An Experimental Short Form Of The Staggered Spondaic Word List For Learning Disabled Children

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Today, one of the biggest challenges faced by the diagnostician is that of properly diagnosing learning disabilities. Those in the fields of Speech Pathology, Audiology, Education, Psychology and Medicine are highly cognizant of the fact that swift discrimination of the nature of learning disabilities may mean the difference between success and failure in early educational development of the handicapped child. (Myklebust, 1968; Birch, and Leffard, 1964.)

It is the consensus of many specialists in the field of learning disabilities that central auditory impairments are often the most disruptive and debilitating to the learning process. These authors further indicate that the heavy emphasis on the visual modality of many learning disabled children may be misguided. It has been demonstrated that one of the most reliable indicators of neurological dysfunction is impairment of the central auditory processing system. It seems that central auditory integrity is significant to learning and should be examined prior to issuing any diagnostic statement about a learning disabled child. (Katz, 1962; Katz & Illmer, 1972; Johnson & Myklebust, 1967; Myklebust, 1965; Boshes & Myklebust, 1964; Myklebust, 1968; Tanopol, 1969; Zigmond, 1969; Cruickshank, 1971.)

The detection of central auditory dysfunction is a most complicated task; one that defies measurement in Hertz and decibels. The processing of the complex of acoustic events in auditory function determines what message an individual receives from the speech signal and/or other auditory stimuli. Thus, routine audiometric techniques that indicate only deficits in peripheral auditory acuity are useless in the detection of central auditory dysfunction. (Berry, 1969; Bocca & Calearo, 1963; Davis & Silverman, 1970; Matkin & Olsen, 1971; Myklebust, 1968.)

However, the literature reveals certain specialized auditory tests designed to identify central auditory problems. One of these specific diagnostic tools is the staggered Spondaic Word Test (SSW) developed by Katz. This instrument uses speech audiometry in the presentation of a dichotic listening task for the detection of central auditory impairment (Katz, 1972).

PURPOSE OF THE STUDY

This study compares the performance of a group of seven through eleven year old children labeled as "learning disabled" with a comparable group of children judged as "normal achievers" on a shortened, twenty item form of the SSW Test of central auditory dysfunction.

HYPOTHESES

1) When normally achieving children, seven through eleven years of age, are matched with children of the same age but thought to be learning disabled and administered fifty percent of the SSW Test, a difference should be seen. The learning disabled children should score consistently lower on a measure of central auditory dysfunction than children with no diagnosed learning disorders.

2) A twenty item, short form of the SSW Test should be as sensitive to the measure of central auditory dysfunction in learning disabled children as the full range, forty item SSW Test.

DEFINITION OF TERMS

The following definitions were used as a basis for the research on central auditory dysfunction.

Learning Disabled: ....."learning disability refers to deficits in one or more of the specified intellectual processes. Children with learning disabilities demonstrate a discrepancy between expected and actual achievement in spoken, read or written language, mathematics or other school subjects.

a) The learning breakdown may be in understanding, integrating or using information. It is not primarily the result of sensory, motor, intellectual or emotional handicap, nor lack of opportunity to learn" (Adapted by Katz and Illmer, 1972 from Kass and Myklebust, 1969 and Masland, 1969).

b) *Dichotic Listening:* A special type of figure - ground task that is presented to both ears with each receiving a different message from well separated channels.

c) *Central Processing:* Analysis, synthesis, storage and retrieval of

sensory information.

d) *Central Auditory Area:* "The primary auditory reception center of the cerebral cortex, which encompasses the superior temporal gyrus, bilaterally, particularly the middle and posterior portions" (Katz, 1968).

e) *Ear Scores:* The sum of noncompeting and competing (N-C,C) error responses for each ear.

f) *C-SSW Scores:* Corrected SSW scores. The total percent of errors after correcting for peripheral hearing loss.

PROCEDURES

The population of this study consisted of forty subjects, male and female, between the ages of seven and eleven years. The study group consisted of twenty children referred from throughout the State of Oregon to the Oregon College of Education Educational Evaluation Center for the purpose of psychometric and educational testing. These children experienced school difficulties to such a degree that they were categorized as "learning disabled" at their respective schools. Two of the children were age 7, 6 were age 8, 3 age 9, 3 age 10, and 6 age 11.

The comparison group consisted of 20 children of the same ages from the Campus Elementary School (located at the Oregon College of Education, Monmouth, Oregon) who were judged as "normal achievers" in their school work.

All children, in both groups, were free from observable gross physical disabilities.

TEST PROCEDURES:

a) *Pure tone test Procedures:*

The peripheral sensitivity of each subject was measured using a screening technique with 10 dB HL as the level of intensity at the following frequencies: 250, 500, 1000, 2000, 4000, 6000 and 8000 Hertz. If any child had thresholds poorer than this level, further testing was instituted.

b) *Speech audiometric procedures:*

Hearing sensitivity for air conducted speech signals was assessed by obtaining a speech reception threshold. This was done by using live voice and tape recorded presentations from CID Auditory Test W-1 fed through a speech audiometer.

Speech discrimination levels were reported as percentages of correct responses to monitored live voice and taped presentations of CID Auditory Test W-22.

c) *Central Auditory test procedures:*

The test utilized to assess central auditory integrity was the SSW Test developed by Katz (1962; 1968). It was administered at 50 dB SL (that level 50 dB above the child's speech reception threshold for each ear). Presentations were made using the first twenty items of the standard SSW Test List EC (See Appendix A for list) on stereophonic cassette tape.

Standard calibration techniques were employed to check equipment prior to initiation of the project and twice during the study to insure adherence to ANSI 1969 SPL standards. (See Appendix B for list of instrumentation.)

The Staggered Spondaic Word Test developed by Katz (1962; 1968), and standardized by Katz, Basil and Smith (1963) is a dichotic listening task in which the subject is expected to repeat both messages as presented. Spondaic words are used to lessen the effects of peripheral hearing loss and to broaden the range of patient applicability. Each test item is composed of two spondees recorded in a partially overlapping manner. Different spondees are presented to each ear with the last portion of the first spondee being overlapped in time with the first part of the second spondee in the opposite ear. See Figure 1 for an

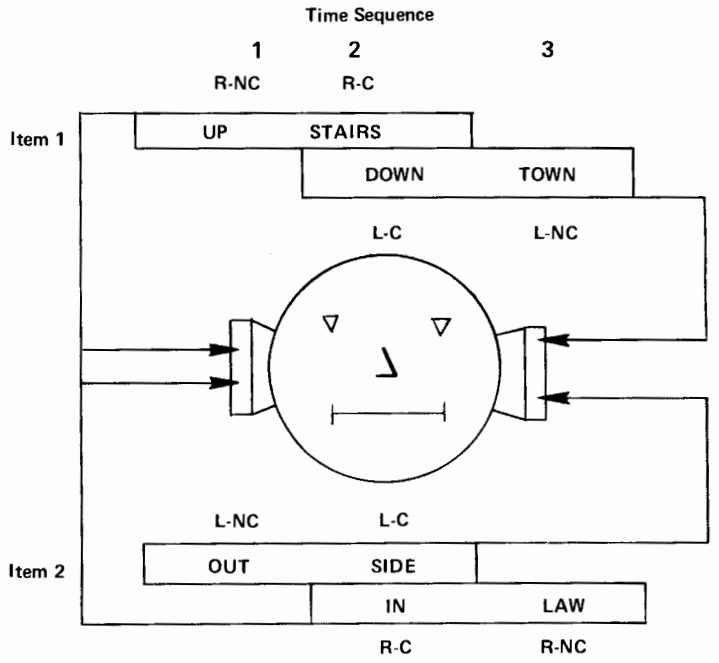

Figure 1. The Staggered Spondaic Word Test

example of two SSW Test items illustrating temporal sequence of word presentation and reversal of the leading ear (Brunt, 1972). The ear stimulated first changes with each presentation of two spondic word pairs. To further enhance the difficulty of the task for subjects with central auditory dysfunction the test words are paired so the noncompeting words form a third meaningful word.

RESULTS

Table I. Means and Standard Deviations of Total C-SSW Scores (percent of error) for LD Group and Comparison Group By Age (20 Items)

	LD		COMPARISON	
AGE	MEAN	STND. DEV.	MEAN	STND. DEV.
7 years	25.16	10.50	10.75	3.29
8 years	25.6	10.50	2.95	3.29
9 years	15.58	10.50	3.33	3.29
10 years	8.21	10.50	1.14	3.29
11 years	13.25	10.50	2.29	3.29

The results of testing for both groups are shown by age level in Table I. A definite difference does exist between the learning disabled children and the normal children on the twenty item test. A wide range of disparity was found between the standard deviations of the two sample groups; 10.50% and 3.29% respectively.

This difference is even more significant when viewing Figure II; a graphic comparison of the mean total C-SSW* scores for both groups. An examination of the means indicates that when a discrimination between the two groups is made, an obvious separation will be seen at all age levels.

* Score corrected for any discrimination loss, if present in conventional discrimination testing.

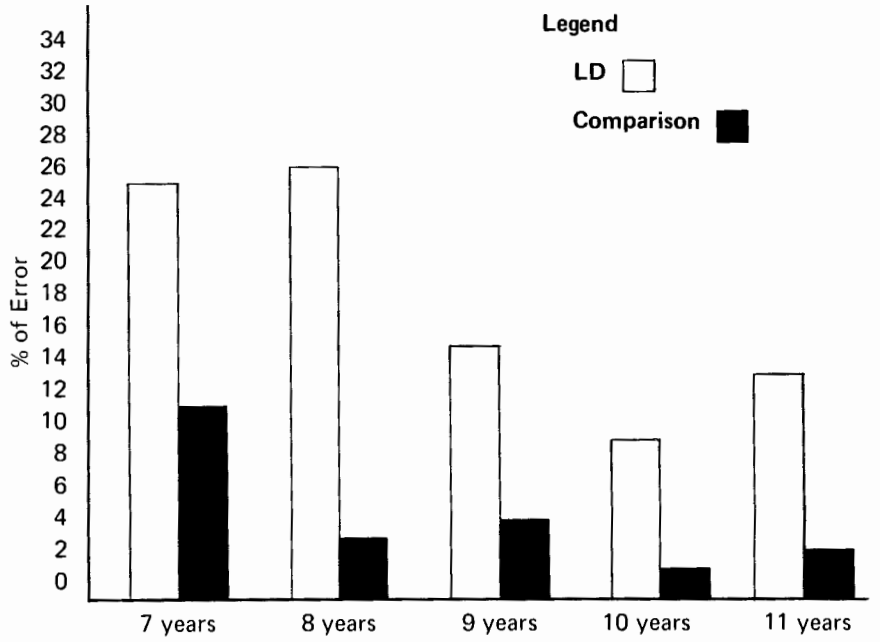

Figure 2. Mean Total C-SSW Scores (per cent of error) for LD Group and Comparison Group (20 Items)

Table II contains the group mean total C-SSW scores, standard deviations, the critical ratio for *t* and the level of significance from the twenty item study. The table indicates that the group mean total

Table II. Group Mean Total C-SSW Scores (percent of error), Group Standard Deviations, and Critical Ratio for t and Level of Significance

Learning Disabled		Comparison	
Mean	Stnd. Dev.	Mean	Stnd. Dev.
16.64	10.50	3.4	3.29

Critical Ratio for t	5.40
Level of Sig.	> .001

C-SSW score of the learning disabled children was 16.64%. The standard deviation for the learning disabled group was 10.50%. The group mean total C-SSW score for the normal achievers was 3.4%. The standard deviation for the comparison group was 3.29%. The critical ratio for *t* was 5.40 and the difference between the two sample groups was highly significant, at .001 level of significance.

Finally, Table III contains the ear and total mean C-SSW scores for the learning disabled children and normal children from a previous study utilizing the forty item SSW Test (Young & Stubblefield) and from the present study. The most significant aspect of this table is the relative closeness of the mean total C-SSW scores for each age level from the forty item study, and for each age level from the twenty item study. The difference between the group means of the learning disabled children of both studies was 2.50%. And the spread between the group means of the normal children in both studies was 2.01%.

The mean C-SSW scores were also plotted graphically for each age group, learning disabled and normal, and are available from the senior author upon request.

CONCLUSIONS

Based on results of the research and within the limits of the population sampled and audiometric techniques utilized, certain conclusions may be enumerated. When children, seven through eleven years of age, labeled as "normal achievers" are matched with a comparable group of children labeled as "learning disabled" and administered fifty percent of the SSW Test (List EC), a highly significant difference between the two groups will be seen. The *t* test indicates that central auditory problems are more prevalent among a population of learning disabled children. When considering individual scores, all children in the comparison group, short form study, except one, scored lower (better) on the twenty item SSW Test than most, not all, of the learning disabled children. The large standard deviations for the learning disabled children from the twenty item study probably reflects the fact that all learning disabilities are not caused by central auditory dysfunction. The short form SSW Test seems as sensitive to the detection of central auditory dysfunction as the full range test, and both will yield a significant difference between learning disabled and normal children. Despite the fact that many past studies have stated that dichotic listening tasks are sensitive to the detection of all children with learning problems, it is not probable that all learning disabled children experience central auditory problems. The short form of the SSW Test should be utilized as a standard tool in all diagnostic test batteries for learning disabled children, where feasible.

Table III. Mean C-SSW, Ear and Total Scores (per cent of error) from Two Studies

COMPARISON SUBJECTS

AGE	20 Item Study		Total C-SSW Scores	40 Item Study		Total C-SSW Scores
7	RE: 10.00	LE: 11.50	10.75	RE: 0.00	LE: 0.00	0.00
8	RE: 2.40	LE: 4.40	2.95	RE: 0.00	LE: 0.00	0.00
9	RE: 1.66	LE: 3.33	3.33	RE: 1.00	LE: 3.50	2.10
10	RE: 1.83	LE: 1.41	1.41	RE: .62	LE: 2.42	1.53
11	RE: 1.66	LE: 2.08	2.29	RE: 1.00	LE: 1.50	1.25

LEARNING DISABLED SUBJECTS

AGE	20 Item Study		Total C-SSW Scores	40 Item Study		Total C-SSW Scores
7	RE: 30.33	LE: 19.33	25.16	RE: 18.87	LE: 18.00	18.43
8	RE: 19.40	LE: 31.30	25.60	RE: 12.00	LE: 25.00	18.33
9	RE: 10.16	LE: 20.50	15.58	RE: 15.00	LE: 15.12	Not Stated
10	RE: 14.00	LE: 6.78	8.21	RE: 2.25	LE: 15.12	8.59
11	RE: 14.00	LE: 12.50	13.25	RE: 9.20	LE: 16.95	13.18

APPENDIX A

PRACTICE ITEMS

a.	air	plane	wet	paint
c.	north	west	stair	way

b.	cow	boy	white	bread
d.	oat	meal	flash	light

Left First / Right First	L-NC (A) R-NC	L-C (B) R-C	R-C (C) L-C	R-NC (D) L-NC	Rev	WRONG
1.	up	stairs	down	town	T P	
3.	day	light	lunch	time	T P	
5.	corn	bread	oat	meal	T P	
7.	flood	gate	flash	light	T P	
9.	meat	sauce	base	ball	T P	
11.	house	fly	wood	work	T P	
13.	sun	day	shoe	shine	T P	
15.	back	door	play	ground	T P	
17.	snow	white	foot	ball	T P	
19.	blue	jay	black	bird	T P	
SUM					___	

Left First / Right First	R-NC (E) L-NC	R-C (F) L-C	L-C (G) R-C	L-NC (H) R-NC	Rev	WRONG
2.	out	side	in	low	T P	
4.	wash	tub	black	board	T P	
6.	bed	spread	mush	room	T P	
8.	sea	shore	out	side	T P	
10.	block	board	air	mail	T P	
12.	green	bean	home	land	T P	
14.	white	walls	dog	house	T P	
16.	school	boy	church	bell	T P	
18.	band	saw	first	aid	T P	
20.	ice	land	sweet	cream	T P	
SUM					___	

COMMENTS: _____

APPENDIX B

Audiologic equipment used to assess peripheral auditory acuity:
2 Beltone Model 12-D Puretone and Speech Audiometers with connections to allow 2 channel capabilities
TDH-39 Earphones
Beltone Narrow Band Masking Generator
IAC Model No. 1602-A, two room sound treated audiological test suite
Qualitone Acoustic Appraiser 2-Channel Audiometer
IAC single audiological test suite
Qualitone cassette tape

Equipment utilized for evaluation of central auditory dysfunction:
Beltone 12-D Audiometer
Beltone 2-Channel 12-D Speech Audiometer
TDH-39 Earphones
Voice of Music Stereo Cassette Player
IAC Model No. 1602-A two room audiological test suite
Stereo cassette tape recording of the SSW Test

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