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ABSTRACT

The Lindamood Auditory Conceptualization (LAC) Test was constructed with the recognition that the process of decoding involves an integration of the auditory, visual, and motor senses. Requiring the manipulation of colored blocks to indicate conceptualization of test patterns spoken by the examiner, subtest 1 entails coding of identity, number, and sequence of isolated sounds in patterns, while subtest 2 entails coding of phoneme addition, substitution, omission, repetition, and shift within a syllable pattern. Both the LAC Test and reading and spelling subtests of the Wide Range Achievement Test (WRAT) were administered at mid-school year to a randomly selected group of 660 students--representing wide background variables--from kindergarten through grade 12. Results showed that stepwise linear regression based on LAC total test as the primary predictor, with subtest components allowed to make residual contribution, yielded correlations with the WRAT at each grade level of .66 to .81, with an average of .73. (Tables and references are included.) (JM)

THE LAC TEST: A NEW LOOK AT AUDITORY CONCEPTUALIZATION AND LITERACY DEVELOPMENT K - 12.

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Numerous research studies on auditory discrimination and its relationship to reading performance have been reported over the last forty years. Research approaches have included measures of auditory memory, auditory blending, auditory-visual integration involving visual representation of rhythms or language patterns, auditory discrimination of initial and final consonants in word units, etc. Many research studies have used the Wepman (1960) or similar minimal pairs test activities which require judgment of sameness vs difference.

The contradictory and inconclusive findings of previous research (Russell and Fea, 1963, McNinch, 1971, Orton, 1937, Christine and Christine, 1964, Durrell and Murphy, 1953, Neville and Bucke, 1969, Vernon, 1960, and Wepman, 1960), may be due to the widely diverse and gross nature of the test tasks. Many are unrelated to the syllable units of the reading task, or tend to involve unit identity judgments without indication of <u>where</u> or <u>how</u> patterns compare and contrast.

The judgment of sameness or difference in respect to minimal pairs is an important gross judgment, but is not directly relevant

to the more discrete judgment needed for self-correction during reading (decoding). The process involved in decoding is inter-sensory in nature. Jastak (1965) calls this to attention in his description of reading and writing as a transcoding process and reading disability as an impairment of this process of transcoding. He defines transcoding as "the central processing of auditory input to allow unimpeded visual and motor output and vice versa."

Integration of the auditory, visual, and motor modalities is specifically involved in perceiving the degree of correspondence between a sequential unit of sound and a sequential unit of letters. For example, when an individual looks at a visual pattern and decodes it in error, as when better is called butter, there is called three, twelve is called twenty, or tried is called tired, self-correction can occur as the individual is able to hold and perceive the contrasts between the two patterns. Does the vocal or subvocal pattern correspond to the visual pattern in terms of specific identities and sequence?

The importance of identity and sequence can be seen in this respect; spoken language is normally the first medium of communication. After some years of experience with oral language, individuals are expected to learn a symbol system so they can relate to a written representation of the oral language. However, if an individual cannot discriminate one speech sound from another and perceive their occurrence and sequence in syllables and words, the written representation of these units has no tie to reality.

Reading and spelling contrasts such as it, bit, sit, and its then become a matter of memorized whole unit associations rather than an internalizing of the logical relationship between the phonemic identities and sequences of spoken patterns and the visual identities and sequences of written patterns.

HYPOTHESIS

It was hypothesized that specific and detailed coding tasks requiring conceptualization of phonemic identities and sequences would reveal significant correlations between auditory conceptualization and reading/spelling performance at all grade levels, K-12.

PROCEDURES

Subjects

At mid-school year a test population of 660 students was randomly selected from the Monterey Peninsula Unified District. (California). It was representative of the wide variation within the district in socio-economic, ethnic, and linguistic variables. Design factors were grade (K-12), sex (male or female), and academic achievement (upper half or lower half by teacher rating.) There were 60 students at each grade K-6, and 40 at each grade 7-12.

Materials and procedures

The Lindamood Auditory Conceptualization Test (Lindamood and Lindamood, 1971) and Reading and Spelling subtests of the Wide Range Achievement Test were individually administered. The LAC

Test requires manipulation of colored blocks to indicate conceptualization of test patterns spoken by the Examiner. Subtest I requires coding of identity, number, and sequence of isolated sounds in patterns. Subtest II requires coding of phoneme addition, substitution, omission, repetition, and shift within a syllable pattern.

RESULTS AND DISCUSSION

Stepwise linear regression based on LAC total test as the primary predictor and subtest components allowed to make residual contribution yielded correlations with WRAT Reading and Spelling at each grade level of .66 to .81, with an average of .73, supporting the original hypothesis. (Table 1).

There were no significant sex differences. Virtually all students could conceptualize sequences of isolated sounds by grade 5. Although conceptualization of isolated sounds is apparently a prerequisite to syllable conceptualization, it is no predictor of function with syllables. Syllable sequences were more difficult for all groups, but large differences were found between academically upper half and lower half through grade 12.

The bulk of predictable reading/spelling variance was accounted for by the LAC Test total score, but significant residuals were added by the isolated sounds subtest through grade 3, and the syllable subtest from grade 2 on. The predictive validity of the

syllable subtest is particularly called to attention. This precise syllable coding task taps a perceptual function which reading programs assume to be generally present for individuals. Examination of the distribution of LAC Test scores calls this assumption into question. The data reveal a marked bimodal trend from grade 2 through 12. This indicates that for a significant number of students maturational factors and present educational practices do not facilitate this critical conceptualization of syllables. (Table 2).

EDUCATIONAL IMPLICATIONS

1. Kindergarten or first grade readiness testing has tended to show that knowledge of letter names, sounds, and symbols is correlated with success in first grade reading. (Stanchfield, 1971) This would seem to parallel one of the findings of this study - that conceptualization of isolated sounds contributes a significant residual to prediction of reading/spelling variance through grade 3. However, another finding of this study indicates that readiness testing emphasis on isolated letter names, sounds, and symbols may be misleading in terms of continued success with reading unless further testing is done in respect to syllable conceptualization. Conceptualization of isolated sounds is no predictor of syllable conceptualization, and from grades 2 through 12 the conceptualization of syllables is a significant variable in relation to reading/spelling performance. "The Electric Company's" definition of its target audience is: children in the second, third, and fourth grades who are beginning to experience reading difficulty.

(Underlining ours.) The existence of "The Electric Company's" target audience may be due to this previously unassessed factor of syllable conceptualization. It would appear that the concept of "readiness testing" and "readiness programs" should be extended to include this factor.

2. The presence of a certain degree of auditory conceptualization appears highly predictive of grade level or above performance in reading and spelling. Therefore, the importance of direct attention to this factor at all grade levels can not be minimized. The data suggest that school districts would be well advised not only to plan for developmental work in auditory conceptualization on a preventive basis in kindergarten and the primary grades, but also to continue to test and teach for this function in succeeding grades until auditory perceptual competency for complex syllable unit contrasts can be demonstrated by each student.

In the authors' experience, auditory conceptualization can be developed regardless of how long dysfunction has been present. (Lindamood & Lindamood, 1969)

TABLE 1

Correlations between LAC Test scores
and WRAT combined Reading and Spelling scores
K-12 (N = 660)

K	+.75
1	+.68
2	+.75
3	+.66
4	+.68
5	+.80
6	+.66
7	+.75
8	+.81
9	+.76
10	+.78
11	+.70
12	+.69

TABLE 2

Number of students in each LAC Total Test score range having below vs at or above grade level performance in reading and spelling

LAC Total Test Scores	Grade levels											
	K		1		2		3		4		5		6	
	below	at or above	below	at or above	below	at or above	below	at or above	below	at or above	below	at or above	below	at or above
91 -100						+++++ ++ .		+++++	--	+++++ +++++ +++		+++++ +++++ ++	---	+++++ +++++ ++++
81 - 90				+		+++++ +		+++++	-	+++++		+++++ +	---	+++++
71 - 80				+++		++++	--	+++++ ++	---	++	-	+++++ +++++ ++	---	++++
61 - 70				+	--	++	-	++++	--	+++	---	++	--	+
51 - 60		+	---	++++	----	+++++ ++	----- ----	+++	-----	++	----- ----	++	----	++
41 - 50	-	+++++ +++++ +	----- ---	+++++ +++++	----- -	+++++	-----	++++	----- ---	+++	----- -----		----- -----	++++
31 - 40	---	+++++ +++++ +++++	----- ----- ----	+++++ +	----- -----	++	----- ----	+++	----- -	+	---		----	+
21 - 30	----- ----	+++++	----		----		--		----					
11 - 20	-----	++	---											
0 - 10	----- ---		---		-		-							

Specific figures for grades 7 - 12 (N = 240) have not been included, but percentages had stabilized from sixth grade on and correlations were essentially the same.

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