MEAN	20%	10%	10%	10%	5%
NS +1 SD	28%	18%	19%	17%	11%
LNC					
HUCD MEAN	5%	5%	4%	3%	-2%
NS CUTOFF	8%	4%	4%	4%	4%

National Sample (NS) 1981

Table 2 shows how the group compares to the NS group for the total C-SSW score. Of the 49 children tested, 28 exceeded the cutoff limit for the total C-SSW score. In terms of age groups, we observe that 6 of 9 in age group 7, 6 of 11 in age group 8, 8 of 15 in age group 9, 3 of 8 in age group 10 and 5 of 7 in age group 11 exceeded the cutoff limit. 71% of the 11 year

old children had scores that exceeded the cutoff limit while 67% of the 7 year old group had scores that exceeded the cutoff limit. One might interpret this to mean that any maturational lags have not been "made up" by age 11.

TABLE 2
MEANS FOR TOTAL C-SSW FOR HUCD & MEANS +1,+2 STANDARD DEVIATION FROM THE NATIONAL SAMPLE (NS)

AGE	HUDC MEANS	NATIONAL SAMPLE MEANS	+1SD	+2SD
7	22%	8.5%	13.3%	18.1%
8	11%	4.2%	8.6%	13.1%
9	9%	3.6%	8.1%	12.7%
10	9%	4.1%	7.2%	10.3%
11	6%	.5%	3.6%	6.6%

Table 3 displays the array of response biases observed among our group on the SSW test. One of the more apparent RB is the Type A pattern. Twelve, or 24%, of the 49 children tested had a Type A pattern. According to Lucker (1981) a Type A pattern is associated with reading, writing and spelling problems. Our results compare closely with results obtained by Lukas and Eschenheimer (1981). They found that 21% of their population of learning disabled children had Type A patterns. Our group data also agrees well with Lucker's (1982) results in which 26% of his population of 90 learning disabled had Type A patterns.

Another frequently discussed and observed RB is reversals. Lucker (1981) found reversals in 61% of his sample. However, only 28% of his population had more than 10 reversals. Kushner, Johnson and Stevens (1982) found reversals (defined by these authors "as a change in word order; that is, words that are repeated in any order other than the order in which they were presented") in 20% of their population of LD children. Pinheiro (1977) tested 14 LD children, and found the average number of reversals to be 4.8 with 6 subjects (43%) having more than 5 reversals. However, only 16% had more than 10 reversals. Lucker (1981) feels that children with 10 or more reversals are typically described as being unable to follow sequential directions, unable to complete assignments independently, and to be disorganized.

Lukas (1980) notes that Katz believes that a child with a H/L (High/Low) Order Effect may have a memory problem, i.e., the child loses the inital pieces of information and retains the more recent. Lucker (1981) points out SSW workshop information that a child with a L/H (Low/High) Order Effect tends to have poor phonemic processing. Lucker states that the diagnostic significance of a child with a L/H (Low/High) Ear Effect is poor auditory processing in the dominant hemisphere related to auditory-linguistic overloading.

TABLE 3
SSW RESPONSE BIAS RESULTS FOR EACH HUCD AGE GROUP

AGE	N	ORD EFFECT	EAR EFFECT	10/MORE REVERSALS	TYPE A PATT'N	DOUBLE PEAK	LE PEAK	RE PEAK
7	8	4	1	2	2	4	4	0
8	11	1	1	0	5	2	7	0
9	15	2	0	2	3	2	11	2
10	8	0	0	3	1	2	2	0
11	7	0	0	1	1	2	3	0
SUM	49	7	2	8	12	12	28	2

Ear and Order Effects were not a very prominent RB for our group. Only 7 of the 49 children tested had an Order Effect, and 2 of those 7 had an Ear Effect. The 7 Order Effects were H/L, and the two Ear Effects were L/H. You may recall that it was discussed earlier that Ear and Order Effects can be assumed to be invalid when a Type A pattern is present. When this interpretation is applied to our subjects, we find that 5 of the 7 cases also had a Type A pattern, which means that only 2 of the 49 children tested (or less than 5%) had a valid Ear or Order Effect, and both of these were H/L Order Effects.

Lucker (1981) found Order Effects in 12% of his sample, and Ear Effects in 8% of his sample. Kushner, Johnson and Stevens (1982) found Ear Effects in 55% of their sample, and Order Effects in 60% of their sample. One possible explanation for the difference in percentages of subjects demonstrating Ear and/or Order Effects is that of the interpretation of what constitutes an Ear and Order Effect. In interpreting our group data, we did not consider the subject to have a significant Ear or Order Effect, unless there was a difference of 10 or more, whereas many other researchers use a difference of 5 to constitute a significance. If we use a difference of 5 as being significant, then we find that 65% of our group had significant Ear and Order Effects and this agrees well with the Kushner, Stevens and Johnson data.

Another prominent finding was the SSW-gram results. Table 4 compares Lucker's (1981) findings with those of the present study. The only major difference between Lucker's data and the data for our group on the SSW-gram is in the number of subjects showing pattern 3 (normal) SSW-grams.

Based on the results of our data, it seems tha the SSW test provides diagnostically useful information in several areas. It seems that LD children will have scores of the RC, LC and total C-SSW that will significantly exceed the range of normal. A significant percentage (24%) can be expected to have a Type A pattern. Pattern 1B and pattern 2 SSW-grams occurred with a large percentage of the children -- 59% and 24% respectively. A smaller percentage (16%) may be expected to have 10 or more reversals. If one uses a difference of 10 or more as resulting in a significant Ear and/or Order Effect, then this particular RB may not be expected to occur a significant percentage of the time.

In conclusion, we feel that these results indicate that the SSW test appears to be a valuable tool in identifying the auditory perceptual problems expirienced by learning disable children. In addition, a close relationship was observed between the error patterns and response bias for this sample when compared to previous studies. When similar criteria are used, this would suggest a commonality in the distribution of auditory symptoms in groups of LD children. In the absence of any published SSW sample of black children (either normal or LD) and using previous studies (Turner, 1966, Towson, 1980, Rawiser, 1982) poorer performance by our group could have been anticipated. There appears to be no evidence in this LD sample that suggests any qualitative differences when compared to previous studies which had a majority of white children.

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