Phoneme Segmentation Training: Effect on Reading Readiness

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Recent evidence suggests that the ability to segment words into phonemes is significantly related to reading success, and that training in phoneme segmentation appears to have a positive influence on beginning reading. In this study, we evaluated the effect on reading readiness of phoneme segmentation training in kindergarten. Ninety nonreaders with PPVT-R standard scores of 78 or higher were randomly selected from six kindergarten classrooms and assigned to one of three treatment conditions: a) phoneme segmentation group; b) language activities group (control group I); and c) no intervention (control group II). The phoneme segmentation group received seven weeks of instruction in segmentation and in letter names and sounds. Also for seven weeks, the language activities group received the identical instruction in letter names and sounds and additional language activities. Prior to the intervention, the three groups did not differ in age, sex, race, PPVT-R phoneme segmentation, letter name and letter sound knowledge, or reading ability. After the intervention, the phoneme segmentation group outperformed both control groups on phoneme segmentation and reading measures. This study provides additional strong support for including phoneme segmentation training in the kindergarten curriculum. Clinical suggestions for teachers are included.

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The nature of the relationship between oral language development and reading has interested researchers and educators for some time. Despite the ease with which most children learn to communicate orally, substantial numbers of these children experience difficulty learning to read. One explanation for the discrepancy between the ease with which children acquire oral language skills and the difficulty many children have in acquiring reading skills has focused on linguistic awareness (Mattingly 1972). Linguistic awareness, or metalinguistic ability (as it is more often referred to today), is the ability to reflect deliberately on language in and of itself, as opposed to the automatic use of language to convey meaning (Cazden 1972). One category of metalinguistic development which continues to attract attention as an important component of early reading skills is phoneme awareness. Phoneme awareness (sometimes called phonological awareness, phonemic analysis, or phoneme segmentation) is the ability to recognize that a spoken word consists of a sequence of sounds.

It has been over 20 years since the initial Russian studies on phoneme analysis were translated into English (Elkonin 1963; Zhurova 1963). Today, there is a large body of evidence which suggests that phoneme awareness is related to success in early reading (e.g., Blachman 1984b; Bradley and Bryant 1978, 1983; Fox and Routh 1980; Juel, Griffith, and Gough 1986; Liberman et al. 1974; Lundberg, Olofsson, and Wall 1980; Stanovich, Cunningham, and Cramer 1984). It has also been suggested that training in phoneme awareness is one of the most promising avenues for improving reading instruction (Juel 1986; Williams 1984).

In this paper we will present the results of a kindergarten reading readiness intervention study that focused on phoneme segmentation training. Clinical suggestions for implementing phoneme segmentation instruction are also included.

Background

Research has demonstrated that language tasks that measure phoneme awareness are significantly related to success in the early stages of reading (Blachman 1983; Bradley and Bryant 1983; Calfee, Lindamood, and Lindamood 1973; Fox and Routh 1975; Helfgott 1976; Liberman et al. 1974; Lundberg, Olofsson, and Wall 1980; Mann and Liberman 1984; Morais, Cluytens, and Alegria 1984; Williams 1984; Zifcak 1981). The importance of this relationship becomes clear when one considers the task of reading an alphabetic writing system. To read (and spell), the beginning reader must make use of the alphabetic code. This requires the student to realize that words can be broken into syllables and phonemes, and that the phoneme is the unit in the speech stream represented by the symbols in an alphabetic script. To an individual with well developed phoneme awareness, our alphabetic system is a reasonable way to repre-

sent our language. To those with little or no phoneme awareness, it is likely that the system appears arbitrary.

In fact, many beginning readers experience difficulty in accessing the phonemic units of words (Liberman et al. 1974; Rozin and Gleitman 1977). Research demonstrating the complex relationship among the phonemes in the speech stream has provided some insight into the difficulty of this task (A. Liberman 1970; A. Liberman et al. 1967). Spectrographic analysis of the speech stream has shown that although we may teach children to "hear" three sounds in *cat*, the three sounds are not characterized in the acoustic stimulus itself. Rather, the phonemes are merged (encoded) into larger units of approximately syllable size, and it is difficult (if not impossible) to separate them out without some articulatory distortion (for detailed discussion see Liberman et al. 1977). Therefore, when a word is segmented into individual sounds, the phonemes are not the actual units of the spoken word; rather, they are abstract representations of the sounds in the spoken word. Gaining access to these coarticulated or "encoded" phonemes, as well as blending phonemes to form a word, is more a matter of abstraction than discrimination. In light of its abstract nature, it is not surprising to find that phoneme awareness develops in stages and is often not present in kindergarten children (Bruce 1964; Gleitman and Rozin 1977; Liberman et al. 1974; Rosner and Simon 1971).

Numerous studies have demonstrated a robust relationship between phoneme awareness skills and success in the beginning stages of reading (Blachman and James 1985; Calfee, Lindamood, and Lindamood 1973; Elkonin 1963, 1973; Fox and Routh 1980; Helfgott 1976; Stanovich, Cunningham, and Cramer 1984). These studies consistently show that good readers outperform poor readers on a wide range of phoneme awareness tasks, even when differences in general intelligence and socioeconomic status have been controlled. In addition, many studies have found performance on phoneme segmentation tasks to be predictive of success in early reading (Blachman 1984b; Bradley and Bryant 1983; Juel, Griffith, and Gough 1986; Liberman 1973; Lundberg, Olofsson, and Wall 1980; Mann and Liberman 1984; Share et al. 1984). That is, preschool, kindergarten, or first grade children with the poorest segmentation skills are likely to be among our poorest readers.

It has been suggested that developing an understanding of the link between the sounds of speech and the signs of print is the basic task facing the beginning reader (Liberman 1971; Liberman and Shankweiler 1985; Rozin and Gleitman 1977). There is evidence that some individuals do not develop this understanding without intervention, and that this is the stage of reading development that is the most problematic for children later labeled learning disabled (Chall 1983; Gough and Tunmer 1986). Teaching phoneme segmentation skills to young prereaders may help to prevent some children from experiencing failure.

There are reports that at least some aspects of phoneme awareness can be taught to kindergarten children (Bradley and Bryant 1985; Fox and

Routh 1984; Olofsson and Lundberg 1983). Furthermore, evidence suggests that training in these skills significantly improves early reading performance, particularly in children with below average phoneme segmentation skills (Bradley and Bryant 1985). (See Blachman 1984a, in press, Wagner and Torgesen 1987, and Williams 1984 for a detailed review of phoneme segmentation training studies.)

Two of the most promising training studies will be discussed here. The first study, conducted in Sweden by Olofsson and Lundberg (1983), provided segmentation training to groups of kindergarten children. The results indicate that phoneme awareness skills can be developed in young children. The game-like activities used in their study appear to be fun and adaptable to diversified class groupings. However, the children who participated in this study were a year older than the typical kindergarten youngster in the United States. The effectiveness of training groups of younger children to segment using these activities has not been evaluated.

The second study, carried out in England by Bradley and Bryant (1983), provided individual instruction for 5- through 7-year-old children. Children were assigned to four experimental groups: a) instruction in categorizing words according to common sounds (such as by rhyme or alliteration); b) instruction in categorizing words according to common sounds and the use of plastic letters to represent those common sounds; c) instruction in categorizing words according to semantic categories (control group I); and d) no intervention (control group II). Bradley and Bryant found that children who received sound categorization training outperformed both control groups in reading, while those who participated in sound categorization activities supplemented with alphabet letters were the most successful group. This study offers the strongest evidence to date of a possible causal link between phoneme awareness and reading ability. However, the highly individualized nature of the training makes it difficult to ascertain the potential of this type of instruction with *groups* of children. Furthermore, one cannot tell from this study whether a group that was exposed to letter names and letter sounds without sound categorization training would have performed as well on reading and spelling tasks as the groups that received sound categorization training.

The few training studies conducted in the United States provided either one-to-one instruction or were conducted with older children (Hohn and Ehri 1983; Wallach and Wallach 1976; Williams 1980). To date, no one in the United States has evaluated a phoneme segmentation training program with *groups* of kindergarten children as part of the regular school day. Thus, the goals of our segmentation training project were as follows:

1. To replicate the finding that children in kindergarten can be taught to segment words into their constituent phonemes.
2. To explore the influence of letter name and letter sound knowledge on the acquisition of phoneme segmentation skills.

3. To explore the effects of segmentation training in kindergarten on reading readiness ability.
4. To validate a set of procedures which can be used with groups of kindergarten children within a typical school day.

Method

Subjects

Children were selected from the total enrollment of six kindergarten classrooms (N = 151) in three schools in the Syracuse Public School District. In February 1987, the Peabody Picture Vocabulary Test-Revised (PPVT-R) and the Word Identification Subtest of the Woodcock Reading Mastery Test (WRMT) were administered to all children. Students whose PPVT-R scores were more than 1.5 standard deviations below the mean (M = 100, SD = 15) were not included in the study. Additionally, all students who were reported to be readers by their classroom teachers, or who obtained raw scores greater than 3 on the WRMT Word Identification Subtest, were also eliminated from the study. In each of the three schools, 30 students (total N = 90) from the remaining pool were randomly selected to participate in the project. One child was eliminated from the study due to an excessive number of absences. The mean age of the sample was 5.71 years.

Procedure

Students from each school were randomly assigned to one of three groups: a) phoneme awareness training; b) language activities group (control group I); and c) no intervention (control group II). Prior to the intervention, no significant differences among the groups were found on age (treatment M = 5.77, control group I M = 5.69, control group II M = 5.69), $F(2, 88) = .64$, $p = .53$; sex, $\chi^2(2, N = 89) = .15$, $p = .93$; race, $\chi^2(2, N = 89) = .57$, $p = .75$, or any of the pretraining variables, including PPVT-R, WRMT, phoneme segmentation test, letter name knowledge, and letter sound knowledge (see Table I).

Students in the phoneme awareness condition met in groups of five, for 20 minutes, four times each week over a period of seven weeks. Each 20-minute segmentation training session contained three components: a) say-it-and-move-it segmentation activities; b) segmentation-related activities; and c) letter name/sound training.

Activities included in the two segmentation components of the training were adapted from suggestions in the segmentation literature (Bradley and Bryant 1985; Elkonin 1973; Lewkowicz 1980; Liberman et al. 1980). The *say-it-and-move-it* segmentation activity was designed to make explicit the role of segmentation in an alphabetic system. Children were instructed to represent phonemes in one-, two-, or three-phoneme items with disks on a card (see Figure 1). They were taught to say each phoneme in the item and simultaneously to move a disk to represent each pho-

Table I
Pretest Means for Treatment and Control Groups[a]

Variable	Phoneme Segmentation Training		Language Activities (Control I)		No Intervention (Control II)		
	Mean	*SD*	Mean	*SD*	Mean	*SD*	*F*[b]
PPVT-R	101.4	14.6	101.4	12.7	101.2	14.4	.00
Woodcock	0.0	0.0	.2	.6	.2	.7	1.55
Segmentation	13.7	3.6	14.3	4.8	13.8	4.3	.19
Letter Names	19.0	6.4	18.1	7.2	18.5	6.9	.14
Letter Sounds	9.5	5.8	9.9	6.6	8.9	7.0	.17

[a] $n = 29$ for phoneme segmentation training group; $n = 30$ for control group I; $n = 30$ for control group II.
[b] Analysis of variance performed on each of the variables revealed no statistically significant differences.

neme. The second segmentation component, *segmentation-related activities*, included activities which involved various degrees of segmentation. For example, a task much like the sound categorization tasks (e.g., categorize by rhyme or alliteration) used in the training study by Bradley and Bryant (see Bradley and Bryant 1985, and the clinical suggestions in this paper for details) and an adaptation of DISTAR's Say-It-Fast were two activities included in this component.

The *letter name/sound training* component provided instruction in letter sound-symbol associations. Previous training studies indicate that the use of letter sound symbols with segmentation training may increase the effectiveness of segmentation training (Bradley and Bryant 1983). Nine letters which generate a substantial number of real cvc words were included in the training (a, m, t, i, s, r, f, u, b). Pictures with initial sound associations (e.g., an apple and an ant for the letter *a*) accompanied by

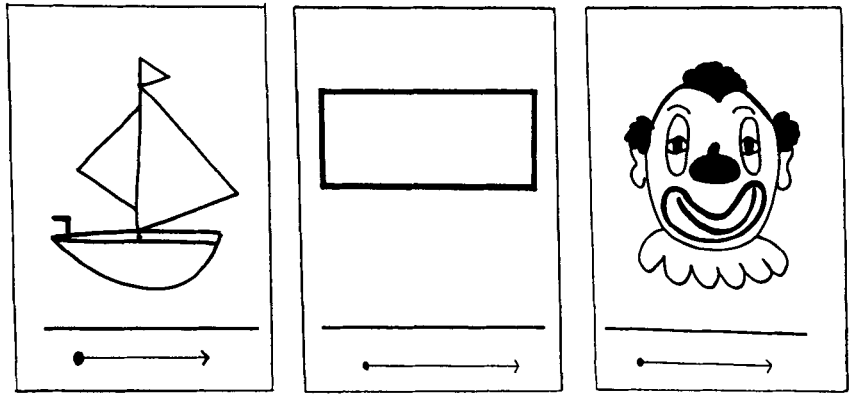

Figure 1. These cards were designed to be used with the say-it-and-move-it segmentation activity.

hand-clapping rhythm games and drills which emphasized the letter-sound relationships were part of the instructional activities.

A second group (language activities group) was included in this study to control for Hawthorne effects resulting from participation in special groups and to provide needed information on the effect of letter name/sound knowledge on segmentation and beginning reading ability. The children in this condition also met in groups of five and spent 20 minutes, four times a week, for seven weeks participating in a variety of language activities, such as general vocabulary development, listening to stories, and semantic categorizations. In addition, children received training on letter names and sounds that was identical to the letter name/sound instruction received by the phoneme segmentation group. It was hoped that this would control for the possible influence on segmentation ability of the incremental letter sound instruction received by the phoneme segmentation group (see Wagner and Torgesen 1987 for a full discussion of this design issue). Through the letter name/sound component, we sought to investigate whether an increase in letter name/sound knowledge alone would positively influence phoneme segmentation ability and beginning reading skill. Students assigned to the third group received no intervention (control group II).

At the end of the seven-week training, children were retested on phoneme segmentation, alphabet letter names and sounds, and the Woodcock Reading Mastery Word Identification Subtest. In addition, they were asked to read a list of 21 phonetically regular words selected for this study.

Measures

The PPVT-R and the WRMT Word Identification Subtest were used for subject selection (see Subjects for criteria). The PPVT-R is a measure of receptive vocabulary and the WRMT Word Identification Subtest is a measure of reading which consists of word lists selected from a sample of basal readers.

In addition to the PPVT-R and WRMT, a phoneme segmentation test and a test of letter name and sound knowledge were administered to all children prior to the training. The phoneme segmentation test (adapted from Liberman et al. 1974) was developed to be used both as a pretest and posttest to assess student progress in segmenting abilities after direct instruction. The phoneme segmentation test consists of 34 randomly arranged one-, two-, and three-segment items (see Table II). The segmenting test was preceded by a sound counting control task and four phoneme segmentation training sequences. The sound counting task was used to insure that poor performance on the segmenting task was not due to an inability to count sounds (Treiman 1976). The training sequences provide modeling and corrective feedback in segmenting one-, two-, and three-phoneme items. The administration of the phoneme segmentation test requires the child to indicate the number of segments (from one to three)

Table II

Phoneme Segmentation Test

1. o (hot)_____	13. av_____	25. need_____
2. rub_____	14. ban_____	26. a (cake)_____
3. if_____	15. zone_____	27. a (mat)_____
4. in_____	16. us_____	28. he_____
5. cake_____	17. ou (loud)_____	29. am_____
6. e (set)_____	18. rip_____	30. bum_____
7. ache_____	19. mat_____	31. sun_____
8. mud_____	20. i (it)_____	32. ad_____
9. ab_____	21. now_____	33. fit_____
10. up_____	22. sam_____	34. low_____
11. loud_____	23. is_____	
12. it_____	24. vat_____	

in the stimulus item by moving disks on a card (see Figure 2). The internal reliability of the test measured .91 using the Spearman-Brown split-half analysis.

Letter name and sound knowledge was assessed both before and after the intervention using the same informal task. Each of the 26 letters of the alphabet was written on a card and presented in random order. Children were asked to name each letter and to give the sound of each letter. The order of presentation was identical for each child.

The phonetically regular word list was used as a posttest only measure. Children were presented 21 phonetically regular words, one word

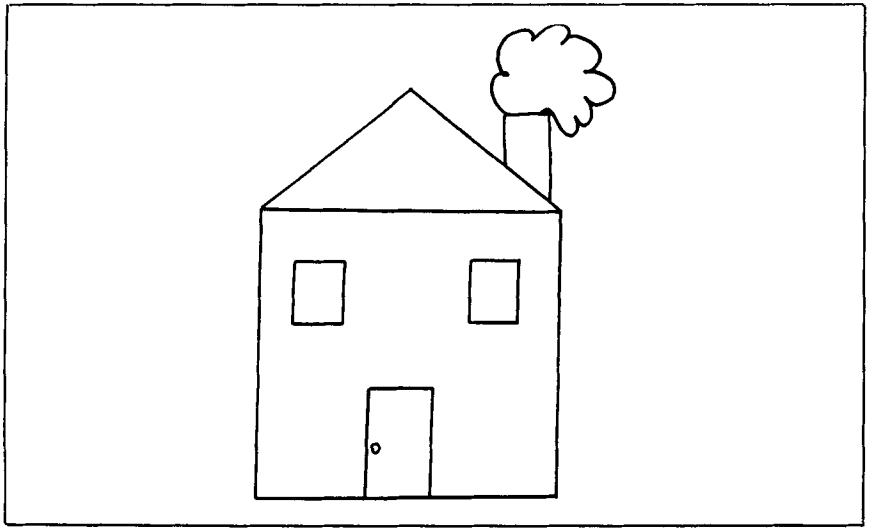

Figure 2. Card used during phoneme segmentation test. Children represented each phoneme in the stimulus item by sliding a disk out of the house and below the line.

Table III
Phonetically Regular Word List

1.	it	12.	Tim
2.	mat	13.	ram
3.	sit	14.	rut
4.	fat	15.	at
5.	am	16.	rub
6.	tab	17.	rim
7.	bat	18.	sam
8.	us	19.	rib
9.	sub	20.	sum
10.	bum	21.	fit
11.	if		

per card (see Table III). The words on the list were selected from the pool of real words generated by the nine graphemes taught during the letter name/sound instruction provided to the children in the phoneme awareness condition and the language activities condition (control group I).

Results and Discussion

As mentioned previously, there were no significant pretreatment differences among the three conditions (see Table I). Posttest scores on the phoneme segmentation test, letter name/sound knowledge task, the Woodcock Word Identification Subtest, and the phonetically regular word list were used to evaluate the effects of the intervention. Means and standard deviations for each posttest variable are found in Table IV. Analysis of covariance, using pretest scores as the covariate, was used to assess treatment effects whenever the assumptions of convariance were met. In

Table IV
Pretest Means for Treatment and Control Groups[a]

	Phoneme Segmentation Training		Language Activities (Control I)		No Intervention (Control II)	
Variable	Mean	*SD*	Mean	*SD*	Mean	*SD*
Segmentation	24.4	5.8	16.4	4.8	15.4	5.0
Letter Names	21.3	5.1	20.7	5.8	21.7	4.9
Letter Sounds	16.6	5.2	16.5	4.6	13.1	7.1
Woodcock	3.2	4.6	1.4	2.5	1.1	3.1
Phonetically Regular Words	10.9	8.4	3.9	6.7	2.2	3.7

[a] $n = 29$ for the phoneme segmentation training group; $n = 30$ for control group I; $n = 30$ for control group II.

cases where the assumptions were violated (e.g., scores were not normally distributed), nonparametric statistical techniques were employed.

Phoneme Segmentation

Our first question concerned the feasibility of teaching kindergarten children to segment words into their constituent phonemes. The effect of the training on phoneme segmentation scores was analyzed using an analysis of covariance with the phoneme segmentation pretest as covariate. Adjusted means and standard deviations for this variable are shown in Table V. Results indicate that differences on the phoneme segmentation posttest were significant among the three conditions, F (2, 85) = 28.46, $p < .0001$. Follow-up multiple comparisons indicate that the treatment group (segmentation training) performed significantly better than either control group, and there were no significant differences between control group I and control group II. Thus, these data indicate that the kindergarten children who received segmentation training successfully learned to segment words into phonemes as measured by the phoneme segmentation test.

Letter Names

Differences among the three groups in letter name knowledge were also evaluated using analysis of covariance with the pretest as covariate (see Table V). There were no significant differences among the three

Table V

Analysis of covariance on Phoneme Segmentation, Letter Names, and Letter Sounds Posttest Scores[a,b]

Variable	Phoneme Segmentation Training	Language Activities (Control I)	No Intervention (Control II)
Segmentation			
Adjusted mean	24.5	16.3	15.4[c]
SE	.93	.91	.91
Letter Names			
Adjusted mean	21.0	21.0	21.7
SE	.47	.46	.46
Letter Sounds			
Adjusted mean	16.6	16.2	13.5
SE	.65	.64	.64

[a]Final scores adjusted by pretest scores.

[b]n = 29 for phoneme segmentation training group; n = 30 for control group I; n = 30 for control group II

[c]The adjusted means for groups which share a line are not significantly different.

groups on letter name knowledge. By the end of the kindergarten year, most children know a high percentage of letter names. The limited variance in letter name knowledge, and consequent lack of group differences on this variable, indicate that any differences among the groups which we may find on segmentation or reading scores cannot be explained by differences in letter name knowledge.

Letter Sounds

There were significant group differences in letter sound knowledge as indicated by an analysis of covariance, again using pretest scores as the covariate, $F(2, 85) = 6.90, p < .0002$. Follow-up comparisons indicate that both the treatment group (phoneme segmentation training) and control group I (language activities) had significantly higher letter sound scores than control group II, but did not differ from each other (see Table V). These results show that the letter sound instruction (identical in the treatment group and control group I) was effective in improving letter sound knowledge for both the phoneme segmentation group (treatment group) and language activities group (control group I). However, this finding also indicates that increased letter sound knowledge alone does not improve segmentation skills, because only the phoneme segmentation treatment group (and not the language activities group) made significant gains in segmentation skills.

Reading

Nonparametric statistical techniques were used to analyze the effects of the training on both reading measures (i.e., Woodcock Word Identification Subtest and the posttest only phonetically regular word list). The means and standard deviations for these posttests are also found in Table IV. To evaluate group differences on the Woodcock posttest, scores were categorized according to our pretreatment sample selection criteria. That is, children with raw scores of 3 or less were considered to be nonreaders and children reading four or more words on the WRMT were considered to be readers. (Prior to the intervention, children reading four or more words on the WRMT were eliminated from the initial subject pool because they were considered to be readers.) It should also be noted that prior to the intervention only children in the original sample of 90 were able to read one, two, or three words on the WRMT, and all seven children were distributed through random assignment to the two control groups. All other children had scores of 0 on the Woodcock Word Identification pretest. Table VI shows the breakdown of posttreatment Woodcock scores for each treatment group using this a priori cut-off decision. Differences among the groups on this measure were significant, $\chi^2(2) = 8.4, p = .015$. It is of clinical interest that over 34 percent of the treatment group were able to read four or more words on the WRMT after the segmentation intervention, as opposed to 13 percent for control group I (language activities group), and only 7 percent for control group II (no intervention).

Table VI
Group Scores on Woodcock Reading Mastery Posttest (Word Identification Subtest)

	Phoneme Segmentation (Treatment Group)		Language Activities (Control Group I)		No Intervention (Control Group II)	
	f	%	f	%	f	%
Students RS ≤ 3	19	65.5%	26	86.7%	28	93.3%
Students RS > 3	10	34.5%	4	13.3%	2	6.7%
Totals	29	100.0%	30	100.0%	30	100.0%

X^2 (2) = 8.4, p = .015

Thus, it appears that increased phoneme awareness had an impact on the ability to read words on the Woodcock.

The means and standard deviations of the phonetically regular word list raw scores are shown in Table IV. A Kruskal Wallis analysis of variance (a one-way analysis of variance applied to the ranked scores) of the phonetically regular word list scores also indicates significant differences among the conditions, F (2, 86) = 11.97, $p < .0001$. Follow-up comparisons indicate that the children in the treatment group (phoneme segmentation training) have significantly higher ranks than both control I (language activities group) and control group II (no intervention), and there is no significant difference between the two control groups. These results reflect the superior ability of the phoneme segmentation group to break the alphabetic code. To read phonetically regular words, a child must be aware that words can be broken into phonemes and that each phoneme corresponds to a symbol(s) in our orthography. These data suggest that the treatment group (phoneme segmentation training) is more able than either control group to match the written symbols to the sound-segments of the word.

The results of this study indicate that the methods used in the segmentation intervention were successful in teaching kindergarten children to segment one-, two-, and three-phoneme items as measured by the phoneme segmentation test. Thus, we were able to demonstrate (as have others, for example, Bradley and Bryant 1985; Fox and Routh 1984; Olofsson and Lundberg 1983) that kindergarten children can be taught to segment words and that this skill has an impact on some important aspects of early reading. The increased ability in phoneme segmentation skills demonstrated by the treatment group had a significant impact on aspects of their early reading skills—specifically, reading phonetically regular words and words on the Woodcock. The results also indicate that increasing letter sound knowledge, in and of itself, is not sufficient to improve phoneme segmentation skills, nor does it have an impact on reading as

measured by the WRMT Word Identification Subtest or the ability to read a list of phonetically regular words. Furthermore, we were able to validate a set of procedures that can be used with groups of kindergarten children during a typical school day.

Clinical Suggestions

The results of this training study again reinforce the importance of including instruction in phoneme segmentation in the kindergarten reading readiness curriculum. Although we are not suggesting that phoneme awareness skills are the only skills necessary for success in early reading, phoneme awareness skills are an important component of readiness for beginning reading. Reading programs that incorporate this emphasis into a rich oral language environment will enhance prereading instruction for a substantial number of children.

There are a number of interesting and creative techniques in the literature which have been used to increase phoneme awareness (see for example, Camp, Winbury, and Zinna 1981; Liberman et al. 1980; Rosner 1975). The entertaining games used by Olofsson and Lundberg (1983) provide many ideas. For example, in their game "Spider Web," the teacher holds a ball of yarn and says a sound (e.g., *m*) followed by a word (e.g., *ice*) which, when blended with the sound, will form a new word. The teacher tosses the ball of yarn to one of the children, but she holds onto the end of the yarn. The child, to whom the ball is thrown, repeats each of the two segments and then blends them together to form the new word (*mice*). The teacher then produces another combination and the ball is tossed to the next child. Each child holds the yarn in hand when tossing the ball. This continues until a spider web is formed. When complete, a spider song is sung after which the ball is slowly rewound with each child repeating his word and the two original parts (see Olofsson and Lundberg 1983 for details and several more games).

Bradley and Bryant (1983, 1985) use a clever sound categorization task to teach phoneme segmentation skills. In this activity, words are grouped together according to rhyme, matching initial sounds, matching final sounds, or matching middle sounds. The children are to choose one of four pictures that does not fit a particular sound categorization grouping. For example, after naming each picture in a *rat*, *cat*, *bat*, and *mug* series, the child must decide which picture is the "odd-one-out," or which picture does not belong with the others (see Bradley and Bryant 1985 for a full description of sound categorization activities). We adapted the Bradley and Bryant activity for group instruction by using large pictures with magnetic tape affixed to the backs. This permitted us to display the pictures on a magnetic board where they could be seen easily and manipulated by all the children.

The say-it-and-move-it procedure used in this study required only

those materials that are readily available in any classroom and included activities that can be used with groups of children (see procedures). We began by instructing children to represent a single continuant phoneme with a disk and systematically progressed to three-phoneme items. An example of a say-it-and-move-it lesson will be described below, followed by a sketch of the skill progression which we used in our study.

At the start of the lesson, each child is given the maximum number of disks (or buttons, tiles, blocks) needed to segment items on that particular day. Their disks are placed "on board" the sailboat or, for example, on the clown's ears or nose, to indicate a ready and listening position (see Figures 1 and 3). Disks are stored on the picture when children are not actively segmenting an item. Typically a new item is introduced to the group with the instructor or a child modeling the correct segmentation of the item. For example, the instructor pronounces "*it*," places her finger on a disk, moves the disk down below the line onto the arrow while saying *iiiii* in a drawn-out fashion. She returns to the boat, places her finger on another disk, and moves that disk to the arrow while pronouncing *t*. The teacher repeats the item in its original blended form while running her finger across the two disks now on the arrow (see Figure 3). The two disks are then returned to the boat. After observing the correct model, the children are cued that it is now their turn ("all aboard!"). The item (*it*) is again pronounced by the teacher. When the children hear the teacher's cue, "say-it-and-move-it," they place a finger on a disk and say each sound as they move each corresponding disk to the appropriate place on the arrow. After moving the disks, children are asked to repeat the original blended item. The same procedure is used with single, double, and

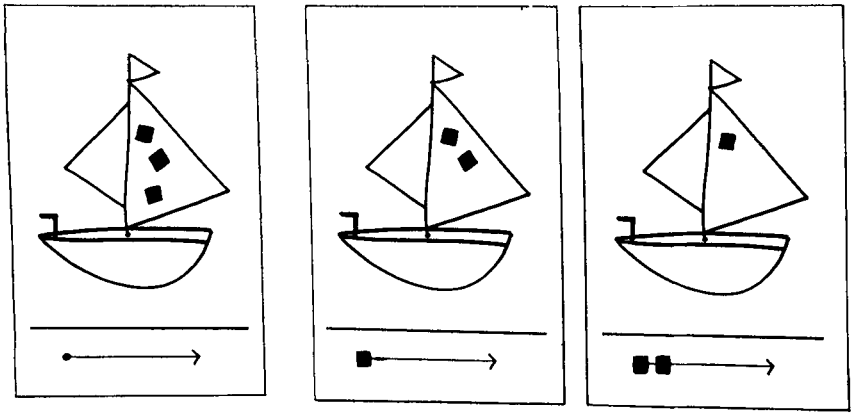

Figure 3. Say-it-and-move-it instructional sequence. Step 1: Children store all tiles/disks on the picture. Step 2: After repeating the stimulus item, children slide one tile/disk below the line as they pronounce slowly the first phoneme. Step 3: The second phoneme is pronounced slowly as children move the second tile/disk below the line. The original blended item is then repeated.

triple phoneme items. It is important to coordinate each speech segment with the appropriate disk during segmentation. Modeling and corrective feedback are used as needed.

The first series of say-it-and-move-it lessons instructs children to represent single continuant sounds or a single continuent sound produced twice (e.g., *i, i*). The second series to say-it-and-move-it lessons adds two-phoneme combinations (vowel-consonant). Typically a single sound (e.g., "*i*") is represented with a disk first and a two-phoneme combination, including the first sound, follows (e.g., "*it*"). After the children segment each item and move the disks, they are encouraged to "read" the disks by sweeping a hand across the arrow and repeating the word. Segmenting three-phoneme items is the last series of lessons included in say-it-and-move-it. Again, a portion of each three-phoneme lesson includes the building of words (segmenting "*a*," then "*at*," then "*sat*") or removing phonemes ("*sat*," then "*at*," then "*a*"). Three-phoneme items beginning with a continuant sound are introduced first (e.g., *sat, sam*). Words with stop consonants in the initial position are the last items on which children receive instruction, since these appear to be the most difficult. Noting the difficulty of segmenting a word with a stop consonant in the initial position, one rather clever child had a solution for the group. He said, "It's easier to move two disks down for "ba" and one for "t" when we do "*bat*" (rather than the more distorted disk-by-disk "buh ah tuh"). In fact, it may be helpful for the teacher to point out this alternative to children who have difficulty segmenting items with stop consonants in the initial position.

To further establish the link between the sound-segments of speech and alphabet letters, it may be beneficial to extend the segmentation task by adding a grapheme to a disk, once a child has mastered that particular grapheme-phoneme relationship. All children need not work with the same letters or the same number of letters. Thus, segmentation instruction can be individualized by providing more challenging tasks for those children who have an understanding of phoneme segmentation and who have mastered certain sound-symbol correspondences.

It is important to reiterate that our study provides additional strong support for including segmentation training in the kindergarten curriculum. Despite the accumulated evidence supporting the value of such early intervention, these activities are not yet included in the majority of our beginning reading programs. Activities that focus the child's attention on the internal sound structure of the word, particularly those activities that increase phoneme awareness, have the potential to increase the child's early reading ability. It is hoped that our description of these activities will serve as a springboard and enable teachers to include phoneme awareness instruction in the kindergarten curriculum. No doubt creative teachers will be able to expand on this series of instructional ideas and develop a broad range of techniques suitable for their students.

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