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Effects of Oral Reading Rate and Inflection on Intraverbal Responding

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Reading comprehension may be defined as a type of intraverbal responding. Only a few studies have reported the effects of the rate and inflection of oral reading performances on this class of intraverbals. In the present study the effects of four conditions; low reading rates (40 to 60 words per minute), with and without inflection, and high reading rates (150 to 200 words per minute), with and without inflection, were studied using six subjects. Two of the subjects were of high school age, reading below grade level, and four were typical third grade students, reading on grade level. The results indicated that the combination of high oral reading rate with inflection, a condition approximating conversational speech, increased both the accuracy and speed of intraverbal responding (comprehension), more than any other combination of variables. A second experiment was conducted which systematically replicated the findings across reading levels, reading passage content, settings, and subjects.

The impact of correct inflection during oral reading on reading comprehension has not been studied extensively (Weaver, Holmes, Curtis, & Reynolds, 1970). However many reading specialists have noted the importance of correct inflection (Durrell, 1949; Heilman, 1967; Spache & Spache, 1977). Reading rate has been considered a major variable in the development of reading comprehension by several investigators (Lovitt, 1982; Smith, 1971). However, this area of research is in relatively early stages. Neither the combination of rate and inflection, nor the parameters of either have been studied systematically.

Skinner (1957) has described reading as a verbal operant called texting, and reading comprehension as a verbal operant of the intraverbal class. Within his analysis understanding written language is similar to listening comprehension. The two behaviors are similar in that they both need a preceding set of events to set the occasion for either to occur. Also, both types of comprehension must be functional (produce benefits for the listener or reader), to maintain their occurrence. An obvious difference between the two comprehension operants is that listening comprehension is under the control of a person's vocal behavior and reading comprehension is, in the first instance, under the control of text. However, in oral reading with good inflection and conversational rates, the text controls the readers vocal behavior, thus providing essentially the same stimuli for reading comprehension that exist for the comprehension of conversational speech.

Normal hearing students come to reading instruction with a long history of reinforcement for listening to, and comprehending, what others say to them. The logic underlying this research is the proposition that if readers can understand conversational speech, and are then taught to read so that text comes to control a behavioral repertoire similar to conversational speech in terms of both rate and inflection, then reading comprehension ought to be similar to the comprehension of conversational speech. This prediction is likely to be limited to cases in which the vocabulary and grammatical structures presented in the text read does not exceed the reader's previous experience with spoken vocabulary and grammatical structures.

Most conversational speech rates fall in the range between 150 and 185 words per minute. Radio and television newscasters and announcers are trained to speak at between 170 and 180 words per minute. The broadcast industry believes these are the rates that lead to maximum comprehension and acceptability by the general public. Yet elementary school reading instruction leaves the typical student reading accurately, without good inflection, at between 40 and 90 words per minute (Lovitt, 1982). Such performances do not come close to reproducing conversational speech and may be a significant cause of the comprehension

problems so commonly found in developing readers in the United States.

The general experimental question of this study was: Can reading comprehension be improved by teaching students to read at rates in the conversational speech range with good inflection? A related concern was the effect of these new reading performances on the retention of the material read.

METHOD

Independent Variables

The two independent variables were rate of reading and type of inflection. Two rate conditions were used; low rate (30 to 60 words per minute) and high rate (150 to 200 words per minute). Errors were required to be fewer than three per minute for both rate conditions. Two inflection conditions were used; reading in an evenly paced monotone and reading with conversational inflection. Inflection was defined as those audible qualities of oral reading that come under the control of punctuation marks to make the text read sound like conversational speech. Reading without inflection was reading words with an equal emphasis on each word in a flat monotone voice.

Dependent Variables

There were three dependent variables, all intraverbal operants. There were, free recall of facts, spoken answers to ten questions (minimal inference question of the what, when, where, and how type) and filling in blanks (writing words) for a Cloze procedure in which every fifth word was deleted. The Cloze procedure was viewed as a subset of an intraverbal (Joyce, 1989). The Cloze procedure was the visual equivalent of a transcription.[1]

[1]The Cloze procedure was not discussed within *Verbal Behavior* (Skinner, 1957). However; a transcription is similar to the Cloze procedure except the Cloze requires the respondent to write the textual information from what has been read instead of what has been said. It is a subset of an intraverbal, because the missing text that is supplied must come from a prior controlling event (having read the text from which the Cloze was created). A correct synonym that was provided instead of the exact text was also accepted as a correct response, because the functional outcome of the Cloze procedure was not changed.

The sequence in which the dependent measures were taken required careful control. The free recall procedure was first, followed by the ten comprehension questions, which was followed by the Cloze procedure. Both the questions and the Cloze procedure provide prompts which could have inflated the free recall measures. Thus, the three measurement procedures followed a sequence from least to most prompts.

Subjects and Settings

Two subjects were students in a Job Corps program; a Black male, age 18 and a White male, age 16. Measures from a modified informal reading inventory procedure showed the older student to be reading on the 6th grade level and the younger student to be at the 2nd grade level. These subjects were seen daily in their usual classroom at the Job Corp center. In addition, four White females, between the age of eight and nine, were selected randomly from a list of qualifying subjects for a second experiment. They came from three different classrooms in the same elementary school. All four students were reading at the third grade level as determined by their progress in the Ginn Reading Series (Ginn, 1976) and on an individually administered Inventory of Basic Skills (Brigance, 1980).

Experimental Questions

The experimental problem was to identify the combination of high and low reading rates, with and without inflection, that produced the best outcomes in terms of reading comprehension intraverbals. The effects of four conditions were studied: (1) low rate, no inflection (LRNI), (2) low rate, with inflection (LRWI), (3) high rate, no inflection (HRNI), and (4) high rate, with inflection (HRWI). Our rationale predicted that the HRWI condition would produce the best comprehension intraverbal performances.

Experimental Design

Since the study required that the independent and dependent variable occur in a predetermined sequence, a design was used that would help detect sequence, practice, maturation threats to internal validity if they occurred (Johnston & Pennypacker, 1980). The study used the four conditions listed in

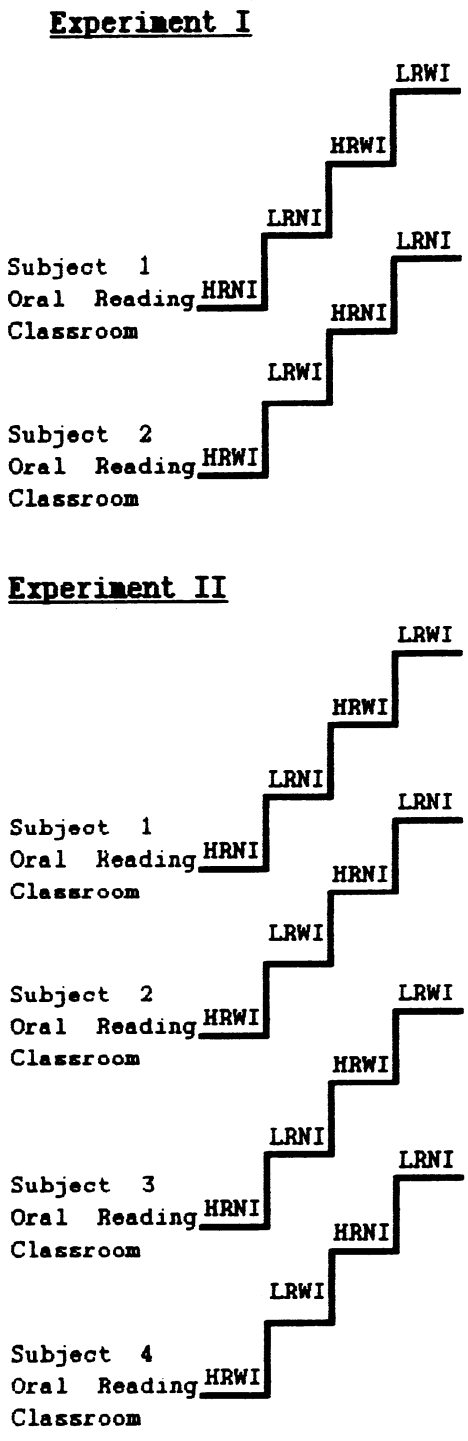

Fig. 1. The experimental design and sequence of conditions. HRWI = High rate oral reading with infection; LRWI = Low rate oral reading with infection; HRNI =High rate oral reading without infection; LRNI =Low rate oral reading without infection.

the experimental question section in two sequences. The sequence for subjects one, two, three and five was HRNI, LRNI, HRWI, LRWI. For subjects four and six, the sequence of conditions was HRWI, LRWI, HRNI, LRNI. This design made it possible to replicate across subjects and sequences. Figure 1 presents a diagram of the design conditions and sequences.

For the LRNI and LRWI conditions, the number of opportunities to read a story was determined by the number of times stories were read in HRNI and HRWI conditions, respectively. That is, the number of times a subject read a story in order to meet the reading rate criterion in condition HRNI was the same number of times the subject was permitted to read a story in the LRNI condition. This equalized the amount of practice within the two rate conditions, across each inflection condition.

Procedure

The data for the two older subjects were gathered first. Data gathering with the four younger students followed. In both experimental phases the students were seen daily in their normal school settings. Experimental sessions were about half an hour each.

Pretraining. To establish confidence that reading can be as fluent as conversational speech, fluency training with easier skills was conducted for all subjects. The two skills were, "Think-say letters of the alphabet, in sequence, with repeats for 1 minute," and "Think-say the phrase 'Star Wars is one of my favorite movies' with repeats, for 1 minute." These fluency developing drills occurred just prior to reading or rereading one of the text passages. For subjects who showed slow rates of improvement in oral reading fluency (improvement less than 10% per session with rates below 100 words per minute), reading rate criteria for conditions A and C were reduced to 100 words per minute correct with two or fewer errors.

Error Correction. When a subject misread a word during oral reading samples, the experimenter said the word aloud to the subject so that fluency would not be disrupted. However, misread words were noted and later taught and practiced. Error words were practiced daily until the error list was read correctly at 40 or more words per minute.

Experimental Conditions. The high rate no inflection condition (HRNI) required subjects to reread a story orally without inflection until above 150 words per minute with two or fewer errors. When error rates went above two per minute the experimenter modeled reading without inflection. The modeling procedure was as follows: (a) The subject was asked to read quickly paying no attention to the punctuation marks, (b) subjects were told the reading should sound like the Federal Express commercial so that the words came out in a fast monotone, and (c) the experimenter read the passage at between 150 and 200 words per minute in a monotone.

When a criterion performance occurred, measures of intraverbals and transcription were taken before starting the next condition. The number of trails to criterion was recorded and used in a yoked condition in which the number of trials in the LRNI matched the number in the HRNI condition. A new story was used for each subsequent condition.

The LRNI condition required subjects to reread a story orally without inflection at a rate between 30 and 60 words per minute with two or fewer errors. Modeling and instructions were similar to those for the HRNI, except subjects were asked to read slowly. The experimenter modeled this by reading in a monotone voice with equal emphasis on each word, at a rate of one word per second. When criterion performance occurred in this condition, measures of intraverbal and transcription operants were taken.

Prior to implementing any condition involving inflection, punctuation and inflection training was provided. The punctuation marks taught were period, comma, quotation mark, question mark, and exclamation mark. This training involved bringing to criterion performance five interrelated skills involving control of speech sounds by visually presented punctuation marks. These tasks were: see isolated punctuation mark - say name of punctuation mark; see isolated punctuation mark - say function of mark; see punctuation marks embedded in text - say name; see punctuation mark embedded in text - say function; and see punctuation mark embedded in text - read with inflection. Following this training the experimenter modeled reading eight sentences quickly and with proper inflection. The subjects were asked to read the same eight sentences as if they were speaking to someone. At first daily one minute timings were used. Later, subjects reread these phrases as many times as they could in two one-minute timings. Reading a phrase with correct inflection was counted as one correct movement. Misread words were not counted as errors if inflection was correct.

In the HRWI and LRWI conditions an error was recorded when incorrect inflection occurred. The HRWI condition involved rereading a story until criterion was reached with correct inflection. When this occurred, measures of intraverbal and transcription operants were taken. The LRNI condition required subjects to reread a story for the same number of trials it took to reach criterion in the HRWI condition. When criterion performance occurred, measures of intraverbal and transcription responses were taken.

An audio cassette tape recorder was used to record the oral reading performances of all subjects. A wrist chronograph was used to take one minute timings.

RESULTS

Figures 2, 3, and 4 show the rates of free recall, the percent correct on the the comprehension questions, and for the four younger students the percent correct on Cloze procedure completions, respectively. The dashed horizontal lines running through the data within each condition represent the median values for each condition.

Free recall. Figure 2 displays the performance of each subject under each condition. The HRWI condition consistently produced more facts recalled than any other condition. The HRNI condition produced more facts recalled than either of the low rate conditions. The median rate of recall under the two high rate conditions (17 facts per minute) was more than twice the median rate of recall for the two low rate conditions (8 facts per minute). The inflection (LRWI) condition was consistently better than the monotone (LWNI) condition.

Comprehension questions. Figure 3 displays the percentage of correct vocal responses to ten spoken comprehension questions.

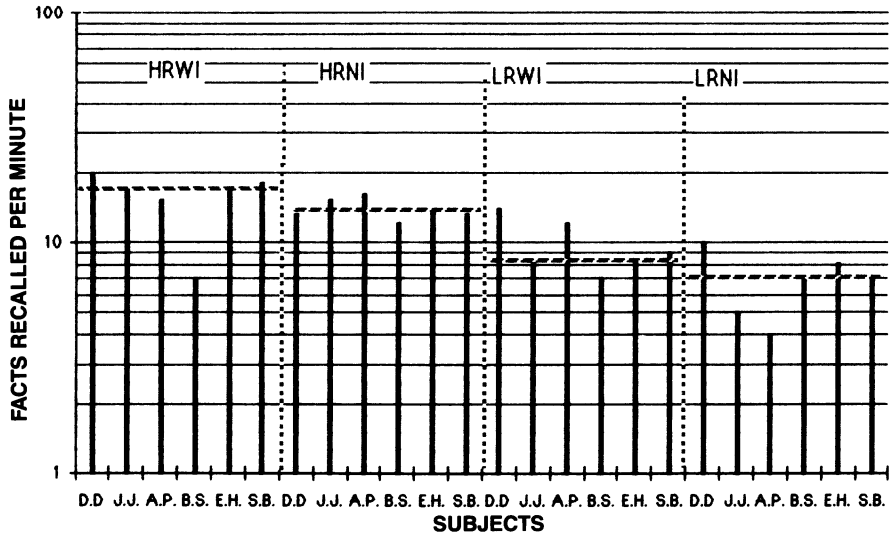

Fig. 2. Fact recalled per minute for each subject under the four conditions.

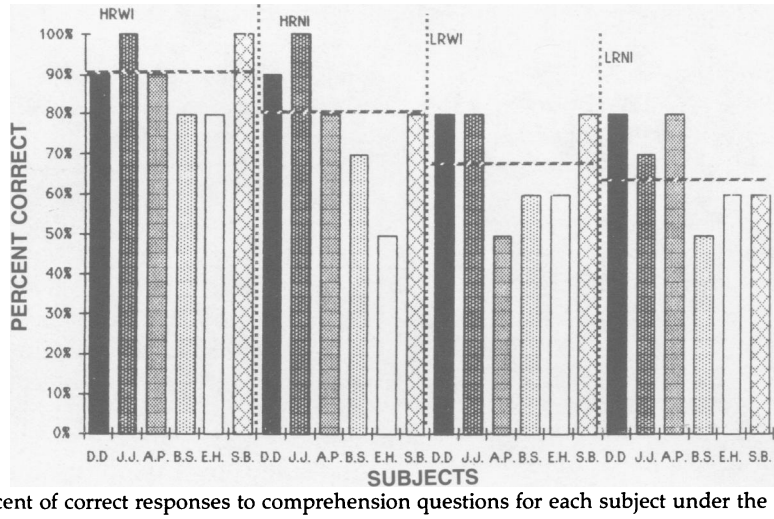

Fig. 3. The percent of correct responses to comprehension questions for each subject under the four conditions.

For all subjects a high rate condition produced a higher percentage of correct answers than any other condition. The median percentage correct for the two high rate conditions was about 20% above the median for the two low rate conditions. The HRWI condition produced a higher percentage of correct answers more often than any other condition.

Cloze procedure measures. Figure 4 displays the performance of each of the four subjects. The graph depicts their written responses to missing textual material.

The Cloze procedure measures show that the median percentage correct for the two high rate conditions was 10% above the median percentage correct for the two low rate procedures. Again, the HRWI condition was best for the majority of subjects.

DISCUSSION

Our findings show that the high reading rate conditions are consistently associated with better intraverbal responding. The high rates are defined as those typical of conversational speech, 150 to 170 words per minute. Reading with inflection regardless of rate also improved intraverbal and transcription responses even more. When rates are held constant with inflection allowed to vary, inflection produces more accurate intraverbal and transcription responses

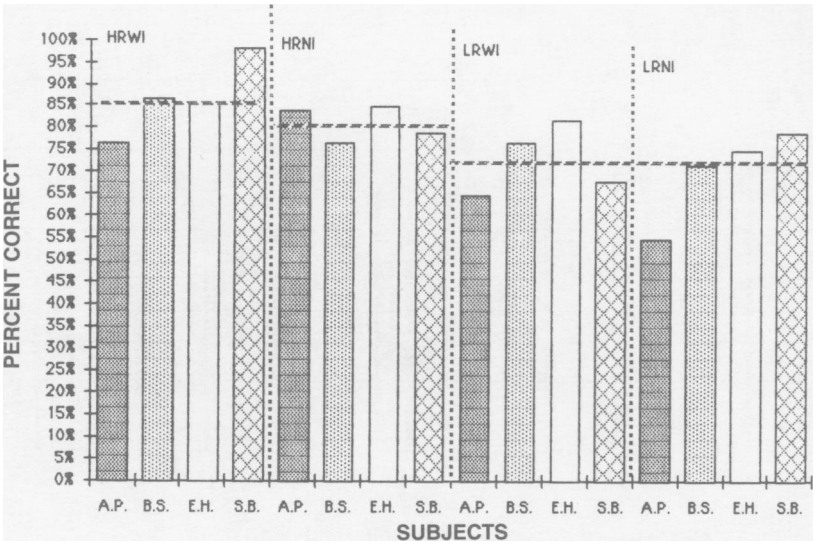

Fig. 4. The percent of correct written responses to Cloze questions for each subject across the four conditions.

than non-inflection. Thus, inflection training proved to be another useful dimension of the oral reading response to train in order to develop intraverbal and transcription responding even further.

The implications for reading instruction are important since neither rate nor inflection training are prominent parts of reading instruction as currently applied in the USA. Yet reading specialists are acutely aware of the need to develop adequate comprehension among students learning to read. They are also aware that the job is currently not being done well. Learning to read without high comprehension of the text sets the occasion for secondary problems because it deprives the reader of the most important natural reinforcers for the texting operant.

The data from this study suggest that a goal for reading instruction with students who have normal speech and hearing should include providing the reader with the opportunity to learn to read as if she/he is speaking as in a conversation. In most cases, it is reasonable to assume that teaching should begin with the terminal objective complex skill being taught first (Lindsley, 1983). If, however, the student has trouble reading at high rate with inflection as the first step, then the training focus should be on developing accuracy and speed. The data in this study supports the view that a high rate of oral reading, even without inflection, will increase a student's repertoire of intraverbals compared with slow reading with or without inflection. Once the student has developed and knows what fast reading is like, inflection training should increase performance even more.

This research raises several questions related to oral reading and comprehension. For example, this study did not directly train the subjects on two of the dependent measure skills, free recall and Cloze procedure responding. It would be interesting to see if the absolute magnitude of change would have been different under each condition relative to other conditions if the students had received direct training on the dependent measures as general response classes. This experimental tactic would also help us develop an understanding of whether children with speech defects, such as one subject in this study, would do better under the control of high oral reading with inflection when specifically trained to provide fluent answers to open ended questions.

Another area of textual/intraverbal research of interest is to explore the effects of training in reading dialogue, as the lines spoken by characters in plays. A play is written with the speaker/listener dichotomy explicitly mapped. The play parallels everyday vocal speech along with the conditions that evoke the speech of the characters. An examination of the conditions under which certain types of responses are emitted along with the natural cues for inflection, may lead to another way to improve the listener/reader's production of intraverbals.

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