DOCUMENT RESUME

ED 080 969 CS 000 707

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TITLE Segmented Print as an Aid to the Identification of Polysyllabic Words.
PUB DATE May 72
NOTE 25p.; Adapted from a paper read at the Annual Meeting of the International Reading Assn. (Detroit, May 1972)

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS Graphemes; Junior High School Students; *Oral Reading; *Pronunciation; Reading; *Reading Research; *Retarded Readers; *Word Recognition
IDENTIFIERS *Segmented Print

ABSTRACT

This study compared accuracy of word identification in oral reading of materials in which polysyllabic words were spatially divided with performance on undivided materials of comparable difficulty. Retarded readers in junior high schools were tested with two forms of the Gilmore Oral Reading Test. The experimental form presented polysyllables divided into groupings containing positional and marker grapheme clues to pronunciation. The control version was left unsegmented. Subjects performed significantly better with experimental forms than with control versions. However, treatment effect was differentiated according to reading grade level. The 4.0-4.9 reading grade group showed a non-significant difference with segmented print, while those in the 5.0-5.9 and 6.0-6.9 groups registered experimental differences equivalent to six and nine months respectively. These results suggest that segmented print may well serve as an interim treatment for identifiable groups of retarded readers. (Author/LL)

SEGMENTED PRINT AS AN AID TO THE IDENTIFICATION OF POLYSYLLABIC WORDS*

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Educators have long been uncomfortably aware that large numbers of pupils slow down or even grind to a halt in their reading progress in the intermediate and junior high school grades, with consequent adverse effects on academic and personal development. There are, of course, many possible explanations for this phenomenon, and reading ability has been shown to be affected by such diverse factors as physical and neuro-physiological deficits or dysfunctions, intelligence, motivation, socio-economic conditions, emotional maladjustment, and educational opportunity (Robinson, 1946; Eisenberg, 1966). Diverse, too, are the reading skill deficits manifested by these pupils, including various combinations of limitations in decoding skills, concept and vocabulary development, mastery of syntactical patterns, and the ability to apprehend relationships of ideas (Bond and Tinker, 1957).

One skill deficit that is frequently found in these grades is a weakness in the identification of polysyllabic words. Poor readers often have difficulties with such words even when they are in the pupil's listening or speaking

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*Adapted from a paper read at the International Reading Association Convention, May, 1972 in Detroit, Michigan.

vocabulary, with a resultant impairment of his ability to derive meaning from the printed page.

Since polysyllables occur with ever-increasing frequency in the reading materials for each succeeding grade, it is essential that pupils be helped to remove the skill deficiency, else the widening gap between reading ability and the difficulty levels of materials suitable for the school curriculum and pupils' social maturity will result in continued academic failure, deepening negative attitudes toward reading as a source of pleasure and profit, and adverse effects on pupils' self-esteem.

Goodman (1968) suggests that the ability to identify visually unfamiliar words requires the use of three "cue systems":

1. Cues within the materials, including (a) simple and compound graphemes, (b) spelling patterns and commonly occurring affixes, and (c) context clues.

2. Cues within the reader, including (a) the decoding strategies with which he is familiar; (b) his language experience -- mastery of syntax, phonology, and lexicon; and (c) his conceptual background.

3. External cues such as skill charts and dictionary phonetic respellings.

Although a developmental or remedial reading program must address itself to the strengthening of each of the cue systems, the present study had a more limited objective. It proposed to determine whether the task of decoding polysyllables could be simplified for disabled readers ad interim by presenting polysyllables in segmented form, spatially

divided in a manner so as to include in each segment such clues to the pronunciation of vowels and some consonants with variant spelling-to-sound correspondences as position in the graphemic group and correspondence-affecting marker graphemes.

The use of typographical divisions of polysyllables has a long history as a teaching device. As far back as 1570, John Hart divided polysyllables in his system of reading instruction (Pitman and St. John, 1968). Noah Webster's famous American Spelling Book, published in 1783, presented polysyllabic words in segmented fashion in his "tables", or lists of new words, and in some connected passages. A number of reading texts in the nineteenth century followed Webster's practice (Williams, 1830; Monroe, 1885; Moore, 1886). Special reading systems employing a simplified or augmented alphabet sometimes included segmented print in their methods. Those devised by Benn Pitman and by Ellis in the nineteenth century are illustrative (Pitman and St. John, 1968).

Objective evaluations of the effectiveness of segmented print either as an instructional technique or as an interim facilitator are notably absent, however, either because none was attempted or because segmentation was but one feature in a special reading method and was not treated as a distinct independent variable. Moreover, the bases for deciding on syllable boundaries were not specified and appear to have been determined subjectively.

More recently, Rettke (1958) found that "syllabified print" based on dictionary entry word division resulted in significantly higher scores on a test of word recognition for both poor and good readers in grades four, five, and six.

In the present study the basis for determining the divisions of polysyllables was the inclusion in each segment of such determinants of variant spelling-to-sound correspondences as position in the segment and adjacent or non-adjacent marker graphemes. Spelling-to-sound correspondence determinants on the graphemic level were derived from the analysis of a 20,000 word corpus by Weir (1964), Venezky (1965) and Weir and Venezky (1965).

Hypothesis

Retarded readers will demonstrate greater accuracy in word identification in material in which polysyllabic words are segmented into graphemic environment groups than in non-segmented material of comparable difficulty.

Definitions of Terms

The following terms are defined according to the sense in which each is used in the study:

1. Polysyllabic word refers to a word whose pronunciation as indicated by the phonetic respelling in A Pronouncing Dictionary of American English (Kenyon and Knott, 1951) includes two or more vowel nuclei.

2. Graphemic environment group refers to a cluster of one or more graphemes that includes at least one vowel grapheme, together with such determinants of variant spelling-to-sound correspondences as position in the group, adjacent and non-adjacent affective graphemes, and marker graphemes. (A complete listing of major spelling-to-sound correspondences and their graphemic environments is given in Appendix A).

Graphemic environment groups may consist of only part of a morphemic unit. The word spicy, for example, consists of two morphemes, spic and y. In the present study, however, it was considered that a morphemic division, spic y, might give retarded readers less of a clue to the word than the graphemic environment groupings, spi cy. The latter grouping serves to indicate more clearly the correspondence of i with /aI/ in final position and the correspondence of c with /s/ before y.

A graphemic environment group may extend beyond syllable boundaries to include marker graphemes that serve to signal a regular, though variant correspondence. The word necessary, would here be divided as neces sary rather than as nec es sar y, the dictionary entry word division. The first graphemic environment group, neces, exceeds syllable boundaries in order to include the second e that serves not only as a referent for a schwa, but also as a marker to signal the correspondendence of the c with /s/. The graphemic environment group, sary, includes the y to signal the correspondence of a with /ɛ/ before ry.

Method

Sample

From a population of retarded readers in grades seven, eight, and nine drawn from nine schools in the New York City area, a sample of ninety Ss was selected, divided into three groups of thirty each on the fourth, fifth, and sixth grade reading levels. Each S met the following conditions:

1. A reading comprehension level at least two years below grade placement, but no lower than 4.0 on the Stanford Diagnostic Reading Test, Level II, Form X.

2. A listening vocabulary score on the SDRT. Form X, at least two stanines higher than his score on the equivalent Form W used as a test of reading vocabulary.

3. Normal visual and auditory acuity, according to school health records. A visual defect greater than 20/40 for each eye, corrected by glasses was deemed reason for elimination.

4. Fluency in spokem English, without gross foreign accent or speech defect, according to evaluations by teachers and the investigator.

Data concerning distribution of Ss by reading achievement level, grade placement, sex, ethnic origin and age is summarized in Table I.

TABLE I

DISTRIBUTION OF SUBJECTS BY READING ACHIEVENT LEVEL, GRADE PLACEMENT, SEX, ETHNIC ORIGIN, AND AGE

Rdg. Ach. Level	N	Gr. Place. 7	8	9	Sex M	F	Eth. Orig W	B	H	Mn. Age (in years)
4.0-4.9	30	17	13	0	14	16	7	14	9	13.3
5.0-5.9	30	6	24	0	15	15	4	16	10	14.1
6.0-6.9	30	0	22	8	20	10	10	13	7	14.3
Totals	90	23	59	8	49	41	21	43	26	(13.9)

Preparation of Material

Forms A and B of the Gilmore Oral Reading Test were each prepared in segmented print (SP) and in non-segmented print (NSP), yielding Forms A-SP, A-NS, B-SP, and B-NS. In SP versions all polysyllables in which every spelling unit had its major spelling-to-sound correspondence were spatially separated into graphemic environment groups. Polysyllables in which one or more spelling units did not have a major spelling-to-sound correspondence were left unsegmented. (It was assumed that Ss would be most familiar with the major correspondences). There were, however, two classes of exceptions:

1. Compounds formed of two elements, each of which was an independent unit were divided between the two units regardless of whether one or both elements contained a mi-correspondence.

2. Words containing syllable-increasing inflectional endings were divided between the root and the inflectional ending even in instances where the root contained a spelling unit with a minor correspondence.

When a division of a polysyllable between morpheme syllables did not alter the clues that would have been provided by graphemic environment grouping, segmenting was made between the morphemes. (Examples: farm er rather than far mer; last ed rather than las ted; but ta ken rather than tak en; sha dy rather than shad y).

Each test form was prepared with an IBM Executive typewriter and reproduced by xerography.[1] In SP forms, a two-unit space separated graphemic groups and a six-unit space separated words and sentences in selections in which 25 per cent or more of the words were polysyllabic. In selections in which fewer than 25 per cent of the words were polysyllabic, a one-unit space was inserted between graphemic environment groups, a three-unit space was inserted between monosyllables and between sentences; a four-unit space preceded and followed polysyllables. (Spacing patterns were designed to eliminate a possible confusion of a graphemic environment group with a whole word).

In NS forms no added space was inserted within words. Other spacings followed SP versions. (See Appendix B).

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[1]With the kind permission of the copyright owner, World Book Company.

Procedure

Each subject was tested with two forms of the Gilmore Oral Reading Test, one in SP and the other in NSP. The order of form presentation was counterbalanced by school, and each Ss protocols were completed within a two-week period to minimize the effect of any change through learning.

Test protocols were taped so that scoring could be rechecked. If, for any reason, no clear decision as to the correctness of a response could be made, that response was scored as an error. SP and NS forms were administered and scored according to the directions in the Test Manual except that an additional direction calling attention to the typographical division of polysyllables was included for SP forms.(See Appendix B).

Design

A 3 X 2 randomized block factorial design with repeated measures was used to test the hypothesis of greater accuracy in word identification with SP materials than with NS materials.

Results

The results of the analysis of variance on word identification are presented in Table 2. These results show a significant between-form effect for the experimental treatment ($F= 58.901$; df 1,87; $p<.01$).The interaction effect of Grade X Form was also significant ($F=3.634$; df 2,87; $p<.05$).

TABLE II

SUMMARY OF ANALYSIS OF VARIANCE OF DATA FOR ACCURACY OF WORD IDENTIFICATION

Source of variance	SS	df	MS	F
Total	17,397.644	179	--	--
Between subj total	15,165.644	89	--	--
Between grades	6,339.744	2	--	--
Within sub. total	2,232.000	90	--	--
Between form (a)	888.889	1	888.889	58.901**
Pooled-within-cells	1,239.567	87	14.248	
Pooled-within-cells + interaction	1,343.111	89	15.091	--
Grade X Form (b)	103.544	2	51.772	3.634*

(a) Compared with the sum of pooled-with-cells and interaction sources of variances.

(b) Tested by pooled-within-cells variance

** $p > .01$

* $p > .05$

The main effect indicates that the performance of Ss on SP forms was significantly better than on NSP forms. It may be concluded, therefore, that the presentation of polysyllabic words in segmented form had a facilitating effect on word identification.

The significant F ratio for Grade by Form interaction indicates that the treatment effect was differentiated by

reading grade level. Table 3 summarizes the means, standard deviations, and differences between treatment means for the total sample and for each reading grade level.

TABLE III

MEANS, STANDARD DEVIATIONS, AND MEANS DIFFERENCES FROM RAW SCORES FOR ACCURACY OF WORD IDENTIFICATION

	Combined Groups	4.0-4.9 Group	5.0-5.9 Group	6.0-6.9 Group
$\bar{X}_{SP}$	50.267	41.883	50.967	58.000
$\bar{X}_{SP}$	45.822	39.533	45.500	52.433
$\bar{X}_{SP} - \bar{X}_{NS}$	+4.445	+2.300	+5.467	+5.567
SD_{SP}	10.014	6.988	7.784	7.900
SD_{NS}	9.231	6.124	8.241	8.357

A Tukey comparison of means for each of the three reading grade groups was computed for the .05 level of significance, indicating that a difference between treatment means of at least 2.76 was required for significance at the .05 level. Inspection of Table III reveals that the obtained difference for the 4.0-4.9 group was +2.3 and is smaller than that required for significance at the .05 level. The obtained differences for the 5.0-5.9 and 6.0-6.9 groups were +5.467 and +5.567 respectively, both significant beyond the .05 level.

Discussion

Within the limitations of the experimental design and conditions, results of the study indicate that the hypothesis of greater accuracy in word identification with segmented print than with non-segmented print remains tenable. The enhanced performance was limited, however, to Ss on the fifth and sixth grade levels in reading achievement.

Although the study did not systematically gather data to support a firm explanation for the non-significant treatment effect for the 4.0-4.9 group, informal analysis of the tape-recorded protocols suggests that the ineffectiveness of the experimental treatment may be ascribed to Ss deficiencies in syllable phonics, so that they were unable to take full advantage of the decoding clues provided by segmented print.

Another possibility is that some Ss habitually employ word identification strategies of attending only to initial parts of words or to whole word configurations, supplemented by guessing. The experimental treatment may not have provided a sufficiently strong stimulus to change in in one brief testing session a mind set developed over a period of years.

The obtained mean raw score differences between SP

and NS treatments for the 5.0-5.9 and 6.0-6.9 groups were found to be significant beyond the .05 level. Translated into grade equivalents, the raw score differences in favor of SP correspond to gains of six months for the fifth grade group and nine months for the sixth grade group. Considering that retarded readers in the eighth or ninth grade have had nine to ten years of schooling, and have averaged, thefefore, approximately five to seven months of progress per school year, the enhanced performance with SP suggests that the treatment effect may offset approximately one year of instruction.

Pending further investigation, it appears that segmented print may serve a useful function by providing teachers with a means of meeting individual needs of their pupils. It has long been recognized that students who have attained even an identical reading level differ in the degree of mastery of the various underlying skills. For pupils who have difficulty with the identification of polysyllabic words, the use of segmented print may have value as an interim device for bringing the difficulty level of materials closer to the skills levels of retarded readers.

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APPENDIX B

Major Spelling-toSound Correspondences

Consonants

Spelling Unit	Correspondences	Environment	Examples
b	/b/[1]	Any	be low; deb it webbed
c	/s/	Before e, i, or y	cell; ci gar i cy
	/s/	Before i + vowel	so cial; sus picion
	/k/	All other	cab in; pic nic;
ch	/c/	Any	church; searched
d	/t/	In final position as past tense or participle marker after unvoiced consonant except /t/	taped; liked
	/d/	All other	ad dress; named
f	/f/	Any	fear; baf fle; safe ty
g	/j/	Before e, i, or y	gin ger; o blige gym nast
	/g/	All other, except after n	go; beg gar; ea gle

[1]Geminate consonant clusters (bb, dd, ff, etc.) are pronounced as single consonants within morphemic units. It

Spelling Unit	Correspondences	Environment	Examples
h	/h/	Initial position	hap haz ard; be-have
j	/j/	Initial position	en joy; jest er
ck	/k/	Final or medial position	pock et; pickle
k	/k/	Any	kip per; ca pok; liked
l	/l/ *	Any	lull; lit tle
m	/m/ *	Any	mad am; arm y
ng	/ŋ/	Final position	going; sing er
	/ŋg	Medial, final position	single; ang ry
nk	/ŋk/	Medial, final position	ankle; thank ful
n	/n/ *	Any	kid nap; ran som wanton
ph	/f/	Any	pho to; sphe roid graph ic; graphed
p	/p/ *	Any	per haps; lapped

is assumed that separated geminates will be combined into a single consonant when graphemic environment groups are synthesized into the whole word.

Spelling Unit	Correspondences	Environment	Examples
qu	/kw/	Initial position	quar rel; e qual
r	/r/ *	Any	ru ler; barrel; burner
s	/z/	Final position after a voiced consonant spelling; medial position between an unstressed vowel and a stressed vowel.	no mads; desig nation; reso nance; closing
	/əz/, /z/, /s/	After /s/, /z/, /š/, /ž/, /č/, or /j/, morphemic s becomes / z/; after any other voiced morphophoneme, it becomes /z/; otherwise it becomes /s/	cases; houses; wishes; arches; judges; garages; judges; es tate; stor y
	/s/	All other	
sh	/š/	Any	ship ment; fool ish; shrimp; wished
t	/s/	Followed by vowel + vowel when not preceded by s or x	par tial; na tion
	/č/	Palatalized before u in unstressed syllable	na ture; for tune
	/t/ *	Any other	try; hat ter; but
th	/ð/, /θ/	Any	ŧ ther; ei ther; thim ble; bathe

Spelling Unit	Correspondences	Environment	Examples
v	/v/	Any	val ue; e volved; solv ing
w	/w/	Initial position; in digraphs	win ning; dwell er swel ter; twelve
	/hw/	Initial	wha ler; whi tish
x	/ks/	Final position in accented syllable	ex pert
		Final position in unaccented syllable	ex am ine
y	/j/	Initial position	yel low; can yon
z	/z/	Followed by u in unstressed syllable	azure; sei zure
	/z/	Any other	ze bra; to paz
dg	/ǰ/	Final position; followed by e in word-final position	midg et; judg ing dis lodge
sch	/sk/	Initial position	schol ar; schoon er

Spelling Unit	Correspondences	Environment	Examples
ay	/e/	Final position	play er; to day
	/i/	Final position in unstressed syllable	Sun day
ey	/e/	Final position	o bey; a bey ance
au/aw	/ɔ/	Any	au di ence; aw ful; maud lin; bawd y
eu/ew	/ju/	Any	neu tron; pew ter
ea	/i/	Any	teach er; leav ing
ee	/i/	Any	ab sen tee; eer ie
ie	/aɪ/	Final position in monosyllabic words	die; lie
	/i/	Final or medial position	be lieve; cal or ie
oi/oy	/ɔɪ/	Any	loi ter; oy ster
oa	/o/	Any	ap proach; goal ie
oo	/u/ / /	Medial or final position	ty coon; ta boo; hood
ou/ow	/au/	Initial and final positions	owl; moun tain
	/o/	Final position	pill ow; arrow
ui	/u/	Medial and final positions	nui sance; suit or

Spelling Unit	Correspondences	Environment	Examples
i/y	/aɪ/	Final position in stressed syllable	pi lot; ri pen; reply; dynamite
		VCe pattern in stressed syllable	po lite; re fined
	/ɪ/	Final position; followed by consonant or consonant digraph; followed by geminate r or r + vowel	in di vi du al; cit y; with er mirror; spirit
	/ə/	Followed by single r	dirt y; cir cle; myrtle
o	/o/	Final position in stressed syllable	po ny; mo tion
		VCe pattern in stressed syllable	ex pose; con done
	/a/	Followed by consonant, consonant digraph, or geminate r	bot tle; cop per; soph ist; borrow
	/ɔ/	Followed by single r	bor der; for tune
u	/ʊ/, /ju/	Final position in stressed syllable	flu ent; Cu ban
		VCe pattern in stressed syllable	a cute; di lute
	/ə/	Followed by consonant or consonant digraph	pub lic; Dutch
		Followed by r	fur ther; mur der
ai	/e/	Medial or final position	dai sy; fair y

VOWELS

Spelling Unit	Correspondences	Environment	Examples
a	/e/	Final position	ba by; in fla tion
		VCe pattern in stressed syllable	be came; late ly
	/æ/	Initial or medial position followed by consonant, consonant digraph, or geminate r	hat ter; gath er; barri cade
	/ɑ/	Followed by single r	bar ter; quar rel
	/ə/ **	Any position in an unstressed syllable	a bout; del i cate; at tack; pa rade
e	/i/	Final position	He brew; se ri ous
		VCe pattern in stressed syllable	com plete; su preme
	/ɛ/	Followed by consonant or consonant digraph, geminate r's or r + vowel	beck on; deb it; wheth er; terror de merit
	/ə/	Followed by retroflex r	her mit; sum mer
	/ɸ/	Final in VCe pattern	res pite
		Graphotactical marker	motive; table; argue

**The schwa sound is a major spelling-to-sound correspondence for all vowel and vowel combination spelling units in an unstressed syllable. This correspondence will not be listed in subsequent correspondences.

APPENDIX B

AD DI TION AL DI REC TIONS FOR SEG MENT ED PRINT[1]

In the test you are a bout to take, you will see that many words have been di vi ded in to parts (or syl la bles) by leav ing a small space be tween them. This has been done to help you sound out words that you may not know.

Look at the word Di rec tions, for ex am ple. How many parts, or syl la bles, do you see in this word?

Yes, there are three parts - Di rec tions - be cause the word has three syl la bles when you pro nounce it. It is one word - Directions - but if you were not sure of the word, see ing the sep a ra ted parts might help you sound it out.

Of course, if you know the word, you don't have to s ound out the syl la bles. Do you un der stand what you are to do?

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[1]This page provides a sample of the type face and spacing treatment employed for segmented print test versions.

ABSTRACT

Bibliography	Segmented Print as an Aid to the Identification of Polysyllabic Words Louis Simon The City College of New York
Purpose	Compared accuracy of word identification in oral reading of materials in which polysyllabic words were spatially divided with performance with undivided materials of comparable difficulty.
Method	Retarded readers in junior high schools were tested with two forms of the Gilmore Oral Reading Test. One form presented polysyllables divided into groupings containing positional and marker grapheme clues to pronunciation. Control version was left unsegmented.
Results and Conclusions	Ss performed significantly better with experimentally treated forms than with control versions ($p<.01$). Treatment effect was differentiated, however, according to reading grade level. Ss in the 4.0-4.9 reading grade group showed a non-significant difference with segmented print, while those in the 5 .0-5.9 and 6.0-6.9 groups registered experimental differences equivalent to six and nine months respectively. Suggests that segmented print may well serve as an interim treatment for identifiable groups of retarded readers.