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ABSTRACT

This study investigated the relationship between letter-sound ability and general reading ability in Israeli Hebrew and explored the value of letter-sound ability as a predictor of later reading success. The subjects were 130 children in primary classes in two Israeli public schools differentiated by socioeconomic status (SES). Stimuli were 31 synthetic Hebrew words. Each child was tested individually on his reading of the list of words. One year later a standardized reading test was administered to all subjects. The results showed a significantly high correlation of letter-sound ability with later reading success for middle SES children first tested in grade 1, but insignificant correlations for middle SES children thereafter. In the lower SES school, the highest correlation was achieved in grade 2, indicating a one-year lag behind the middle SES school. Letter-sound ability appears to be a good predictor of later reading success when children have just mastered the basic mechanics of the reading process; however, when this beginning phase is ended, the predictive power of letter-sound ability decreases. (Author/WR)

Technical Report No. 247

LETTER-SOUND GENERALIZATIONS AS PREDICTORS OF READING ABILITY IN ISRAELI CHILDREN

by

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Report from the Basic Prereading Skills Component
of Program 2: Development of
Instructional Programs

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Statement of Focus

Individually Guided Education (IGE) is a new comprehensive system of elementary education. The following components of the IGE system are in varying stages of development and implementation: a new organization for instruction and related administrative arrangements; a model of instructional programing for the individual student; and curriculum components in prereading, reading, mathematics, motivation, and environmental education. The development of other curriculum components, of a system for managing instruction by computer, and of instructional strategies is needed to complete the system. Continuing programmatic research is required to provide a sound knowledge base for the components under development and for improved second generation components. Finally, systematic implementation is essential so that the products will function properly in the IGE schools.

The Center plans and carries out the research, development, and implementation components of its IGE program in this sequence: (1) identify the needs and delimit the component problem area; (2) assess the possible constraints—financial resources and availability of staff; (3) formulate general plans and specific procedures for solving the problems; (4) secure and allocate human and material resources to carry out the plans; (5) provide for effective communication among personnel and efficient management of activities and resources; and (6) evaluate the effectiveness of each activity and its contribution to the total program and correct any difficulties through feedback mechanisms and appropriate management techniques.

A self-renewing system of elementary education is projected in each participating elementary school, i.e., one which is less dependent on external sources for direction and is more responsive to the needs of the children attending each particular school. In the IGE schools, Center-developed and other curriculum products compatible with the Center's instructional programing model will lead to higher student achievement and self-direction in learning and in conduct and also to higher morale and job satisfaction among educational personnel. Each developmental product makes its unique contribution to IGE as it is implemented in the schools. The various research components add to the knowledge of Center practitioners, developers, and theorists.

Acknowledgments

The initial portion of this study was planned in co-operation with Professor Robert Calfee whose assistance is gratefully acknowledged. Testing of letter-sound ability was done by Esther Kozlovsky in 1970. Reading scores were obtained by Yael Shiloah in 1971, and transcriptions of the children's pronunciations were done by Gilead Morahg. The co-operation of these persons is sincerely appreciated, as is the co-operation of the Ministry of Education of the State of Israel and the principals and teachers in the two schools: Kiryat Sharett in Raanana and Morasha in Ramat Hasharon.

Table of Contents

List of Tables

Abstract

Letter-sound correspondences have played a central role in the teaching of reading during the past century, but only recently has research been done on the learning of letter-sound correspondences and on the relationship of such learning to reading ability. Earlier research on American English and on Finnish showed only moderately high correlations between letter-sound ability and general reading ability. The present study investigated this relationship in Israeli Hebrew and explored the value of letter-sound ability as a predictor of later reading success.

Subjects were 130 children in primary classes in two Israeli public schools differentiated by SES. Stimuli were 31 synthetic Hebrew words. Each child was tested individually on his reading of the list of words. One year later a standardized reading test was administered to all the subjects.

The results showed a significantly high correlation of letter-sound ability with later reading success for middle SES children first tested in grade 1, but insignificant correlations for middle SES children thereafter. In the lower SES school, the highest correlation was achieved in grade 2, indicating a one-year lag behind the middle SES school.

Letter-sound ability appears to be a good predictor of later reading success when children have just mastered the basic mechanics of the reading process; however, when this beginning phase is ended, the predictive power of letter-sound ability decreases, probably due to the increased importance of syntactic/semantic context and whole-word recognition which letter-sound ability aids in developing.

I
Introduction

Letter-sound correspondences have played a central role in the teaching of reading for the last 100 years in almost all countries which use alphabetic writing systems, yet until recently no empirical studies of the learning of letter-sound correspondences were reported. During the past few years, however, both the development of letter-sound generalizations and their relationships to general reading ability have been explored for American English (Venezky, Chapman, & Calfee, 1972; Venezky & Johnson, 1973) and to a lesser degree for Finnish (Venezky, in press). In these studies the developmental patterns for English and Finnish letter-sound generalizations differed widely, yet both languages showed only moderately high correlations between letter-sound ability and general reading ability, thus indicating that for both the most regular and the least regular orthographies in use today, variables other than letter-sound ability account for a large share of the variance in primary-level reading abilities. (In the Finnish study only about 25 percent of the variance in reading scores was accounted for by letter-sound ability.)

These results, if capable of being replicated both in their original settings and in other cultures, raise serious questions about reading methods which overstress letter-sound learning--a tendency which appears not only in many currently popular "phonics" and "linguistics" programs, but also seems to be the vogue in the eclectic reading systems which are popping onto the market.

The present study was planned in conjunction with the earlier American English (Venezky, Chapman, & Calfee 1972) and Finnish (Venezky, in press) studies, and was designed as an investigation of letter-sound ability and its relationship to reading ability in immigrant and first-generation children in Israel. In contrast to these studies, however, the ability of letter-sound scores to predict later reading scores was examined.

Hebrew Orthography

Hebrew is written from right to left using 22 consonant symbols, five of which have alternate forms for word-final position. Poetry, some street signs, and beginning reading texts, however, often use a system of superscripts, subscripts, and inscripts developed in the seventh century A.D. to mark vowels plus certain consonant alternates.[1] The relationship between symbol and sound for punctuated ("pointed") texts is considerably more predictable than for English, but does not approach the simplicity of Finnish. Among the deviations from a one-symbol, one-sound system are:

1. Although vowel points are generally pronounced after the consonant to which they are associated, this order of pronunciation is reversed for certain gutterals in word final position.
2. One vowel symbol (petah) has two phonemically distinct pronunciations, which in certain words require etymological information for the proper choice. Another vowel symbol (schwa) is either silent or pronounced as an unstressed half-vowel.
3. One consonant symbol (yod) may be pronounced as a semi-vowel or a vowel, or it may be silent. Another (vav) may be a consonant or either of two phonemically distinct vowels. All of these, however, are predictable from their graphemic environments.
4. One vowel superscript may be omitted when it overlaps the identical graphic point on a particular following consonant (shin).

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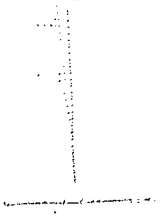
[1] The full punctuation system, which is rarely used except for Biblical texts, marks accentuation, all vowels, and several consonant factors.

5. Three consonant symbols (beth, peh, and kaph) each represent two phonemically distinct consonants, depending upon the presence or absence of a midpoint.



6. Several vowel points have the same sound, as do several consonants including (for some dialects) two silent letters.

II
Method

Subjects

The subjects were 130 children in first-, second-, and third-grade classes in two Israeli public schools. One school (School R) was in a low SES neighborhood consisting primarily of families who immigrated to Israel from Morocco, Turkey, and Rumania in the early and middle 1960's. Fewer than one half of these children were born in Israel. The second school (School M) was in a middle SES neighborhood composed primarily of families which immigrated from Iraq in the period 1949-51. All except three of these children were born in Israel.

The total number of males and females tested in each school and class is shown in Table 1. (Four children in the first grades of each school were excluded because they could not read. Otherwise, all children in the six classes were tested.)

Stimuli

The stimuli were 31 synthetic Hebrew words, constructed to contain all the common predictable correspondences, plus all the deviations from a one-symbol, one-sound system which exist in Hebrew. These words (see Table 2) included at least two occurrences of all Hebrew consonants and at least one occurrence of each punctuation (point). Stimuli were hand lettered on separate 3" x 5" cards in a style commonly used in Israeli classrooms.

Procedure

Each child was tested individually in the spring of 1970 by a native speaker of Hebrew. Prior to testing, the child was told that he would see some printed words which he might not recognize, but that he should attempt to pronounce each one as best he could. A single ordering of the test items was used, with three real words at the beginning for warming up and three at the end for boosting morale. Responses were tape recorded and later transcribed by a native Israeli speaker. Responses were then scored as correct or incorrect.

A standardized reading test, the Ortar Reading Test, was administered one year later to all children who were still attending the original test schools.

TABLE 1
TOTAL SUBJECTS FOR BOTH TESTS[a]

	Grade									
	1			2			3			
School	M	F	Total	M	F	Total	M	F	Total	Total
M	15	11	26	7	10	17	10	10	20	63
R	9	9	18	10	13	23	11	15	26	67
Total	24	20	44	17	23	40	21	25	46	130

[a] 172 Ss were tested for letter-sound ability. The numbers shown here represent those original Ss who were available for testing one year later on reading ability. The attrition rate was 25.0% in School R (low SES) and 23.8% in School M (middle SES).

TABLE 2
STIMULI RANK ORDERED BY DIFFICULTY IN GRADE 1

List Position	Word	% Correct Grade 1	20-Item Subset
26	תִּשְׁפָּר	9	
8	רִשׁוּר	13	
14	לְהָקִיץ	14	
30	פַּלַיְנָה	14	
28	הָלָחַ	16	*
29	כְּלַאי	20	*
23	סְרָאוֹן	25	*
25	בּוּחַ	25	*
21	טָפוּי	30	*
22	לָצִיהַ	31	
5	אִיכֵן	36	
27	לַיְפָה	36	*
16	מַהֲיָם	41	*
13	וָלְרְדוּ	43	*
2	זָכָשִׁים	45	
17	מְשָׁטָא	48	*
3	צִתְק	50	*
12	בָּצְחוּ	52	*
1	עוּב	55	
4	יְמָמוֹת	55	*
10	בָּכְרֵשׁ	55	
11	רְוִיל	55	*
7	מָאָסִיבָּה	57	
18	אָוִיס	57	*
20	מְגוּדָה	59	*
24	נוֹמָס	61	
15	קִינֶף	68	*
19	חַאֲגִיצַ	68	*
31	זוֹרַעַת	70	*
6	סִיק	75	*
9	נָלָה	82	*

III
Results

Tables 3 and 4 show the mean number of words correct by school, grade, and sex for the 31 test items and for the Ortar Reading Test given one year later. From item analyses on the synthetic word test, the 20 items which showed the highest part-whole correlations were pooled, and new scores for each subject were computed on this subset. The Hoyt reliability of the 20-item subset was 0.89 and the part-whole correlations ranged from .48 to .66. (The items included in this subset are marked with an asterisk in Table 2.) Means for school, grade, and sex for the 20-item subset are shown in Table 5.

An unequal-n analysis of variance, Sex x Grade x School, using total correct on the 20-item subset as the dependent measure, showed no significant main effects or interactions at the .01 level, and only the school effect significant at the .05 level (F [1/118] = 5.20).

The correlations between number correct in the 20-item subset and total score on the Ortar Reading Test given one year later show highly different patterns for the two schools. The highest correlation for the middle SES school (M) was for Grade 1 letter-sound scores (.81, $p < .01$); thereafter the correlations were low and not significant. For the low SES school (R), however, the highest correlation was reached for Grade 2 letter-sound scores (.70, $p < .01$), while the Grade 1 (.44, $p < .05$) and Grade 3 (.52, $p < .05$) correlations were moderately high.

TABLE 3
MEAN NUMBER CORRECT ON 31-ITEM SYNTHETIC WORD TEST

		Grade								
		1			2			3		
School		M	F	Total	M	F	Total	M	F	Total
	M	15.4	16.2	15.8	12.7	16.9	15.1	15.4	18.3	17.1
	R	13.3	10.8	12.2	10.7	14.6	13.0	13.0	17.6	15.3
Total				13.7			14.2			16.3

TABLE 4
MEAN NUMBER CORRECT ON 55-ITEM READING TEST

		Grade								
		1			2			3		
School		M	F	Total	M	F	Total	M	F	Total
	M	41.3	38.4	39.9	42.6	40.7	41.7	43.9	44.1	44.7
	R	27.1	28.4	27.7	31.6	42.8	37.2	39.5	45.3	41.7
Total				32.6			40.1			43.3

TABLE 5
MEAN NUMBER CORRECT ON 20-ITEM SUBSET OF SYNTHETIC WORD TEST

		Grade								
		1			2			3		
School		M	F	Total	M	F	Total	M	F	Total
	M	11.0	11.9	11.4	9.5	12.1	11.0	12.5	13.8	13.2
	R	9.4	7.5	8.6	7.9	11.0	9.7	10.6	12.8	11.7
Total				9.8			10.4			12.6

IV
Discussion

Although the mean number correct on the 20-item subset increased with increasing grade level, the lack of a significant main effect for grade indicates that the amount of letter-sound learning that occurred after Grade 1 was minimal. (Since the percentage correct on the synthetic words varied from 49% in Grade 1 to 63% in Grade 3, the lack of a significant main effect for grade is not due to a ceiling effect in the letter-sound scores.) The failure of letter-sound scores to improve beyond what they did in this study could result from the lack of emphasis which letter-sound relationships received after the first year, but may also be affected by the switch at the second- and third-grade levels from reading words with the vowel points to reading without the vowel points. Without the vowel points, context and word shape become dominant cues at the expense of sound, and hence the rate of development of letter-sound generalizations should decrease. Differences between the two SES groups in reading comprehension and in decoding ability decreased sharply between Grades 1 and 3, showing, as was found in the USA data, that no cumulative deficit occurred.

The correlation between letter-sound ability and general reading ability was found to decrease with increasing grade level in Finland (Venezky, in press) and in the United States (Calfee, Venezky & Chapman, 1969; Venezky & Johnson, 1972). In the present study, in which reading ability was measured one year after letter-sound ability was measured (as opposed to measuring both at the same time as was done in the Finland and USA studies), a dramatic decrease in correlation was observed between Grades 1 and 2 in the middle SES school. But in the low SES school, the correlation increased from Grade 1 to Grade 2 and then decreased. This difference appears to relate to differences in reading abilities for the two schools. The mean reading score achieved by the original Grade 1 class in the higher SES school is approximated by the original Grade 2 class of the lower SES school indicating about a one-year difference in reading ability between the two schools. Thus, in the classes which most closely approximate an average Israeli school, letter-sound ability in Grade 1 is a good predictor of reading ability by the end of Grade 2; however, at Grades 2 and 3, letter-sound ability is a poor predictor of later reading competence. The sharp decrease in correlations from Grade 1 to Grade 2 for the middle SES school cannot be attributed to an increase in decoding ability at the higher grade level since the percentage correct in Grade 2 is not significantly different from that of Grade 1. Nor does this decline appear to be a result of the small increase in reading comprehension scores or of changes in score distributions. The explanation hypothesized here is that the decline is due to a change in utility of decoding from Grade 2 to Grade 3. (The reading comprehension scores were obtained one year after the decoding scores.) The middle SES subjects obtained, on the average, adequate decoding ability by the end of Grade 1. During Grade 2 they were able to apply this ability in reading, probably quite frequently at first, but less and less as they gained experience in visual word recognition and in the use of contextual cues. At the end of Grade 2 reading ability still reflected adeptness in decoding, but by the end of Grade 3 and thereafter, decoding ability was washed out by ability to use syntactic/semantic context and word-oriented visual cues for word recognition. Decoding at these levels appears to serve a back-up role, being called into play for words not immediately recognized by other means and for words that the reader is not sure he has recognized properly. (Subvocalization begins to disappear by Grade 3, and for the average reader silent reading speed approaches oral reading speed.)

This argument can also be applied to the correlations for the lower SES subjects, except

that decoding ability is not well enough developed by the end of Grade 1 to have a major effect on reading comprehension one year later. (At the end of Grade 1, 65.5% of the lower SES subjects failed to do better than 50% correct on the synthetic words.) Thus, it is only during Grade 2 that decoding ability reacnes a level at which it can be a major aid in reading. Therefore the Grade 3 reading comprehension scores should show for this group the highest correlation with year-earlier decoding scores. The size of the correlation at its peak, however, is probably attenuated by the large range of decoding abilities relative to the middle SES group. That is, some low SES subjects do not reach mastery of decoding until Grade 3 while others reach it during Grade 1. Furthermore, some of the poorer decoders may have acquired word recognition strategies which allow them to partially bypass the use of decoding, even when they become adept at it.

To validate this hypothesis beyond what can be established with the meager data presented here will require replication of the experiment with testing of both decoding and reading comprehension at several intervals during the school year. In this way the time lag between decoding mastery and reading comprehension testing which gives the highest correlation between the two abilities could be determined. There is no reason to assume that this lag will be the same for different ability groups. It is also desirable to determine the degree to which decoding ability is applied in learning to read, especially in "silent" reading, but so far no one has suggested a reliable technique for doing this.

GPO 603-288-3

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