

## **Phonemic Analysis and Severe Reading Disability in Children**

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*Forty-five first-grade children of average intellectual ability were studied, consisting of one group of average readers, one group with mild reading difficulty, and one group with severe reading disability. A striking deficit in phonemic analysis was observed in children with severe reading disability. These children were unable to segment spoken syllables into individual speech sounds, while children with only mild reading difficulty or none were quite proficient at this skill. In fact, using phonemic analysis scores, it was possible to distinguish the severe reading disability group from the others with perfect accuracy.*

### **INTRODUCTION**

This study examined the ability of children with reading difficulty to segment spoken syllables into individual speech sounds. From the literature, there seemed to be reason to suspect that some of these children might have difficulty at such a phonemic analysis task. Durrell and Murphy (1953), for example, summarized their informal experience by stating that almost every child who came to their clinic with reading achievement below first-grade level had "a marked inability to discrimi-

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nate sounds in words” (p. 560). They went on to state that children with severe handicaps at what is here called phonemic analysis would seldom achieve even a primer level in reading. A theoretical statement as to why reading disability might be associated with impairment in phonemic analysis was given by Liberman (1973). Because the alphabet represents the phonemes of a language, a child must be quite explicit about the phonemic structure of the spoken word in order to decipher an unknown written word.

The phonemic analysis task used in the present study was developed by Fox and Routh (1975). Compared to the tasks used by other investigators, it has minimum extraneous cognitive requirements and can be adapted to children as young as 3 years of age. In the initial study, Fox and Routh (1975) found that the number of phonemes differentiated from syllables showed clear improvement from age 3 to age 6, leveling off between age 6 and age 7 years. There was a moderate correlation between phonemic analysis and reading recognition scores on a standard achievement test. In a subsequent study, Fox and Routh (1976) showed that phonemic analysis predicted the ability of 4-year-old children to learn a reading analogue task using Gibson letterlike forms as stimuli and short common words with 1:1 letter-sound correspondence as responses. More important, it was shown that only children who could segment spoken syllables into phonemes were able to benefit from instruction in blending phonemes together into words.

In the present study, the same phonemic analysis task was applied to children with reading problems. If our working hypothesis about the importance of phonemic analysis in “word-attack” skills is correct, at least some children with reading problems should have deficient performance in this area.

## **METHOD**

### **Subjects**

The subjects were 45 children attending the first grade in public schools in the Raleigh, North Carolina, area. Teachers were asked to nominate three groups of 15 children, one in which the children were average readers, one in which the children were experiencing mild reading difficulties (below expected level for their grade placement but not in need of special instructional assistance), and one in which the children

suffered from severe reading disability (not benefitting substantially from the reading program and in need of special instructional assistance). Teacher judgment was supplemented by administering to each child the Reading Recognition subtest of the Peabody Individual Achievement Test (Dunn and Markwardt, 1970). Children with below-average intellectual ability according to a screening test, the Peabody Picture Vocabulary Test (Dunn, 1965), were dropped from the study and replaced by others.

The children in the present study were being taught to read with a basal reading program. The children with severe reading disability were, according to teacher judgment, performing at a reading readiness level. At the time of testing, they were judged by their teachers to be unable to read even the easiest preprimer materials. Several were receiving special instructional assistance by a trained aide or reading specialist, and most were recommended for retention in the first grade the next year. In contrast, the children in the mild reading difficulty group were, according to teacher judgment, reading at a preprimer level. These children were judged to be benefitting from the reading instruction provided but were not expected to complete all first-grade materials by the end of the first-grade year. The children judged as average readers in this grade were expected to complete all first-grade materials by the end of the year.

The subject population had a mean Peabody IQ of 98.9 (SD 6.0). There were 30 boys and 15 girls in the total group (10 boys and 5 girls in each of the subgroups). On the Hollingshead (1957) occupational rating scale, these children's fathers (or heads of household) averaged 4.7 (category 4 on the scale includes clerical and sales workers, technicians, and owners of small businesses), with a standard deviation of 1.5. Analyses of variance with grade, reading group, and sex as independent variables indicated no significant differences among the groups in IQ or parental occupation. The children had a mean age of 6 years, 11 months (SD 3.8 months).

### **Procedure**

The children were examined individually in one 45-min session in the late spring of the school year. The Peabody Picture Vocabulary Test was given first, followed by the Peabody Reading Recognition subtest. The child's ability to segment spoken syllables into phonemes was assessed according to the procedure developed by Fox and Routh (1975). This procedure requires that the child first be asked to segment eight sentences into words and then eight words into syllables before being given a set of syllables to be broken down into phonemes.

## RESULTS

The judgments of the teachers about the children's reading levels were generally confirmed by the Peabody Reading Recognition subtest scores. The children nominated as average readers had a mean PIAT Reading Recognition grade level of 1.3. Those considered to have mild reading difficulty had a mean grade level of 0.8, and those with severe reading difficulty a mean of grade level of 0.1 on the PIAT.

All of the children except those with severe reading disability were able to segment the eight sentences into words without error. In the severe reading disability group, the girls' sentence segmentation scores (mean 6.4, SD 3.6) were not significantly below the scores of the other children, according to a *t* test. The boys with severe reading disability segmented significantly fewer of the sentences into words (mean 3.3, SD 4.4) than did the other children,  $t = 3.67$ , 9 df,  $p < 0.01$ . The difference between the scores of girls and boys within the severe reading disability group was not, however, significant.

The results on segmenting words into syllables were similar. All of the children except those with severe reading disability had perfect scores of 8 on this task. The girls in this subgroup (mean 6.2, SD 3.5) did not have scores significantly below those of other children, according to a *t* test. The boys with severe reading disability segmented fewer words into syllables (mean 3.2, SD 4.1), which was significantly below the scores of other children,  $t = 3.69$ , 9 df,  $p < 0.01$ . Within the severe reading disability group, however, the difference between girls and boys in word segmenting was not significant.

The data on phonemic analysis were very much like the other results reported. All average readers and the girls in the group with mild reading difficulty had perfect scores of 43 on this task. The boys with mild reading difficulty had a slightly lower than perfect score on this task (mean 40.4, SD 3.4), not significantly different from the perfect scores achieved by most groups. The scores of the children with severe reading disabilities, however, were markedly lower than those of other groups. In this group, both the boys (mean 1.6, SD 3.1) and the girls (mean 2.0, SD 2.4) had scores significantly below those of other groups ( $t$  ratios of 43.13 and 23.60, 9 df,  $p < 0.01$ ). Within the group with severe reading disability, the girls and boys did not differ from each other significantly in phonemic analysis scores.

By using the results of the phonemic analysis task, it was possible to distinguish the severe reading disability children from all other subjects,

with perfect accuracy. In the present study, any subject with a phonemic analysis score below 30 was a child with a severe reading disability. Conversely, all children with severe reading disability had phonemic analysis scores well below this level.

## DISCUSSION

The results provided striking confirmation of Durrell and Murphy's (1953) hypothesis that school children who cannot read have marked inability to discriminate the sounds in words. The children in this study who were still not able to read an easy preprimer had some difficulty in all the segmenting tasks. These nonreaders found the phonemic analysis task almost impossible. Thus the present results, when combined with the previous studies using the same task (Fox and Routh, 1975, 1976), strongly implicate the process of phonemic analysis in the initial stages of a child's learning to read.

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## REFERENCES

- Dunn, L. M. (1965). *Expanded Manual: Peabody Picture Vocabulary Test*, American Guidance Service, Minneapolis, Minn.
- Dunn, L. M., and Markwardt, F. C., Jr. (1970). *Peabody Individual Achievement Test Manual*, American Guidance Service, Minneapolis, Minn.
- Durrell, D. D., and Murphy, H. A. (1953). The auditory discrimination factor in reading readiness and reading disability. *Education* 1953, 73:556-560.
- Fox, B., and Routh, D. K. (1975). Analyzing spoken language into words, syllables, and phonemes: A developmental study. *J. Psycholing. Res.* 4:331-342.
- Fox, B., and Routh, D. K. (1976). Phonemic analysis and synthesis as word-attack skills. *J. Educ. Psychol.* 68:70-74.
- Hollingshead, A. B. (1957). Two-factor index of social position. Unpublished manuscript (available from August B. Hollingshead, 1965 Yale Station, New Haven, Connecticut 06520).
- Liberman, I. Y. (1973). Segmentation of the spoken word and reading acquisition. *Bull. Orton Soc.* 23:65-77.