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Jean R. Harber  
*Indiana University, Terre Haute*

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# AUDITORY CLOSURE AND READING

*Dr. Jean R. Harber*

DEPT. OF SPECIAL EDUCATION  
INDIANA UNIVERSITY, TERRE HAUTE, INDIANA

In contrast with visual perception, about which there is a larger body of knowledge, relatively little information exists concerning auditory perception and its relationship to reading. This fact is both surprising and troublesome as several researchers have found that auditory perceptual measures are better predictors of reading achievement than are visual perceptual measures (Blank, 1968; Linder & Fillmer, 1970; Muehl and Kremenak, 1966). It has been widely assumed that some basal level of auditory skill is related to normal language acquisition, school readiness, and academic achievement, particularly reading. Various auditory perceptual processes have been described, including the processes of discrimination, memory, synthesis (sound blending), and analysis (closure).

A review of the literature indicates that much of the research in auditory perception has focused on auditory discrimination and memory, with a lesser amount of attention paid to sound blending, and very little attention paid to closure. The most thoroughly investigated area of auditory perception is auditory discrimination correlates moderately with reading achievement (e.g., Benger, 1968; Morency, 1968; Oakland, 1969; Peck, 1977; Wepman, 1960) and it is generally assumed that a minimal level of auditory discrimination is necessary for the normal acquisition of reading and general verbal skills (e.g., Deutsch, 1964; Zigmond, 1969). Auditory memory and auditory sequential memory have also been investigated by many researchers. Although the research is not conclusive, it appears the impairments in memory are related to reading disabilities (Witkin, 1969). Numerous researchers have reported significant correlations between reading achievement and memory (e.g., Badian, 1977; Boyd & Butler, 1971; Morency, 1968; Peck, 1977; Poling, 1953). Research on sound blending is not as extensive as research on discrimination and memory. Skill in sound blending has been suggested as providing possible clues to reading performance (Finkenbinder, 1972) and as a component of the decoding process (Richardson & Bradley, 1974). Most researchers who have studied the relationship of sound blending to reading in primary grade children have reported statistically significant correlations (Richardson, DeBenedetto, & Bradley, 1977; Harber, Note 1). Studies which compared sound blending ability in good and poor readers reported that the two groups perform significantly differently while studies which determined concurrent and/or predictive relationships reported low to moderate correlation coefficients.

Research on auditory closure is far less extensive than that on other auditory perceptual skills. Several researchers have suggested that auditory closure is a necessary or at least helpful skill in the acquisition of reading (Finkenbinder, 1972; Fox & Routh, 1976; Kass, 1966; Kroth, 1971; Oakland & Williams, 1971). Of the studies which compared the performance of good and poor readers on auditory closure tasks, two found no significant differences (Macione, 1970; Sears, 1970) and one found differences which approached but did not reach statistical significance (Golden & Steiner, 1969). Intelligence was controlled in two of these studies. Other studies which determined concurrent and/or predictive relationships between auditory closure and reading achievement reported low to moderate coefficients (Elkins, 1972; Gallistel, Boyle, Curren, & Hawthorne, 1972; Harber, Note 1). Intelligence was controlled in only one of these three studies. When uncontrolled, intelligence tends to inflate the resulting coefficients, thereby suggesting that the true magnitude of the relationship between closure and reading achievement might be somewhat lower than it appears.

Harber (Note 1) studied the relationship between auditory closure and reading performance (word analysis skills, oral reading, and silent reading) in learning disabled subjects. With the effects of intelligence and chronological age controlled, correlations between auditory closure and reading performance reached statistical significance ( $r = .35$ ,  $p < .001$  with word analysis skills,  $r = .32$ ,  $p < .001$  with oral reading, and  $r = .29$ ,  $p < .01$  with silent reading). While all three coefficients reached statistical significance, only one reached the cut-off point Harber established for educational significance.

The present study further explores the relationship between auditory closure and reading performance. It has been suggested (Elkins, 1972) that auditory closure skill becomes more critical to reading success at the third grade level. As most subjects in the Harber (Note 1) study had not yet reached that level of reading, it was hypothesized that the relationship between auditory closure and reading may be found to be greater in more advanced readers. This suggestion is further supported by Kaluger and Kolson's (1978) statement that ability in phonetic analysis (closure) is needed by the middle of second grade level because by this time too many words look alike for children to successfully discriminate among them through visual clues alone. Kaluger and Kolson suggest that it is at this time that children with auditory perceptual problems begin having difficulty with reading. The purpose of the present study is to explore the relationship between auditory closure and reading performance in learning disabled children who have achieved varying levels of reading competency.

#### METHOD

*Subjects.* Seventy-five children who had been identified as learning disabled according to prevailing guidelines. Learning disabled subjects were selected according to the following criteria: (1) they evidence an

academic deficit sufficient to warrant special education services, (2) they obtained intelligence quotients in the average or above average range, (3) they do not have physical, sensory, or primary emotional problems, and (4) they are between the ages of 6-0 and 11-0. Mean IQ was 94.

*Procedures.* The following test instruments were utilized. Auditory closure was measured by the Auditory Closure subtest of the Illinois Test of Psycholinguistic Abilities (ITPA) (Kirk, McCarthy, & Kirk, 1968). The Durrell Analysis of Reading Difficulty (Durrell, 1955), Word Recognition and Word Analysis, Oral Reading, and Silent Reading subtests were used to measure reading performance. Subjects who were unable to read at least ten words on this subtest were also administered the Hearing Sounds in Words subtest of the Durrell. Performance in reading was measured by the composite scores of the subtests administered. All subjects were tested individually. The order of the tasks remained constant for all subjects. After all subjects were tested, three groups (low, middle, and high) were formed according to performance on the Durrell Analysis of Reading Difficulty. Mean composite reading scores were: low group,  $X = 126.12$ ; middle group,  $X = 134.35$ ; high group,  $X = 188.61$ .

*Statistical Technique.* Second-order partial correlational procedures were utilized in order to determine the relationship between auditory closure and reading skills for each group, without the contaminating influence of intelligence and chronological age. To determine whether the relationships were substantial enough to be of educational value, it was necessary to establish a minimum level at which the correlation coefficients attain practical significance. Guilford (1956) suggests the educationally significant correlation coefficients must reach .3 since coefficients below that level indicate negligible relationships between the variables. Garrett (1954), on the other hand, suggests that only coefficients of .4 or above are useful, as lesser values denote negligible or at best, slight relationships. In the present study, .35 was used as the cut-off point between coefficients with practical significance and those without. Differences between resulting correlation coefficients were tested for significance utilizing the  $Z$  statistic.

### RESULTS AND DISCUSSION

Second-order partial correlations are presented in Table 1. Correlation coefficients for each group exceeded the established cut-off point for practical significance.

The correlation between auditory closure and reading performance was highest for the low group and lowest for the high group. However, the differences in magnitude of correlations between groups were not statistically significant ( $Z(72) = .17$  to 1.86). These findings are somewhat surprising in light of the suggestions found in the literature that auditory closure skill becomes more critical to reading success after initial reading skills are acquired (Elkins, 1972; Kaluger and Kolson,

TABLE 1

Correlation Coefficients Between Auditory Closure  
and Reading Skills

Group	<i>r</i>	<i>p</i>
<i>Low readers</i>	.92	<i>p</i> .001
<i>Middle readers</i>	.87	<i>p</i> .001
<i>High readers</i>	.47	<i>p</i> .025

1978). However, the findings of this study do support the relationship between auditory closure and reading, suggesting that the relationship is indeed educationally significant. This study's findings clearly support the suggestions of Finkenbinder (1972), Fox and Routh (1976), Koss (1966), Kroth (1971), and Oakland and Williams (1972) that auditory closure is a necessary or at least helpful skill in the acquisition of reading.

## REFERENCE NOTE

1. Harber, J. R. Auditory perception and reading: Another look. Manuscript submitted for publication, 1978.

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