

# THE DIFFERENTIAL EFFECTS OF RACETRACK PROCEDURES FOR SAYING LETTER SOUNDS BY TWO FIRST-GRADE STUDENTS WITH LEARNING DISABILITIES\*

**Jessica Travis**  
Gonzaga University  
USA

[jtravis@zagmail.gonzaga.edu](mailto:jtravis@zagmail.gonzaga.edu)

**T. F. McLaughlin**  
Gonzaga University  
USA

[mclaughlin@gonzaga.edu](mailto:mclaughlin@gonzaga.edu)

**K. Mark Derby**  
Gonzaga University  
USA

[derby@gonzaga.edu](mailto:derby@gonzaga.edu)

**Marilyn Carosella**  
Spokane Public Schools, Spokane  
WA, USA

[marilynca@spokaneschools.org](mailto:marilynca@spokaneschools.org)

## ABSTRACT

*The purpose of the present study was to examine the effects of a racetrack procedure on saying the letter and sound of each letter in the alphabet with two first-grade students. Data collected were the percent of correct letters sounds at the end of each session. These data were gathered in the school resource classroom. The overall results indicated an overall increase for saying the letters of the alphabet for each of our participants. These data were statistically significant for both students. For one student, higher overall accuracy and outcomes were found. The procedures were easily implemented and data collection was straightforward and took little extra time. The reasons for our outcomes are discussed.*

*Keywords: racetrack procedures, spelling, single case designs, students with learning disabilities, timing, model, lead and test error correction.*

## INTRODUCTION

Spelling skills are necessary in multiple functions in life (Carter, McLaughlin, Derby, Schuler, & Everman, 2011; Graham, 1999, Shapiro, 2011). These skills are also linked to reading which are necessary for, both social skills and academics. Once a child had mastered the letters of the alphabet; as well as, all of the sounds for the letters of the alphabet, they can begin to read (Engelmann, Haddox, & Bruner, 1983; Marchand-Martella, Slocum, & Martella, 2004; National Reading Panel, 1990). Learning the letters and sounds of letters will allow students the ability to read a book on their own and browse over a magazine when they want to, with ease. Multiple school districts become more lax when promoting research based curriculums and often are quite lax regarding written language curricula" (Graham & Harris, 2009). This approach states that the process of learning to read is gained in a similar manner to how one a child may learn to crawl (i.e. naturally). Sure some children are capable of grasping the task of reading or spelling as easily as some learn to crawl. But there is a growing percentage of children who are needing a more leveled approach to gaining literacy skills (Carnine, Silbert, Kameenui, & Tarver, 2004; Engelmann et al., 1983; Graham, & Harris, 2009). These types of students need evidence-based curriculum materials (National Reading Panel, 1990; National Research Council, 1998) as well as evidence-based classroom interventions (Horner, Carr, Halle, McGee, Odom, & Wolery, 2005).

\* Requests for reprints should be sent to Evan T. Anderson, Department of Special Education, Gonzaga University, Spokane, WA 99258-0025 or via email at [eanderson@zagmail.gonzaga.edu](mailto:eanderson@zagmail.gonzaga.edu) or [mclaughlin@gonzaga.edu](mailto:mclaughlin@gonzaga.edu).

Racetrack procedures make use of various active responding procedures combined with direct instruction and precision teaching methodology (McLaughlin, Weber, Derby, Hyde, Violette, Barton, et al. 2009, 2011; Rinaldi, Sells, & McLaughlin, 1997). The racetrack procedure makes use of a racetrack containing 28 cells (See Figures 1 through 3). The teacher can place sight words, (Hyde, McLaughlin, Weber, & Everson, 2009; Romjue, McLaughlin, & Derby, 2011; McLaughlin et al., 2009) math facts, (Beveridge, Weber, Derby, & McLaughlin, 2005; Erbey, McLaughlin, Derby, & Everson, 2011), sight words (Erbey et al., 2011; Green, McLaughlin, Derby, & Lee, 2010; Kaufman, McLaughlin, Derby, & Waco, 2011) or letters on the track. Using racetrack-like procedures also requires the use of timing, the model, lead, and the test error correction procedure employed with direct instruction (Marchand-Martella, Slocum, & Martella, 2004), and employing both new and familiar sight words, math facts, etc. (Anthony, Rinaldi, Hern, & McLaughlin, 1997; Rinaldi et al., 1997; Falk, Band, & McLaughlin, 2003; Kaufman et al., 2011; Printz, Band, & McLaughlin, 2006). Each session, the students are informed how long they are to be timed and whether they can continue around the track or have to stop after one lap (McLaughlin et al., 2009, 2011; Rinaldi et al., 1997)

This study focused on the use of a modified reading racetrack for two primary students, with disabilities. The purpose of the research was to employ and extend a spelling racetrack procedure with younger students than we have employed in our previous research. We hoped to assess the effects of using a racetrack on the accuracy and fluency of saying letter sounds.

## METHOD

### Participants and Setting

The participants in this study were all enrolled in an public elementary school with resource pull-out model. They attended the resource room for 45 minutes per day. Student A was a 6-year-old female diagnosed with learning disabilities (LD). Student B was a 7-year-old male diagnosed with developmental delays (DD) and learning disabilities (LD). Both students had deficits in the areas of spelling, reading, writing and math. The focus of this study was chosen because both students need to learn their letters and sounds in order to be successful in any of the other areas of concern.

This study was conducted in an elementary school special education resource room. There was an average of six other students in the resource room at the same time all at the same level as the two children in the study. Diagnostic labels for the other students in the room at the same time included learning disabilities (LD), developmental delays (DD) and ADHD. There was a certified teacher and two certified instructional aides to assist the students with their academic and social skills.

While the students were in the resource room they were to sit at the table with their group, if time allowed they were to go to the library in the classroom and read quietly. This was permitted if the students finished their work promptly and were on task for the entire time. The students in the study were also asked how many tickets they felt they should earn each day for participating in the study and how many they should get if they happen to finish the entire racetrack. Student A decided she wanted one ticket each day for trying and two tickets when she finished the racetrack. Student B had the same standards as Student A.

## MATERIALS

During the study the first author utilized consequences to help motivate the students as possible. Different brightly colored and laminated pictures of the spelling racetrack were used for each student (see Figures 1 through 3). In addition to the spelling racetracks the use of tactile letters made with pipe cleaners were used to drill the students before moving onto the racetrack (see Figure 4), overhead markers, tiny teddy bear used as a marker on the track (see Figure 5), tickets to motivate them to do their best. To keep track of time, the first author made use of stopwatch (see Figure 6). Data were collected using pre-made data sheets that had each student's letters typed in columns. The other materials are seen in Figures 7 and 8. Data collection and analysis followed the guidelines of precision teaching (Lindsley, 1990).

## Dependent Variables and Measurement

There were three dependent variables. The first of the three target areas was the number of letters correctly read. The second target was the number of letter errors. The third target was to get the percent of the racetrack that each completed on the timing for that session.

## Data Collection and Interobserver Agreement

The first author counted the number of correct responses on the racetrack that the student said then divided that into the total number of responses possible on the racetrack. Event recording was used to count how many letters the students responded to correctly and incorrectly. A pre-test was taken at the beginning of the study. Each time the students did the racetrack the first author kept track on a separate sheet by making a + for a correct or a – for errors. The percent of each racetrack completed was calculated by taking the number correct over 28 to determine the percent.

Before interobserver agreement the first author went over what a correct and what an errors were. A correct response would be saying the letter or sound correctly without self-correction and an error would be not saying the correct letter or giving an “I don’t know” response with no self-correction; if the student self-corrects the answer becomes correct. Interobserver agreement was taken by either one of the classified aides in the classroom or the primary teacher through out the study. The first author sat beside the student working, while the interobserver tallied corrects and errors on an identical recording sheet as the first author, and sat beside the first author. After the racetrack was finished, the first author and the interobserver compared their data. The formula for computing interobserver agreement was the smaller number divided by the larger number and multiplying that number by 100. Reliability was 100% over the duration of the study.

## Experimental Design and Conditions

The intervention was evaluated using a multiple baseline design across students (Barlow, Nock, & Hersen, 2008; Kazdin, 2010). The design was implemented beginning with a pre-test, three sessions of baseline for Students A and B and a post-test. After baseline data stabilized the intervention began for Students A and B during session five. Each intervention session lasted approximately 10 to 15 minutes, depending on student performance. Only one data point was taken for each session, for each student. The spelling racetrack was completed over 28 sessions for Student A and 24 sessions for Student B.

**Baseline.** The first author prompted the students to work with her at a designated table in the classroom or outside in the hallway. The participants were seated next to the first author. These data were taken next to the student on a clipboard held at a 90-degree angle, so the student couldn’t see the first author’s scoring. The students were provided tactile letter cards, each card had a letter on it and the students were to tell the first author what that letter was. For the pretest the students did every letter on their own as the first author took data on how they did, this was not timed. During baseline both students worked together and they played a game with the tactile cards called “Pick-a-Letter”. Each student picked a letter and had to tell what the letter was. Each student picked 13 cards for each of the three sessions of baseline.

During baseline, the students did not receive feedback, only prompts such as “Keep going”, “Don’t stop”, “Don’t worry about it, just keep going”. “Get Ready”, “Go” or “Stop”. After completing each session, the first author thanked the student for all their hard word and sent them back to their regular education classrooms

**Spelling racetrack 1-4.** The intervention had that same technique and method for each student as baseline, but the letters for each student were different. The racetrack included seven letters that they had difficulty on during baseline and showed difficulty. The seven letters showed up on the track four different times, so the students saw the same letters multiple times. The letters were written in a repetitious manner around each racetrack. If possible, the first author was careful to not place auditory or visually similar letters next to each other on the racetrack. Each new racetrack included the new letters to be taught.

To begin each session the students were given the tactile letters for the letters that appear on their racetrack. They were given the seven letters at the start of the session to look over and touch for three minutes. Next, first author would ask each participant each letter.

The student would then be given their racetracks and allowed two minutes to get ready and put their “thinking caps on”; the first author would wait for the student to say, “Lets start”. Then the first author would say “Get ready” and tell them to put the teddy bear on the first letter and then the first author would hold up the timer and say “Go”. The student would then begin reading the letters as quickly and accurately as possible. The student was not stopped or told the corrections until their time was finished. The first author would give extra praise if the student self-corrected themselves. After the students finished their racetrack the first author would walk them back around the racetrack at a slower pace allowing them to think about each letter before responding. When they got to a letter that they missed during the timing the student was told that they missed that letter and together the author and the student worked over the missed letter by getting the tactile letters out and moving our fingers over the letter to get the feel of the letter.

**Pre- and post-testing.** A pre test was given to determine which letters or sounds each participant could day. For the posttest, all letters were presented after the end of formal data collection for both participants.

## RESULTS

### Baseline

For student A, her scores ranged from 76%, 92%, and 84% during baseline. Her overall mean in baseline was 84% correct. and the posttest was at 96 percent. Student B had a mean of 84% in baseline. and the post testing was at 65%.

### Spelling Racetrack 1-4

Student A increased her mean performance compared to baseline. During racetrack 1, Student A’s accuracy increased ( $M = 98.5\%$ ; range 67 to 100%). During racetrack 2 for Student A performance declined somewhat ( $M = 79.25\%$  range 46-100%). During racetrack 3 the student’s performance increased to 100% for each session. During racetrack four the student’s percentages decreased ( $M = 75.8\%$ ; range 26 to 100%).

Student B increased his performance during spelling racetracks. During racetrack one the student’s percentages were from 7% to 100%. His performance was quite different that that of Student A.

### Pre and Posttest

Student A’s percentages during the pretest were 92% and 96% during the posttest. Student B’s percentages during the pretest were 84% and it decreased to 65% for the posttest.

### Inferential Statistics

Using a Friedman Nonparametric Analysis of Variance (Siegel, 1956), the difference between conditions was statistically significant for the number of corrects ( $\chi^2 = 20.708$ ;  $p = .0004$ ). Follow tests using a Wilcoxon Matched Pairs Signed Ranks Test revealed significant differences between baseline and the various spelling racetracks for Student A. Follow up tests were also significant between baseline and the spelling racetrack conditions for Student A ( $Z$ 's ranged from -2.201 -2.371; and probabilities ranging from .018 to 028). All other combinations were not statistically significant for Student A. A Wilcoxon Matched Pairs Signed Ranks Test was significant between baseline and the spelling racetrack phase for Student B. ( $Z = -2.232$ ;  $p = .026$ ).

## DISCUSSION

A functional relationship was demonstrated between increasing both speed and accuracy of letters and decreasing letter recognition errors with a spelling racetrack procedure for Student A. Those present outcomes extend and replicate the use of spelling racetracks to children with disabilities as well as more severe disabilities than was employed in our prior research (Erbey, McLaughlin, Derby, &

Everson, 2011; Falk et al., 2003; Kaufman, McLaughlin, Derby, & Waco, 2011; Printz et al., 2006; Rinaldi & McLaughlin, 1996; Rinaldi et al., 1997; Romjue et al., 2011).

The delayed improvement in performance for Student B was an interesting finding. As the sessions progressed, showed gradual increase on her letter recognition and improved attitude toward doing the racetrack. Student A was energetic and ready to work each session where Student B was always disappointed and hated working because he thought it was pointless because he felt he already knows all of the letters. Student B went on vacation for two weeks and sick a few days as well. The addition of an additional procedure such as cover, copy, and compare (CCC) may have improved the performance of Student B. Combining CCC with reading racetracks or DI flashcards has been shown to be effective in other research (Bishop, McLaughlin, & Derby, 2011; Erbey et al., 2011; Green et al., 2010; Kaufman et al., 2011). Finally, a more powerful set of consequences (Arkoosh et al., 2009; Cooper et al., 2007) may have been shown to be effective.

To better validate the success of a spelling racetrack, we could gather further data regarding spelling racetracks across various settings and by using multiple instructors. This would be a beginning in an attempt to increase the generalization of these procedures to other skills and classroom settings (Alberto & Troutman, 2008; Barlow et al., 2008; Cooper et al., 2007; Kazdin, 2010)

The classroom teacher felt that the spelling racetracks procedure was quite time intensive at this age level. She has continued to employ spelling racetracks in her classroom.

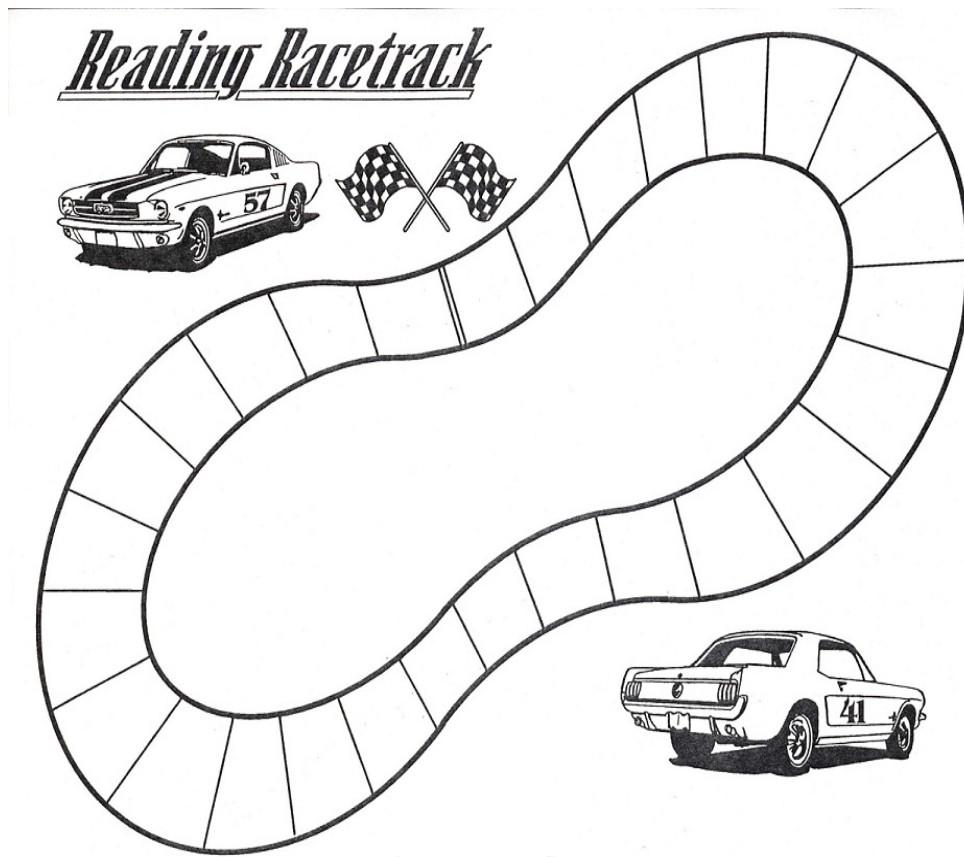


Figure 1. Racetrack sample.

Student A's Racetrack

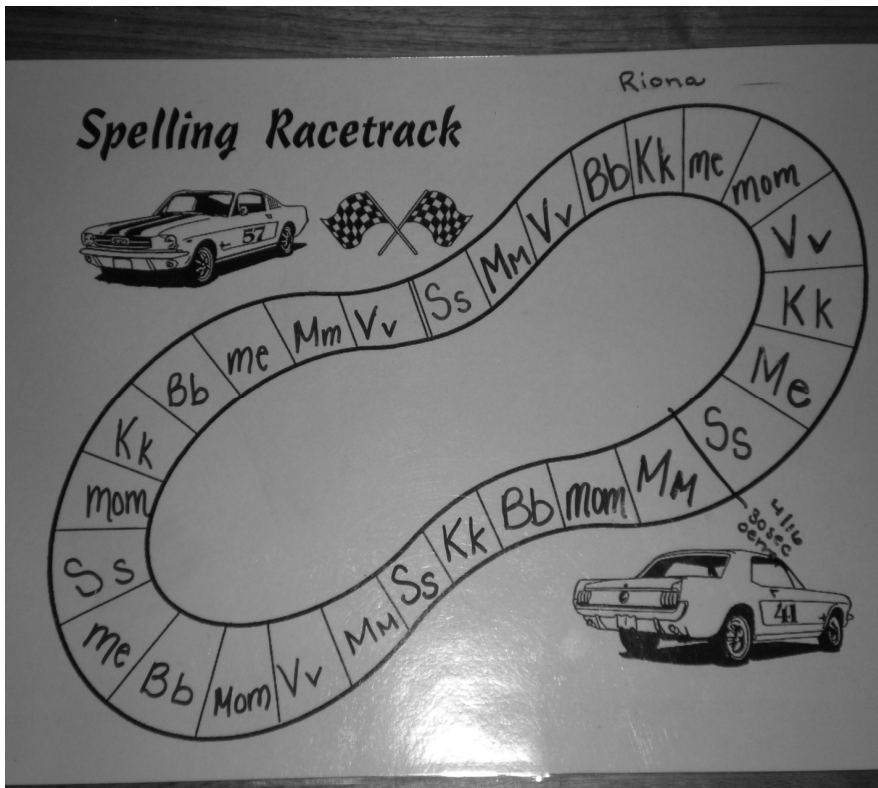


Figure 2. Student A's racetrack.

Student B's Racetrack

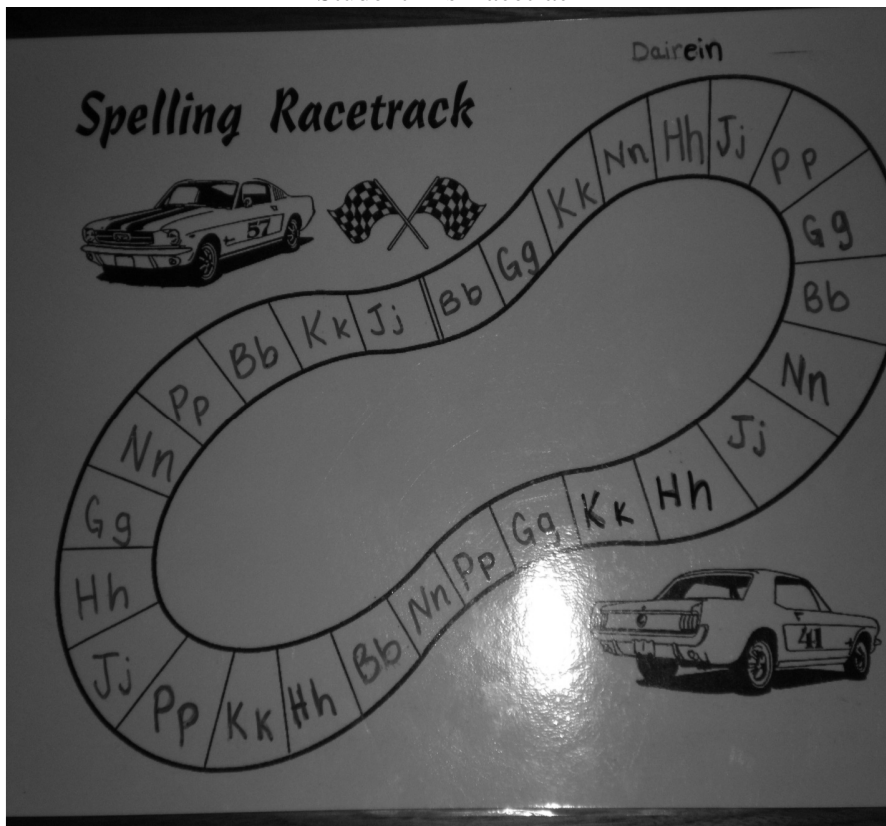


Figure 3. Student B's racetrack.

Tactile Letters Used A-Z  
(Made with pipe cleaners; handwriting without tears letters)



Figure 4. Examples of pipe cleaner letters employed.

Stopwatch and Teddy Bear marker used



Figure 5. Stopwatch and maker employed in the research.

**Student A Set List**

<u>Set 1:</u>	<u>Set 2:</u>	<u>Set 3:</u>	<u>Set 4:</u>	<u>Set 5:</u>	<u>Set 6:</u>
B	Q	R			
G	V	I	S	a	mom
K	W	C	M	I	cat
N	D	D	Z	me	dog
H	F	L	E	no	dad
J	X	T	U	to	love
P	A	Y		the	can
				and	we

Figure 6. Letters and words broken into sets for Student A.

**Student B Set List**

<u>Set 1:</u>	<u>Set 2:</u>	<u>Set 3:</u>	<u>Set 4:</u>	<u>Set 5:</u>	<u>Set 6:</u>
B	Q	R	S	a	mom
G	V	I	M	I	cat
K	W	C	Z	me	dog
N	D	D	E	no	dad
H	F	L	U	to	love
J	X	T		the	can
P	A	Y		and	

Figure 7. Student B's set lists.



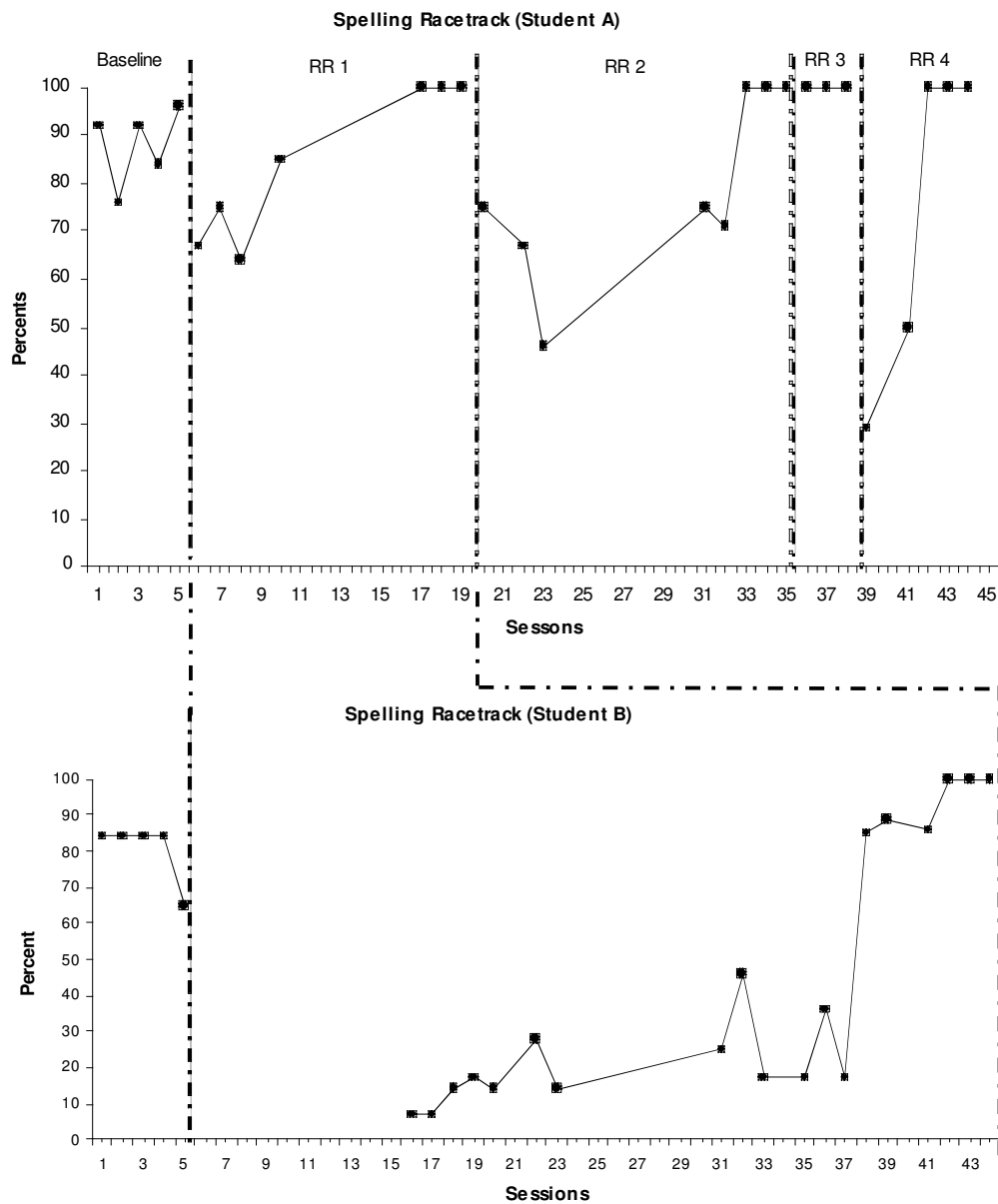


Figure 8. The number of corrects (open circle) and errors (closed circle) during each experimental condition for each participant. The number of words read per minute is shown as grey circles for Student A and B.

**REFERENCES**

Alberto, P., & Troutman, A. (2008). *Applied behavior analysis for teachers* (8<sup>th</sup> ed.). Upper Saddle River, NJ: Merrill/Pearson Education.

Anthony, C., Rinaldi, L., Hern, C., & McLaughlin, T. F. (1997). Reading racetracks: A direct replication and analysis with three elementary students. *Journal of Precision Teaching and Celeration*, 14(2), 31-36.

- Arkoosh, M., Weber, K. P., & McLaughlin, T. F. (2009). The effects of motivational/reward system and a spelling racetrack on spelling performance in general education: A case report. *The Open Education Journal*, 2, 17-20. Retrieved from <http://www.benthamscience.com/open/toeduj/index.htm>
- Barlow, D. H., Nock, M., & Hersen, M. (2008). *Single case research designs: Strategies for studying behavior change* (3<sup>rd</sup> ed.). New York: Allyn and Bacon.
- Beveridge, B., Weber, K. P., Derby, K. M., & McLaughlin, T. F. (2005). The effects of a math racetrack with two elementary students with learning disabilities. *International Journal of Special Education*, 20(2), 58-65.
- Bishop, L., McLaughlin, T. F., & Derby, K. M. (2011). A comparison of direct instruction flashcards and reading racetracks on the acquisition and generalization of core words in context for a seven-year-old elementary student with health impairments, learning delays, and behavioral concerns. *International Journal of Social Science and Education*, 1(4). Retrieved from: <http://ijsse.com/>
- Carnine, D., Silbert, J., Kameenui, E. J., & Tarver, S. (2004). *Direct instruction reading* (4<sup>th</sup> ed.). Upper Saddle River, NJ: Pearson Publishing.
- Carter, M., McLaughlin, T. F., Derby, K. M., Schuler, H., Everman, J. (2011). Differential effects of cover, copy, and compare in spelling with four high school students with severe behavior disorders. *Academic Research International*, 1, 44-52. Retrieved from: <http://www.journals.savap.org.pk/issue.html>
- Cooper, J., Heron, T., & Heward, W. E. (2007). *Applied behavior analysis* (2<sup>nd</sup> ed.). Upper Saddle River, NJ: Prentice-Hall/Pearson.
- Engelmann, S., Haddox, P., & Bruner, E. (1983). *Teach your child to read in 100 easy lessons*. New York: Simon & Schuster.
- Erbey, R., McLaughlin, T. F., Derby, K. M., & Everson, M. (2011). The effects of using flashcards with reading racetrack to teach letter sounds, sight words, and math facts to elementary students with learning disabilities. *International Electronic Journal of Elementary Education*, 3(3), 213-226. Retrieved from: <http://www.iejee.com/index.html>
- Falk, M., Band, M., & McLaughlin, T. F. (2003). The effects of reading racetracks and flashcards on sight word vocabulary of three third grade students with a specific learning disability: A further replication and analysis. *International Journal of Special Education*, 18(2), 51-57.
- Green, C., McLaughlin, T. F., Derby, K. M., & Lee, K. (2010). Using reading racetracks and flashcards to teach sight words to students with disabilities: Effects for acquisition and response maintenance. *Journal of Educational Research: JER*, 13(2), 84-98. Retrieved from: [http://www.iub.edu.pk/jer/previous\\_issue.html](http://www.iub.edu.pk/jer/previous_issue.html)
- Horner, R., Carr, E., Halle, J., McGee, G., Odom, S., & Wolery, M. (2005). The use of single-subject research to identify evidence-based practice in special education. *Exceptional Children*, 71, 165-180.
- Hyde, C. A., McLaughlin, T. F., & Everson, M. (2009). The effects of reading racetracks on the sight word fluency and acquisition for two elementary students with disabilities: A further replication and analysis. *The Open Social Science Journal*, 2, 1-4. Retrieved from <http://www.benthamscience.com/open/tosscij/>
- Kaufman, L., McLaughlin, T. F., Derby, K. M., & Waco, T. (2011). Employing reading racetracks and DI flashcards with and without cover, copy, and compare and rewards to teach of sight words to three students with learning disabilities in reading. *Educational Research Quarterly*, 34, 24-44

Lindsley, O. R. (1991). Precision teaching's unique legacy from B. F. Skinner. *Journal of Behavioral Education, 1*, 253-266.

McLaughlin, T. F., Weber, K. P., Derby, K. M., Hyde, C., Violette, A., Barton, C., Petersen, P., Green, C., Verduin, S., Printz, K., Gonzales, R., & Arkoosh, M. (2009). The use of a racetracks procedure to improve the academic behaviors of students in special and remedial education: Suggestions for school personnel. In O. Demir & C. Celik (Eds.). *Multimedia in education and special education* (pp. 95-111). Columbus, OH: Nova Science Publishers, Inc.

McLaughlin, T. F., Weber, K. P., Derby, K. M., Hyde, C., Violette, A., Barton, C., Petersen, P., Green, C., Verduin, S., Printz, K., Gonzales, R., & Arkoosh, M. (2011). The use of a racetrack procedure to improve the academic behaviors of students in special and remedial education: Suggestions for school personnel. In Melanie L Falese (Ed.). *Encyclopedia of educational research (2 Volume Set)*. Columbus, OH: Nova Science Publishers, Inc.

Marchand-Martella, N. E., Slocum, T. A., & Martella, R. (2004). (Eds.) *Introduction to direct instruction*. Boston, MA: Pearson Education, Inc.

National Reading Panel. (2000). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction*. Available online: <http://www.nichd.nih.gov/publications/nrp/smallbook.htm>.

National Research Council. (1998). *Preventing reading difficulties in young children*. Washington DC: National Academy Press.

Printz, K., McLaughlin, T. F., & Band, M. (2006). The effects of reading racetracks and flashcards on sight word vocabulary: A case report and replication. *International Journal of Special Education, 21*(1), 103-108.

Rinaldi, L., & McLaughlin, T. F. (1996). The effects of reading racetracks on the fluency of see-to-say words in isolation by a student with learning disabilities. *Journal of Precision Teaching and Celeration, 13*(2), 44-52.

Rinaldi, L., Sells, D., & McLaughlin, T.F. (1997). The effects of reading racetracks on sight word acquisition of elementary students. *Journal of Behavioral Education, 7*, 219-234.

Romjue, H., McLaughlin, T. F., & Derby, K. M. (2011). The effects of reading racetracks for teaching sight words. *Academic Research International, 1*(2) 134-146. Retrieved from: <http://www.journals.savap.org.pk/issue.html>

Ruwe, K., McLaughlin, T. F., Derby, K. M., & Johnson, K. (2011). The multiple effects of direct instruction flashcards on sight word acquisition, passage reading, and errors for three middle school students with intellectual disabilities. *Journal of Developmental and Physical Disabilities, 23*, 241-255.

Shapiro, E.S. (2011). *Academic skills problems: Direct assessment and intervention* (4th ed.). New York: Guilford Press.

Siegel, S. (1956). *Non parametric statistics for the behavioral sciences*. New York: McGraw-Hill.