DOCUMENT RESUME

ED 042 587 24 RE 003 027

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TITLE	Transfer from Word Components to Words and Vice Versa in Beginning Reading.
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SPONS AGENCY	Department of Health, Education, and Welfare, Washington, D.C. National Center for Educational Research and Development.
REPORT NO	TR23
BUREAU NO	BR-6-2865
PUB DATE	31 Mar 70
NOTE	14p.
EDRS PRICE	EDRS Price MF-$0.25 HC-$0.80
DESCRIPTORS	Graphemes, *Kindergarten Children, Phonemes, *Phonics, *Reading Processes, *Reading Research, *Transfer of Training, Word Study Skills

ABSTRACT

The transfer relationships between three tasks used in the Southwest Regional Laboratory's (SWRL) First-Year Communications Skills Program to help the child recognize the relationship between isolated letter sounds and the same sounds embedded in a word context were investigated. The three tasks were learning isolated letter sounds, learning sounded-out (phonemically segmented) words, and learning whole words. The subjects were 96 children attending prekindergarten and kindergarten sessions. Each subject was randomly assigned to one of eight groups. Three lists (whole words, sounded-out words, and isolated letters) were presented to each of the eight groups. The results ranked the degree of transfer to be expected between words and word components. The greatest amount of transfer was obtained between isolated letter sounds and sounded-out words; the next largest amount of transfer was obtained between sounded-out words and whole words. In general, the results showed that learning the sounded-out words is a very useful pivot task because there was considerable transfer from this task to both isolated letter sounds and whole words while there was little, if any, direct transfer between the latter two tasks. References are included. (Author/NH)

SWRL

SOUTHWEST REGIONAL LABORATORY FOR EDUCATIONAL RESEARCH & DEVELOPMENT

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23 31 MARCH 1970

Published by Southwest Regional Laboratory for Educational Research and Development, a public agency supported as a regional educational laboratory by funds from the United States Office of Education, Department of Health, Education, and Welfare. The opinions expressed in this publication do not necessarily reflect the position or policy of the Office of Education, and no official endorsement by the Office of Education should be inferred.

TRANSFER FROM WORD COMPONENTS TO WORDS AND VICE VERSA IN BEGINNING READING

George Marsh and Marjorie Sherman[1]

A major problem in the early stages of a phonics-emphasis reading program is to get the child to transfer grapheme-phoneme correspondences learned in one context to other similar situations. This study investigates the transfer relationships between three tasks which are used in the SWRL First-Year Communication Skills Program to help the child recognize the relationship between isolated letter sounds and the same sounds embedded in a word context. These tasks are: a) learning isolated letter sounds, b) learning sounded-out (phonemically segmented) words, and c) learning whole words. Several writers (Bloomfield, 1942; Fries, 1963) have assumed that children can induce letter-sound correspondences from a knowledge of one set of whole words and use these letter-sound correspondences to decode a novel set of words made up of the same letter-sound components. Available experimental evidence (Jeffrey & Samuels, 1967; Silberman, 1964) suggests that this is not true. Children apparently need explicit training on the letter-sound correspondences in order to show the appropriate transfer behavior.

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[1]The authors would like to thank Elizabeth Reeke and Sheila Bernstein for assistance in data collection.

Three previous studies have been specifically concerned with transfer between letters and words. Bishop (1964), using adults, found that letter training had greater transfer value than word training in decoding a transfer list consisting of previously learned grapheme-phoneme correspondences. Two-thirds of Bishop's adult subjects induced letter-sound correspondences from whole words and these subjects showed as much positive transfer as the letter trained groups. Knowledge of grapheme-phoneme correspondences was not necessary to read the words but was necessary for transfer to new words.

Aside from the use of adult subjects to study processes in beginning reading, two other aspects of Bishop's study are noteworthy. In many cases she used syllabic rather than phonemic responses, and there is reason to believe that it is easier to segment between syllables than within syllables at the phonemic level. Secondly, she did not preserve the position of some of the graphemes in the transfer lists which may have had an effect on the subject's ability to decode the new transfer words.

A study similar to Bishop's was conducted by Jeffrey and Samuels (1967). These investigators used kindergarten children as subjects and phonemic rather than syllabic responses. They preserved the position of the graphemes from training to transfer lists. Jeffrey and Samuels' results agree with Bishop's finding that letter-trained groups are superior to word-trained groups, but the children in this study, in contrast to Bishop's adults, did not induce grapheme-phoneme associations to any appreciable degree from whole word training.

The third study of this problem was reported briefly by Calfee, Chapman, and Venezky (in press). They attempted to study transfer relations from single letters to double letter combinations and vice versa. Due to the limited amount of training given, their subjects showed little learning on the initial lists, so it was really not possible to evaluate transfer. In addition they varied the position of graphemes and consequently changed the vowel sound (e.g., on vs no).

The present research was also designed to throw light on the synthetic versus analytic approaches in learning to read. An analytic approach begins with whole words and proceeds to letter sounds, usually with an intermediate stage of phonemic segmentation. The synthetic approach starts with isolated letter sounds and proceeds to whole words. Each approach has both advantages and disadvantages. With the analytic approach the child may recognize that the letter sounds are related to sounds in the words he already knows rather than being meaningless abstract sounds which must be learned by rote. On the other hand, learning to code and store a word as a whole word may interfere with his ability to deal with its constituent parts.

In a synthetic approach the graphemic and phonemic elements are isolated from the beginning, and the child does not have to segment a well integrated vocal response. However, the initial associative

learning of isolated letter sounds may be difficult because of low response availability. In addition, the coding principle (i.e., that the spatial order of graphemes corresponds to the temporal order of the phonemes) must be induced by the child.

None of the previous studies included groups which learned a sounded-out or phonemically segmented list. Such lists are usually included in instructional sequences both during analytic training (sounded-out) and synthetic training (as elements to be blended). The sounded-out list preserves some of the advantages of both isolated letter sound lists and whole word lists. The order information is preserved as in a whole word list, thus possibly facilitating the acquisition of the coding principle. On the other hand, the responses are already phonemically segmented for the child, as in isolated letter sound lists.

If a child were to show positive transfer from one set of words to another set containing the same grapheme-phoneme elements he would need both analytic and synthetic skills. The process may be schematized as follows:

Stage	Example
1. Whole words	pat; men
2. Phonemic segmentation	p-a-t; m-e-n
3. Isolated letter sounds	a, e, m, n, p, t
4. Phonemic recombination	p-e-n; m-a-t
5. Whole words	pen; mat

In the above example the elements must be combined into new patterns, but the position of the elements in the words remains the same. When the position varies (i.e., given "pan" decode "nap") the task may be more difficult.

The present study dealt with the case where the phonemes in isolation were as similar as possible to phonemes embedded in a word context, and where no substitution or recombination of elements on recording of positions of the elements was involved. These other task components will be investigated in future studies.

METHOD

SUBJECTS

The subjects were 96 children attending pre-kindergarten and kindergarten sessions. The children ranged in age from 4 years, 11 months to

6 years with a mean age of 5 years, 5 months. There were 51 boys and 45 girls. An additional 66 children were dropped from the sample because of refusal to cooperate or failure to learn the first list within 20 trials. Subject loss was not significantly different across experimental conditions ($X^2 = 9.96$ $p > .10$), although it limits the generality of the results obtained here to the better learners in the sample.[2]

DESIGN

The three lists--whole words (W), sounded-out words (S-O), and isolated letters (L)--were studied in all six possible two task sequences (W-SO; W-L; SO-W, SO-L LOW, L-SO). In addition two word control groups learned, as a first task, isolated letter sounds (C-L) or sounded-out words (C-SO) with grapheme-phoneme elements different from those used in six experimental groups.

Comparison of groups with the same second (transfer) list allows assessment of the relative transfer of any two tasks on the third task (e.g., L-W vs SO-W). The two control groups were designed to assess absolute transfer from either learning letters or sounded-out words to whole words. This kind of control group is more appropriate to assess specific versus nonspecific transfer (i.e., learning to learn and warm-up) than the controls run in previous studies. Bishop (1964) gave her control groups no practice on any task. Jeffrey and Samuels (1967) used a nonrelated very easy P-A task.

MATERIALS

The materials used in the present study were similar to those used by Jeffrey and Samuels (1967). A miniature consonant-vowel matrix employing the consonants m and s and long vowel sounds ā (/e/) and ē (/i/) were used to generate four words mā, sā, mē, and sē. Pilot studies indicated that learning a four-item word or sounded-out list was more difficult than learning a four-item letter list. In order to equalize list difficulty, only three items (mē, mā, and sē) were used in the word and sounded-out tasks.

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[2]The major cause of the high S attrition was the difficulty many children had in learning short paired-associate (P-A) lists in a single experimental session. Further work is needed to investigate procedures for facilitating P-A learning of grapheme-phoneme lists in kindergarten children.

The initial intention was to use standard orthography; but, screening for knowledge of the alphabet indicated that over 50% of nursery school children knew some of the letters involved in the study. Since speed of learning the letters was one of the main dependent variables, it was necessary to switch to an artificial orthography. Gibson's letter-like forms (Gibson, 1965) were used because they have many of the same distinctive features as the English alphabet.

The graphemes were photographed on 35 mm film and presented by means of a slide projector.

The control lists involved a different set of graphemes (the consonant phonemes t and l and long vowels ō /o/ and ī /ay/.

The phoneme /l/ in the control list was very difficult for children to articulate. This was unexpected, since available data (Templin, 1957) suggests that most 4-year-olds can articulate all the single consonant and vowel sounds. However, the Templin data may be misleading because it was collected in context of familiar words. Producing some phonemes in isolation seems to be a more difficult requirement.

Each S was randomly assigned to one of the eight groups in the order of appearance for the testing session. There was an N of 12 in each group.

PROCEDURE

The various lists assigned to each of the eight groups are shown in Table 1 (where M-A stands for a phonemically segmented response). The lists were arranged in four different random orders to prevent serial position learning. Each stimulus was presented for 8 seconds and a 16 second interval was used between trials. A study-recall method was used in which study trials alternated with recall test trials. On a study trial E pointed to each stimulus and pronounced the sound associated with it and S repeated the sound after E. On test trials the stimuli were shown alone and S was asked to say the correct sound. Following his response, E informed him whether or not he had responded correctly. Study and test trials on the first list continued until two successive errorless trials were achieved. When the S reached criterion on the first list he was trained on the second list approximately 20 minutes later with the same procedure. The transfer list was presented until S responded to all items correctly on a single trial or until a maximum of ten trials had been given.

TABLE 1

LETTER SOUNDS AND WORDS USED IN THE EXPERIMENT

Group	W-L	W-SO	SO-W	SO-L	L-W	L-SO	SO-W	L-W
List 1	MA	MA	M-A	M-A	E	E	T-1	T
	SE	SE	S-E	S-E	S	S	T-U	1
	ME	ME	M-E	M-E	A	A	L-1	U
					M	M		L
List 2	E	M-A	MA	E	MA	M-A	MA	MA
	S	S-E	SE	S	SE	S-E	SE	SE
	A	M-E	ME	A	ME	M-E	ME	ME
	M			M				

RESULTS

Table 2 shows the various performance measures for the eight groups. The transfer scores were computed by subtracting the number of trials to criterion on the first list from the number of trials on the second list for each S. An overall analysis of variance on the mean number of trials to criterion on the first list was not significant ($f = 2.04$, $df = 7,88$, $p > .05$), while the mean number of trials to criterion on the second (transfer) list was significant ($f = 5.94$, $df = 7,88$, $p < .001$). Multiple comparisons were made to evaluate the relative transfer between the pairs of groups receiving the same transfer list. The group trained on the sounded-out list showed significantly more transfer to the letter list than the groups trained on whole words ($t = 3.10$, $df = 22$, $p < .01$). The group trained on letters showed more transfer to the sounded-out list than groups trained on whole words ($t = 3.40$, $df = 22$, $p < .01$). The group trained on sounded-out lists was superior to the group trained on letters when the transfer list was whole words ($t = 3.0$, $df = 22$, $p < .01$).

With regard to absolute transfer to words, the letter trained group was not significantly different from the letter-control group ($t = 1.0$, $df = 22$, $p > .30$). In contrast the SO-W group was marginally superior to its associated control group ($t = 1.79$, $df = 23$, $p < .10$).

The amount of absolute transfer from the sounded-out and letter lists to word lists is underestimated because the control lists, unfortunately, turned out to be more difficult to learn than the experimental lists. Therefore, there is a subject selection factor favoring the control lists (e.g., in the sounded-out control group 15 Ss had to be discarded which is nearly twice as many as in any other group). Because of the subject selection bias the comparisons of sounded-out and letter lists with their related controls are of limited usefulness. A better measure of transfer in these two groups is the transfer scores. The group given sounded-out training showed approximately six times more transfer to words than the group given letter training.

In general there were no marked asymmetries in transfer as a function of direction of training. Multiple range test comparisons of groups W-SO vs SO-W; groups W-L vs L-W, and groups L-SO vs SO-L all failed to reach significance at the .05 level.

The percentage of various types of errors made by each group on the first and second lists are shown in Table 3, ("other" refers to extra-list intrusions). It was hypothesized that the major difficulty in learning the letter lists would reside in the Ss unfamiliarity with the letter sounds (phonemes) used as responses and that the word lists would give rise to intra-list interference effects because of the overlapping stimulus elements in these lists. In contrast, response availability, in the word lists should be higher because the responses were all short familiar words. The sounded-out lists would have both sources of difficulty. It was further thought that response availability problems

TABLE 2

PERFORMANCE SCORES ON FIRST AND SECOND LISTS

Group	First List		Second List			
	Mean trials to criterion	Mean % correct over all trials	Mean trials to criterion	Mean % correct over all trials	Mean % correct on last trial	Mean transfer scores
W-L	8.83	57.6	8.16	52.9	79.2	0.67
SO-L	10.33	51.1	3.75	74.3	95.8	6.58
W-SO	7.67	56.9	6.33	48.6	88.9	1.34
L-SO	5.92	71.2	3.25	76.6	100.0	2.67
SO-W	10.9	47.7	5.00	54.0	100.0	5.90
L-W	9.33	59.7	8.00	48.0	88.9	1.33
(C)SO-W	7.50	60.8	4.33	63.4	100.0	3.17
(C)L-W	7.42	73.7	7.33	47.5	91.7	0.09

TABLE 3

PERCENTAGE OF ERROR TYPES ON FIRST AND SECOND LISTS

Group	First List			Second List			
	Omission	Intra-list intrusion	Other	Omission	Intra-list intrusion	Inter-list intrusion	Other
W-L	45.2	46.9	07.8	43.3	35.3	16.1	05.1
SO-L	38.3	38.4	22.7	12.6	67.9	06.7	12.8
W-SO	41.1	54.8	04.1	42.3	27.5	24.1	06.0
L-SO	46.0	39.9	14.1	26.7	57.5	03.3	12.5
SO-W	54.7	36.7	08.5	47.5	45.6	0.14	05.5
L-W	43.4	40.9	15.7	28.0	55.0	12.3	04.6
(C)SO-W	55.0	25.9	19.1	36.6	51.2	06.3	06.0
(C)L-W	58.6	30.8	10.6	35.2	60.1	02.6	02.1

would be indexed by omissions while intra-list interference would be indexed by intra-list intrusion errors. However, as can be seen in Table 3, the percentage of the various types of errors are similar across groups. This was confirmed by an analysis of variance run on the differences in the percentage of the three error types by the three list types (word, sounded-out, letters) on the first lists. There was no significant main effect for list type ($F < 1$), and no list by error type interaction ($F = 1.21$, $df = 2,138$, $p > .05$). There was a significant effect for error types ($F = 35.68$, $df = 2,138$, $p < .001$), which could be attributed to the difference between extra-list intrusions, and the two other error types. The same error pattern was obtained on list 2.

The pattern of inter-list intrusions from the first to second list is interesting. Only two Ss, who were transferred from sounded-out to letter lists, (groups SO-L and L-SO) made inter-list intrusion errors. Eights Ss in group W-SO made inter-list intrusions as compared to one subject in group SO-W. In the groups transferred directly from letters to words and vice versa (W-L and L-W), there were 13 subjects who made inter-list intrusion errors.

Four Ss who transferred from letters to sounded-out lists or vice versa, learned the transfer list on the first trial with no errors. This complete transfer was not obtained in any of the other groups.

DISCUSSION

The results of the present study rank the degree of transfer to be expected between words and word components. The greatest amount of transfer was obtained between isolated letter sounds and sounded-out words.

The Ss in these two groups apparently picked up the principle that each grapheme is associated with a single phoneme and the spatial order of graphemes from left to right corresponds to the temporal order of phonemes. This is shown by the large amount of transfer from the double grapheme-phoneme pairs in the sounded-out words to the single grapheme-phoneme pairs in isolation and vice versa. This cross-modal intergration is essential for learning to read by a phonics technique (Blank, Weider, & Bridger, 1968).

The next largest amount of transfer was obtained between sounded-out words and whole words. In order for transfer of this type to occur, the child must recognize the sound of an isolated phoneme when it is embedded in a word context. Apparently it is much easier for him to do this when the segmented sounds are presented in the form of a sounded-out list than when they are presented in the form of isolated letter sounds. The sounded-out list has the same visual characteristics as the words, and the order of the phonemes in the words is preserved.

In this study, little if any positive transfer was obtained between isolated letter sounds and words or vice versa. The present results differ somewhat from those of the previous studies discussed in the introduction to this paper.

In the Bishop (1964) study, there was a greater amount of transfer from words to letters than vice versa, although results of Bishop's study are not particularly relevant here for reasons discussed previously (i.e., use of adults, use of syllabic rather than phonemic responses, etc.). In the Jeffrey and Samuels (1967) study there was greater transfer from letters to words than vice versa. The Ss in the Jeffrey and Samuels (1967) study read a mean of 1.25 words on the first trial of the transfer list. However, the Ss in their experiment had previous training on sounding-out and blending the items used in the transfer list.

In general children appear to show little direct transfer from isolated letter sounds to words. Since reading words is usually considered to be the terminal task one might question the usefulness of training on isolated letter sounds in a phonics reading program. All phonemes could be presented in the context of sounded-out words. However, it is necessary to consider that the present experiment did not deal with children's abilities to recombine phonemes into new words, or to deal with words which have the phonemes in different orders.

Isolated letter sounds are "free variables" which presumably could enter into all kinds of new combinations, whereas sounded-out words may be constrained by position of phonemes in a word.

According to the five-state process schematized in the introduction, a stage of dealing with isolated phonemes is necessary to show transfer to novel words. The same considerations apply to the use of syllabic units as basic units in a phonics reading program. The Stanford group (Rodgers, 1967) uses syllabic units termed "vocalic center groups," and the SWRL program uses vowel-consonant syllables termed "phonograms." Both types of syllabic units are probably easier for the child to articulate, segment, and recombine than isolated phonemes. However, the isolated phonemic unit is clearly the most productive unit as there are only a small number of English phonemes and there are potentially thousands of syllabic units. In addition the English alphabet is phonemic not syllabic.

In general the results show that learning the sounded-out words is a very useful pivot task in that there is considerable transfer from this task to both isolated letter sounds and whole words while there is little, if any direct transfer between the latter two tasks.

Finally, it is worth noting that the lack of differences in transfer as a function of direction of training suggests than analytic and synthetic sequences are essentially equivalent techniques for getting the child to see relationships between isolated sounds and the same sounds embedded in a word context.

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