A new reading test for Grade 1

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A new matching and coding test has been designed and validated for diagnosing reading ability at the end of Grade 1. The test presents pairs of letters or words projected on a screen. The child is asked to decide whether the two items sound the same or different. Seventy Grade 1 children in a local school, aged 6.6 to 8.0 years, were tested. The correlation between error scores on the coding test and Gray oral reading scores was $-.8$. Errors ranged from 0% to 61%, and reading scores ranged from 0 to 37 (grade levels of 1.1 through 4.3). The children judged a pair by appearance when they could not sound out the words. There were 49% errors on sound-alike pairs and only 20% errors on different pairs. Most different errors involved confusion between D and b. The central process of learning to read involves learning the various graphemes that may represent each sound.

A series of reading tests have been devised, based on the model shown in Figure 1 (Mackworth, 1972). The first two major stages of the process involve the visual matching of letters and words with stored visual models and the transformation of the matched visual input into speech motor programs. It may be true that the highly skilled reader may omit this central coding process, but the child must go through the whole process while he is learning to read.

Three major versions of the coding test have already been given to 150 children in the age range from 5 to 17 years (Mackworth & Mackworth, 1974a, b). One test was given to 5-year-olds, one to Grades 1 through 6, and one to Grade 10. The nursery school children were shown pairs of pictures and pairs of upper/lower case letters and asked to decide whether they were the same or different. The letter pairs were to be judged the same if they sounded the same. The school children were also shown pairs of words to be judged by sound. It was found that the homophone or sound-alike words (e.g., pair—pear), proved most difficult for the younger readers, but the different pairs (e.g., left—left) distinguished most sharply between the older readers. Such sequencing confusions are characteristic of the more severely handicapped readers (Birch & Belmont, 1964; Bryden, 1972). The Grade 10 students received a more advanced version of the coding test which included the ability to judge whether a word was spelled correctly.

These tests proved adequate for Grades 2 through 10. However, they were too difficult for even the good readers in Grade 1. Therefore, a new test was designed for Grade 1.

METHOD

Subjects

All 70 children in Grade 1 of a local school were tested. Their ages ranged from 6.6 to 8.0 years.

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Figure 1. Model of reading process.

Apparatus

The child is shown a pair of items projected on a screen. He is given a box with a pair of buttons, one red and one black, labeled "Same" or "Different." He is asked to press one button and, at the same time, to say aloud the appropriate word. The function of the buttons in this latest test was simply to give the child something to do with his hands, since reaction times were not recorded. It had become clear in earlier tests that reaction times were more a function of age and temperament than of reading ability.

Procedure

Each child was tested by himself in a trailer. The slide remained on view until the child had made his decision. He was then informed if he was correct. If he was wrong, the two letters or words were read to him. The material is shown in Table 1. The child was praised each time he made a correct decision, so that he was rewarded on at least half of the items by chance

Table 1

Percentage Errors on Each Pair in Grade 1 Test (70 Subjects)

B-K	0	let-lot	6
C-C	0	cup-cup	0
C-F	0	loaf-foal	14
E-E	0	son-sun	60
Bd	14	meat-mate	19
Dd	20	read-road	14
Nn	4	to-two	19
Db	14	hear-here	61
Few-Few	0	bear-dear	17
May-Man	4	who-why	1
bunch-punch	1	won-one	39
knew-new	66	hang-bang	1
by-buy	61	peal-peel	57
bare-bear	54	did-bid	47
clover-clever	36	beat-boat	6
four-for	27	meat-meet	46
which-witch	56	blue-blew	49
dear-bear	46	month-mouth	29
think-thick	2	left-felt	6
know-no	47	real-reel	50

Note—Fourteen pairs different: 20% errors; 14 pairs sound-alike: 49% errors.

guessing. The children enjoyed the task and competed for the visit to the trailer.

After the coding test, each child received the Gray oral reading test. The child is presented with the first passage and asked to read it aloud. The time taken to read the passage and the number of errors are recorded. If the child makes more than four errors and takes longer than 53 sec, he scores zero. If he makes a positive score, he tries the next passage. This continues until he makes a zero score on the most difficult passage given to him. The scores for each passage are totaled, and his grade level in reading is assessed from this total. The maximum score for each passage is 9.

RESULTS

The range of errors on the coding test was 0-22 out of 40. The overall correlation between the error score of each child and his Gray oral reading score was $r = -.8$ for the 70 children. The Gray oral scores ranged from 0 through 37, representing grade levels of reading ability from 1.1 through 4.3. The mean grade level at the end of Grade 1 should be about 2.0.

Figure 2 was constructed by dividing the children into groups according to their Gray oral reading scores. The scores within a group ranged from 0 to 5, 6 to 10, and so on. The number of subjects within each group was 9, 19, 16, 10, 5, and 11. The highest group contained children whose reading scores ranged from 26 through 37. The mean errors on the coding test were averaged for each group, to give the points shown in Figure 2.

Table 1 shows the difficulty of each pair of words in the coding test. There was an average score of 13% errors on the four upper/lower case letter pairs. Five-year-old children make 50% errors on these same pairs, and kindergarten children make 21% errors. Since even 11-year-old poor readers may make an error on Db, it is important to examine the ability of the child to

recognize the printed letter. These four pairs were chosen as being the most difficult for young children.

The children in Grade 1 made 49% errors on the 14 sound-alike pairs, with a range of 0% to 100% errors. Thus, the word pairs selected were suitable for Grade 1 children. The poor reader who does not know how to pronounce a word will usually make his decision on the basis of the appearance of the word. Thus, he will decide that words are different because they look different. Thus, he is not guessing at random. The different pairs are also judged on appearance, and may be judged same, when they contain the same letters in different order, such as meat-mate. The major source of the errors with the different pairs was the confusion between D or d and b. Thus dear-bear was judged same by nearly half the children, as was did-bid. Strangely enough, D-b received only 14% same judgments.

DISCUSSION

This new coding test has demonstrated its usefulness with Grade 1 children. It correlates closely with the ability to read connected prose. The test was given under optimal conditions, in the sense that each child was tested alone, given repeated feedback on his performance, and encouraged by approving remarks. The children enjoyed the slide presentation and the use of the response buttons. It is planned to try out the material as pencil and paper tests in the classroom.

The major problem for the beginning reader is the need to learn phonics. He must learn the arbitrary relationship between the spoken and the written word. The material that he is given to read is so simple that almost every child can understand it if it is read aloud to him. Comprehension is not a problem at this stage. Boder (1971) points out that dysphonetic children constitute over 60% of poor readers. Dyseidetic children, who have difficulty in learning what the letters look like, form only 9%. She recommends that the dysphonetic should be taught initially with the whole word method, as advocated by Johnson and

Figure 2. The relationship between percentage errors in the Grade 1 coding test and the Gray oral reading test. The children were grouped according to their Gray oral reading scores: 0-5, 6-10, ... 26-37.

Myklebust (1967). He can be given simple reading material as soon as possible. Boder recommends that the dyseidetic child should be given phonics as soon as possible.

Bateman (1969), however, has found that the auditory method of teaching was superior to the visual method even for those children whose visual facility was greater than their auditory skill. It may be emphasized that perceptual training in material other than the printed word does not help the child to read. Dubois and Brown (1973), Hammill (1972), and Martin (1973) reported that the Frostig test and program did not measure nor improve reading ability. Similar results have been reported with the Delacato method (O'Donnell, 1969). Hartman and Hartman (1973) conclude that the task-oriented approach, in which remedial training for poor readers involves reading, is more likely to help the poor reader than the process-oriented approach. The training procedure should be as closely related as possible to the desired learning.

Too many methods purporting to help poor readers have received wide publicity without any adequate proof that they do in fact help. The child must learn by rote the relation between the temporal sequence of sounds in speech and the spatial sequence of letters in words. He must also learn that there is no one-to-one relationship between speech sounds and the printed grapheme. His puzzlement in this matter can be eased when it is explained to him that the different spellings for one sound indicate different meanings.

In conclusion, early reading depends on the ability to link the two codes of speech and print, and there is a very wide range of ability in reading at the end of Grade 1. At least 13% can barely read.

REFERENCES

- Bateman, B. Reading: A controversial view. Research and rationale. In L. Tarnopol (Ed.), *Learning disabilities*. Charles C. Thomas, Springfield, Illinois: 1969, 289-304.
- Birch, H. G., & Belmont, W. H. Deficiencies in verbal labeling in retarded readers. *American Journal of Orthopsychiatry*, 1964, 34, 852-861.
- Boder, E. Developmental dyslexia: Prevailing diagnostic concepts and a new diagnostic approach. In H. R. Myklebust (Ed.), *Progress in learning disabilities*. Vol. II. New York: Grune and Stratton, 1971. Pp. 293-321.
- Bryden, M. P. Auditory-visual and sequential-spatial matching in relation to reading ability. *Child Development*, 1972, 43, 824-832.
- Dubois, N. F., & Brown, F. L. Selected relationships between Frostig scores and reading achievement in a first grade population. *Perceptual and Motor Skills*, 1973, 37, 515-519.
- Hammill, D. Training visual perceptual processes. *Journal of Learning Disabilities*, 1972, 5, 552-559.
- Hartman, N. C., & Hartman, R. K. Perceptual handicap or reading disability? *The Reading Teacher*, 1973, 26, 684-695.
- Johnson, D., & Myklebust, H. *Learning disabilities: Educational principles and practices*. New York: Grune and Stratton, 1967.
- Mackworth, J. F. Some models of the reading process: Learners and skilled readers. *Reading Research Quarterly*, 1972, 8, 701-733.
- Mackworth, J. F., & Mackworth, N. H. How children read: Matching by sight and sound. *Journal of Reading Behavior*, 1974, 6, 295-303. (a)
- Mackworth, J. F., & Mackworth, N. H. Spelling recognition and coding by poor readers. *Bulletin of the Psychonomic Society*, 1974, 3, 59-60. (b)
- Martin, J. C. Effects of visual perceptual training on visual perceptual skills and reading achievement. *Perceptual and Motor Skills*, 1973, 37, 564.
- O'Donnell, P. A. The effects of Delacato training on reading achievement and visual-motor integration. Thesis, Stanford University, 1969.

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