The Effects of Reading Racetracks on the Sight Word Acquisition and Fluency of Elementary Students

Lisa Rinaldi, M.Ed., Dana Sells, M.Ed., and T. F. McLaughlin, Ph.D.

The effectiveness of using the reading racetrack drill and practice intervention on the sight word acquisition and fluency of 15 elementary students was examined in two separate experiments. A multiple baseline design across participants was used. The participants were 15 third and fourth-grade students attending a public (n = 10) or parochial (n = 5) elementary school. Participants included children receiving special education services in a resource room, services for learning difficulties, and those in a general classroom setting. Reading racetracks is a novel approach which employ error correction, timing, and drill and practice procedures. This strategy also utilized drill and practice probe sheets that resemble an automotive racetrack. The results indicated that during the reading racetrack intervention all of the participants more than doubled their correct rate in oral reading. There was also a marked decrease in the number of errors made by each of the participants in this study. The implications of employing reading racetrack procedures for practitioners are outlined.

KEY WORDS: reading racetrack; drill and practice; sight word acquisition; special education.

Regardless of the philosophical orientation, educators seem to agree that literacy is one of the most important skills a student can apply to functional living in our society (Slavin, 1996; Weaver, 1990). Research in reading indicates that children who read well have a very high probability of achieving...
success in school (Slavin, 1989, 1991, 1996; Slavin, Madden, Dolan, Wasik, Ross, & Smith, 1994). If these reading skills are not acquired and mastered, children have an increased chance of later dropping out of school as well as being incapable of performing successfully in today's society (Hansen & Eaton, 1978; Howard, McLaughlin, & Vacha, 1996; McLaughlin & Vacha, 1992a, 1992b; Slavin et al., 1994; Vacha & McLaughlin, 1992, 1993). Unfortunately, there is a great deal of disagreement regarding how to increase the likelihood that all students will leave our current educational system able to read fluently.

Many school districts have adopted a somewhat laissez faire approach to teaching reading. Often, the approach they follow is labeled as whole language (Weaver, 1990). With this approach, students are said to acquire literacy naturally, in much the same way as they acquire oral language (Altwerger, Edelsky & Flores, 1987; Goodman, 1986, 1989). While some students learn to read in this manner, an increasing number of students appear to require a more structured and systematic approach to attain this skill. Finally, recent scholarship and analysis has called into question the efficacy of employing some of the whole language strategies with students who are at risk for school difficulties (Liberman & Liberman, 1990). However, many schools continue to employ instructional methods that lack validity (Engelmann, Haddox, & Bruner, 1983).

While public schools usually have access to additional programs such as special education, learning assistance services, or tutoring program to help children who are at risk of having difficulties in reading, many parochial schools do not qualify for the funding necessary to implement such programs (Maddaus, 1991). Consequently, children attending parochial schools depend upon their classroom teachers to develop and implement supplemental reading programs that will assist them in this vital area of instruction. Without such programs some students have had to seek assistance elsewhere. This takes valuable time away from their education because of time spent traveling between locations (Morra, 1993). Although some parochial schools do qualify for and utilize additional reading programs, these schools are rare and are inaccessible to most students receiving a private education (Lipkin, 1989).

According to the current research literature, there are several effective and efficient teaching strategies to improve reading fluency. These include skill based programs such as Direct Instruction (Carnine, Silbert, & Kameenui, 1990), procedures that allow students to actively practice skills (Lindsley, 1991), drill and practice (Barbeta, Heron, & Heward, 1993; Barbeta, Heward, & Bradley, 1993; Shapiro, 1996), classwide peer tutoring (Greenwood, Delquadri, & Hall, 1989; Greenwood et al., 1987; Greenwood et al., 1984; Greenwood, Hart, Walker, & Risley, 1994). The following methods incorporated in our study contain a novel extension of several of
these procedures. They employ the “model, lead, test, and retest” found in the Direct Instruction procedures, the precision teaching techniques of timed readings, fluency building, probe sheets, and student self-charting of performance, and finally the use of drill and practice procedures (Barbetta et al., 1993, 1993b; Shapiro, 1996). Finally, they conform to the Direct Instruction principle of not introducing words which are auditorily and visually similar in the same lesson.

The purpose of our study was to determine the effectiveness of using the “reading racetrack” practice procedure and precision teaching techniques to increase the fluency of reading isolated Dolch Sight Words by elementary school students in both the public and private education sectors. To assess the ability to generalize the reading racetrack procedures, data were gathered across children with different characteristics and demographics.

**Experiment 1**

**METHOD**

**Participants and Setting**

Ten students participated in the study. Seven had been diagnosed by a multidisciplinary team as disabled and received special education services in a resource room (see Table 1). The participants’ disability designations included learning disabilities, mild mental retardation, and health impaired (including Attention Deficit Hyperactivity Disorder (ADHD) and Juvenile Rheumatoid Arthritis). Several participants also displayed mild to severe behavior problems as well as other social/emotional difficulties. According to the school psychologist and the special education teacher, two of the participants also displayed many of the physical characteristics and behavior patterns of children affected by Fetal Alcohol Syndrome (FAS) or Fetal Alcohol Effects (FAE).

The three remaining participants had been referred to multidisciplinary teams for assessment to determine program eligibility; but did not qualify for special education services. These students continued to have difficulties in their regular classroom settings particularly in the areas of reading and written language. The three participants were eligible to receive services from the Learning Assistance Program (LAP) which is a special program offered by the school district for students having difficulties in the classroom in the area of reading. According to LAP statistics, participants 1, 2, and 3 were all reading in the lowest 10th percentile of children who
<table>
<thead>
<tr>
<th>Participant/Gender</th>
<th>Age</th>
<th>Disability Designation or Other Remedial Services</th>
<th>Teacher Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-1 Female</td>
<td>10.8</td>
<td>No Disability/Normal Intelligence—LAP Services, lowest 10% in reading. Truancy is excessive and unexplainable</td>
<td>Difficulties in all subjects particularly reading and written language. Organizational skills are minimal and assignments are often incomplete</td>
</tr>
<tr>
<td>P-2 Male</td>
<td>9.6</td>
<td>No Disability/Normal Intelligence—LAP services, lowest 10% in reading</td>
<td>Area of difficulty in classroom is reading, motivation, and does not finish assignments</td>
</tr>
<tr>
<td>P-3 Male</td>
<td>10.3</td>
<td>No Disability, low-average intelligence—LAP Services, lowest 10% in reading</td>
<td>Little success with classroom assignments, difficulty reading and spelling</td>
</tr>
<tr>
<td>P-4 Male</td>
<td>9.1</td>
<td>Learning Disabled, Difficulty staying on behavior problems, reading goals on IEP</td>
<td>Difficulty staying on task, inability to finish assignments, reading at grade 1.2 level</td>
</tr>
<tr>
<td>P-5 Male</td>
<td>11.5</td>
<td>Learning Disabled, behavior problems, reading goals on IEP</td>
<td>Reading and comprehension at grade 2 level, lacks motivation and regularly removed from classroom for inappropriate behavior</td>
</tr>
<tr>
<td>P-6 Male</td>
<td>9.3</td>
<td>Health Impaired/ADHD, severe behavior problems, reading goals on IEP</td>
<td>Reading and comprehension at grade 1.5 level, excessive inappropriate behavior occurs regularly</td>
</tr>
<tr>
<td>P-7 Male</td>
<td>8.10</td>
<td>Learning Disabled, social/emotional problems reading goals on IEP</td>
<td>Recent sexual abuse has caused added difficulties in classroom, difficulties in attending and seems confused regularly, teacher and school psychologist observed many characteristics of FAS</td>
</tr>
</tbody>
</table>
were served by this program. See Table 1 for additional information on participants 1-10.

This study took place in the resource room of an elementary school in a low-socioeconomic area in a large urban city in the Pacific Northwest. The first author worked with each participant one-on-one, while the other participants worked in pairs practicing their racetracks. The primary teacher in the resource room had five years of teaching experience and had an instructional aide and a volunteer researcher who implemented the study. The researcher worked with each child for approximately five minutes daily at various times between 11:30 a.m. and 2:00 p.m. The school’s LAP instructor was also in the classroom at various times to assist with data collection and to perform reliability checks.

Materials

A variety of materials were used: lists of Dolch Sight Word sets 1-4 were used, a stop watch, scratch paper, red and blue ink pens, and a data
collection sheet devised for the experiment. The reading racetracks were drill sheets designed to resemble an automotive racetrack.

The words read on the racetracks were taken from the lists of Dolch Sight Words sets 1-4 that were commonly used in the school district. The words taken from this list were carefully selected to avoid having any two words on a particular racetrack that were either auditorily or visually similar.

There were two different types of racetracks, each containing 28 cells. The first type of racetrack consisted of seven target words that were repeated in random order. The random order was an attempt to avoid the occurrence of patterns which may have interfered with the participants learning the words and instead focusing on and learning the pattern in which the words appeared. Every fifth racetrack was a review racetrack containing the accumulation of the 28 different words that were introduced in the four previous racetracks.

**Dependent Variables and Measurement Procedures**

Two dependent measures were taken. The first was the number of words read correctly from the reading racetrack during a 1-min timing while the second was the frequency of errors during the same 1-min timed reading. An error was defined as a word being read incorrectly, an omission or addition of a word, or any words that were read out of order. An error was not counted if the participant made a self-correction before going on to the next word.

**Experimental Design and Procedures**

A multiple baseline design across participants was employed to evaluate the effects of the reading racetrack procedure. A description of the various conditions follows.

**Baseline**

The baseline consisted of having the participants read the lists of Dolch Sight Words orally as they normally appeared. No instruction was provided during this phase. The researcher recorded whether or not the participants read each word correctly with the only addition to their regular program was the use of timing. The participants were given the lists of words and were told to read them as quickly and as accurately as they could. The participants were aware that they were being timed, and they
began reading when a researcher cued them to start. At the end of one minute the researcher said, “Stop,” praised them for their hard work and cooperation, and then recorded the data. Baseline consisted of three 1-min timings for participant 1, and an additional consecutive timing for participants 2 through 10. Participants were tested once per day.

Reading Racetracks

The procedures used during this phase were somewhat similar to those during the baseline condition; however, the reading racetracks were used in place of the Dolch Sight Word lists. At the beginning of each intervention session, the participants were given the particular racetrack that he or she was working on. The participant was then instructed to inform the researcher when he or she was ready to begin. This was followed by the researcher giving the cue, “On your mark, get set, go!” The researcher would then keep track of the number of words read by placing a mark each time the participant completed a full circle around the track. At the end of the 1-min timing, the researcher would say, “Stop!” The participant and the researcher would then mark the word that was just read. Upon completion of each 1-min timing, the participant would count the number of words that he or she read and self-record the data. The first author would tally the number of errors, give this number along with specific feedback to the participant, who would then record these data below the number correct. These data were then collected and documented by the researcher on the data collection sheet.

At this point, the researcher would use the “model, lead, test and retest” Direct Instruction procedure to teach or review the words that were missed by the participant. This procedure consisted of first modeling the correct pronunciation of the word, then saying the word with the participant, the participant would then read the word independently, and finally, the participant would be asked to reread the word correctly several more times. This procedure took approximately one minute. The participants remained on a given racetrack until they had reached the criterion of 90 words read correctly per minute with zero errors, or until they had completed five sessions on a particular racetrack.

Posttest

On the final day of the experiment the researcher retested the children on the Dolch Sight Word lists that were used during the baseline phase.
Reliability

Interobserver reliability checks were taken during a minimum of 30% of the timed intervention sessions (range 11-17 reliability checks). The researcher and another observer would independently tally the number of words read correctly and the number of errors made during the 1-min timing. Many of the reliability sessions were also recorded on audio tape and were later scored for reliability. The percentage of interobserver agreement was calculated by dividing the smaller number by the larger number and multiplying by 100. The overall percentage of total interobserver agreement was 99.9% (range 99.8 to 100%) for corrects and 92.6% (range 78.8 to 100%) for errors. Reliability as to the implementation of the independent variables was taken by audio taping 30% of the sessions. Total reliability for fidelity of the independent variables was 100%.

RESULTS AND DISCUSSION

The number of words read correctly per minute and the number of errors per minute during baseline and reading racetrack sessions are shown in Fig. 1. During baseline, the mean number of words read correctly by the participants during baseline was 27.9 (range 9 to 57), and the mean number of errors was 5.9 (range 0 to 19).

With the implementation of the reading racetracks there was an immediate increase in the number of words read correctly by each of the participants. The mean number of words read correctly during the reading racetrack intervention phases was 83.9 (range 33 to 146) and the number of errors made during the reading racetrack phases was .66 (range 0 to 14). During posttest, the mean number of words read correctly was 62.4 (range 41 to 87), and the mean number of errors was 1.9 (range 0 to 6).

The reading racetrack procedure was not only effective in terms of a marked increase in the number of words read in a 1-min period, but also in the elimination of nearly all errors. We felt that the increase in correct reading, which more than doubled the highest score during baseline for all of the participants, was meaningful for the participants.

The purpose of Experiment 2 was to replicate the outcomes of Experiment 1 with children enrolled in a parochial school setting. In this way an attempt to examine the generality of the findings with another population could be examined. Due to time constraints, we did not have the participants self-chart their performance as we did in Experiment 1.
Fig. 1. Correct reading and errors for participants 1-10.
Fig. 1b.
Experiment 2

METHOD

Participants and Setting

The study took place in the third-grade classroom of a parochial elementary school in an upper socio-economic area in a large urban city in the Pacific Northwest. The classroom was staffed by one teacher who had six years teaching experience. The students were five third-grade students in a class of 23 students. Each of the five students was determined by the classroom teacher to be having difficulty in reading. The students, two boys and three girls ranged in age from 8 to 10 years. Student 1, who had a moderate speech impairment was the only student with a known disability. The researcher worked individually with the students within their classroom setting. Each day, with the exception of Thursday, immediately following their lunch hour at 12:50 p.m., the students were given a period of time to complete work or spend time on free-choice reading. The students were seated at a desk in the room and worked on their reading for approximately 5 minutes. This study was conducted four days per week for 15 weeks. There were six occasions where the students completed 2 sessions per day.

Procedure

Experiment 1 procedures were replicated, with the exception that the students did not undertake self-recording of their data. Another difference between Experiment 1 and 2 was the manner in which the students were allowed to progress through the various reading racetracks. If the child read greater than 90 words per minute from a specific reading racetrack, the experimenter allowed the student to read the next review racetrack rather than requiring the child to read each successive racetrack up to the review racetrack. This was done to allow the students to progress through the various racetracks as soon as possible.

Reliability

Interobserver reliability checks were taken during 27% of the sessions. The overall percentage of interobserver agreement for total words read was 99.2% (range 79.4 to 100%). Reliability of the independent variable was
taken by audio taping 27% of the sessions. Reliability for treatment fidelity was 100%.

RESULTS AND DISCUSSION

The number of words read correctly, and the number of errors during baseline and reading racetrack sessions are shown in Fig. 2. The mean number of words read correctly during baseline was 41.1 (range 20 to 76) and the mean number of errors made during baseline was 5.1 (range 0 to 10). The mean number of words read correctly during the pretest portion of Experiment 2 was 96.6 (range 57 to 119). The mean number of errors for the pretest were 3.2 (range 1 to 6). With the implementation of the reading racetracks, the overall mean number of words read correctly increased to 98.9 (range 52 to 156), and the mean number of errors decreased to 1.9 (range 0 to 17). The mean number of words read correctly in the posttest was 109.4 (range 72 to 147) and the mean number of errors were 2.2 (range 0 to 5).

GENERAL DISCUSSION

These two experiments clearly demonstrate that the reading racetrack procedure was effective with children with and without disabilities from two settings. The improved reading fluency of the Dolch sight words appeared to generalize to reading in context, with the five participants in participants in Experiment 2. Likewise, all of the 10 participants in Experiment 1 were able to generalize their rate and accuracy while reading the Dolch Sight Word lists.

The reading racetracks procedure was practical, but did require the use of one-to-one instruction. However, other effective programs to assist children in the area of reading have employed one to one teaching (Slavin, 1996; Slavin et al., 1994). While implementing this program during the previous year (Rinaldi & McLaughlin, 1996), we discovered that the review racetracks not only served as the cumulative review they were intended to, but they also served as an efficient and effective initial assessment tool. Following the baseline session, the researchers presented the participants with the review racetracks. If a student was able to read the words on the given review racetrack at the target rate, they would then move on to the next review racetrack until reaching a point at which the student was unable to read at an acceptable rate. Using this procedure, the researchers were able to determine the appropriate placement for each participant.
Fig. 2. Correct reading and errors for participants 11-15.

Another aspect of this program which made it very attractive and practical is the fact that after the initial session, subsequent daily sessions lasted
only a maximum of five minutes for each participant. This, this program, in conjunction with classwide peer tutoring, could offer individualized instruction for an entire classroom in less than 10 minutes of daily classroom time. This could be especially valuable in grades 1 and 2 when students are expected to learn and remember sight words that do not follow the phonetic rules being taught.

To assist children at risk for difficulty in reading, active approaches such as Direct Instruction, teaching code based reading, and active student responding should be implemented. Reading racetracks are straightforward, effective, and make use of several effective teaching methodologies.

The teachers involved were very impressed with the effects of the reading racetrack program on the reading fluency of see-to-say words in isolation with these students. The resource room teacher also planned to implement this procedure with several other students who receive special services in her classroom. It should be noted that all 15 of the participants enjoyed the reading racetrack intervention and they were pleased with their progress.

ACKNOWLEDGMENTS

This research was completed by the first two authors in partial fulfillment of the Master of Education in Special Education from the Graduate School at Gonzaga University, Spokane, WA. The authors gratefully acknowledge Carol Hern for her development of the reading racetrack and appreciate the assistance of Cheryl Anthony and Marquelle LaPorte in data collection. A special note of thanks to Dr. Stephanie Peck for her assistance with this paper. Copies of the materials can be obtained from the authors.

REFERENCES

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