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ABSTRACT

This report summarizes the findings of a February 1971 administration of a revised and expanded version of the Wisconsin Basic Prereading Skill Test to 138 kindergartners. The test battery being developed has two purposes: (a) the identification of prereading skill deficits in kindergartners for individualized curriculum planning, and (b) the prediction of reading achievement at the end of first grade. Included in the February 1971 test battery were visual tests for attending to letter orientation, letter string order, and letter string detail; auditory tests for sound matching and sound blending; and learning rate tests for picture-sound association and word segmentation. For background information a letter-naming test was also included. Data were gathered on two forms of each visual test by testing a child on the complete test battery one day and the alternate forms of the visual tests the preceding or following day. Item analyses, test reliabilities, test correlations, and descriptive statistics are reported for the test battery. Implications for further test revision are discussed. (Author)

Technical Report No. 187

REPORT ON THE FEBRUARY 1971 VERSION OF THE WISCONSIN BASIC PREREADING SKILL TEST

by
Robin S. Chapman

Report from the Project on Basic Prereading Skills:
Identification and Improvement

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Statement of Focus

The Wisconsin Research and Development Center for Cognitive Learning focuses on contributing to a better understanding of cognitive learning by children and youth and to the improvement of related educational practices. The strategy for research and development is comprehensive. It includes basic research to generate new knowledge about the conditions and processes of learning and about the processes of instruction, and the subsequent development of research-based instructional materials, many of which are designed for use by teachers and others for use by students. These materials are tested and refined in school settings. Throughout these operations behavioral scientists, curriculum experts, academic scholars, and school people interact, insuring that the results of Center activities are based soundly on knowledge of subject matter and cognitive learning and that they are applied to the improvement of educational practice.

This Technical Report is from the Basic Prereading Skills: Identification and Improvement element of the Reading and Related Language Arts Project, in Program 2, Processes and Programs of Instruction. The objectives of Program 2 are to develop curriculum materials for elementary and preschool children, to develop related instructional procedures, and to test and refine the instructional programs incorporating the curriculum materials and instructional procedures. Contributing to these objectives, this project has two general objectives: (1) to develop kindergarten level tests for diagnosing deficits in skills which relate to reading, and (2) to develop a kindergarten-level program for teaching these skills. Tests and instructional programs will be developed for: visual and acoustic skills, including letter and letter string matching with attention to order, orientation and detail; auditory matching, segmentation, and blending; and for relating sounds to symbols.

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Abstract

This report summarizes the findings of a February 1971 administration of a revised and expanded version of the Wisconsin Basic Prereading Skill Test to 138 kindergartners. The test battery being developed has two purposes: (a) the identification of prereading skill deficits in kindergartners for individualized curriculum planning, and (b) the prediction of reading achievement at the end of first grade.

Included in the February 1971 test battery were visual tests for attending to letter orientation, letter string order, and letter string detail; auditory tests for sound matching and sound blending; and learning rate tests for picture-sound association and word segmentation. For background information a letter-naming test was also included. Data were gathered on two forms of each visual test by testing a child on the complete test battery one day and the alternate forms of the visual tests the preceding or following day. Item analyses, test reliabilities, test correlations, and descriptive statistics are reported for the test battery. Implications for further test revision are discussed.

I
Introduction

This report summarizes the results of administering a revised version of the Wisconsin Basic Prereading Skill Test (BPST) to 138 kindergartners in February 1971 and discusses the implications of those results for test revision. An administration of an earlier version of the test battery in fall 1970 is described by Chapman (1971).

The BPST is being developed to identify specific visual and auditory skill deficits in kindergartners through short, individually administered tests. A second purpose of the test battery is to predict reading achievement at the end of first grade. (For discussion of the research leading to prereading skill identification and the rationale for development of a diagnostic battery, see Calfee, Chapman, & Venezky, 1970; and Venezky & Chapman, in press.) Concurrently an instructional program to teach the same specific skills is being developed; a tryout of the first part of this program took place in spring 1971.

The same visual skills—attention to letter orientation, letter string order, and letter string detail—were assessed in both the fall 1970 and February 1971 administrations, although the tests themselves were completely revised. Auditory skills assessed in the February 1971 version included sound matching and sound blending. Ability to learn to segment monosyllabic words and to associate individual speech sounds with pictures was also tested. Of the auditory and learning skills, only segmentation learning had been previously assessed, and that in a different testing paradigm.

II
Method

The BPST Visual Tests

Two forms, designated A and B, were constructed for each of the three visual skill tests.[1] Each test consisted of 16 multiple-choice items with the standard presented at the left and two alternates to the right in a horizontal row. The correct alternate occurred in rightmost (second) position 75 percent of the time.[2] The child was asked to point to the alternate just like the standard; about two minutes were required to complete each test. The particular nature of the standards and distractors for each test is discussed by test in the following paragraphs.

Letter Orientation

The standards for this test consisted of the single letters p, q, b, and d, and pairs formed with each of these letters and a lowercase vowel initially or finally. For each item, the distractor was identical to the standard except for the substitution of the left-right reversal—p for q or vice versa and b for d or vice versa.

Letter Order

The standards for this test consisted of pairs of dissimilar letters (e.g., wf) uppercase or lowercase.[3] The distractor for each test item was formed by reversing the order of letters in the standard (e.g., fw).

Letter String Detail

The standards for this test consisted of upper- or lower-case triplets of dissimilar letters (e.g., rfg). The distractor for an item consisted of the standard with a similar letter substituted for one of its three letters (e.g., rfy).[4]

The BPST Auditory Tests

Sound Matching

Twelve multipe-choice items comprised this test. Each item consisted of a row of four line drawings of familiar objects (e.g., a cup, a knife, a shirt, a horse). Three pictures representing the sounds /š/ (as in shoe), /o/ (as in oh), and /s/ (as in see) served as stimulus items: a girl with a

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[1] Test items for each form are listed in Appendix A; the examiner's script, in Appendix B.

[2] The reasons for these constraints on number and arrangement of alternates are given in Chapman (1971).

[3] For lowercase letters, three dissimilar sets were defined: those letters with no extenders, those with upward extenders, and those with downward extenders. For uppercase letters, the three dissimilar sets were defined as letters composed entirely of straight line segments, those composed of both line and curve segments, and those composed entirely of curves.

[4] Similar letters were drawn from the similar sets previously defined and were selected to be as closely similar as possible in the test constructor's judgment.

finger to her lips, a boy with his mouth open in surprise, and a snake, respectively.[5] A stimulus picture was used to elicit the sound of interest from the child prior to a block of four items. Each item in turn was then presented, the four pictures named by the examiner, and the child asked to point to the picture of the word that had the sound in it. The test required about four minutes.

The two consonant sounds, /v̌/ and /s/, occurred in words twice initially and twice finally; /o/ always occurred medially. All distractors were pictures of monosyllabic words. Two practice items for /v̌/ preceded the test.

Sound Blending

In this test the examiner pronounced the consonant-vowel segment of a word, paused one second, and then pronounced the final consonant (e.g., /faɪ/ . . . /v/, for five). The child was asked to say the word the sounds made—i.e., to produce the blend; see Appendix B for the script. If the examiner was doubtful about the child's response, he asked "What do you do with that?" to provide a semantic basis for judgment. The correct answer was given after each item attempt. The test required about four minutes.

The list of 15 test items is presented in Appendix A; the first three test items were also used as practice items to introduce the task. All words were high frequency and monosyllabic; the vowel in each case was one which could occur in word-final position (i.e., an unchecked vowel).

The BPST Learning Tests

Segmentation Learning

The segmentation test of the fall 1970 BPST consisted of five anticipatory trials on a three-item list followed by six items testing transfer of learning. An example of an item would be the stimulus-response pair feet-eat; the child had to learn to give the VC response (a real word) to the CVC stimulus (also a real word).

The scores for fall 1970 learning and transfer correlated significantly with each other ($r = .59$, $p < .01$), but hardly as strongly as one would expect for reliable tests, if the same skill were being tested. Since our primary interest was in whether the child would "catch on," or show transfer, we used a modified version of the task in the February 1971 test administration: a 15-item transfer test with a single study trial only for the first three items.[6] That is, each stimulus word (with the exception of the first three) was presented only once and the child forced to guess the real word response before hearing the correct answer. The child was instructed to repeat the stimulus word prior to his answer, but not penalized for failure to do so. The test required approximately five minutes.

Picture-Sound Association Learning

This test required the child to learn to say a single sound in response to a picture of something which might plausibly make that sound; for instance, to learn an association between the sound /e/ (as in hey!) and the line drawing of a bespectacled, puzzled woman with her hand cupped behind her ear. Three other picture-sound pairs were used, in addition to the example: a picture of a two-headed Martian creature with /ǰ/ (as in jig); a picture of a baby with /b/ (as in burble); and a stylized representation of the wind with /w/ (as in woo). Following an initial study trial, these four pairs were presented for four anticipatory learning trials, or a total of 16 "items."[7] Total test time was approximately five minutes.

Other Components

Also included in the full February 1971 test battery were a four-item practice test for the multiple-choice tasks, two rest breaks of about 30 seconds each in which the examiner and the child played "Simon Says," and a one-minute test of letter

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[5] The three stimulus pictures, the practice items, and the pictures and labels comprising the twelve multiple-choice test items are given in Appendix A; the examiner's script, in Appendix B.

[6] Test items appear in Appendix A; examiner's script, in Appendix B.

[7] Stimulus pictures and item orders are listed in Appendix A; examiner's script, in Appendix B.

Table 1

Order of Testing in Full Test Batteries
and Visual Tests Only
for February 1971 BPST Administration[a]

	FULL TEST BATTERIES		
TEST NO.	Order 1	Order 2	VISUAL TESTS ONLY
0[b]	Practice test	Practice test	Practice test
1	Letter Orientation	Letter Orientation	Letter Orientation
2	Letter Order	Letter Order	Letter Order
3	Sound Matching	Sound Matching	Letter String Detail
	Rest break	Rest break	
4	Picture-Sound Association Learning	Segmentation Learning	—
5	Letter String Detail	Letter String Detail	—
6	Sound Blending	Sound Blending	—
	Rest break	Rest break	
7	Alphabet Naming	Alphabet Naming	—
8	Segmentation Learning	Picture-Sound Association Learning	—

[a]The three visual tests were either all Form A or all Form B.
[b]The practice test was given only on the first day of testing.

naming which included the ten uppercase letters most likely to be known to kindergartners. This test was given to provide a rough prediction of first-grade reading achievement in the absence of standardized readiness tests appropriate for midyear kindergartners.

Test Administration

Test Condition

Two orders of the full test battery were used (see Table 1), differing only in which of the two learning tasks came fourth and which came last. These two tests were counterbalanced for order because of their relatively greater length and, hence, susceptibility to fatigue or boredom effects. The full test battery included either Form A or B of all three visual tests and required about 26 minutes for administration. Each child also received the visual test section of the battery a second time in opposite form, on a day either before or after the administration of the full test battery. The visual tests required approximately six minutes. Thus a child could be assigned to one of the eight separate testing treatments listed in Table 2; within a class, each successive child was assigned to the next condition of a random permutation of the eight possible conditions. The number of subjects ultimately assigned to each condition is also indicated in Table 2.

Table 2

Number of Subjects in Each Testing Condition of February 1971 BPST Administration

CONDITION	FIRST DAY			SECOND DAY			LOW SES Ss (n = 38)	MID SES Ss (n = 51)	HIGH SES Ss (n = 49)	ALL Ss (n = 138)
	Battery	Order	Vis Form	Battery	Order	Vis Form				
1	Full	1	A	Visual only	—	B	5	6	5	16
2	Full	2	B	Visual only	—	A	3	6	6	15
3	Full	1	B	Visual only	—	A	5	7	6	18
4	Full	2	A	Visual only	—	B	4	7	6	17
5	Visual only	—	B	Full	1	A	5	7	7	19
6	Visual only	—	A	Full	2	B	3	6	6	15
7	Visual only	—	A	Full	1	B	6	6	6	18
8	Visual only	—	B	Full	2	A	7	6	7	20

Examiners

Five college students served as test administrators (four females, one male). All had had some previous experience in testing kindergartners and had rehearsed the BPST before administering it. The testing schedule was arranged so that each examiner was assigned to a classroom for the two-day block necessary to completely test a set of children (usually, six per morning or afternoon class) and then moved to another classroom. When necessary, a second examiner completed the second day of testing for a child. The distribution of subjects by examiners is show in Table 3.

Table 3

Number of Children Tested by Each Examiner in February 1971 BPST Administration

	EXAMINER NO.				
	1	2	3	4	5
Low SES	12	5	10	11	0
Mid SES	11	11	10	7	12
High SES	16	13	11	0	9
All Ss	39	29	31	18	21

Subjects

One hundred and thirty-eight kindergartners from the same classrooms tested in fall 1970 participated in the study, with the exception of a single extra classroom tested at Hawthorne Elementary School in the fall.[8] Mean age of the children tested in February was 68 months; of them, 125 had received the fall 1970 version of the BPST. The four Madison elementary schools which participated in the study draw students from different ranges of the socioeconomic spectrum: roughly Hawthorne can be classed as low SES in the sample, Glendale as middle, and Muir and Stephens as high. The distribution of boys and girls in each classroom tested is shown in Table 4.

[8] Three children from that classroom who were to take part in the spring tryout of the instructional program were tested in the February study.

Table 4

Distribution of Ss by Class, School, SES, and Sex
in February 1971 BPST Administration

CLASS	SCHOOL	SES	SEX M	SEX F	TOTAL
AM[a]	Hawthorne	Low	10	12	22
PM	Hawthorne	Low	7	9	16
AM	Glendale	Mid	9	19	28
PM	Glendale	Mid	12	11	23
AM	Stephens	High	11	18	29
PM	Muir	High	9	11	20
TOTAL	Hawthorne	Low	17	21	38
	Glendale	Mid	21	30	51
	Stephens / Muir	High	20	29	49
			58	80	138

[a]Includes 3 Ss from other AM kindergarten.

III
Results and Discussion

Test Condition Effects

Visual Tests

The number of correct responses out of 16 was computed for each S for each test form. Mean visual test scores in each test condition are presented in Table 5. The pairs of scores for each visual test were analyzed in a 2 x 2 x 2 unequal-n Anova with repeated measures on the last factor, visual test order (AB

Table 5

Mean Visual Test Scores by Test Condition on February 1971 BPST

CONDITION NO.	TEST ORDER		NO.	ORIENTATION		ORDER		DETAIL	
	Visual Test Order	Sound Test Order	Ss	A	B	A	B	A	B
1	AB	1st	16	13.8	13.9	13.4	13.9	13.4	13.7
2	BA	1st	15	14.9	14.3	14.1	14.1	14.0	14.6
3	BA	1st	18	14.0	13.6	13.2	12.7	13.5	13.9
4	AB	1st	17	12.8	13.2	11.1	12.2	12.9	13.3
5	BA	2nd	19	14.9	14.5	13.6	12.6	14.0	13.9
6	AB	2nd	15	12.3	13.1	11.9	11.6	11.7	12.5
7	AB	2nd	18	12.7	13.9	12.5	11.9	12.4	12.6
8	BA	2nd	20	14.4	12.6	12.9	11.8	14.0	13.0
Average	AB	—	66	12.9	13.5	12.2	12.4	12.6	13.0
	BA	—	72	14.5	13.7	13.4	12.7	13.9	13.8
Average	—	1st	66	13.8	13.8	12.9	13.2	13.4	13.8
	—	2nd	72	13.7	13.5	12.8	12.0	13.1	13.0

Table 6

Mean Auditory, Learning, and Letter Naming Test Scores by Test Condition on February 1971 BPST

CONDITION	TEST DAY	TEST ORDER	NO. Ss	AUDITORY TESTS Matching	AUDITORY TESTS Blending	LEARNING TESTS Pix-Sound	LEARNING TESTS Segmentation	OTHER Letter Naming
1	1st	1	16	8.1	11.9	9.8	6.4	8.2
2	1st	2	15	6.5	10.4	9.5	4.9	8.1
3	1st	1	18	7.2	10.6	6.9	5.3	6.6
4	1st	2	17	6.8	9.9	7.2	3.8	6.8
5	2nd	1	19	7.8	10.9	8.4	6.3	7.8
6	2nd	2	15	7.1	10.1	6.1	3.9	6.1
7	2nd	1	18	6.9	10.0	7.8	4.8	6.2
8	2nd	2	20	7.7	11.1	8.8	5.5	8.4
Average	1st	—	66	7.2	10.7	8.3	5.1	7.4
	2nd	—	72	7.4	10.6	7.9	5.2	7.2
Average	—	1	71	7.5	10.8	8.2	5.7	7.2
	—	2	67	7.1	10.4	7.9	4.6	7.4

or BA) by sound test order (1st or 2nd) by test form (A or B). An alpha level of .01 was specified. Only one significant difference was found in the analysis of Letter Orientation scores: the interaction of test form and visual test order ($F\ [1, 134] = 20.31$, $p < .01$), which is tantamount to comparing test and retest scores. The mean number correct on first orientation testing was 13.3; on retest, 14.0. No effect was significant in the Letter Order and Letter String Detail analyses. Failure to find a significant difference between Form A and B for any of the three tests establishes the equality of means desired for parallel forms of a test.

Auditory Tests

The mean number correct out of 12 items on Sound Matching and out of 15 on Sound Blending is shown by condition in Table 6. For each test a 2 x 2 unequal-n Anova, test day (1st or 2nd) by test order (1 or 2), was run on the total correct scores. No significant effects or interaction were found.

Learning Tests

Test scores by condition are also presented in Table 6 for Picture-Sound Association Learning (16 items) and Segmentation Learning (15 items). An Anova identical to that run on each of the auditory tests was run for each learning test; no significant effects or interaction were found.

Table 7

February 1971 BPST Test Performance by Socioeconomic Status of Schools

TEST	HIGH SES (n = 49)			MID SES (n = 51)			LOW SES (n = 35)			ALL SES (n = 138)		
	%	$\bar{X}$	SD	%	$\bar{X}$	SD	%	$\bar{X}$	SD	%	$\bar{X}$	SD
VISUAL TESTS												
Orientation A	88%	14.02	2.22	88%	14.10	2.67	79%	12.66	3.56	86%	13.74	2.82
Orientation B	88%	14.00	2.55	89%	14.26	2.26	76%	12.11	3.61	85%	13.63	2.87
Order A	83%	13.33	2.64	82%	13.06	3.36	74%	11.77	2.98	80%	12.85	3.05
Order B	80%	12.80	3.32	79%	12.63	3.61	76%	12.14	3.51	79%	12.59	3.44
Detail A	87%	13.92	2.44	83%	13.26	2.83	77%	12.37	2.89	83%	13.28	2.74
Detail B	86%	13.78	2.43	83%	13.24	2.96	82%	13.06	2.27	84%	13.41	2.58
AUDITORY TESTS												
Matching	62%	7.49	2.10	64%	7.74	2.18	53%	6.40	2.49	61%	7.29	2.26
Blending	76%	11.49	3.20	66%	9.88	3.95	69%	10.40	3.64	71%	10.63	3.63
LEARNING TESTS												
Picture-Sound	57%	9.16	3.82	49%	7.82	4.12	46%	7.29	4.33	50%	8.07	4.12
Segmentation	42%	6.35	4.08	29%	4.29	3.82	32%	4.74	3.30	34%	5.15	3.84
OTHER												
Letter Naming	86%	8.57	2.48	74%	7.39	3.04	56%	5.63	3.44	73%	7.29	3.19

Letter Naming

Mean Letter Naming scores, out of ten, are also displayed by condition in Table 6. An Anova identical to that run on each auditory test revealed no significant effects or interaction.

SES Differences

In the fall 1970 BPST administration to entering kindergartners, all tests except Segmentation Transfer showed significant differences between Hawthorne and Glendale and the high SES schools (Chapman, 1971). That is, test performance improved as the socioeconomic status of the school population increased. In Table 7 are presented, by SES level, the percent correct, mean correct, and standard deviation for the February administration of each test. Table 8 summarizes t-test values for high versus middle and middle versus low SES groups on each test.

The BPST February data differ from those collected in October in two striking ways. The first is the improvement in performance from fall to February testing, which may be attributed either to the greater ease of the revised tests or the intervening learning. Letter Naming scores increased from 50% to 73%, overall; Letter Order, from 50% to 80%; Letter Orientation,

Table 8

t-Test Values for High vs. Middle SES Scores and Middle vs. Low SES Scores

TEST	HIGH vs. MIDDLE (df = 98)	MIDDLE vs. LOW (df = 84)
VISUAL TESTS		
Letter Orientation (A)	-.16	2.12[a]
Letter Order (A)	.44	1.81[a]
Letter String Detail (A)	1.24	1.41
AUDITORY TESTS		
Sound Matching	-.58	2.61[b]
Sound Blending	2.21[a]	-.61
LEARNING TESTS		
Picture-Sound Association	1.67	.57
Segmentation	2.58[b]	-.56

[a] $t > 1.67$, $p < .05$, 1-tailed
[b] $t > 2.37$, $p < .01$, 1-tailed

from 50% to 86%; and Letter String Detail from 44% to 83%. The second finding of interest is the degree to which the February test data fail to vary with SES level. Although the three groups continue to differ significantly in Letter Naming, no difference can be found between high and middle SES groups on any of the visual tests. For these skills at least, the middle group appears to have "caught up." The additional auditory and learning tests, moreover, do not bear a simple relation to SES; the middle group is worst on Sound Blending and Segmentation Learning. the high group poorer than the middle on Sound Matching.

These findings are contrary to the view that skill deficits found in lower SES children cumulate over time (e.g., Deutsch, 1967). Rather, they suggest what we assume in practice: that the child is educable, and that the fact of initial ignorance does not inexorably guarantee later academic failure.

Test Reliability

Internal Consistency Reliability

The FORTAP program (Baker & Martin, 1968) was used to compute Hoyt internal consistency reliabilities for each test. These reliabilities are given in Table 9. Reliabilities of .80 or greater were desired; they were obtained for both test forms of Letter Orientation, Letter Order (Form B), Sound Blending, Picture-Sound Association Learning, Segmentation Learning, and Letter Naming. Internal consistency for Letter Order, Form A ($r = .78$) is borderline acceptable. The rs for Letter String Detail and Sound Matching, however, are not; revisions likely to improve test consistency will be suggested in the sections dealing with performance on each test.

Alternate-Form Reliability

It can be asked whether the two forms of each visual test constitute parallel forms in the sense of having equal means

Table 9

Hoyt Internal Consistency Reliabilities
and Standard Errors of Determination
for February 1971 BPST

TEST	FORM	NO. ITEMS	$\bar{X}$	SD	HOYT r	SE
VISUAL TESTS						
Letter Orientation	A	16	13.74	2.88	.81	1.20
Letter Orientation	B	16	13.63	2.87	.81	1.22
Letter Order	A	16	12.85	3.05	.78	1.38
Letter Order	B	16	12.59	3.44	.83	1.39
Letter String Detail	A	16	13.28	2.74	.74	1.34
Letter String Detail	B	16	13.41	2.58	.72	1.32
AUDITORY TESTS						
Sound Matching		12	7.29	2.26	.59	1.39
Sound Blending		15	10.63	3.63	.84	1.41
LEARNING TESTS						
Picture-Sound Association		16	8.07	4.12	.85	1.53
Segmentation		15	5.15	3.84	.85	1.44
OTHER						
Letter Naming		10	7.29	3.19	.91	.93

and equal variances. Hartley's (1950) F_{max} statistic for testing homogeneity of variance showed no significant departure from homogeneity for Letter Orientation ($F_{max}\ [2,137] = 1.04$), Letter Order ($F_{max}\ [2,137] = 1.13$), or Letter String Detail ($F_{max}\ [2,137] = 1.06$). In the Anovas on visual test scores, no significant differences between means for Form A and Form B on any test were found.

The correlations between Forms A and B of each test for the 138 Ss were disappointingly low, however; rs were .73, .64, and .59 for Orientation, Order, and Detail respectively. Since the visual tests are essentially achievement rather than aptitude tests, long-term stability or test-retest reliability is not sought; high correlations would not be expected unless the instruction intervening between test and retest were identical and identically effective for all Ss. Thus correlations between fall 1970 and February 1971 versions of the BPST visual tests, for those 125 Ss receiving both, are relatively low (though statistically significant) and no higher between fall and February tests for the same visual skill than for fall and February tests of different skills (see Table 10). These particular data, of course, are confounded by the intervening test revisions.

Attenuation of the correlations between Form A and B of each visual test in the February administration, however, is hard to attribute to intervening variation in instruction, since the test-retest period is only 24 hours. Some attenuation can be accounted for by the combination of practice and ceiling effects; on Letter Orientation, where a significant practice effect was found, the number of Ss making perfect scores rose from 32 on the first test to 64 on the second. Similarly, the

number of Ss making perfect scores increased from 31 to 43 on Letter String Detail and from 32 to 37 on Letter Order, but the ceiling effects are hardly so striking (nor the overall practice effects significant) in these latter cases.

Additional attenuation may be attributed to internal inconsistencies in the tests, as indicated by the Hoyt reliabilities. The easiest explanation for the relatively low correlations, that Forms A and B of a test sample somewhat different skills, is hard to accept in the face of the severe restrictions on item construction and the item statistics reported in the following sections.

High internal consistency reliability ($r > .80$), rather than test-retest reliability, will be made the goal of further test development, since internal consistency rather than long-term stability is to be expected on theoretical grounds.

Test Performance

Letter Orientation

Frequency distributions of Ss' scores

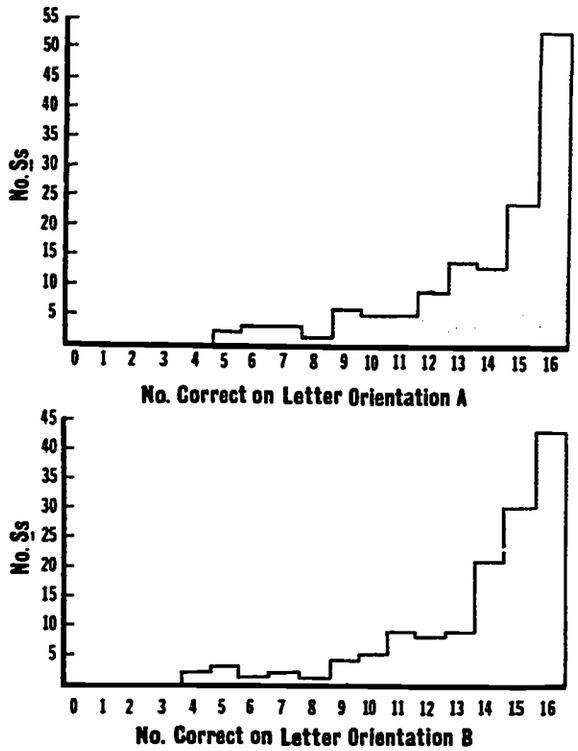

Figure 1. Frequency distribution of Ss' scores on Letter Orientation, Forms A and B.

on Forms A and B are shown in Figure 1. Item difficulty (actually, proportion passing item), biserial r, $\bar{X}_{50}$, and δ values are reported for Forms A and B of Letter Orientation in Table 11. Average item difficulties were .86 and .85 for A and B, respectively, with ranges of .82 - .93 and .76 - .93. The remaining item statistics differed markedly for the four

Table 10

Correlations Between February 1971 and Fall 1970 BPST Visual Tests[a]

FEBRUARY 1971 BPST	FALL 1970 BPST Orientation	Order	Detail
Orientation A	.27	.41	.32
Orientation B	.23	.36	.33
Order A	.27	.40	.31
Order B	.32	.41	.33
Detail A	.27	.38	.31
Detail B	.35	.43	.40

[a] $p < .01$ for all entries, $r > .23$, $df = 124$, 2-tailed test.

items on each test with the correct alternate in initial position. As shown in Table 12, these items correlated less with total score, discriminated among Ss more poorly, and differentiated the bottom 5% rather than 15%. The data suggest exclusion of initial-position correct items, but since Hoyt r levels were acceptable and a test with only one position correct would present special problems, these changes will not be made for Letter Orientation.

Letter Order

Frequency distributions of Ss' scores on Forms A and B are shown in Figure 2. Item statistics are reported for each form in Table 13. The proportions of Ss passing averaged .80 and .79 for Forms A and B respectively. Item statistics differed most for the four items on each form with the correct alternate in initial position. As shown in Table 14, these items correlated less with total score and discriminated more poorly among Ss than other items. Conversion of one of

Table 11

Item Analysis Summary for Forms A and B of Letter Orientation

	FORM A					FORM B			
Item No.	d[a]	r	$\bar{X}_{50}$[c]	ß[c]	Item No.	d[a]	r	$\bar{X}_{50}$[c]	ß[c]
1	.86	.74	-1.48	1.09	1	.79	.65	-1.24	.86
2[b]	.89	.30	-4.05	.32	2	.93	>1.00	—	—
3	.91	.94	-1.40	2.83	3[b]	.86	.40	-2.72	.44
4	.87	.99	-1.14	5.85	4	.76	.72	- .99	1.02
5	.89	.66	-1.86	.89	5	.99	>1.00	—	—
6	.86	.95	-1.15	2.94	6[b]	.83	.46	-2.02	.52
7	.93	>1.00	—	—	7	.87	>1.00	—	—
8[b]	.76	.44	-1.60	.49	8	.79	.93	- .87	2.56
9	.84	.92	-1.07	2.42	9[b]	.88	.42	-2.88	.46
10	.85	.93	-1.10	2.61	10	.83	.82	-1.15	1.42
11	.86	.98	-1.11	5.17	11	.85	.92	-1.12	2.27
12[b]	.82	.58	-1.57	.71	12	.86	.80	-1.36	1.35
13[b]	.83	.60	-1.57	.75	13	.88	.95	-1.22	3.10
14	.83	.87	-1.11	1.80	14	.87	>1.00	—	—
15	.83	>1.00	—	—	15	.89	.98	-1.26	5.24
16	.91	>1.00	—	—	16[b]	.83	.46	-2.10	.52

[a]Proportion of Ss giving correct response.
[b]Items with correct alternate in Position 1.
[c]$\bar{X}_{50}$ and ß are not computed when the biserial r is greater than 1.

Table 12

Average Item Statistics for Letter Orientation Items with First or Second Position Correct

	FORM A				FORM B			
	d[a]	r	$\bar{X}_{50}$	ß	d[a]	r	$\bar{X}_{50}$	ß
Position 1 Correct	.82	.48	-2.20	.57	.85	.44	-2.43	.48
Position 2 Correct	.87	.92	-1.27	2.84	.85	.89	-1.15	2.23
All Items	.86	.81	-1.50	2.27	.85	.78	-1.47	1.79

[a]Proportion of Ss giving correct response.

Table 13

Item Analysis Summary for Forms A and B of Letter Order

FORM A					FORM B				
Item No.	d[a]	r	$\bar{X}_{50}$	β	Item No.	d[a]	r	$\bar{X}_{50}$[c]	β[c]
1	.79	.71	-1.13	1.02	1	.79	.69	-1.17	.95
2	.75	.70	- .94	.99	2	.87	.92	-1.22	2.35
3[b]	.74	.49	-1.32	.56	3[b]	.68	.50	- .94	.58
4	.81	.74	-1.19	1.10	4	.82	.83	-1.10	1.48
5[b]	.70	.47	-1.08	.54	5	.78	.83	- .94	1.48
6	.80	.78	-1.10	1.26	6[b]	.72	.33	-1.81	.35
7	.85	.79	-1.24	1.32	7	.79	.88	- .91	1.90
8	.89	.97	-1.28	3.73	8	.82	.85	-1.07	1.64
9	.83	.90	-1.04	2.09	9[b]	.75	.43	-1.54	.48
10	.86	.84	-1.25	1.58	10	.83	.91	-1.07	2.15
11[b]	.70	.45	-1.18	.51	11	.78	.89	- .85	1.93
12	.83	.76	-1.28	1.16	12	.80	.91	- .91	2.25
13	.86	.87	-1.26	1.73	13[b]	.72	.48	-1.24	.55
14	.88	.75	-1.59	2.13	14	.81	>1.00	—	—
15[b]	.78	.53	-1.48	.62	15	.81	.84	-1.05	1.58
16	.78	.75	-1.01	1.13	16	.81	.88	-1.00	1.89

[a]Proportion of Ss giving correct response.
[b]Items with correct alternate in position 1.
[c]$\bar{X}_{50}$ and β are not computed when the biserial r is greater than 1.

Table 14
Average Item Statistics for Letter Order Items with First or Second Position Correct

	FORM A				FORM B			
	d[a]	r	$\bar{X}_{50}$	β	d[a]	r	$\bar{X}_{50}$	β
Position 1 Correct	.73	.48	-1.26	.56	.72	.44	-1.38	.49
Position 2 Correct	.83	.80	-1.20	1.52	.81	.87	-1.03	1.78
All Items	.80	.72	-1.22	1.28	.79	.76	-1.12	1.46

[a]Proportion of Ss giving correct response.

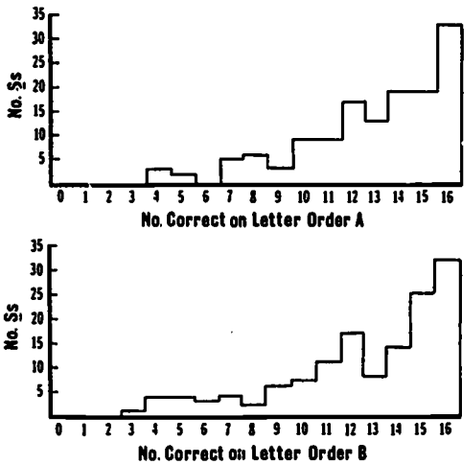

Figure 2. Frequency distribution of Ss' scores on Letter Order, Forms A and B.

these items to a second-position-correct item would probably eliminate the borderline status of the Hoyt r for Form A at the cost of decreasing the difference between a chance score for second-position bias and a mastery score.

Letter String Detail

Frequency distributions of Ss' scores on Forms A and B are shown in Figure 3. Item statistics are reported for each form in Table 15. Average item statistics are given for several item subsets in Table 16: the four items with correct alternate in initial position; the four of the remaining 12 items in which the first letter of the distractor differs from the standard; the four for which the second or middle letter differs; and the four in which the third or final letter differs. Those items with the correct alternate in position 1 are clearly poorest; those with the final letter changed are functioning next most poorly as discriminators. The revisions recommended to increase internal consistency are the elimination of one of the four initial-position-correct items and final letter-changed distractors.

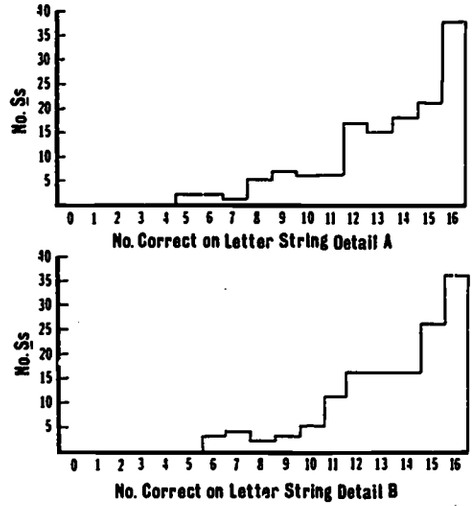

Figure 3. Frequency distribution of Ss' scores on Letter String Detail, Forms A and B.

Sound Matching

The frequency distribution of Ss' scores on Sound Matching is shown in Figure 4. Item statistics for the correct alternates are shown in Table 17. Item difficulty ranged from .36 to .90. Four of the 12 items had ßs below the .70 considered desirable; for at least two of those four choices (dish, toes) the pictures were judged to be poor by examiners. Each of those four items also had incorrect alternates which were functioning poorly (i.e., with negative ßs of small magnitude) as did two other items (#7 and #12) for which correct choice ßs were in the desired range.

There is no clear pattern to those items which were bad, although poor or familiar pictures (e.g. dish, toes, chair) and phonetic similarity (e.g., lip rounding in /o/ and /u/) are among the explanations which could be advanced. It is recommended that item revision proceed empirically through: (a) deletion of those items and distractors not meeting criteria; (b) creation of a large item pool for /š/, /o/, and /s/; (c) addition of a pool of items for another consonant (e.g.,

Table 15

Item Analysis Summary for Forms A and B of Letter String Detail

FORM A					FORM B				
Item No.	d[a]	r	$\bar{X}_{50}$	β	Item No.	d[a]	r	$\bar{X}_{50}$	β
1	.82	.41	-2.22	.45	1	.85	.63	-1.64	.80
2	.78	.76	-1.03	1.16	2[b]	.80	.27	-3.06	.28
3	.89	.81	-1.52	1.38	3	.87	.86	-1.30	1.71
4[b]	.83	.42	-2.24	.46	4	.87	.56	-2.01	.67
5	.85	.73	-1.41	1.06	5	.91	.91	-1.45	2.14
6[b]	.83	.50	-1.93	.58	6[b]	.78	.42	-1.85	.46
7	.82	.74	-1.23	1.11	7	.80	.83	-1.00	1.47
8	.83	.60	-1.62	.74	8	.82	.71	-1.27	1.02
9[b]	.83	.55	-1.75	.67	9	.81	.75	-1.17	1.15
10	.84	.84	-1.19	1.55	10	.87	.88	-1.28	1.82
11	.81	.89	- .99	1.99	11[b]	.83	.32	-3.04	.34
12	.86	.60	-1.81	.76	12	.80	.67	-1.28	.90
13[b]	.81	.39	-2.24	.43	13[b]	.83	.60	-1.57	.75
14	.77	.82	- .89	1.45	14	.81	.81	-1.10	1.36
15	.84	.83	-1.20	1.48	15	.89	.83	-1.49	1.48
16	.86	.93	-1.13	2.63	16	.87	.77	-1.46	1.21

[a]Proportion of Ss giving correct response.
[b]Items with correct alternate in position 1.

/m/); and (d) the selection of two 15-item alternate forms from the item pool on the basis of another tryout.

Sound Blending

The frequency distribution of Ss' scores on Sound Blending is shown in Figure 5. Item statistics are shown in Table 18. A study trial was given on the first three items; it is apparent that this practice reduced their effectiveness as test items.

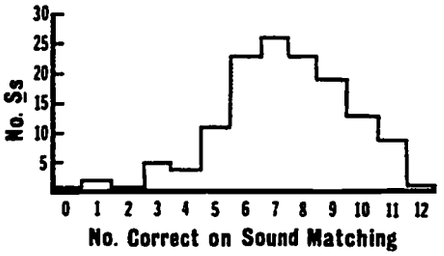

Figure 4. Frequency distribution of Ss' scores on Sound Matching.

Table 16

Average Item Statistics for Letter Orientation Items

	NO. ITEMS	FORM A				FORM B			
		d^a	$\underline{r}$	$\bar{X}_{50}$	β	d^a	$\underline{r}$	$\bar{X}_{50}$	β
Position 1 Correct	4	.82	.46	-2.04	.54	.81	.40	-2.38	.46
Position 2 Correct	12	.83	.75	-1.35	1.31	.85	.77	-1.37	1.31
1st Letter Change	4	.85	.84	-1.26	1.77	.85	.83	-1.26	1.59
2nd Letter Change	4	.82	.73	-1.32	1.13	.85	.79	-1.35	1.39
3rd Letter Change	4	.82	.67	-1.48	1.05	.84	.68	-1.51	.95
All Items	16	.83	.68	-1.52	1.12	.84	.68	-1.62	1.09

[a]Proportion of Ss giving correct response.

Table 17

Item Analysis Summary for Choice of Correct Alternate on Sound Matching

ITEM NO.	POSITION OF CORRECT ALTERNATE	d^a	$\underline{r}$	$\bar{X}_{50}$	β
1	3	.89	.93	-1.32	2.59
2	4	.64	.28	1.78	.29
3	1	.87	.58	-1.95	.71
4	2	.76	.60	-1.17	.76
5	2	.68	.71	- .67	1.00
6	3	.37	.54	.62	.64
7	1	.62	.60	- .49	.75
8	2	.56	.56	- .26	.67
9	2	.54	.67	- .16	.91
10	3	.36	.39	.97	.42
11	1	.90	.70	-1.81	.99
12	3	.43	.58	.28	.72

[a]Proportion of Ss giving correct response.

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Stimulus Materials: II. Letter Order

FORM A				FORM B			
Item #	Standard	1st Alt.	2nd Alt.	Item #	Standard	1st Alt.	2nd Alt.
1	XC	CX	XC	1	gm	mg	gm
2	wf	fw	wf	2	RF	FR	RF
3[a]	dj	dj	jd	3[a]	AD	AD	DA
4	TU	UT	TU	4	OM	MO	OM
5[a]	RO	RO	OR	5	nf	fn	nf
6	lv	vl	lv	6[a]	zp	zp	pz
7	DF	FD	DF	7	gh	hg	gh
8	HB	BH	HB	8	kw	wk	kw
9	GZ	ZG	GZ	9[a]	SV	SV	VS
10	QJ	JQ	QJ	10	LQ	QL	LQ
11[a]	ug	ug	gu	11	JW	WJ	JW
12	km	mk	km	12	GP	PG	GP
13	yh	hy	yh	13[a]	dy	dy	yd
14	jz	zj	jz	14	BC	CB	BC
15[a]	SP	SP	PS	15	jt	tj	jt
16	gt	tg	gt	16	xb	bx	xb

[a]Items have correct alternate in first position.
Type used was Futura Medium, 36 point.

Table 18

Item Analysis Summary for Sound Blending

ITEM NO.	CORRECT RESPONSE	d[a]	r	$\bar{X}_{50}$	β
1	five	.69	.69	- .77	.83
2	boot	.81	.65	-1.35	.86
3	soap	.87	.55	-2.05	.66
4	page	.49	.81	.02	1.36
5	joke	.59	.81	- .29	1.37
6	seed	.38	.77	.41	1.20
7	eat	.75	.74	- .90	1.08
8	beach	.65	.70	- .56	.97
9	food	.70	.69	- .75	.94
10	house	.72	.82	- .70	1.42
11	tape	.75	.75	- .92	1.13
12	cheese	.83	.83	- .92	1.48
13	knife	.89	.89	-1.23	1.93
14	cake	.78	.78	-1.17	1.24
15	face	.90	.90	- .84	2.09

[a]Proportion of Ss giving correct response.

In future use of this test, two to three additional items which do not appear in the test are recommended for illustration and practice in blending.

A learning effect observed for the remaining items is graphically presented in Figure 6. With some variation attributable to item differences, Ss progressed from approximately 50% correct, on the first nonpractice trial, to 90% correct on the last. It may be asked whether it is appropriate to use a learning task for assessing sound blending; use of feedback confers one advantage obvious in the generally increasing $\bar{X}_{50}$s for items 4—12. It produces better differentiation among Ss in

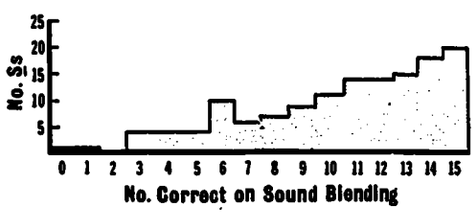

Figure 5. Frequency distribution of Ss' scores on Sound Blending.

BPST, Winter 1970

Stimulus Materials: III. Sound Matching Test (Form A)

Correct answers are underlined.

Practice:	(a)	<u>shoe</u>	dog	plug	tire
	(b)	pig	bed	<u>fish</u>	stove
Test /$\overset{v}{s}$/:	(1)	cup	knife	<u>shirt</u>	horse
	(2)	book	church	box	<u>dish</u>
	(3)	<u>sheep</u>	flag	house	ring
	(4)	lamp	<u>brush</u>	chair	fence
Test /o/:	(5)	broom	<u>boat</u>	cat	frog
	(6)	hand	bread	<u>comb</u>	moon
	(7)	<u>rope</u>	truck	spoon	bag
	(8)	school	<u>toes</u>	ear	clock
Test /s/:	(9)	glove	<u>dress</u>	leaf	keys
	(10)	nail	cheese	<u>sock</u>	ball
	(11)	<u>seal</u>	foot	hat	car
	(12)	tree	chain	<u>bus</u>	fire

Copies of items are attached.

Stimulus Materials: IV. Picture-Sound Association Learning (Form A)

	Picture Stimulus #	Response to be learned		Picture Stimulus #	Response to be learned
Trial 1.	(2)	j	Trial 3.	(1)	ā
	(4)	w		(3)	b
	(3)	b		(4)	w
	(1)	ā		(2)	j
Trial 2.	(4)	w	Trial 4.	(3)	b
	(1)	ā		(2)	j
	(2)	j		(1)	ā
	(3)	b		(4)	w

Copies for the four stimulus pictures are attached.

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Table 19

Item Analysis Summary for Picture-Sound Association Learning

ITEM NO.	RESPONSE	d[a]	r	$\bar{X}_{50}$	β
1	y	.29	.62	.90	.78
2	w	.32	.66	.71	.89
3	b	.43	.78	.21	1.26
4	e	.73	.75	- .82	1.14
5	w	.36	.67	.55	.91
6	e	.76	.78	- .91	1.24
7	y	.23	.87	.84	1.80
8	b	.50	.75	.00	1.13
9	e	.83	.75	-1.25	1.14
10	b	.64	.65	- .57	.83
11	w	.32	.73	.64	1.08
12	y	.33	.89	.51	1.96
13	b	.62	.67	- .44	.90
14	y	.49	.75	.05	1.12
15	e	.83	.77	-1.25	1.21
16	w	.40	.69	.37	.96

[a]Proportion of Ss giving correct response.

the range of σs of interest: -.5 to -1.5 σ, or the bottom 15% to 25% of the distribution. Further validation of this assessment technique must await longitudinal data on first grade reading achievement.

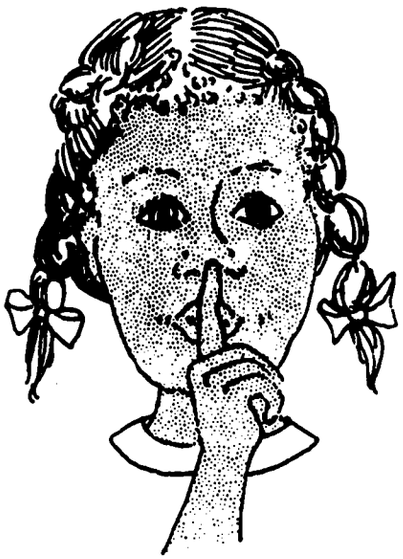
Picture-Sound Association Learning

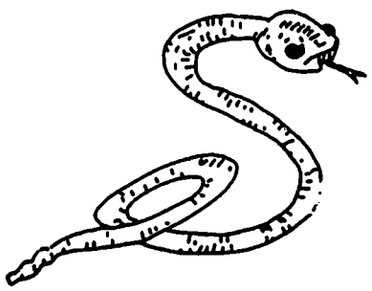
The frequency distribution of Ss' scores on this test is shown in Figure 7. Item statistics are summarized in Table 19. All βs are above the .70 desired. For this test, intended to identify slow, medium, and fast learners, a range of $\bar{X}_{50}$s is desirable; the distribution obtained (-1.25 to +.90) appears satisfactory. Item difficulty varies both with the stimulus-response pair tested and the number of previous presentations of the pair; this interaction is displayed in Figure 8, where learning curves are plotted separately for each pair.

Segmentation Learning

The frequency distribution of Ss' scores on Segmentation Learning is shown in Figure 9. Item statistics are presented in Table 20, and the percent of Ss responding correctly to each item is presented again in Figure 10. As was the case with Sound Blending, the item data suggest that two to three additional items, not to reoccur

TEST NO. 3
CARDS
REPRESENTING
sh, ō, s
SOUNDS





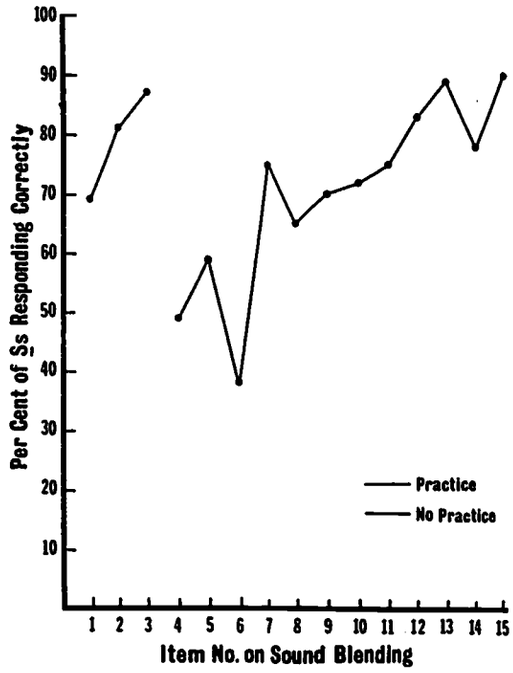


Figure 6. Learning curve for Sound Blending items.

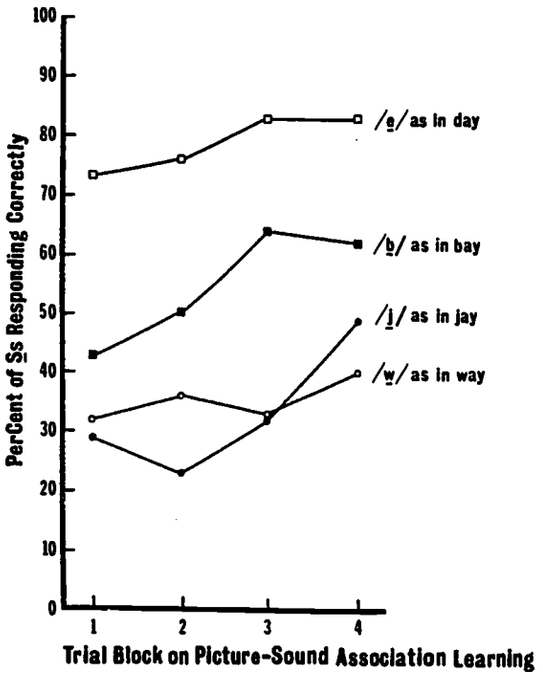


Figure 8. Learning curves for each picture-sound pair in the Picture-Sound Association learning test.

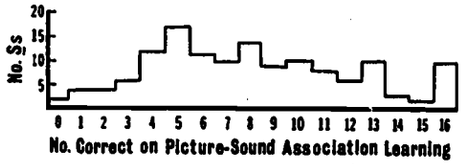


Figure 7. Frequency distribution of Ss' scores on Picture-Sound Association learning.

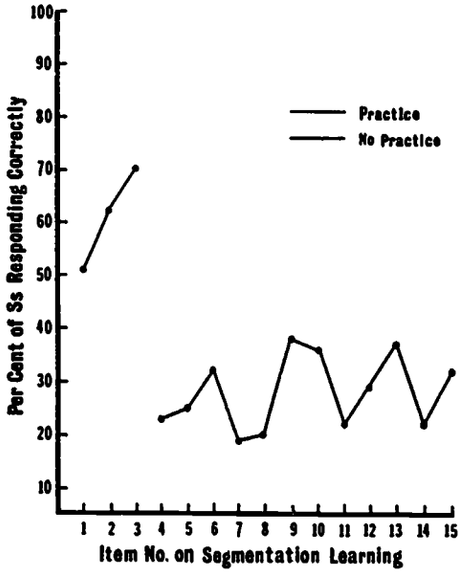
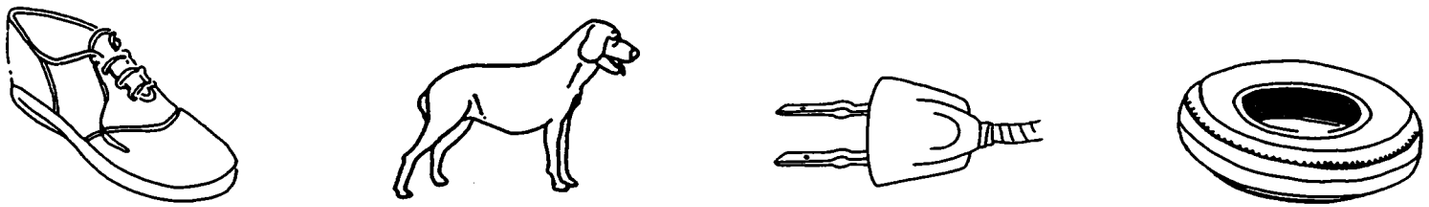


Figure 9. Frequency distribution of Ss' scores on Segmentation learning.

PRACTICE ITEMS, TEST NO. 3

(a)



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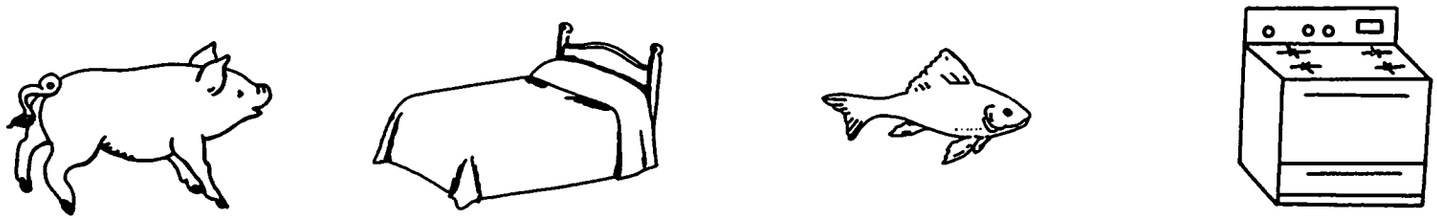

Table 20

Item Analysis Summary for Segmentation Learning

ITEM NO.	STIMULUS	d[a]	r	X_{50}	β
1	feet	.51	.57	- .03	.69
2	shout	.62	.62	- .47	.80
3	nice	.70	.46	-1.16	.52
4	cup	.23	.71	1.10	1.00
5	joke	.25	.77	.86	1.21
6	shape	.32	.77	.61	1.22
7	mash	.19	.92	.96	2.40
8	learn	.20	.84	1.02	1.54
9	cough	.38	.87	.36	1.72
10	page	.36	.84	.44	1.57
11	cheese	.22	.83	.92	1.47
12	bug	.29	.81	.68	1.38
13	dear	.37	.75	.44	1.14
14	will	.22	.86	.91	1.66
15	boil	.32	.76	.62	1.18

[a]Proportion of Ss giving correct response.

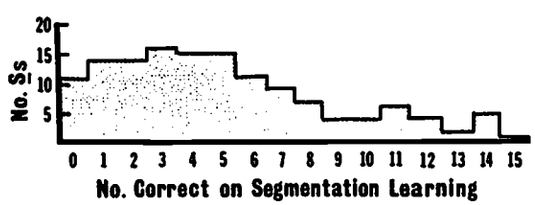

Figure 10. Performance on Segmentation learning.

in the test, should be used for illustrating the task.

It is apparent from Figure 10 that performance on the novel items (numbers 4—15) did not improve perceptibly, although the provision of a study trial led to a large improvement in performance on the three practice items (numbers 1—3). This finding clearly makes inappropriate the use of Segmentation scores as learning rate measures. Segmentation Learning is obviously a misnomer.

Also apparent in Figure 10 are differences in difficulty among the novel items. Various explanations for item difficulty can be cited, including response familiarity (is it a word to the child?) and response meaningfulness (is it a substantive word?). Correctness of response also appears to

ITEMS, TEST NO. 3

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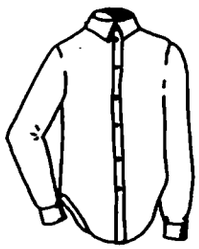

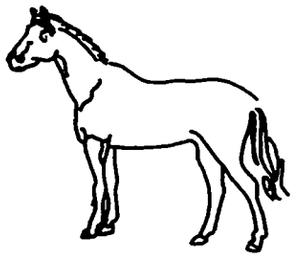

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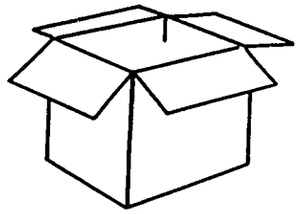

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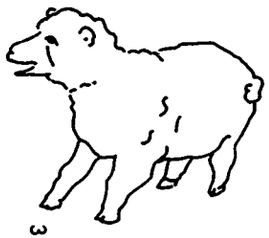
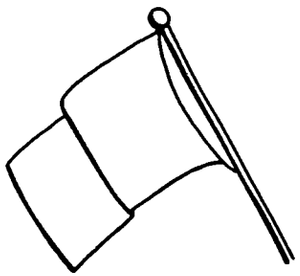




vary with phonological characteristics of the response (free or checked vowel?) and stimulus (is the initial consonant a stop?). A previous segmentation study showed better learning of real words than nonsense responses in a five-trial paired associate task (Calfee, Chapman, and Venezky, 1970). Response characteristics become less satisfactory as explanations for item differences, however, when the correctly given responses have not been presented before in the task. Additional evidence will be necessary to the choice of explanation.

The addition of the learning test category to the BPST visual and auditory test categories was made only tentatively, after it had become obvious in the planning of the prereading skills instructional program that grouping of children would be facilitated if reliable predictions of individual differences in learning rate could be made. Evidence for stable individual differences in rate of learning a given type of material (e.g., picture-sound associates) must still be obtained.

The Segmentation test was not included among auditory skill tests in this BPST version because it was not found necessary to teach segmentation in developing an instructional sequence for sound analysis and blending. Thus the test could serve no diagnostic function in the instructional program. Should Sound Matching and Sound Blending account for most of the same variance as Segmentation in predicting first grade reading achievement, there will be no further reason to retain Segmentation Learning in the BPST battery.

Letter Naming

The distribution of Letter Naming scores, as shown in Figure 11, was again bimodal, with high SES Ss disproportionately represented by higher scores. No item analysis summary will be reported, since the test is substantively identical to that used in the fall administration.

Test Relationships

Visual Tests

Pearson product-moment correlations are reported separately for Forms A and B of the visual tests (and Letter Naming) in Tables 21 and 22. Correlations between

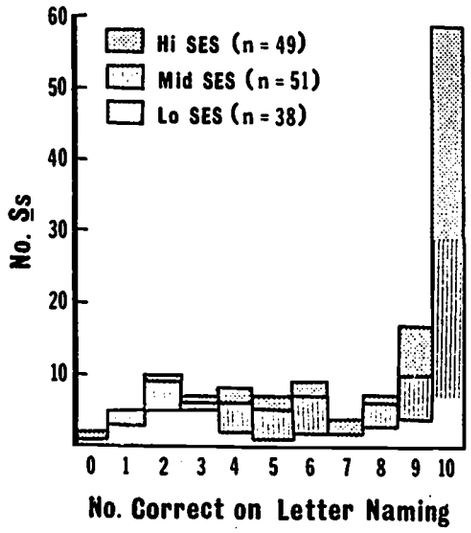
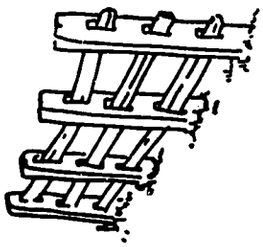
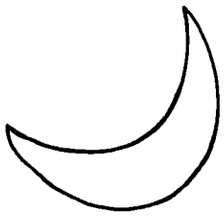


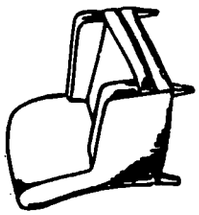
Figure 11. Frequency distribution of Ss' scores on Letter Naming, by SES group.

Forms A and B are shown in Table 23. All correlations reported in the three tables are significant ($p < .01$), including those of visual tests with Letter Naming, the rough predictor of reading achievement.

The tests of Letter Orientation, Letter Order, and Letter String Detail correlate rather more with each other and rather less with their alternate forms than was expected. An early theoretical aim of the prereading skills research program was the isolation of independent skills. Although the three visual skills meet logical criteria for independence, the data of Tables 21—23 clearly indicate empirical association of the abilities to attend to letter orientation, letter string ordering, and letter string detail according to relatively consistent tests. The observed association does not necessarily vitiate the basic conceptual framework of independent skills, however; so long as instruction in one teachable skill is associated with instruction in another, we may expect to observe a significant post-instruction correlation between them despite theoretical independence. It can be argued that both the parent and the kindergarten teacher will tend to use all three special criteria of identity—element orientation, order, and shape—in monitoring the child's interaction







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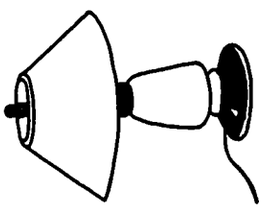

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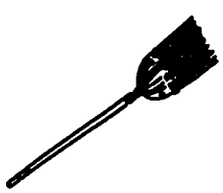

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Table 21

Correlations for Form A of the BPST Visual Tests and Letter Naming[a]

		1	2	3
1	Letter Orientation A			
2	Letter Order A	.56		
3	Letter String Detail A	.60	.64	
4	Letter Naming	.42	.37	.42

[a]$p<.01$ for all entries, $r>.23$, $df = 137$, 2-tailed test.

Table 22

Correlations for Form B of the BPST Visual Tests and Letter Naming[a]

		1	2	3
1	Letter Orientation B			
2	Letter Order B	.43		
3	Letter String Detail B	.39	.67	
4	Letter Naming	.36	.31	.39

[a]$p<.01$ for all entries, $r>.23$, $df = 137$, 2-tailed test.

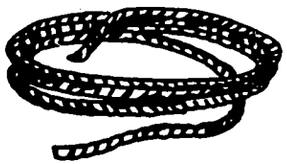
Table 23

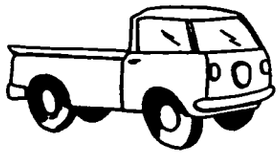
Correlations Between Forms A and B of the BPST Visual Tests[a]

	FORM A	FORM B		
		Letter Orientation	Letter Order	Letter String Detail
1	Letter Orientation	.73	.44	.50
2	Letter Order	.40	.64	.57
3	Letter String Detail	.44	.52	.59

[a]$p<.01$ for all entries, $r = .23$, $df = 137$, 2-tailed test.

(7)





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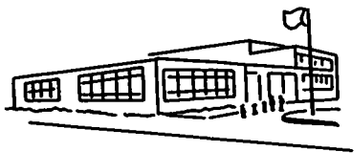

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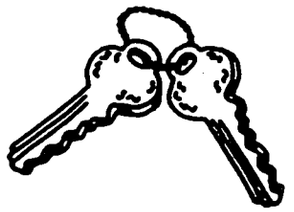


Table 24

Correlations for BPST Auditory Tests, Learning Tests, and Letter Naming

	1	2	3	4
AUDITORY TESTS				
Sound Matching				
Sound Blending	.19			
LEARNING TESTS				
Picture-Sound Association	.36[a]	.27[a]		
Segmentation	.36[a]	.27[a]	.31[a]	
OTHER				
Letter Naming	.38[a]	.12	.57[a]	.17

[a] $p<.01$, $df = 137$, $r>.23$, 2-tailed test.

with letters. If this argument is accepted, the correlations which we find among the three visual skills are no longer surprising. Indeed, one should predict that the correlations will increase as instruction time in word identification increases.

Auditory and Learning Tests

Pearson product-moment correlations are reported in Table 24 for auditory, learning, and Letter Naming tests. Sound Matching and Sound Blending do not correlate significantly with one another, suggesting that the attempt to isolate independent auditory skills has been successful. Sound Matching, but not Sound Blending, correlates significantly with Letter Naming. The relation of each to first grade reading achievement must be further demonstrated in multiple regression analyses of longitudinal data to be gathered in spring 1972.

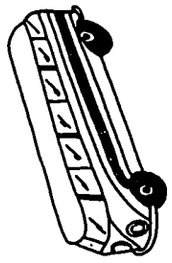
The modest (though significant) correlation of the two learning tasks is hardly surprising, since no evidence of learning was found in the Segmentation test. The failure of the present version of the Segmentation test to correlate with Letter Naming supports the tentative decision to discard the former. The significant correlation of Picture-Sound Association Learning with Letter Naming, on the other hand, is the highest of any test in the BPST battery with that predictor, suggesting that inclusion of the Picture-Sound Association test will be merited predictively as well as diagnostically.

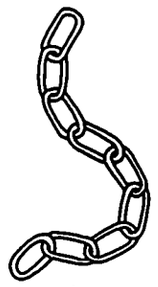
Relationships Between BPST Visual Tests and Auditory and Learning Tests

Correlations between visual tests and auditory or learning tests are presented in Table 25. The two auditory skills appear to be unrelated to any of the visual skills. Of the twelve correlations between an auditory and a visual test, eleven are insignificant and the twelfth (Sound Matching and Letter String Detail, Form A) is of small magnitude ($r = .25$, $p<.01$). Nor does Segmentation Learning correlate significantly with any visual test. Picture-Sound Association Learning, in contrast, shows a clear pattern of significant but modest correlation ($.30 \leq r \leq .37$) with each visual test.

Test Validities

The correlational data, then, confirm the test relationships expected for the most part. Validity of the BPST battery will be further established in two ways. First, data on reading achievement will be taken for these Ss at the end of first grade. A significant multiple regression correlation





(10)

(11)

(12)

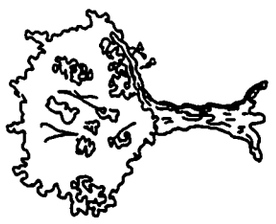


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Table 25

Correlations Between BPST Visual Tests and BPST Auditory or Learning Tests

	VISUAL TESTS					
	Orient. A	Orient. B	Order A	Order B	Detail A	Detail B
AUDITORY TESTS						
Sound Matching	.16	.19	.18	.19	.25[a]	.23
Sound Blending	.08	.09	.14	.10	.11	.17
LEARNING TESTS						
Picture-Sound Association	.34[a]	.32[a]	.32[a]	.33[a]	.30[a]	.37[a]
Segmentation	.11	.05	.20	.16	.14	.07

[a] $p < .01$, $r > .23$, $df = 137$, 2-tailed test.

of BPST scores (excluding Letter Naming) with reading will be sought for those Ss not participating in the spring instructional program tryout. It will be further required that each test make a significant contribution to the regression equation when added last (i.e., that β weights be significantly different from zero).

A second approach to validation will be experimental. It will be asked whether those Ss successfully completing the spring tryout program also succeed in reading; and, conversely, whether those Ss failing to read at grade level also failed to receive the instructional program, or failed to master all the skills when instructed. As a further requirement, the number of children falling into the last category should be significantly smaller than the number of children failing reading who were in the classroom taught by the same teacher but without tryout of the instructional program. This second approach to validation depends on the development of an instructional program successful in teaching each of the five skills; given such a program, the procedure will validate not only the tests but also the instructional program by demonstrating that the skills as tested and taught are causally related to early reading achievement. As supplementary evidence, good and poor first grade readers will be tested this year with the February version of the BPST, excluding Segmentation.

Patterns of Test Mastery

Test mastery was defined as 90% correct or better on a test. By this criterion, 92 of the 138 children tested in February demonstrated mastery of at least one test (data taken from Form A only of visual tests). The distribution of Ss mastering zero to five tests is shown in Table 26, broken down into those groups defined by the Picture-Sound Association Learning test as being fast (12—16 correct), medium (5—11 correct), or slow (0—4 correct) learners.

Children classified as fast learners showed mastery of 2.7 tests, on the average; those classified as intermediate, 1.5; and those classified as slow, 1.1. Tests differed in the number of Ss showing mastery: 77 Ss mastered Letter Orientation A, 59 mastered Letter String Detail A, 52 mastered Letter Order A, 38 mastered Sound Blending, and 10 mastered Sound Matching. This information is represented in the diagonal entries of Table 27 as the unconditional probability of test mastery. Off-diagonal entries represent the conditional probability of mastering the test named to the left, given that the S has shown mastery of the test heading the column. (Again, the visual test data reported are for Form A only.)

Among the visual tests, every possible combination of test mastery occurs, as indicated in Table 28. Similarly all four possible patterns of auditory test mastery

(1)

(2)

(3)

(4)

Table 26

Number of Fast, Medium, and Slow Learners
Mastering None, One, or More BPST Visual and Auditory Tests

NO. OF TESTS MASTERED	PICTURE-SOUND ASSOCIATION LEARNING RATE			ALL Ss
	Fast	Medium	Slow	
None	3	25	14	42
One Only	5	15	4	24
Two Only	2	19	5	26
Three Only	12	14	4	30
Four Only	5	4	1	10
All Five	4	2	0	6
Total	31	79	28	138

Table 27

Unconditional and Conditional Probabilities of Test Mastery[a]

	LETTER ORIENTATION	LETTER ORDER	LETTER STRING DETAIL	SOUND MATCHING	SOUND BLENDING
Letter Orientation	.56	.87	.88	1.00	.63
Letter Order	.53	.38	.59	.30	.42
Letter String Detail	.63	.66	.43	.90	.55
Sound Matching	.13	.17	.15	.07	.18
Sound Blending	.34	.42	.36	.70	.28

[a]Underlined entries, on the diagonal, represent unconditional probability of mastery. Off-diagonal entries represent the probability of mastering test named at left, given that the test named above was mastered.

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BPST, Winter 1970

Stimulus Materials: V. Letter String Detail

FORM A				FORM B			
Item #	Standard	1st Alt.	2nd Alt.	Item #	Standard	1st Alt.	2nd Alt.
1	yhe	yhc	yhe	1	cty	cfy	cty
2	PCK	POK	PCK	2[a]	ugh	ugh	ubh
3	gzl	jzl	gzl	3	ODA	QDA	ODA
4[a]	OAB	OAB	OAP	4	rdj	rdg	rdj
5	vkj	wkj	vkj	5	bzp	hzp	bzp
6[a]	kgs	kgs	kjs	6[a]	ZCB	ZCB	ZOB
7	mjd	mgd	mjd	7	pef	pof	pef
8	VPG	VPC	VPG	8	IQD	IQB	IQD
9[a]	QDY	QDY	QBY	9	ogt	cgt	ogt
10	rfg	rfy	rfg	10	UXS	UKS	UXS
11	IGR	TGR	IGR	11[a]	EJO	EJO	FJO
12	LJS	LIS	LJS	12	ykn	ykm	ykn
13[a]	bpn	bpn	hpn	13[a]	glx	glx	gtx
14	JSE	JSF	JSE	14	PGL	RGL	PGL
15	gtu	gfu	gtu	15	SMR	SNR	SMR
16	HUQ	AUQ	HUQ	16	CPV	CPN	CPV

[a]Items have correct alternate in first position.
Type used was Futura Medium, 36 point.

Table 28

Frequency of Visual Test Mastery Patterns

NO. TESTS	TESTS MASTERED			NO. Ss
	Orientation	Order	Detail	
None				49
One	✓			13
		✓		5
			✓	5
Two	✓	✓		12
	✓		✓	19
Three		✓	✓	2
	✓	✓	✓	33

occur. The practical consequence of findings like these is the necessity of individualizing instruction when possible; one child's learning experience can easily mean another child's boredom, if all children receive the same lesson. Not only rate of learning, but also what must be learned, varies from child to child. The prereading skills instructional program being developed concurrently with the BPST will use mastery information to individualize instruction and learning rate scores to group children.

BPST, Winter 1970

Stimulus Materials: VI. Sound Blending (Form A)

	Stimulus	Response
1.	fī v	FIVE
2.	bū t	BOOT
3.	sō p	SOAP
4.	pā j	PAGE
5.	jō k	JOKE
6.	sē d	SEED
7.	ē t	EAT
8.	bē ch	BEACH
9.	fū d	FOOD
10.	hou s	HOUSE
11.	tā p	TAPE
12.	chē z	CHEESE
13.	nī f	KNIFE
14.	kā k	CAKE
15.	fā s	FACE

Stimulus Materials: VIII. Segmentation Learning (Form A)

	Stimulus words	Response words
1.	feet	eat
2.	shout	out
3.	nice	ice
4.	cup	up
5.	joke	oak
6.	shape	ape
7.	mash	ash
8.	learn	earn
9.	cough	off
10.	page	age
11.	cheese	ease
12.	bug	ugh
13.	dear	ear
14.	will	ill
15.	boil	oil

BPST, Winter 1970

Stimulus Materials: VII. Alphabet Naming (Form A)

On each of two strips of white card stock, there are five capital letters:

(1) P X B A I

(2) S T D L O

All letters except the I were printed sans serif. The I was printed as: I.

References

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Appendix B
Script for Administration of the Basic Prereading Skill Test, Full Battery, February 1971

VISUAL MATCHING SKILLS PRACTICE TEST: FOUR ITEMS

Present first flash card.
Circle standard with finger, while saying, "SEE THIS?"
Circle each of the two alternates, while saying, "WHICH ONE LOOKS JUST LIKE THIS?"
(Circle the standard again.)
If S makes correct selection, say "GOOD" and present next item.
If S points to both alternates, ask S to select one that looks most like the standard.
If S points to standard, ask S to select another one that looks like that.
If S does not respond, ask S which one he thinks looks like the standard, OR if he agrees that the one E points to looks like the standard—so that S will be able to infer what he is expected to do from this example.
If S makes a single, incorrect selection, point to the correct one and explain that it looks like the standard.
Proceed similarly with all four test items.
Do not record S's practice test score unless S still does not understand how to correctly respond to the test after having gone through all four items. In such a case, indicate this fact with a check mark (✓) in the appropriate column in the Log Sheet.

NOTE: For all tests, record only S's first response on score sheet unless S is correcting himself. If S corrects himself, record only his corrections. If S insists that there are two correct items on a visual matching test—either more like the standard than the other—record the position number of the alternate closest to the standard's position.

I. LETTER ORIENTATION

For each item, move index finger along row of alternates, circling each one, while saying: "JUST LIKE BEFORE/THE OTHER PICTURES I SHOWED YOU, SHOW ME WHICH ONE OVER HERE LOOKS EXACTLY LIKE THAT." (Circle standard.)
Only give feedback which indicates that S is performing the task—in general—correctly: "THANK YOU" or "OKAY" for example.
Proceed to next item after S responds or indicates that he will not select an alternate.

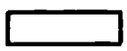
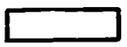
SCORING

0 = no response by S (including when S says he does not know)

1,2 = position of alternate selected by S.

Appendix A
Basic Prereading Skill Test
February 1971: Test Items

PRACTICE TEST
STIMULUS MATERIALS

Item #	Standard	Alternates	
1	dog	bird	dog
2			
3			
4	mi	xf	mi

Alternates used in item one:

II. LETTER ORDER

For each item, follow the same procedure—including scoring—as that outlined above for I. LETTER ORIENTATION.

III. SOUND MATCHING

Introduction

A. Show picture for /š/.
"WHAT IS SHE SAYING?"

If S says, "She's saying to be quiet," say: "WHAT SOUND DO YOU MAKE WHEN YOU ASK SOMEONE TO BE QUIET?"

If S does not give the sound, say: "YOU SAY /š/. CAN YOU SAY /š/?"

If again there is no response, say: "SAY /š/."

If S imitates the sound incorrectly, say: "NO, IT GOES /š/."

When S gives the correct sound, say: "/š/. GOOD!
CAN YOU HEAR THE /š/-SOUND WHEN I SAY SHOP?"

If S nods or says "yes," say: "YOU'RE RIGHT. SHOP HAS THE /š/-SOUND. SHOP."

If S does not respond or says "no," say: "LISTEN CAREFULLY. CAN YOU HEAR THE /š/-SOUND IN SHOP?"

Respond as above to correct responses. If again there is no response or negative response, say: "I CAN HEAR IT. LISTEN AGAIN. /š/. SHOP. THERE IS THE /š/-SOUND IN SHOP."

"LET'S LISTEN AGAIN. CAN YOU HEAR THE /š/-SOUND IN BIRD?"
If S shakes his head or says "no," say: "YOU'RE RIGHT. THE /š/-SOUND IS NOT THERE IN BIRD."

If S does not respond or says "yes," say: "LISTEN CAREFULLY. CAN YOU HEAR THE /š/-SOUND IN BIRD?"

Respond as above to correct response. If again there is no response or wrong response, say: "I DON'T HEAR IT. LISTEN AGAIN. BIRD. THE /š/-SOUND IS NOT THERE IN BIRD."

Other introductory stimuli

B. When picture for /o/ appears, say: "OH! HERE IS A BOY SAYING /o/."

If S does not imitate the sound, say: "CAN YOU SAY /o/?"

If again there is no response, say: "SAY /o/."

If S imitates the sound incorrectly, say: "NO, IT GOES /o/."

When S gives the correct sound, say: "/o/. GOOD! OKAY, THIS TELLS US THAT NOW WE'RE GOING TO LISTEN FOR THE /o/-SOUND IN WORDS."

C. When picture of snake appears, say: "HERE IS A SNAKE. THE SNAKE SAYS /s/."

BPST, Winter 1970

Stimulus Materials: I. Letter Orientation

FORM A				FORM B			
Item #	Standard	1st Alt.	2nd Alt.	Item #	Standard	1st Alt.	2nd Alt.
1	p	q	p	1	b	d	b
2[a]	eq	eq	ep	2	di	bi	di
3	da	ba	da	3[a]	qi	qi	pi
4	ob	od	ob	4	ep	eq	ep
5	d	b	d	5	d	b	d
6	ap	aq	ap	6[a]	bi	bi	di
7	qo	po	qo	7	oq	op	oq
8[a]	be	be	de	8	pa	qa	pa
9	pu	qu	pu	9[a]	ad	ad	ab
10	uq	up	uq	10	p	q	p
11	b	d	b	11	ab	ad	ab
12[a]	di	di	bi	12	qe	pe	qe
13[a]	ip	ip	iq	13	ud	ub	ud
14	ed	eb	ed	14	bu	du	bu
15	bi	di	bi	15	q	p	q
16	q	p	q	16[a]	op	op	oq

[a]Items have correct alternate in first position.
Type used was Futura Medium, 36 point.

Continue as for /o/.

Test

A. Present card with 4 stimulus pictures. Say:
"ONE OF THESE HAS THE /s̈/-SOUND. POINT TO THE ONE THAT HAS IT."

Point to pictures in turn, and say name of each.

Repeat, if S hesitates: "ONE OF THESE HAS THE /s̈/-SOUND. POINT TO THE ONE THAT HAS IT."

Record responses 1-4, corresponding to L—R position of S's choice.

On practice items only, if S responds incorrectly or gives no response, tell him to listen carefully, and repeat the item. Repeat as often as required until S selects the correct response.

Say: "GOOD" or "OKAY" or "THANK YOU."

If S wants to help change the stimulus cards, cue him when to do so by saying: "TURN."

Continue with remaining stimuli for /s̈/.

B, C. Continue with picture of /o/-sound and test, picture for /s/-sound and test.

III 1/2. BREAK (after completion of subtest III)

"SIMON SAYS: STAND UP,

STRETCH YOUR ARMS UP HIGH AND WIGGLE YOUR FINGERS,

PUT YOUR ARMS DOWN,

JUMP UP AND DOWN,

TOUCH YOUR TOES,

SIT IN A CHAIR.

THAT'S VERY GOOD."

IV. (Order 1) } PICTURE—SOUND ASSOCIATION LEARNING
[VIII. (Order 2)]}

2-cycle demonstration: Place the four stimuli face-up in front of S one at a time (leaving them all face-up) and say to S "THIS IS _____/ IT GOES/SAYS _____" (giving the sound as S should pronounce it).

Ask S to imitate the sound, correcting S, until S says the sound correctly. When S gives the sound correctly, repeat it and say "GOOD!" If S twice refuses to say anything, begin working with the next sound.

Repeat this procedure for each of the four stimuli.

Point to each of the stimuli, one at a time, asking "DO YOU KNOW/REMEMBER WHAT THE _____ SAYS?"

If S gives incorrect response, say the correct response for S and ask S to say that.

If S gives correct response, repeat it and say "GOOD!"

If S refuses twice to respond, say the correct response, and then point to the next stimulus card.

FOUR TEST TRIALS

Present cards one at a time and ask S what the _____ says.

If S gives correct response, say "GOOD!"

If S gives no response (after having been asked twice) or incorrect response, say the correct sound.

For the five test trials, show only one stimulus card at a time.

If S performs two trials perfectly, consider the task completed, whether or not five test trials have been run.

The sounds and their stimuli are:

Form A	b	a baby
	w	the wind
	j*	two-headed monster
	ā*	woman who has trouble hearing

Scoring:

1 = correct response

X = incorrect response (including no response)

V. LETTER STRING DETAIL

For each item, follow the same procedure—including scoring—as that outlined above for I. LETTER ORIENTATION.

VI. SOUND BLENDING

At all times, point to yourself as you say stimulus, and point to S for his response. Use a physical reminder to be certain that you allow a 1-second pause between the sounds of the stimulus; for example, think of the word Mississippi syllable by syllable, or lift your right foot from the floor and put it down again. Pronounce stimulus sounds as much as possible the way they sound in the monosyllable, not as they would be pronounced as independent units. Avoid pronouncing a long schwa after consonants, but when designating voiceless stops, aspirate them.

Whenever S says a correct form—whether as a response or as a repetition of a correction by E—say "GOOD."

Demonstration (Form A)

"NOW YOU'RE GOING TO PUT SOUNDS TOGETHER TO MAKE A NAME. IF I SAY bū, t THEN YOU SAY būt (BOOT)."

If S doesn't imitate correct response, say: "CAN YOU SAY THAT?"

NOTE: Response counts as correct as long as S gives the blended form, regardless of whether he also gives the separate components. When correcting S, E should always give the components, then the blend.

If S again says nothing, repeat the correct response—both components and the blended monosyllable—and continue with the next item.

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*These sounds are written according to the revision of the Thorndike-Barnhart Elementary dictionary sound chart. In I.P.A, "j" would be /j/ and "ā" would be /e/.

Whenever S gives or repeats a correct response, say "GOOD."

"HERE'S ANOTHER ONE. I SAY THE SOUNDS; YOU SAY THE NAME THEY MAKE. IF I SAY fī, v YOU SAY fīv (FIVE)."

Continue as for BOOT. Do sō, p, sōp (SOAP) the same way.

"LET'S DO IT AGAIN. (Point to self.) I SAY fī, v." (Point to S.) "YOU SAY _____."

If S responds correctly, say "GOOD." If S gives incorrect response or no response, say the correct response. If S then repeats the correct response, say "GOOD."

Record response on score sheet:

1 = correct response

X = incorrect response

0 = no response

Continue with items 2 and 3 (i.e., repetition of Demonstration items).

Say: "LET'S DO SOME MORE."

Proceed with rest of items.

If response is inaudible, or if for any other reason you cannot tell whether S has blended, ask: "WHAT DO YOU DO WITH ONE OF THOSE?" S's answer will indicate whether the word he intended to say was the correct response.

VI 1/2. BREAK

"SIMON SAYS..."

VII. ALPHABET NAMING

Place card #1 face up on the table in front of S. Point to each letter, beginning with letter farthest to S's left, and ask, "DO YOU KNOW THE NAME OF THIS LETTER?"

No matter what S's response—or lack of response—is, say "OKAY" or "THANK YOU," and then point to the next letter to repeat this procedure. When S has had a chance to name each of the five letters on card #1, turn to card #2 and ask S if he can name (each of) the five letters on card #2.

Record S's score as follows:

1 = correct response

X = incorrect response (including no response, or if S says "I don't know.")

NOTE: If S calls "X" "cross" or "O" "zero," ask S if he knows any other name for that. If he doesn't, record his response as incorrect (X).

VIII. (Order 1) } SEGMENTATION LEARNING
[IV. (Order 2)] }

FORM A

STUDY TRIAL

(Point to yourself as you say stimulus word and point to S to cue his response.) "IF I SAY "FEET," you say "FEET, EAT."

If S doesn't imitate correct response, say "CAN YOU SAY THAT?"

NOTE: A response is correct whether S gives the segmented form alone (e.g., "EAT" or if S gives the stimulus plus the response (e.g., "FEET, EAT"). However, when correcting S, E should always give the stimulus plus the segmented response ("FEET, EAT").

If S does not answer at all, say the correct response—e.g., "FEET, EAT"—and proceed to the next item.

Whenever S does give the correct response, say "GOOD."

Repeat for next two items: (2) Shout; and (3) Nice.

"NOW WE'LL DO IT AGAIN."

If S gives no response (within 5—10 seconds) or an incorrect response, say "YOU SAY _____ _____."

If S gives correct response, say "GOOD!"

GPO 827-880-2