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NOVEL WORD DECODING IN KINDERGARTEN AS A FUNCTION OF DECODING STRATEGY AND SEGMENTATION-BLENDING TRAINING FORM*

John Koehler, Jr.

The available evidence indicates that a child's ability to read new words is enhanced more after instruction on letter-sound correspondences and the skills of word decoding than after whole-word training (Jeffrey & Samuels, 1967; Marsh & Sherman, 1970). Most current reading programs thus contain an instructional component, called word attack, that is supposed to develop the reader's skills in decoding unfamiliar words. The skills of word decoding most often referenced in the reading pedagogy literature are 1) segmentation of the printed word into decodable elements, 2) retrieval of the articulatory correspondents for the elements, and 3) blending the elements into recognizable word forms. Instructional tasks addressing these skills are usually confined to practice on segmenting words phonetically and synthesizing the sound elements into whole words. It is assumed, of course, that the correspondents for the elements have been acquired either during practice on the decoding skills or through paired-associate practice. Word attack instruction may also include training on skills considered prerequisite to the component skills of word decoding, e.g., auditory discrimination.

The skills of word decoding will tend to vary in complexity with the strategy used in word decoding. A strategy based on a single-letter approach will generally require more processing skill, due to the number of sound units retrieved and blended, than a strategy where letter combinations are treated as units. The processing requirements will also differ with the form of the letter combination strategy. For example, the elements of the decoding rule for the CCVC word may be initial consonant cluster and VC; initial consonant and CVC trigram; or CCV cluster and final consonant. It is apparent that each of these rules requires somewhat different levels of skill in segmenting, retrieving, and blending word elements.

Marsh (1969), like others, has noted that there may be some problem in finding tasks appropriate for training young children on the word decoding skills. Moreover, little is presently known about the training factors affecting the development of skills that underlie specific word decoding strategies. The present study addresses these problems by exploring the effects of segmentation-blending (SB) training forms under different word decoding (WD) strategies in kindergarteners. Separate groups of prereading kindergarteners were given word attack training on combinations of six SB training forms and two WD strategies.

*Part of this paper was presented at the 1972 AERA meeting in Chicago, Illinois.

The results of this training were evaluated in terms of decoding novel word forms.

The WD strategies were applied to CVC and CCVC word forms. In WD-1, the CVC form was segmented into CV and final C elements and the CCVC form into initial C and CVC elements; in WD-2, the respective forms were segmented into initial C and VC and initial CC cluster and VC. The strategies were selected for study because they varied on element coding ease and pronounceability, two factors believed to influence the decoding process. Under WD-1, the decoder has to use different scanning and segmentation rules for each word form, whereas the CVC and CCVC forms are treated more uniformily under WD-2 in that the VC is a common element to both. Some (Wylie & Durrell, 1970) have also claimed that the VC phonogram tends to stabilize the vowel sound, which should enhance its transferability from one word context to another. On the other hand, the CV may be more appropriate than the initial consonant for decoding CVC forms since the pronunciation of consonants tends to be conditioned by the following vowel Liberman, Cooper, Shankweiler & Studdert-Kennedy (1967). It is also questionable whether the CC in the CCVC form should be treated as a unit since it will probably compound the pronunciation difficulties associated with the individual consonants.

The SB training forms covered sounding out (phonetic segmentation), blending, and recognition of the word elements defined by the WD strategies. The recognition procedure involved selecting the letter or letters that corresponded to the WD element present in a spoken word or to a component of the element pronounced in isolation. The six SB training forms were:

SB-1, sounding out and blending word elements;

SB-2, recognizing and blending word elements;

SB-3, sounding out word elements;

SB-4, recognizing word elements;

SB-5, recognizing word elements and components of the elements;

SB-6, blending word elements;

The recognition task was included in the study, even though it bears less directly on decoding than sounding out or blending, to determine whether 1) phonetic segmentation performance could be improved with the use of a response mode that makes fewer demands on children than sounding out and blending and 2) decoding capability could be extended to components of WD elements so that words other than those containing the WD elements might be read.

Theoretically, it should be possible to read new words by simply acquiring the correspondents for the word elements present in the words. If children could perform at this abstract level, word attack training obviously would be simplified and more efficient. Most evidence suggests, on the contrary, that young children must receive some instruction on the component skills of the word decoding task before any significant transfer to it will occur (Silberman, 1964; Jeffrey & Samuels, 1967; Marsh & Sherman, 1970). But knowledge about the relative effectiveness of skill training tasks is inadequate at this time. Moreover, it is unclear whether word attack instruction must include tasks on both segmentation and blending since many of the same component skills are present in both. The proposed SB training forms thus were designed to examine these issues through appropriate comparisons between individual tasks as well as combinations of segmentation and blending tasks.

METHOD

Seventy-two kindergarteners were group trained and individually tested, with six Ss receiving each of the 2 X 6 treatment conditions. All Ss received four units of training and testing. The first and third units covered CVC forms and the other units the CCVC form. In each unit, three to six Ss were 1) drilled to sight recognize word elements and words used in the SB training, 2) trained on performing the SB tasks, and then 3) tested individually for (a) recall of sight-drilled items, (b) SB task performance and (c) decoding novel word forms. In the first two units, the novel words could be decoded by direct transfer of the WD elements, e.g., train on F - LAM and S - LAG, test on SLAM and FLAG; in the last two units, some words were decodable by direct transfer and others by recombining the letter-sounds within WD elements, e.g., train on F - LAM and T - RIP, test on TRAP. The latter served to test the transfer effects of SB training on components of WD elements.

For training on the sounding out task, E presented an item in spoken form as a whole word. The children were required to sound out the item in accordance with the segmentation rule of the WD strategy. On later presentations, the item was presented in visual and spoken whole forms concurrently. For recognition task training, the item was presented as a spoken word and the children were required to select from a visual array of two or three word elements the element contained in the spoken word. For training on components of the WD elements, which occurred in the third and fourth units, the array displayed to the children contained only single letters. Blending practice was conducted by having E present an item in sounded out form in accordance with the segmentation rule and the children responded with the blended or whole word form. On later presentation, the item was first presented visually in segmented form and the children responded to each segment and then visually in whole word form and the children responded with the blended form.

Under each training treatment, sight drill and SB practice was applied first to the children as a group and then to individual children in rotation until every child had a chance to respond to every training item at least once. Corrective feedback was applied during training only.

The study was conducted in a two-cubical trailer set up on the school grounds where Ss were enrolled. The words and word elements used for training and testing were printed in block capitals on 5" X 8" file cards. A list of the training and testing materials is given in Table 1. Training and testing on each unit took an average of 4 days--3 days of training and 1 day of testing. Daily training was approximately 30 minutes per group, while testing averaged 10 minutes per child for each unit.

The Ss ranged in age from 61-79 months with a mean of 70.7 months. The Ss did not receive reading instruction at school prior to or during participation in the study. The Southwest Regional Laboratory Entry Skills test was used as a screening device; children missing more than three items were not included in the study.

RESULTS AND DISCUSSION

Novel word decoding performance was scored in terms of whole word identification and matching on the initial and final elements defined by the WD strategy. Separate analyses were performed on these measures for CVC and CCVC forms.

A special problem arose which required reducing the scope of the study. The Ss were drawn from three schools in one district. The school dimension, however, could not be made orthogonal to the treatment conditions. An examination of treatment group means indicated that school differences could account for some treatment effects, thus data from the school having the best distribution of Ss across treatments were used in the data analyses. As Table 2 shows, this required eliminating SB-5 and SB-6 conditions from the study design and using unequal numbers of Ss in the remaining treatment groups. The unweighted-means analysis for unequal cell frequencies described by Winer (1962) was used in the ANOVA computations.

The means for whole word identification were calculated on log (X + 1) transformed scores; they are presented in Table 3 for the CVC and CCVC word forms separately. The means in Table 3 tend to suggest that training beginning readers to sound out familiar words (i.e., words previously sight drilled) under the WD-2 strategy improves novel word identification more than the other forms of SB practice. No significant main effects or interaction between SB training form and WD strategy, however, were found in the analysis of these data. The prominence of the sounding out condition in the table is interesting, nonetheless,

Table 1

Words and Word Elements for Training and Testing

Instructional Unit	Treatment Component	Strategy: WD-1	Strategy: WD-2
1	Sight Drill	C: g, m, p CV: la, ri CVC: lag, lap, rig, rip	C: l, r, t VC: am, im CVC: tam, ram, tim, lim
	SB	/læ/+/g/, etc.	/t/+/æm/, etc.
	Element Test	lam, rim	lam, rim
2	Sight Drill	C: f, g, s, t CVC: lam, lag, rim, rip CCVC: flam, slag, grim, trip	CC: fl, gr, sl, tr VC: am, im CCVC: flam, gram, slim, trim
	SB	/f/+/læm/, etc.	/fl/+/æm/, etc.
	Element Test	slam, flag, trim, grip	flim, grim, slam, tram
3	Sight Drill	C: g, m, p CV: ra, li CVC: rag, rap, lig, lip	C: l, r, t VC: ag, ip CVC: rag, tag, lip, tip
	SB	(1) SB-1, 2, 3, 4, 6: /ræ/+/g/, /ræ/+/p/ /lɪ/+/g/, /lɪ/+/p/ (2) SB-5: (a) C: r, l (b) Identify C in ra, li.	(1) SB-1, 2, 3, 4, 6: /r/+/æg/, /t/+/æg/ /l/+/ɪp/, /t/+/ɪp/ (2) SB-5: (a) C: g, p (b) Identify C in ag, ip.
	Element Test	ram, lim	lag, rip
	Element Component Test	pam, gap, map, pig	tap, rig, lap, pig
4	Sight Drill	C: f, g, s, t CVC: ram, lim, rig, lap	CC: fl, gr, sl, tr VC: ag, ip, im, am
		(1) SB-1, 2, 3, 4, 6: /f/+/læm/, /s/+/læg/ /g/+/rɪm/, /t/+/rɪp/ (2) SB-5: (a) C: r, l (b) Identify C in ra, ri, la, li.	(1) SB-1, 2, 3, 4, 6: /fl/+/æm/, /gr/+/æm/ /sl/+/ɪm/, /tr/+/ɪm/ (2) SB-5: (a) C: g, p, m (b) Identify C in ag, ip, im, am.
	Element Test	gram, flim, tram, slim, trig, slap, trim, flag, grip, slam	flag, trip, slag, grip, slam, grim, flip, flim, tram, slip
	Element Component Test	stag, flat, flip, prim, frat, trap, slip	flag, trig, stag, flat, prim, trap, frat

Table 2

Cell Ns for the Curtailed Study Design

	WD-1	WD-2
SB-1	4	2
SB-2	6	6
SB-3	6	4
SB-4	6	6

Table 3

Means for Whole Word Identification

	CVC Form		CCVC Form	
	WD-1	WD-2	WD-1	WD-2
SB-1	.15	.15	.34	.30
SB-2	.22	.08	.45	.33
SB-3	.23	.53	.45	.78
SB-4	.15	.17	.18	.19

since others have also found this form of training to facilitate word identification and learning. In a study conducted at the Southwest Regional Laboratory, Marsh and Sherman (1970) found significant improvement in learning isolated letter sounds and whole words following sounding out practice but little transfer when going directly from letter sounds to words or vice versa. They suggested that the sounding out task may serve to mediate transfer between letter-sound correspondence acquisition and word decoding.

The mean values for SB-1 and SB-2 relative to SB-3 in Table 3 further suggest that giving young children blending practice may have less utility to decoding skill development than sounding out practice. This interpretation, however, disagrees with the view held by a number of investigators that practice at blending word elements is necessary if significant transfer to the word decoding task is to occur (cf. Richardson & Collier, 1971). While this position may be logically defensible and partially supported with research data Chall, Roswell, & Blumenthal (1963), it is rather suspected that the relative effectiveness of sounding out and blending practice may depend upon the stage of decoding skills development. It is probably easier for the beginning reader to learn something about how isolated word elements map into whole word forms in the sounding out task than through blending practice. In blending, the reader is expected to generate the word by scanning the isolated word elements as they are held in auditory store. To reinstate these essentially meaningless sound elements when the word is generated or is given in the corrective feedback event, however, is probably beyond the reach of most young children. In the sounding out task, the reader produces the individual word sounds while the whole word is held in memory. Under these conditions, comparison between the whole word and its sounded out form is always invited since the whole word can be reinstated or rehearsed with relative ease. Once some understanding of the element-to-word mapping process is achieved, it then may be more efficient, as suggested earlier, to have readers practice going directly from the correspondents for WD elements to whole words (i.e., blending). Investigation of this problem, however, will require more extended word attack training and testing of preliterates than that carried out in the present study.

The treatment group means for element matching performance largely agree with the pattern shown in Table 3 for whole word identification, and, again, the differences were nonsignificant. Initial element matching was found to be significantly superior to final element matching for both the CVC form ($F = 12.34$, $df = 1/32$, $p < .01$) and the CCVC form ($F = 49.85$, $df = 1/32$, $p < .01$). Matching accuracy was also found to vary with WD strategy and word form. The WD-1 group matched the final element more than the initial element, and the WD-2 group performed in the reverse fashion on the CVC form; this interaction was significant at the .01 level ($F = 49.56$, $df = 1/32$, $p < .01$). On the CCVC form, both groups matched the initial element more often than the final element.

Matching performance can largely be accounted for by the size of the element. Better matching took place on the single letter element of the WD-1 and WD-2 strategies for CVC forms, i.e., final C and initial C, respectively. This was also the case with the WD-1 strategy for the CCVC form. For the WD-2 strategy, however, better matching on the initial element, which was a CC, was accomplished by means other than simplicity of the element form. It is possible that in this case the initial C of the CVC form mediated encoding the CC element as a unit since it was always the second C and the CC element. But whatever mechanism is responsible for better matching on the CC element, it should be recognized that facility in identifying this element, in spite of its pronunciation difficulties, would favor teaching beginning readers the WD-2 strategy rather than the WD-1 strategy since the former tends to be less complex and more uniform over CVC and CCVC forms than the latter.

Nonetheless, there is still the problem of why identification of the VC element is so difficult. Seemingly, matching on the final consonant of the CVC form will occur even when children have received approximately 6 months of training under the WD-2 strategy. Rudegeair and Mineo (1972) found in a study conducted at the Southwest Regional Laboratory that novel CVC forms were matched more frequently in terms of initial and final consonants, which suggested to the investigators that the VC element is not responded to as a unit during decoding. It is possible, however, that failure to decode the VC as an intact unit represents a greater ease at transfering consonantal sounds relative to vowel sounds since associative training is given on the initial consonant of the CVC form. This interpretation is presently under investigation by having kindergarteners perform segmentation and blending operations on the VC form before practicing these operations on word forms where the VC is treated as a unit. It is posited that this form of training will tend to equalize recognition of the vowel and consonant and thus prepare for improved integration of the elemental sounds into a VC unit.

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