Oral Blending in Young Children: Effects of Sound Pauses, Initial Sound, and Word Familiarity

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ABSTRACT **Oral blending of dictated sounds into CVC (consonant-vowel-consonant) words was markedly and significantly better when no pauses intervened between sounds than when pauses of 1 or 3 sec intervened. In Experiment 1, first graders blended better than nonreading kindergarten children, with the differences pronounced at 1 and 3 sec. In Experiment 2, kindergarten children with extensive blending and reading training blended as well as the first graders, whereas younger, beginning readers paralleled the performance of the Experiment 1 kindergarteners. With age held constant, the effects of training continued as the major determinant of blending. We also found interactions between pause interval and word familiarity (meaningful versus nonwords) and between word familiarity and type of initial sound (held versus stop sounds).**

In an oral blending task, an individual is told the parts of a word (subdivided into a series of isolated sounds, sound combinations, syllables, or other phonological components) and is expected to produce the word from these constituents. Many researchers acknowledge that practice in oral blending can facilitate the accuracy of decoding printed words (Carnine & Silbert, 1979; Richardson, DiBenedetto, & Bradley, 1977; Rohnback, Bell, & McLaughlin, 1982). This assumption is substantiated by the modest correlations (.40 to .60) found between blending and concurrent measures of word recognition taken from the first to the fourth grades (Chall, Roswell, & Blumenthal, 1963; Williams, 1980).

Oral blending ability also is predictive of later reading (Chall et al., 1963; Goldstein, 1976), and, if reading is taught by phonic approaches, blending may be a more important determinant than IQ (Richardson, DiBenedetto, & Bradley, 1977).

Despite the apparent simplicity involved in recombining or synthesizing an ordered set of spoken sounds to form a word, blending tasks have been particularly troublesome for low-performing readers. For example, low-socioeconomic (SES), inner-city children in Grades 1, 2–3, and 4 could correctly blend only 8%, 25%, and 42%, respectively, of the sounds in CVC words (e.g., r-u-g) (Chall et al. 1963). Williams (1980) assessed blending of CVC words with a mixed-age group of 7- to 12-year-old children receiving remedial reading and found accuracy to be 26% in one study and 40% in another. Ramsey (1972) (cited in Haddock, 1976) noted that 40% of the errors made with unfamiliar words in context by marginal second-grade readers were due to blending difficulties, even though they knew the elements of the word.

Typically, the to-be-blended components, when spoken by an examiner, are said discontinuously and are broken by silent pauses. The learner is expected to arrive at the word by bridging the intervening intervals with relevant phonological information. Pausing between segmented sounds or syllables is a presentation feature inherent not only in developmental and training studies of blending (Chall et al. 1963; Goldstein, 1976; Haddock, 1976; Muller, 1972–1973), but also in standardized assessment procedures, such as the blending tests of Katz and Harmon (1982) and Roswell and Chall (1963) and the blending subtests of other instruments (Goldman, Fristoe, & Woodcock, 1976; McCarthy & Kirk, 1961). The dismal blending performance of instructionally naive students and poor readers may be a function of the length of the time interval intervening between the segmented sounds of a word.

In Experiment 1, we tried to ascertain whether pausing between consecutive sounds of a word would be more

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detrimental to blending accuracy than a never-investigated condition of not pausing between sounds. We studied kindergarten and first-grade children partly to assess the influence of developmental differences on blending. Large differences have been found between those two age groups in their ability to process and arrange phonetic sequences (Calfee, Lindamood, & Lindamood, 1973) and to add, omit, substitute, or rearrange phonemes (Rosner & Simon, 1971).

We also evaluated the ability to blend words of different semantic value (familiar versus nonsense or nonwords). Evidence exists that blending real words is easier than nonwords (Williams, 1980), but researchers do not know whether word familiarity interacts with the duration of the pause interval. At a 0-sec pause interval, therefore, no performance differences between the two types seem likely, whereas at increasingly longer pause intervals, real words might be easier to blend than nonwords. The decision of whether the initial consonant sound in a CVC word is a continuant (capable of being said continuously, as in *m* or *s*) or a stop (said briefly, as in *p* or *t*) also could affect blendability.

Because saying stop sounds is assumed to invite the addition of an "intrusive vowel" (e.g., *t* as in *tuh*), a greater distortion in blending should result from words beginning with stop compared with continuant consonants (Gleitman & Rozin, 1973). Of the two types, Coleman (1970) found differences in favor of continuants placed at the beginning and end of words, whereas Haddock (1976) reported no differences.

In Experiment 2, we evaluated for blending ability children who were taught to read through an approach that provided extensive training in synthetic phonics. In this replication, we expected that as training in phonics increased so would oral blending for all durations of delay between sounds. Because Experiment 2 participants were preschoolers, many of whom were able to read at advanced levels (Weisberg, in press), the documentation of levels of blending accuracy higher than that normally seen with this age group (Goldstein, 1976; Rosner, 1973–1974) was a possibility.

Experiment 1

Method

Subjects. We selected kindergarten and first-grade children from heterogeneously grouped homerooms that reflected the same composition of SES backgrounds as the entire public school. The school was racially integrated and included 25% of the children from poverty-level homes (eligible for free and reduced-price meals), 40% from blue-collar homes, and 35% from middle-class homes. We conducted the study during March and April when the kindergarteners' mean age was 71.60 months (SD = 5.34) and the first-graders' mean age was 84.91 months (SD = 5.18). The kindergarten and first-grade groups contained 15 and 12 females, respectively.

The first graders used the Houghton Mifflin basal series, a meaning-emphasis program that teaches whole words with phonic exercises built into the lessons. Skills for oral blending, however, were not taught directly (Beck & McCaslin, 1978). The kindergarteners were not given any formal training, either in oral blending or in reading, and they were considered nonreaders.

We obtained parental consent for participation. Two first-grade students did not participate due to lack of consent for one and relocation of the other. One kindergartener had poorly articulated, unclear speech that precluded participation. Another was excluded through a random *draw* so that each age group would have 22 children.

Composition of target words. Each of 20 meaningful and 12 nonwords consisted of three distinct phonemes. The meaningful words were: *fish, rag, meat, nose, luck, save, whine, them, not, what, gave, cot, deep, give, hen, joke, kite, pan, tube,* and *pull.* Most of these words are high-frequency terms, ranking high on published word lists for children (Barnard & Degracie, 1976; Dolch, 1936). Because of the desire to sample a broad range of different medial vowels and different beginning and ending consonants, however, some words were sampled that ranked lower in frequency of usage, for example, *luck, whine, tube.* Comprehension of the lower ranked words was within the grasp of kindergarten and first-grade children.

These same broad sampling considerations also were followed with the following 12 nonwords: *mōf, fup, sim, ras, shig, thēk, hof, bīs, chēg, dak, tōb,* and *gās.* For each word type, half contained an initial sound that was continuant or could be held indefinitely, as in *rag* and *mōf,* and half contained an initial nonresonate stop sound, as in *game* and *dak.*

A person knowledgeable in segmenting words into their component sounds recorded the 32 words using a Sharp cassette tape recorder that had excellent auditory quality and amplification (50/60 Hz, 24 W). Each word was segmented at one of three intersound intervals, 0, 1, or 3 sec, entailing 96 presentations.

We presented the 32 words in three blocks. A word at one pause interval in one block did not appear at a different interval until the entire block of 32 words was exhausted. Words within each block were randomized and counterbalanced with the stipulation that no more than three pause intervals of the same duration would appear consecutively.

When recorded, each pronounceable sound was exaggerated, with continuant sounds said slowly and held for 2 sec and stop sounds said for a fraction of a second. For the three pause intervals, *not* was segmented as *nnoot*, *nn* (1-sec pause) . . . *oo* (1-sec pause) . . . *t*, and *nn* (3-sec pause) . . . *oo* (3-sec pause) . . . *t*. The recorder was careful not to add the intrusive vowel sound to either held or stop sounds. Following each segmented word, the recorder said, "Say it fast," which was a pretaught direction to say the segmented word at its spoken rate.

Procedure. Prior to individualized testing on the target words, the children were taught to blend different word types through a "say-it-fast" game. Five-to-6 children simultaneously sat in a semicircle. The teacher modeled the game format and then tested first the entire group and, finally, individual children on their ability to blend different word types presented in this order: (a) two-syllable compound words with each part separated by a slight pause (e.g., *ice..cream*, *foot..ball*); (2) two-syllable simple words separated by a slight pause (e.g., *pen..cil*, *af..ter*); (3) a mix of CV (consonant-vowel) and VC (vowel-consonant) words and nonwords, with no pause between sounds (e.g., *mmēē*, *daa*, *aann*, *ūk*); and (4) a mix of CV and VC words with a 1-sec pause between sounds (e.g., *ss..ēē*, *nn..ūū*, *ii..ff*, *aa..t*).

To start the game, the teacher said, "I'll say a word slowly, then I'll say it fast. Listen: *ice..cream.* Say it fast...icecream!" Then the group was given a turn with *ice cream* and the other compound words until everyone could blend each word without assistance. The children had no trouble blending the words from the first three word types, and only a few children had trouble with words from the fourth type. Although still a member of the group, each child was ultimately and individually tested in a random order with words from the fourth type until three consecutive correct blends were given. This test served as the criteria for participation in the study; only one child, who had unclear speech, could not be included.

One or two days following the familiarization-screening procedure, we began testing on the taped target words. The children were individually tested on the initial 48 words, then 2–3 days later on the last 48 words. Prior to testing, children were refreshed and, when necessary, coached on the say-it-fast game using VC and CV words. Noncontingent praise was intermittently given (e.g., "Good talking") during each of the 15- to 20-min testing sessions.

Interobserver agreement. We recorded all blended answers phonetically (e.g., *nose* = *noz*). During 18 randomly selected testing sessions, another trained observer independently scored the blending responses along with the main observer. The proportion of interobserver agreement was computed by the number of agreements (both observers agreed that the word was correctly or incorrectly blended) divided by agreements plus disagreements. The median agreement was .90 (range = .81 to 1.00).

Design. We used a 2 × 3 × 2 × 2 mixed ANOVA with fixed effects to analyze the data. The between-factor variable was age (kindergarten and first grade). The three within-factor variables were intersound interval (0, 1, and 3 sec), word familiarity (meaningful or nonword) and type of initial sound (held or stop).

Results

The means and standard deviations are included in Table 1. We found no significant four-way or three-way interactions. Four of the two-way interactions were significant, and the simple effects were evaluated by one-way ANOVAs. All reported F values were significant at $p < .004$ and t values at $p < .0001$.

The Interval × Age interaction was significant, $F(2, 84) = 17.99$. When further analyzed, first graders performed better than kindergarteners at all three intervals: (a) 0 sec, $F(1, 42) = 10.06$; (b) 1 sec, $F(1, 42) = 29.22$; and (c) 3 sec, $F(1, 42) = 47.83$. Within the kindergarten group, the interval main effect was significant, $F(2, 42) = 142.79$. Pairwise comparisons (using a modified Bonferonni t value of 4.89 based on Keppel, 1982) revealed better performance at 0 sec versus 1 sec, $t(21) = 11.92$, and 0 sec versus 3 sec, $t(21) = 13.77$.

Differences between 1 and 3 sec were not reliable. Within the first-grade group, the interval effect also was significant, $F(2, 42) = 50.79$, and pairwise comparisons yielded a similar pattern with performance better at 0 sec versus 1 sec, $t(21) = 7.89$ and 0 versus 3 sec, $t(21) = 7.74$. The 1- versus 3-sec differences were nonsignificant.

The Word Familiarity × Age interaction, $F(1, 42) = 11.58$, when further scrutinized, disclosed that first graders outperformed kindergarteners on both meaningful and nonwords: $F(1, 42) = 22.29$ and $F(1, 42) = 42.97$,

Table 1.—Percentage Correct Oral Blending Performance

Condition	Kindergarten age		1st-grade age	
	M	*SD*	*M*	*SD*
0-sec pause				
Meaningful				
Stop 1st	75	21	82	11
Held 1st	64	18	77	22
Nonword				
Stop 1st	54	24	76	15
Held 1st	47	22	58	22
1-sec pause				
Meaningful				
Stop 1st	19	23	46	23
Held 1st	13	18	41	26
Nonword				
Stop 1st	20	30	62	20
Held 1st	12	17	45	26
3-sec pause				
Meaningful				
Stop 1st	15	16	50	24
Held 1st	17	20	42	20
Nonword				
Stop 1st	17	26	64	22
Held 1st	7	12	45	24

Note. Means and standard deviations are rounded to the nearest whole number.

respectively. Within the kindergarten group, the word familiarity main effect was significant, $F(1, 21) = 21.06$, with better performance evidenced on meaningful words. First graders, however, did not differ on the two word types, $F(1, 21) = 0.79$.

The significant interaction of Initial Sound × Word Familiarity, $F(1, 42) = 9.36$, revealed after further analysis better performances on both meaningful and nonwords with stop first sounds, $F(1, 42) = 9.72$ and $F(1, 42) = 26.48$, respectively. Analysis of word familiarity with held first sounds uncovered significantly more correct responses only on meaningful words, $F(1, 42) = 14.87$.

A breakdown of the significant Interval × Word Familiarity interaction, $F(2, 84) = 37.91$, uncovered (a) at 0 sec, better performance on meaningful words, $F(1, 42) = 46.88$; (b) at 1 sec, better performance on nonwords, $F(1, 42) = 9.04$; and (c) at 3 sec, no significant differences between word familiarity. Concerning the significant differences of meaningful words, $F(2, 84) = 256.34$, pairwise comparisons (using a modified Bonferoni t value of 4.41) yielded better performance at 0 versus 1 sec. $t(43) = 14.69$; and 0 versus 3 sec, $t(43) = 16.39$. No differences occurred at 1 versus 3 sec. Concerning the significant effect of nonwords, $F(2,84) = 59.74$, pairwise comparisons also were significant for 0 versus 1 sec, $t(43) = 7.78$ and for 0 versus 3 sec, $t(43) = 7.13$, but not for 1 versus 3 sec.

Discussion

The likelihood that school-age children will have difficulty blending CVC words when the successive spoken sounds are broken by silent pauses is supported by the present findings and is consistent with their poor blending performance reported elsewhere (Chall et al. 1963; Williams, 1980). Although the 1- and 3-sec pause intervals produced diminished blending performance of equal magnitude, we are not certain whether the suppression is limited to durations of 1 sec or longer or whether any break in the sequence, however small, is sufficient. Because intersound intervals are not commonly specified in studies on blending, one needs a parametric investigation that includes intervals of less than 1 sec to settle this issue. Interestingly, the short 0.5-sec delay reported by Chall et al. (1963) was accompanied by dismal blending performance.

The effect of pausing between sounds was much more deleterious for the kindergarten children, whose overall correct performance was 16% at 1 sec and 14% at 3 sec, than for the first graders whose comparable performance was 49% and 50%, respectively. When the segmented sounds in a word were presented without any intervening pause, both age groups responded at much higher levels, although first graders still did better at 0 sec (73%) than the kindergarteners (60%). We will discuss the instructional implications of these findings later.

The differences between the two age groups could have resulted both from general experiential factors associated with the first graders' being a year older or specific factors associated with training in reading. We examined these possibilities in Experiment 2, where all children of kindergarten age (or younger) received training in reading through a program that taught them blending skills. Experiment 2 also enabled a replication of Experiment 1 findings.

It is unlikely that the reduced blending accuracy during pausing could be attributed to unfamiliarity with the task demands. The children appeared to understand the say-it-fast game, especially after extensive training in blending various word types without delays and in blending CV and VC words at a 1-sec delay. In addition, the segmented sounds were exaggerated and said slowly, in accord with Liberman's (1974) and Lewkowicz's (1980) conclusions that a "stretched" pronunciation of the word should help the child perceive the separate sounds.

On the other hand, presenting the target words through taped recordings, as is done in standardized blending tests (Goldman, Fristoe, & Woodcock, 1976; McCarthy & Kirk, 1961), may have contributed to a poorer performance than that achieved when the segmented sounds were said in full view of the child and articulatory movements of the mouth served as additional cues.

Some findings relating to the effects of word familiarity and type of initial sound are not clear. As expected, the kindergarten children performed better on the meaningful versus the nonwords, whereas the first graders unexpectedly did not differ on word familiarity. By being better all-around blenders, the first graders did not need to rely on the semantic value of the word as much as the kindergarten children did.

The findings of Coleman (1970) and Williams (1980) that beginning stop-sound words led to better performance than those with beginning held sounds (true for both meaningful and nonwords) was unexpected and incongruent with previous research. Because beginning held sounds lasted longer, they should have aided the recall of sounds more than the split-second stop sounds did. Stop sounds, by supposedly causing the learner to add an extra vowel during the recombining process, should have led to greater word distortions (Gleitman & Rozin, 1973). The narrator, while making the tape, intently avoided the addition of an intrusive vowel. Two possible accounts for the advantage of stop sounds follow: (a) By being sharp and brief, stop sounds heighten attention to them and to the ensuing sounds. (b) Stop sounds reduce the total duration of time spent in synthesizing words that contain them and result in less demand on short-term auditory storage.

The significant Intersound Interval × Word Familiarity interaction revealed that meaningful words were blended better at 0 sec, whereas nonwords were blended better at

Table 2.—Last Reading Lesson Completed and Ages for Reading Groups

Group		Last lesson	Age[a]
Advanced	*M*	274	71.0
	SD	25	9.6
Intermediate	*M*	139	64.8
	SD	31	12.2
Beginning	*M*	32	51.9
	SD	29	8.1

Note. Maximum number of reading lessons = 320.
[a]Ages are in months.

1 sec (no differences appeared at 3 sec). The surprising differences at 1 sec were due largely to the vast differences between the first graders and the kindergarten children at this delay interval.

Experiment 2

Method

Subjects. The children attended a preschool that used the first two levels of the SRA Reading Mastery program (Engelmann & Bruner, 1983). Each level contained 160 lessons. The children were classified according to the last reading lesson completed at the time of the blending test. Three groups (n = 17 each) emerged: advanced, intermediate, and beginning.

According to Beck and McCaslin (1978), Reading Mastery is a code-emphasis program that provides a definite instructional strategy for teaching blending. Oral blending is one prerequisite skill for reading, and, when taught, no pauses occur between sounds.

For the three training groups, there were no group differences on such factors as racial composition, sex, and proportion of children eligible for free meals, all chi-squares (2, N = 51) < 2.04, ps > .05. There also were no initial Slosson IQ differences, $F(2, 48) = .89$, $p = .42$.

Table 2 gives the group breakdown by last lesson and age. The groups differed on number of lessons completed, $F(2, 48) = 310.97$, $p < .0001$ with all intergroup comparisons (Bonferroni t) reliable, all $ps < .001$. The groups also differed according to age, $F(2, 48) = 15.98$, $p < .0001$, with the children in the advanced and intermediate groups each significantly older than the beginning group, $ps < .01$. The advanced versus intermediate age differences fell short of significance, $p = .08$.

Procedure. In Experiment 2 we followed the same familiarization and testing procedures as those in Experiment 1.

The median interobserver agreement, based on two observers independently scoring 27 children, was .96 (range = .88 to 1.00).

Results

There were no significant four-way or three-way interactions. The Reading Group × Interval interaction, the nature of which appears in Figure 1, was significant, $F(4, 96) = 12.92$, $p < .0001$. Three separate, one-way ANOVAs yielded reliable between-group effects at each interval, all $Fs(2, 42) \geq 5.51$ and all $ps < .007$. Pairwise comparisons were completed using modified Bonferroni t values of 2.19, 3.62, and 4.37 for significance levels of .05, .001, and .0001, respectively. The advanced and intermediate groups did not differ at any interval, all $ts(32) < 2.16$, $ps > .05$.

Both groups did significantly better than the beginning group at all intervals, with the differences being more pronounced at the 1-sec and 3-sec intervals, $ts(32) > 4.08$, $ps < .001$, than at 0-sec, $ts(32) > 2.50$, $p < .05$. Performance within interval levels revealed that each group blended significantly better at 0 sec versus 1 sec, all $ts(16) > 8.71$, all $ps < .0001$, and at 0 sec versus 3 sec, all $ts(16) > 8.51$, all $ps < .0001$. The 1-sec versus 3-sec differences were not significant for any reading group.

As in Experiment 1, significant interactions occurred between interval and word familiarity, $F(2, 96) = 5.60$, $p < .005$, and between initial sound and word familiarity, $F(1, 48) = 6.89$, $p < .01$. An analysis of the variables

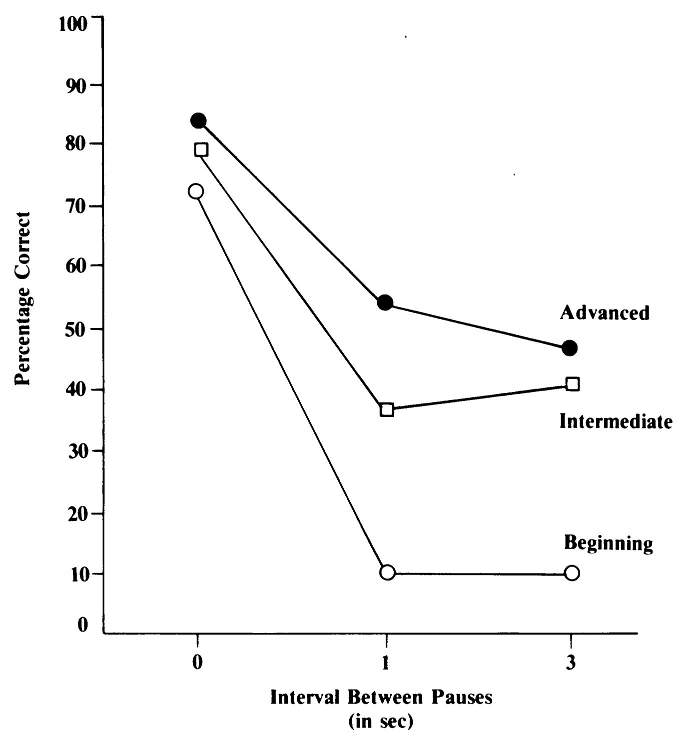

Figure 1. Mean Percentage Correct Blending Performance for the Reading Group × Interval Interaction in Experiment 2.

contained in these interactions yielded essentially the same pattern as that described in Experiment 1. Unlike the findings in Experiment 1 of a significant Word Familiarity × Age interaction, the analogous interaction for Experiment 2 (i.e., Word Familiarity × Reading Group) fell short of significance, $F(2, 48) = 2.73$, $p = .08$.

Blending performance correlated .69 ($p < .01$) with the number of reading lessons, .40 ($p < .01$) with age, but only .11 with entry IQ ($p > .05$). To statistically control for the effect of age and to assess the contribution of the number of reading lessons on blending performance, we conducted an ANCOVA with age as the covariate. Results indicated that the reading group main effect previously revealed by the ANOVA was upheld, $F(2, 47) = 13.80$, $p < .0001$; covariate, $F(1, 47) = .16$, $p = .69$.

A stepwise multiple regression analysis showed that the number of lessons was the best significant predictor, $t(50) = 5.49$, $p < .01$, accounting for over 46% of the blending variance. The next best predictor was IQ, $t(50) = 2.88$, $p < .01$, but it contributed only an additional 7% to the multiple R-square. Age entered the full-model analysis last and was not a significant predictor, $t(50) = 1.11$, $p = .27$, contributing merely 1% to the total.

General Discussion

The apparent justification for injecting pauses between individual or clusters of sounds during oral blending is to demonstrate that words are divisible into parts. If pausing serves this important function, then it is more than offset by preventing the naive learner from recombining these broken parts into whole words with a high degree of accuracy (at least with the pause intervals used herein). The data suggest that the teacher say the sounds slowly in an exaggerated form without introducing any pauses between them. To help convey that words consist of smaller units, the teacher could emphasize changes in sound values by exaggerating mouth movements or by clapping or holding up a finger for each new sound said.

New learners also would benefit by initially blending sounds that form familiar words, and as this skill becomes perfected, sounds from unfamiliar words (or nonwords) could then be programmed. For both kinds of words, however, no intersound pauses should occur.

Improved accuracy in blending words orally, because a teacher (or narrator) said the sounds in a continuous manner, appears to prepare students for decoding printed words (Carnine & Silbert, 1979). If students can be taught to sound words without pausing between the sounds, as the teacher did during oral blending, the process of decoding words should be smoother and more accurate than if the student paused or hesitated between sounds.

Occasionally, however, pausing is necessary. When spelling dictated words, the student is likely to pause momentarily as the word is segmented orally into its parts. The student then probably engages in longer pauses as each pronounced part, either the sound value or the alphabet name of each letter, is converted into its written form to complete the word. Because of their spelling training, the first graders in Experiment 1 and the kindergarten children in the advanced and intermediate groups in Experiment 2 probably learned much about how to derive words under conditions of self-imposed pauses. During oral blending at the 1- and 3-sec pauses, we observed many of these children making nonvocal lip and mouth movements after each dictated sound. Then, following the last sound, the children attempted to repeat all the sounds in sequence prior to saying the word. A distinct possibility exists that the children sometimes arrived at the word by spelling it phonetically.

The kindergarten-aged advanced and intermediate readers blended as well as the first graders across all pause intervals. On the other hand, blending by the nonreading kindergarten children of Experiment 1 was at substantially lower levels, especially when pauses were imposed, and was almost identical to the younger-aged beginning readers. These findings together show that oral blending can be enhanced through direct instruction and is not necessarily one of the phonemic awareness deficits associated with kindergarten-aged children (Calfree, Lindamood, & Lindamood, 1973; Rosner & Simon, 1971).

The results should not imply that blending training itself was responsible for the changes in oral blending, because we employed an independent group receiving instruction in oral blending but not in reading, as other researchers did (Goldstein, 1976; Rohnback, Bell, & McLaughlin, 1982). The fact that a number of reading lessons correlated highest with an ability for blending and accounted for the largest proportion of blending variance is indirect evidence for the promotion of oral blending by reading-related experiences. Advocates of the whole-language approach (Altwergen, Edelsky, & Flores, 1987) might want to expand upon this point: One spin-off of the emerging literacy of young readers could be an improvement in their ability to blend words.

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REFERENCES

Altwergen, B., Edelsky, C., & Flores, B. M. (1987). Whole language: What's new? *The Reading Teacher, 41*(2). 144–154.

Barnard, D. P., & DeGracie, J. (1976). Vocabulary analysis of new primary reading series. *The Reading Teacher, 30*, 177–180.

Beck, I. L., & McCaslin, E. S. (1978). *An analysis of dimensions that affect the development of code-breaking ability in eight beginning reading programs.* Pittsburgh: University of Pittsburgh, Learning Development Center.

Calfee, R. C., Lindamood, P., & Lindamood, C. (1973). Acoustic-phonetic skills and reading: Kindergarten through twelfth grade. *Journal of Educational Psychology, 64*, 293-298.

Carnine, D. W., & Silbert, J. (1979). *Direct instruction reading*. Columbus, OH: Merrill.

Chall, J., Roswell, F. G., & Blumenthal, S. H. (1963). Auditory blending ability: A factor in success in beginning reading. *Reading Teacher, 17*, 113-118.

Coleman, E. B. (1970). Collecting a data base for a reading technology. *Journal of Educational Psychology Monograph, 61*(4), 1-23.

Dolch, E. W. (1936). A basic sight vocabulary. *Elementary School Journal, 36*, 456-460.

Engelmann, S., & Bruner, E. (1983). *Reading Mastery I and II, DISTAR Reading*. Chicago: Science Research Associates.

Gleitman, L. R., & Rozin, P. (1973). Teaching reading by use of a syllabary. *Reading Research Quarterly, 8*, 447-483.

Goldman, R., Fristoe, M., & Woodcock, R. W. (1976). *Goldman-Fristoe-Woodcock Auditory Skills Test Battery*. Circle Pines, MN: American Guidance Service.

Goldstein, D. M. (1976). Cognitive-linguistic functioning and learning to read in preschoolers. *Journal of Educational Psychology, 68*, 680-688.

Haddock, M. (1976). Effects of an auditory and an auditory-visual method of blending instruction on the ability of prereaders to decode synthetic words. *Journal of Educational Psychology, 68*, 825-831.

Katz, J., & Harmon, C. (1982). *Phonetic synthesis: Blending sounds into words*. Allen, TX: Developmental Learning Materials.

Keppel, G. (1982). *Design and analysis: A researcher's handbook (2nd* ed.). Englewood Cliffs, NJ: Prentice-Hall.

Lewkowicz, N. K. (1980). Phonemic awareness training: What to teach and how to teach it. *Journal of Educational Psychology, 72*, 686-700.

Liberman, A. M. (1974). The specialization of the language hemisphere. In F. O. Schmitt and F. G. Woodsen (eds.), *The neurosciences: Third study program*. Cambridge, MA: MIT Press.

McCarthy, J. J., & Kirk, S. A. (1961). *Examiner's manual: Illinois Test of Psycholinguistic Abilities (Experimental version)*. Urbana, IL: University of Illinois Institute for Research on Exceptional Children.

Muller, D. (1972-1973). Phonic blending and transfer of letter training to word reading in children. *Journal of Reading Behavior, 5*, 212-217.

Richardson, E., DiBenedetto, B., & Bradley, C. M. (1977). The relationship of sound blending to reading achievement. *Review of Educational Research, 47*, 319-334.

Rohnback, C. R., Bell, B. J., & McLaughlin, T. F. (1982). The value of auditory blending skills for reading. *Educational Research Quarterly, 7*, 41-47.

Rosner, J. (1973-1974). Auditory analysis with prereaders. *The Reading Teacher, 27*, 379-384.

Rosner, J., & Simon, D. P. (1971). The auditory analysis test: An initial report. *Journal of Learning Disabilities, 4*, 384-392.

Roswell, F. G., & Chall, J. (1963). *Auditory blending test*. New York: Essay Press.

Weisberg, P. (in press). DI in the preschool. *Education and treatment of Children*.

Williams, J. P. (1980). Teaching decoding with an emphasis on phoneme analysis and phoneme blending. *Journal of Educational Psychology, 72*, 1-15.