*ANTECEDENT CONTROL OF ORAL READING ERRORS
AND SELF-CORRECTIONS BY MENTALLY
RETARDED CHILDREN*

NIRBHAY N. SINGH AND JUDY SINGH

UNIVERSITY OF CANTERBURY

Academic behaviors can be enhanced through the manipulation of either consequent or antecedent stimuli. In this study, we evaluated the effects of manipulating two antecedent stimulus events with respect to oral reading errors and self-corrections of four mentally retarded children. Using an alternating treatments design, the effects of previewing the target text and previewing an unrelated text were evaluated against no-previewing. In the first previewing condition, the teacher discussed the target text with the children before they were required to read it orally. The same procedure was used in the other previewing condition but with the provision that an unrelated text was previewed. Oral reading errors decreased and self-corrections increased when the children previewed the target text with their teacher before reading it orally. No changes were observed as a result of implementing the other two procedures, previewing an unrelated text and no-previewing. The results, which were consistent across all four children, showed that reading proficiency can be increased by manipulating antecedent stimulus events prior to oral reading.

DESCRIPTORS: oral reading, self-corrections, antecedent control, retarded children

Although the majority of applied behavioral research in the classroom has dealt with the management of student behavior, a few studies have focused on the enhancement of academic achievement. Procedures most frequently used to change student performance have involved the manipulation of consequent stimuli (Ruggles & LeBlanc, 1982). Student performance in a wide range of academic subjects has been enhanced through direct reinforcement of correct responding, including mathematics (Harris & Sherman, 1974; Kirby & Shields, 1972), reading (Lahey & Drabman, 1974; Singh, Singh, & Winton, 1984), spelling (Foxy & Jones, 1978; Ollendick, Matson, Esveltd-Dawson,

& Shapiro, 1980), handwriting (Trap, Milner-Davis, Joseph, & Cooper, 1978), and story writing (Ballard & Glynn, 1975).

Academic behavior can also be changed through the manipulation of antecedent stimuli or setting events (Bijou & Baer, 1978; Glynn, 1982; LeBlanc, Etzel, & Domash, 1978). However, when compared to the use of reinforcement contingencies, relatively few examples are available in the literature of the influence of antecedent stimuli on academic achievement. Such antecedents as modeling (Brody, Lahey, & Combs, 1978), verbal prompts and instructions (Brodén, Copeland, Beasley, & Hall, 1977), response priming (Rowbury, Baer, & Baer, 1976), and pacing of instructions (Carnine, 1976; Koegel, Dunlap, & Dyer, 1980) are often used by teachers during academic instruction.

The importance of antecedent stimulus events in oral reading has been emphasized in some theoretical models of reading. For example, in psycholinguistic models, contextual cues (as a class of antecedent stimulus events) have been considered an important variable in proficient reading (Clay, 1979; Goodman, 1967; Smith, 1982). Further-

This research was supported by University of Canterbury Research Grants #572627 and #82/3/54 and conducted at Ferndale School, with the approval of the Canterbury Education Board. We are grateful to Ruth de La Mare and Bronwyn Matthews for collecting the data, Rae Collins and Alistair Stewart for their generous support during the course of this study, and to Lyonne Dalley, Jane Guillen, and Robin Phillips for assistance with the preparation of the manuscript.

Reprint requests should be directed to Nirbhay N. Singh, Department of Psychology, University of Canterbury, Christchurch, New Zealand.

more, in terms of reading instruction, the implication has been that increasing the reader's use of contextual cues would result in more proficient reading (Camp, Winbury, & Zinna, 1981; Simpson, 1972). However, with the exception of a study that manipulated a low-progress reader's attention to contextual cues during remedial reading (Wong & McNaughton, 1980), there is little empirical evidence that attests to the efficacy of this instructional technique in enhancing reading proficiency in good or retarded readers. In addition, no data are available to show that the manipulation of antecedent stimulus events, such as contextual cues, increases the oral reading proficiency of mentally retarded children.

We examined the effects of manipulating an antecedent event (the student's familiarity with the target text), termed previewing, on oral reading errors and self-corrections of four moderately mentally retarded children. An alternating treatments design was used to test the differential impact of three conditions: previewing the target text, previewing an unrelated text, and a no-preview control condition.

METHOD

Students and Setting

Three girls (PL, NA, JG) and one boy (CW) from a special school participated. All were moderately mentally retarded according to the AAMD criteria (Grossman, 1977). Two of the students (PL, NA) had Down's syndrome; the etiology of the other two students' disorders (JG, CW) was not known. None of these children suffered from epilepsy or were on medication during the course of this study.

PL was 15 years old, had an IQ of 46 on the Stanford Binet and 39 on the Peabody Picture Vocabulary Test (PPVT), and a reading age of 7 years 1 month on the Burt Word Reading Test (Burt). NA was 14 years old, had an IQ of 54 on the Stanford Binet and 67 on the PPVT, and a reading age of 9 years 7 months on the Burt. JG was 17 years old, had an IQ of 48 on the Stanford

Binet and 42 on the PPVT, and a reading age of 5 years on the Burt. CW was 14 years old, had an IQ of 50 on the Stanford Binet and 60 on the PPVT, and a reading age of 9 years 8 months on the Burt.

The study was conducted in a special resource room using the children's usual reading materials. The usual school procedure, which was discontinued during the study, was to provide each child with individual attention in reading for 10 minutes at least three times a week. The study was carried out by two trained teachers who worked with these children throughout the year.

Stimulus Materials

Books from the *Ready to Read* (1963) series provided most of the reading material for the study. The series consists of story books which are sequenced and graded in terms of reading age and include several supplementary readers at each age level. Where necessary, books from the *Story Box* (1981) series were also used. These books were matched for difficulty on basic words with those from the other series. All students were familiar with books from both series but had not previously read those used in the study. All books chosen for this study were at the reading level reached by each student immediately prior to the study. For each child, a set of 100-word reading passages were randomly assigned to each of the three experimental conditions: previewing the target text, equivalent time spent in previewing an unrelated text, and a no-preview control condition. A specialist reading teacher checked for the equivalence of the books across the three conditions. The books were deemed equivalent in terms of their level of difficulty. The text was 100 words long for all sessions and was read within 5 minutes by all students.

Response Definitions

Two mutually exclusive responses were recorded: oral reading errors and self-corrections. An error was defined as a mismatch between a word in the text and the child's oral response to the word, including substitutions, omissions, and mispronunciations. A self-correction was defined as the child's

spontaneous correction of an oral reading error without the assistance of the teacher. An error was recorded if a self-correction was either not attempted, or the first attempt was inaccurate, even if an accurate self-correction subsequently occurred. For each error one response occurrence was recorded, either an error or a self-correction.

Data Collection and Reliability

The two teachers who acted as experimenters for this study had participated in previous studies on remedial reading (e.g., Singh et al., 1984; Singh, Winton, & Singh, in press). They were given further training prior to this study in response recording and implementing the experimental procedures. Baseline data were collected only after the teachers reached at least 95% agreement on response occurrences between each other and with an independent rater (first author). All baseline and experimental sessions were audiotaped and responses were rated from these recordings. About 20% of the sessions were also videotaped to allow the rater to check that the teachers correctly implemented the experimental procedures, which they did, in all respects. Two students were randomly assigned to each teacher on a daily basis for a one-to-one experimental session.

For each student, five sessions from each phase of the experiment (i.e., 33% of sessions) were scored from randomly chosen audiotapes by an independent rater (first author). Interrater agreement between the two teachers and the independent rater was computed using a word-by-word agreement method (Kazdin, 1982). All agreements were divided by agreements plus disagreements and multiplied by 100. Interrater agreements ranged from 98% to 100% across all children.

Both the experimenters and the independent rater were familiar with the experimental conditions. To check for experimenter bias in the data collection or in the manipulation of the independent variable, a naive observer rescored all the videotapes. Interrater agreement between the two experimenters, the independent rater, and the naive rater was computed using the word-by-word agreement method. Interrater agreements ranged

from 97% to 100%. The naive rater also rated the two previewing conditions, under a single-blind condition (i.e., the target and nontarget stories were not identified), in terms of length, difficulty level of the basic words, and the effectiveness of the preparation. No differences were found.

Procedure

An alternating treatments design (Barlow & Hayes, 1979; Kazdin & Hartmann, 1978) was used to compare the effects of two training conditions and a no-training control condition. Each of three daily experimental sessions was scheduled for about 5 minutes plus reading time for each student. No student took more than 5 minutes to read his or her 100-word passages. Edible reinforcers were provided for participation at the end of each session across all experimental phases. There was at least a 5-minute break between each session.

The study consisted of the following three phases:

Baseline. The student was required to read a new 100-word passage in each baseline session. The student was told: "Here is a book. I want you to read it. Try your best not to make any errors." The teacher was required not to assist the student, correct any errors, or attend to self-corrections. All requests for help with difficult words were ignored and the student was prompted to continue reading.

Alternating treatments. Three intervention conditions were presented daily in a randomized sequence. The baseline requirements were replicated during the no-preview control condition.

During the second condition—preview of the target text—the teacher provided a background to the story, and the teacher and child talked about the story before the student read the text. The title of the story was used as a cue (e.g., "This is a story about a sheep called Bidibidi") and new words in the title were explained. Then the teacher and child discussed the story by looking at the pictures accompanying the text. During this discussion the teacher introduced new words, phrases, and expressions orally, but did not identify them

visually in the text (see Wong & McNaughton, 1980). The teacher also discussed the meanings of new words in the text and answered all the student's questions about the story being discussed. Then the child was instructed to read the story with as few errors as possible. No assistance or feedback was provided but the student was encouraged to continue reading after encountering a difficult word.

The same procedure was replicated for the third experimental condition, except that the teacher and student previewed a story *unrelated* to the text the student was going to read but was at the same level of reading difficulty. Thus, the same amount of time was spent in discussing the unrelated text as in the previous condition. Following this, the child was instructed to read a new story under the same conditions as in the previous condition.

On average, the teacher spent about 3 to 4 minutes discussing the reading material with the student during the two previewing conditions. About five to six new words were discussed per story, with the teacher identifying the words as being new to the student. The teacher did not actually read or point out any of the new words in the text. The new words were simply used in the preliminary discussion of the story and the students were not required to sound out or practice saying them aloud.

The teacher asked between three to five questions related to the pictures in the story, during the two previewing conditions, which the student was required to answer. However, the teacher always provided the correct answer if the student made an error. Students received descriptive praise for each question answered correctly and for any self-initiated story-related interaction with the teacher.

Students were not explicitly instructed to self-correct under any of the three intervention conditions. If a student paused at a difficult word, attempted to self-correct but made an error, or requested assistance with a new word, the teacher prompted the student to continue reading. The student was told, "That's a new (hard) word. Carry on with the next word, if you can't read that one."

Remediation. In the final phase, the most effective of the three intervention conditions was implemented in all three daily sessions.

RESULTS

Figure 1 shows the number of oral reading errors and Figure 2 shows the number of self-corrections for each student across all phases of the study. Because all passages read were of equal length, this also provides a measure of rate (responses per 100 words) independent of individual reading speed. The data points are for each session in the alternating treatments phase but are daily means in the baseline and remediation phases, when the same procedure occurred during all three daily sessions. Table 1 presents the mean numbers of oral reading errors and self-corrections for each student during each phase. Also presented are the mean numbers of total errors (i.e., oral reading errors plus self-corrections).

As shown in Figure 1, the mean number of oral reading errors of the students ranged from about 4 to 11 during baseline. With the exception of JG, the error rate per 100 words of text was relatively stable for each student. During the alternating treatments phase, previewing the appropriate text greatly reduced the number of oral reading errors across all students. However, no marked changes in the mean number of errors (see Table 1) were evident under the other two conditions, previewing an unrelated text and no previewing. The number of errors decreased during the remediation phase across all students when the most effective technique, previewing the target text, was instituted during all three daily sessions.

Figure 2 shows that during baseline the numbers of self-corrections by all students were below two per 100 words and the means were below one. During the alternating treatments phase, all students showed increased self-corrections during the preview of the target text condition. However, self-corrections remained at baseline levels when the other two conditions, previewing an unrelated text and no-previewing, were in effect. The only exception was NA who showed a slight increase in self-corrections during the previewing an unre-

Figure 1. Number of oral reading errors across students and experimental conditions. Data points are from each session in the alternating treatments phase but during both baseline and the remediation phases, the means from three daily sessions are shown because the same conditions prevailed in all three daily sessions.

Figure 2. Number of self-corrections during oral reading across students and experimental conditions. Data points are from each session in the alternating treatments phase but during both baseline and the remediation phases, the means from three daily sessions are shown because the same conditions prevailed in all three daily sessions.

Table 1
Oral Reading Errors and Self-Corrections Across Students
and Experimental Conditions

		Alternating treatments			Remedia- tion*
	Base- line*	No preview	Preview target text	Preview unrelated text	Preview target text
Oral reading errors					
CW	6.3	6.1	1.4	4.8	1.1
JG	10.7	10.5	3.3	9.9	1.2
NA	4.3	4.2	1.5	4.4	1.4
PL	6.1	6.0	1.9	5.9	2.2
Self-corrections					
CW	0.5	0.5	1.9	0.5	1.7
JG	0.9	0.9	2.5	0.8	2.1
NA	0.9	0.8	2.6	1.2	2.2
PL	0.8	0.9	2.8	0.8	2.3
Total errors					
CW	6.8	6.6	3.3	5.3	2.8
JG	11.6	11.4	5.8	10.7	3.3
NA	5.2	5.0	4.1	5.6	3.6
PL	6.9	6.9	4.7	6.7	4.5

* Means of three daily sessions.

lated text condition. All students showed increased numbers of self-corrections in the remediation phase when previewing the target text condition was in effect during all three daily sessions.

Table 1 shows that the mean rates of total errors (i.e., oral reading errors plus self-corrections) during the no-preview and preview of unrelated text conditions were similar to those during baseline. The overall mean rate decreased by 41% during the preview of the target text condition, when compared to baseline. Finally, the overall mean total error rate for all students decreased by 53% during the remediation phase when compared to baseline.

DISCUSSION

The results of this study show that the simple strategy of manipulating an antecedent event, such as the student's familiarity with the reading text, can enhance oral reading accuracy. Oral reading

errors decreased and self-corrections increased across all students when they were allowed to preview the reading text with the teacher. However, having the teacher spend an equal amount of time previewing an unrelated text did not affect either the number of errors or self-corrections. Thus, time spent per se was not the crucial variable.

There are a number of reasons why previewing the appropriate text may improve oral reading accuracy. For example, the student and teacher discuss the story that is to be read and talk about new words that appear in the story. They also discuss the pictures associated with the text. Previewing enables the student to put into a meaningful context the story to be read, increases the probability of eliminating unlikely alternative words, and narrows the choice for selecting the correct word through prior contextual information on the story (also see Smith, 1982). Thus, as found in this study, previewing an unrelated text would not be expected to change the student's error rate on the target text because the contextual information from the unrelated text will not transfer to the target text.

All students increased their rate of self-corrections during the preview of the target text condition in both the alternating treatments and remediation phases. Although some early readers attempt to self-correct at least some of their own oral reading errors (Clay, 1979), research has firmly established that self-corrections tend to increase with increasing reading proficiency (Au, 1977; Clay, 1968; Weber, 1970; Wixen, 1979). The increase in self-corrections in this study could have resulted from the increased reading proficiency of the students under the preview condition. Students can use cues from several sources to self-correct oral reading errors (Clay, 1979), and when meaningful context is provided through previewing, students can use meaning and grammatical cues for self-correction. Whether these cues are more likely to be used than others, e.g., letter-forms and letter-sound relationships, needs to be investigated.

The data show that in terms of total errors (i.e., errors plus self-corrections), there was a mean reduction of about 50% across all students in the

remediation phase when compared to baseline, with over 73% reduction shown by two students. Thus, for all students, the number of errors decreased, the number of self-corrections increased, and the total number of errors decreased.

Although the differences between the preview of the target text and the other two conditions are apparent in the table and figures, their educational significance is not. Unfortunately, no normative error rate data are available for the mentally retarded for a direct comparison to be made. However, comparisons are possible with the normative error rate for nonretarded children. According to Clay (1979), low-progress readers make 1 error in every 3 words, low-middle readers made 1 in 8, high-middle make 1 in 15, high made 1 in 37, and the most proficient readers make 1 in 100 words. Thus, during baseline the students in this study ranged from low-middle to high-middle progress readers. But after intervention, they were in the high-progress category. Not only had their oral reading error rate decreased substantially, but their rate of self-corrections had increased. This demonstrated that the intervention had a significant impact on the students' oral reading proficiency.

This study dealt only with oral reading per se; future research may be directed at the question of comprehension. For example, does previewing a story improve the reader's comprehension of the text? Although there is some disagreement among researchers regarding the relationship between oral reading and reading for meaning (see Smith, 1973), the literature indicates a strong relationship between oral reading accuracy and comprehension (Jenkins, 1979). That comprehension is, in part, dependent on reading accuracy has been experimentally demonstrated (Larson & Jenkins, 1978; Nicholson, 1977; Perfetti & Hogaboam, 1975). Moreover, as pointed out by Goodman (1969), an advocate of reading for meaning, an analysis of oral reading errors (miscues) is useful in determining the comprehension level of the reader. In sum, research on oral reading per se is important and "can be considered one legitimate measure of reading ability, both because of the demonstrated

interrelatedness of various reading skills and because oral reading miscues can reflect comprehension" (Jenkins, 1979, p. 69).

In summary, this study showed that the manipulation of antecedent stimulus events, such as previewing, enhances the oral reading proficiency of mental retarded children. Previewing, as a remedial reading procedure, should be easy to implement since it can be used both in individual and in group instruction. Furthermore, the procedure can easily be implemented by parents because only minimal training in its application may be necessary. Finally, the study provides support for models of early reading that highlight the importance of contextual cues.

REFERENCES

- Au, K. H. (1977). Analyzing oral reading errors to improve instruction. *The Reading Teacher*, 31, 46-49.
- Ballard, K. D., & Glynn, T. (1975). Behavioral self-management in story writing with elementary school children. *Journal of Applied Behavior Analysis*, 8, 387-398.
- Barlow, D. H., & Hayes, S. C. (1979). Alternating treatments design: One strategy for comparing the effects of two treatments in a single subject. *Journal of Applied Behavior Analysis*, 12, 199-210.
- Bijou, S. W., & Baer, D. M. (1978). *Behavior analysis of child development*. Englewood Cliffs, NJ: Prentice-Hall.
- Brodén, M., Copeland, G., Beasley, A., & Hall, R. V. (1977). Altering student responses through changes in teacher verbal behavior. *Journal of Applied Behavior Analysis*, 10, 479-488.
- Brody, G. H., Lahey, B. B., & Combs, M. L. (1978). Effects of intermittent modelling on observational learning. *Journal of Applied Behavior Analysis*, 11, 87-90.
- Camp, L. W., Winbury, N. E., & Zinna, D. R. (1981). Strategies for initial reading instruction. *Bulletin of the Orton Society*, 31, 175-187.
- Carnine, D. W. (1976). Effects of two teacher presentation rates on off-task behavior, answering correctly, and participation. *Journal of Applied Behavior Analysis*, 9, 199-206.
- Clay, M. M. (1968). A syntactic analysis of reading errors. *Journal of Verbal Learning and Verbal Behavior*, 7, 434-438.
- Clay, M. M. (1979). *Reading: The patterning of complex behavior*. 2nd ed. Auckland: Heinemann.
- Fox, R. M., & Jones, J. R. (1978). A remediation program for increasing the spelling achievement of elementary and junior high students. *Behavior Modification*, 2, 211-230.

- Glynn, T. (1982). Antecedent control of behavior in educational contexts. *Educational Psychology*, 2, 215-229.
- Goodman, K. (1967). Reading: A psycholinguistic guessing game. *Journal of the Reading Specialist*, 4, 126-135.
- Goodman, K. (1969). Analysis of oral reading miscues: Applied psycholinguistics. *Reading Research Quarterly*, 5, 9-30.
- Grossman, H. D. (1977). *Manual on terminology and classification in mental retardation*. Washington, DC: American Association on Mental Deficiency.
- Harris, V. W., & Sherman, J. A. (1974). Homework assignments, consequences and classroom performance in social studies and mathematics. *Journal of Applied Behavior Analysis*, 7, 505-519.
- Jenkins, J. (1979). Oral reading: Considerations for special and remedial education teachers. In J. E. Button, T. C. Lovitt, & T. D. Rowland (Eds.), *Communications research in learning disabilities and mental retardation* (pp. 67-91). Baltimore: University Park Press.
- Kazdin, A. E. (1982). *Single-case research designs: Methods for clinical and applied settings*. New York: Oxford University Press.
- Kazdin, A. E., & Hartmann, D. P. (1978). The simultaneous-treatment design. *Behavior Therapy*, 9, 912-922.
- Kirby, F. D., & Shields, F. (1972). Modification of arithmetic response rate and attending behavior in a seventh-grade student. *Journal of Applied Behavior Analysis*, 5, 79-84.
- Koegel, R. L., Dunlap, G., & Dyer, K. (1980). Intertrial interval duration and learning in autistic children. *Journal of Applied Behavior Analysis*, 13, 91-99.
- Lahey, B. B., & Drabman, R. S. (1974). Facilitation of the acquisition and retention of sight-word vocabulary through token reinforcement. *Journal of Applied Behavior Analysis*, 7, 307-312.
- Larson, K. L., & Jenkins, J. R. (1978). *Effects of word recognition corrections on reading comprehension*. Paper presented at the Council for Exceptional Children Annual Convention, Kansas City, MO.
- LeBlanc, J. M., Etzel, B. C., & Domash, M. A. (1978). A functional curriculum for early intervention. In K. E. Allen, V. A. Holm, & R. L. Schiefelbusch (Eds.), *Early intervention: A team approach* (pp. 331-381). Baltimore: University Park Press.
- Nicholson, T. (1977). *The relative effects of different error types on children's understanding of corrected discourse*. Paper presented at the Australian Reading Conference, Melbourne.
- Ollendick, T. H., Matson, J. L., Esveltd-Dawson, K., & Shapiro, E. (1980). Increasing spelling achievement: An analysis of treatment procedures utilizing an alternating treatments design. *Journal of Applied Behavior Analysis*, 13, 645-654.
- Perfetti, C., & Hogoboom, T. (1975). Relationship between single word decoding and reading comprehension skill. *Journal of Educational Psychology*, 67, 461-469.
- Ready to Read*. (1963). Wellington, NZ: School Publication, Department of Education.
- Rowbury, T. G., Baer, A. M., & Baer, D. M. (1976). Interactions between teacher guidance and contingent access to play in developing preacademic skills of deviant preschool children. *Journal of Applied Behavior Analysis*, 9, 85-104.
- Ruggles, T. R., & LeBlanc, J. M. (1982). Behavior analysis procedures in classroom teaching. In A. S. Bellack, M. Hersen & A. E. Kazdin (Eds.), *International handbook of behavior modification and therapy* (pp. 959-996). New York: Plenum Press.
- Simpson, M. M. (1972). *Suggestions for teaching reading in infant classes*. (2nd ed.) Wellington, NZ: Department of Education.
- Singh, N. N., Singh, J., & Winton, A. S. W. (1984). Positive practice overcorrection of oral reading errors. *Behavior Modification*, 8, 23-37.
- Singh, N. N., Winton, A. S. W., & Singh, J. (in press). Effects of delayed versus immediate attention to oral reading errors on the reading proficiency of mentally retarded children. *Applied Research in Mental Retardation*.
- Smith, F. *Psycholinguistics and reading*. (1973). New York: Holt, Rinehart & Winston.
- Smith, F. (1982). *Understanding reading: A psycholinguistic analysis of reading and learning to read*. (3rd ed.) New York: Holt, Rinehart & Winston.
- Story Box*. (1981). Auckland, NZ: Shortland Publications.
- Trap, J. J., Milner-Davis, P., Joseph, S., & Cooper, J. D. (1978). The effects of feedback and consequences on transitional cursive letter formation. *Journal of Applied Behavior Analysis*, 14, 381-394.
- Weber, R. M. (1970). First graders' use of grammatical context in reading. In H. Levin & J. Williams (Eds.), *Basic studies in reading* (pp. 147-163). New York: Basic Books.
- Wixson, K. L. (1979). Miscue analysis: A critical review. *Journal of Reading Behavior*, 11, 163-175.
- Wong, P., & McNaughton, S. (1980). The effects of prior provision of context on the oral reading proficiency of a low progress reader. *New Zealand Journal of Educational Studies*, 15, 169-175.

Received April 15, 1983

Final acceptance October 5, 1983