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# Effects of Direct Instruction Flashcards and Reading Racetracks on Sight Word Acquisition and Maintenance for a Student with Autism

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Effects of Direct Instruction Flashcards and Reading Racetracks on Sight Word  
Acquisition and Maintenance for a Student with Autism

by

Chelsea M. Burton

A THESIS

Presented to the Faculty of  
The Graduate College at the University of Nebraska  
In Partial Fulfillment of Requirements  
For the Degree of Master of Arts

Major: Special Education

Under the Supervision of Professors John Maag & Michael Hebert

Lincoln, Nebraska

July, 2018

Effects of Direct Instruction Flashcards and Reading Racetracks on Sight Word

Acquisition and Maintenance for a Student with Autism

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University of Nebraska, 2018

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A student's abilities in literacy can be indicative of his/her ability to live successfully in our society (Rinaldi, Sells, & McLaughlin, 1997). The ability to read is an area of difficulty, particularly for many students with autism spectrum disorders. Two fundamental cognitive processes required for skilled reading are word recognition and reading comprehension (Spector, 2010). Struggles with word recognition hamper the ability of students with ASD to work towards the goal of literacy (Spector, 2010). Browder and Xin (1998) argued that sight word instruction is important because that knowledge provides a foundation for other functional academic skills. The purpose of this study was to implement and evaluate an instructional method for teaching sight words to students with autism using direct instruction with flashcards and a reading racetrack. The study focused on one elementary school student with autism. A multiple probe design was used across word sets to evaluate the effectiveness of the intervention with this student. Results of the study showed that the instructional intervention using both direct instruction with flashcards and a reading racetrack, can be an effective way to teach sight words to students with autism.

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## CHAPTER 1: INTRODUCTION

Most educators would agree that literacy is an extremely important academic skills a student can acquire. A student's abilities in literacy can be indicative of his or her ability to live successfully in our society (Rinaldi, Sells, & McLaughlin, 1997). However, several years ago, the National Center for Education Statistics (2015) determined that only about one-third of fourth-grade and eighth-grade students have acquired the skills to read at a proficient level.

The ability to read is an area of difficulty, particularly for many students with autism spectrum disorders (ASD). Two fundamental cognitive processes required for skilled reading are word recognition and reading comprehension (Spector, 2010). Furthermore, for successful reading comprehension to take place, Hoover and Gough (1990) posited that both word identification and oral language comprehension are necessary. Oral language comprehension and word recognition have both been identified as impairments for students with ASD on an individual level (Åsberg & Dahlgren Sandberg, 2012) and these difficulties may pose as obstacles to reading comprehension for students with ASD.

Struggles with word recognition hamper the ability of students with ASD to work towards the goal of literacy (Spector, 2010). Browder and Xin (1998) argued that sight word instruction is important because that knowledge provides a foundation for other functional academic skills. These authors also stated that the ability to read sight words can vastly improve the quality of life for individuals with ASD by providing life skills as well as job opportunities.

A number of previous research studies have been conducted to evaluate interventions for sight word instruction with students with a variety of disabilities. Within these studies, providing specific instruction of sight words in isolation using flashcards emerged as a research-based technique for teaching discrete skills to students (Kupzyk, Daly, Andersen, 2011). This approach, often referred to as direct or explicit instruction came from applied behavior analysis with its emphasis on scripted lessons, prompting, systematic reinforcement, and immediate error correction (Engelmann, Becker, Carnine, and Gersten, 1988).

In one study, Ruwe, McLaughlin, Derby, and Johnson (2011) used direct instruction flashcards to study sight word acquisition in three middle school students with intellectual disabilities. They found that the direct instruction flashcards were an effective way to teach sight words to these students, further expanding upon their previous research using direct instruction flashcards to teach math facts.

Other researchers have investigated the effects of direct instruction flashcards combined with another instructional strategy, reading racetracks. The reading racetrack is laid out like a game board, with examples of the target skill included in each cell (See below for an example of a reading racetrack used in the current study). These racetracks provided an additional drill and practice component which, in turn, helped students develop both accuracy and fluency (Crowley, McLaughlin, & Kahn, 2013). Erbey, McLaughlin, Derby, and Everson (2011) used this combination of instructional procedures to teach letter sounds, sight words, and math facts to a group of three students in elementary school with specific learning disabilities in math, reading, and writing. One

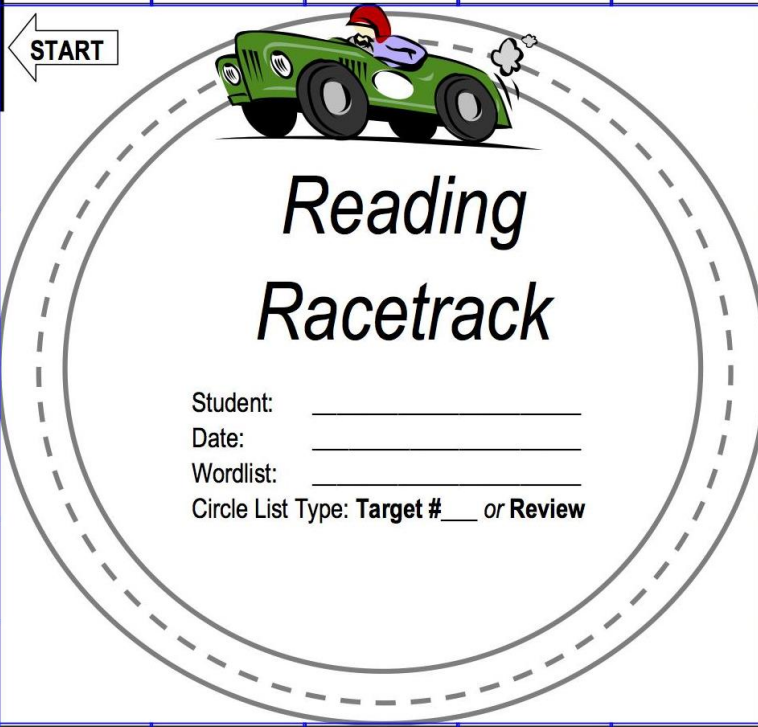
28	vowel	27	early	26	following	25	change	24	usually	23	whole	22	system
1	<b>system</b>	 <p style="text-align: center;"><b>START</b> ←</p> <p style="text-align: center;"><i>Reading Racetrack</i></p> <p>Student: _____  Date: _____  Wordlist: _____  Circle List Type: <b>Target #__ or Review</b></p>										21	machine
2	change											20	vowel
3	around											19	following
4	machine											18	ground
5	whole											17	change
6	vowel											16	early
7	following											15	usually
8	early											9	usually

Image 1.1 Example of a Reading Racetrack as used in the current study.

of the participants was almost four years older than the other two participants and had also been diagnosed with both attention deficit hyperactivity disorder (ADHD) and traumatic brain injury (TBI). McLaughlin and colleagues demonstrated that pairing flashcard instruction with the reading/math racetrack was beneficial to each student, whose reading or math skills were improved. However, one confound of this particular study was that the participant with ADHD and TBI did not take his medicine everyday, which led to uneven performance.



Kaufman, McLaughlin, Derby, and Waco (2011) also employed a combination of the reading racetrack and direct instruction flashcards with a group of three elementary school students, ages seven to nine, with learning disabilities in reading to evaluate effects on their sight word reading. These researchers found the combination of direct instruction using flashcards with the reading racetrack component to be an effective intervention for all three students who demonstrated dramatic improvements in intervention compared to the baseline phase. Like the study conducted by Erbey et al. (2011), Kaufman and colleagues encountered a difficulty with one participant, who was still struggling to learn the words. However, in this study the researchers were able to adjust for the struggles the student was presenting by using a repeated writing piece to help him learn the words more thoroughly. One participant also showed what they labelled “a lack of motivation” as they moved through the study, so the researchers implemented a reward system for this participant which then showed a significant increase in effort, leading to an improvement in his correct responses.

Rather than employing this instructional procedure with younger students, Green, McLaughlin, Derby, and Lee (2010) evaluated the same program of direct instruction flashcards and reading racetracks with two 12-year-old students subsequently entering middle school. One student was diagnosed with a severe behavior disorder as well as a learning disability in the areas of reading, writing, and math. The second student had severe scoliosis as well as reading two grade levels below his current grade. As well as evaluating this procedure with students of different ages, Green and colleagues also included a measure for maintenance of treatment effects, which was not included in either Erbey et al. (2011) or Kaufman et al. (2011).

Green et al. (2010) found that this instructional procedure was successful for both of their participants as each student increased their ability to read the target sight words. Additionally, when the researchers applied a one session reversal phase, they found treatment effects were maintained after it was removed.

While previous studies looked at the effects of the combination of direct instruction using flashcards and reading racetrack practice for students with various learning disabilities, only one study was found that investigated the effects of this program on students with ASD. Crowley, McLaughlin, and Kahn (2013) studied the effects of this instructional procedure on two seven-year-old students with ASD, one of whom used an assistive communication device in the classroom to help with his expressive communication. Both students displayed some challenging behaviors that may have made it difficult for them to be successful in group instruction.

Similar to Erbey et al. (2011) and Kaufman et al. (2011), Crowley et al. (2013) encountered a few obstacles with the participants, and needed to adjust the study according to students' needs. The participant who used a communication device struggled with focusing on the target sight words as well as with saying the words without prompting from the instructors. As a result, Crowley and colleagues began using an iPad as motivation as well as assistance during the reading racetrack portion of the instruction. They found that this technique of combining direct instruction flashcards with the reading racetrack component was also successful for teaching sight word acquisition to these two students with autism. Additionally, these researchers were able to demonstrate that the intervention could be modified for implementation with students that used assistive technology. However, due to the large amount of variation shown in the abilities of

students with autism, conclusions regarding the generalization to other students with autism should be made cautiously (Nation, Clarke, Wright, & Williams, 2006).

The current evidence base provides data to support the effectiveness of using both direct instruction and reading racetracks to teach sight word acquisition to students. These studies demonstrated that the combination of the reading racetrack with the direct instruction provided a motivation for the students as well as valuable additional practice.

Although multiple researchers have documented the benefits of this instructional procedure on students with a variety of learning, behavioral, and intellectual disabilities, there is limited investigation into the effects of this program for students with ASD. Consequently, the purpose of the present study was to investigate the effects of direct instruction with flash cards combined with a reading racetrack component to teach sight word acquisition to a nine-year-old student with ASD. Research reviewed previously demonstrated the effectiveness of this instructional technique for many students with a variety of disabilities, but failed to examine continued maintenance of the treatment effect. By using a multiple-probe experimental design, the current study will allow for a maintenance measure as well as continued maintenance of the skills obtained during the intervention.

A second purpose of the present study was to extend and replicate the previous research of Crowley et al. (2013) using direct instruction flashcards with a reading racetrack to an older student with ASD in a different special education classroom. Data will be collected on number of sight words read correctly during the baseline phase as well as during the treatment phase following the application of the instructional intervention. The goal in the present study was to determine whether instruction with

flashcards combined with the reading racetrack is an effective way to teach sight words to students with ASD.

## CHAPTER 2: METHOD

### **Method**

A multiple-probe design across word lists was used to evaluate the effects of direct instruction with flashcards and a reading racetrack on a student with ASD to improve sight word acquisition. A multiple probe design was chosen because it is useful for demonstrating experimental control within the participant's performance across the word sets introduced. Due to anticipated low responding during the baseline phase because of the lack of prior instruction on these sight words, the multiple-probe design is well-suited to show the student's beginning level of performance while avoiding extended measurement during the second and third word sets which may provide unintended additional practice. Consequently, it is unlikely that there would be changes in the baseline data during the extended baseline, because the students will not be receiving any instruction on the second and third word sets when the intervention is applied with the first sight word set. Due to the lack of change in the subsequent baselines, this design demonstrates experimental control, as the student is acting as his own control. Additionally, the multiple probe design allows for fewer measurements which reduces the likelihood that the student will improve due to the repeated testing.

### **Participant**

The researcher obtained approval from the Institutional Review Board (IRB) before participant recruitment. Potential participants were gathered from a selection of

students that were currently participating in the reading center. The reading center manager pulled a selection of student names that fit the criteria for the study and contacted the families to determine interest in the study. If the parents expressed interest, the reading center manager acquired permission for the researchers to contact them. After contact was made by the researchers, an initial meeting was scheduled to explain the study to the parents and potential participants. At the conclusion of this initial meeting, the researchers obtained consent from the parents of one potential participant through a written informed consent form. The researchers then arranged times for future meetings with the participant who provided verbal assent when asked if he was willing to work with the researchers on reading words.

This study focused on one participant, a 9-year-old male with a documented diagnosis of Autism Spectrum Disorder (ASD). The student was in fourth grade at the time of the study. The student qualified for special education services based on his ASD diagnosis and received services for academic and social/behavior goals as part of his individualized education plan (IEP). The student displayed some challenging behaviors that made group instruction an area of difficulty. Some of these behaviors included screaming, crying, making noises, and hitting. The participant performed at or below the 5th percentile on all reading measures used for screening which are described in a subsequent section.

In addition to these scores, the family provided the student's scores on DIBELS Oral Reading Fluency score and Measure of Academic Progress (MAP), tests administered by his school, to the reading center with his application. These scores were made available to the experimenter via his IEP after the parental consent was given. On

the DIBELS Oral Reading Fluency, the student was able to read nine words per minute with 53% accuracy. The goal for third grade is to read 70 words correctly per minute. The student's MAP scores for reading in the semester prior to the beginning of the study were at the 9th percentile. Due to his scores on these assessments, his parents were concerned with his reading achievement and decided to look to the reading center for assistance.

### **Setting**

The study took place in a reading clinic at a university in the midwest as well as a public city library. The screening sessions took place at the reading clinic. Based on a parental request, baseline and intervention sessions were moved to a city library that was closer to the student's home, making it more convenient for transportation.

At the reading center, students enter the building and must navigate a short hallway to the entrance of the reading center. When entering the reading center, there is a friendly reception area where guests are greeted by the receptionist and checked in. After checking in, students and their families are able to wait in the reception area on comfortable chairs and couches until they are called back. Once through the reception area, students are taken back to the main study room. In the study room, desks are arranged around the room so that each desk is mostly separated from the rest of the room as well as extraneous distractions. In order to further minimize distractions, the researchers arranged for the screening sessions to take place when other students were not in session at the reading clinic. Additionally, the researchers chose the desk that was furthest from the entrance of the reading clinic, away from the distractions of the front office as well. When in the reading center, the participant specifically requested a chair with wheels on the bottom, which was provided by the researchers.

Because the student lived outside of the city, the parents requested that the study be moved to a more convenient location. To accommodate this request, the intervention sessions were moved to a city public library closer to the edge of the city, and the student's home. At the library, there were booths along a back wall that provided a workstation that was relatively secluded. On occasion, the tables in the booth area had papers or bookmarks on them, which provided a temporary distraction for the student but were immediately moved by the researcher. A specific booth was reserved daily for this study, so the student didn't need to adjust to a new table each day.

### **Measures**

**Screening.** An initial screening was conducted in order for the student to qualify for participation in the reading center. The student was given the Woodcock Reading Mastery Test (WRMT) and the Test of Silent Reading Efficiency and Comprehension (TOSREC) upon application to the reading center, approximately six months prior to the beginning of the study. On the WRMT, the student was given the Word Identification, Word Attack, and Passage Comprehension subtests.

**Word Identification Subtest.** For this subtest, students are asked to read a list of words that start easy and get progressively more difficult. This test gives an idea about the difficulty of words that the student already knows. On this subtest, the participant scored at the 2nd percentile. The test-retest reliability coefficient is 0.92.

**Word Attack Subtest.** For this subtest, students read a list of "nonsense" words. The words included follow the rules of the English language. Again, the words start out easy and get progressively more difficult. This test gives an idea of how well the student is able to sound out or "attack" words that he did not know. On this subtest, the

participant scored at the 5th percentile. The test-retest reliability coefficient for this subtest is 0.88.

***Passage Comprehension Subtest.*** For this subtest, students read short passages that have a missing word and have to use clues in the sentence or picture to decide what the missing word should be. This test gives an idea for how well the student is able to understand the sentences he is reading. On this subtest, the participant scored at the 2nd percentile. The test-retest reliability coefficient for this subtest is 0.90.

***Test of Silent Reading Efficiency and Comprehension.*** On the TOSREC, students read as many of the listed sentences as they are able to in 3 minutes. For each sentence, they have to decide if it is true or not true. This test gives an idea of how fast the student is able to read and understand sentences. On this test, the participant scored below the 1st percentile. The test-retest reliability coefficient for this test ranges from 0.81-0.87 depending on the form used.

**Dependent Variable.** The dependent variable was the number of correctly read words. In order to assess the student's acquisition of sight words, collecting data on whether or not he was able to read the words correctly will show if he had learned the target sight words. This assessment was conducted by the researcher using the same flashcard method used in baseline. The student received credit for a correctly read word when it was correctly stated within 3 seconds (including self-corrections). If a word was omitted, mispronounced, substituted, skipped, or the student paused for more than 3 seconds, it was scored as incorrect. Results are scored as correctly read words out of total number of words read. The researcher measured the dependent variable at the beginning of the session that followed the instruction.



## Materials

Materials used during the study included 4 by 6 in. index cards with the target sight words printed on them in landscape orientation. Three different word sets were created for the participant based on the sight words presented prior to beginning baseline. For each word set, reading racetrack practice portions were implemented following instruction. Each word list required different versions of the reading racetrack, so that the student would not learn the sequence of the words, resulting in twelve total reading racetracks. The words from each set were printed randomly around the track. For the second and third word sets, the sight words from the previous sets were also included

<b>Word List 1</b>	<b>Word List 2</b>	<b>Word List 3</b>
around	answer	against
early	course	country
following	oil	decided
vowel	enough	happened
change	figure	products
system	piece	several
usually	round	slowly
ground	unit	would
machine	toward	really
whole	surface	understand

Image 2.1 A collection of the word lists used in the current study.

around the track. Following the flashcard instruction, the student was able to choose a place marker from a collection of themed erasers to use on the reading racetrack to keep his spot.

### **General Procedures**

For maximum benefit of the instructional intervention, unknown sight words were needed. Sight words were chosen as potential stimulus items from high-frequency word lists. If the student was unable to read the word when presented, the word was added to an unknown word list. The unknown words were then assigned to one of three word lists.

The intervention consisted of direct instruction of sight words using flashcards as well as a reading racetrack practice portion. After five baseline data points were obtained for the first list of words, the participant entered the intervention phase for that sight word list. Word lists two and three remained in baseline. After the participant reached mastery on word list one, he entered the intervention phase for list two. The same process was repeated for word list three. The instructional session, following assessment, began with instruction of sight words from the current word list, followed by the reading racetrack for the student to practice for fluency. During every instructional session, the researcher employed immediate error correction for both the sight word instruction and the reading racetrack. At the beginning of the next session, the student completed an assessment of sight word knowledge and learning from the previous session.

The study lasted a total of 17 sessions, including initial screenings, baseline and intervention for each word list, as well as maintenance data collection. Each session lasted approximately 20 minutes. Data collected in each session were de-identified and then stored in file folders inside of a locked file box. The locked file box was stored in

the researcher's locked office. Additionally, because the sessions were audio recorded, the audio recordings were stored on a secured computer in the locked office of the researcher.

### **Instructional Procedures**

The instructional intervention began each day after the data collection/daily assessment were completed. To collect baseline data on each word set, the researcher presented a set of unknown words to the student one at a time. The researcher prompted the student to try to read the word, but allowed the student to say "skip" if he did not know the word. After three seconds, if the student did not provide a response, the researcher removed the card from the student's view and asked him to try the next word. During data collection, the researcher provided no reinforcement for correctly or incorrectly read words.

After the researcher collected five baseline data points for word list one, intervention began. On the first day of intervention on a specific word set, the researcher began by showing the student the sight word cards for the first list one at a time. The instructor said, "This word is \_\_\_\_" and then prompted the student to repeat the word with her, "Say it with me, \_\_\_\_". Finally, the instructor prompted the student to say the word again independently, "Now your turn. Read the word". Each sight word from the word set followed this procedure and then the card was placed at the back of the pile. The instructor went through this procedure twice for the entire word set.

After that instruction was finished, the instructor shuffled the cards and presented them each to the student individually. As in baseline, the instructor presented the card, and said "read the word" or "what word" and waited for the student response. However,

in the treatment phase, if the student read the word incorrectly or failed to answer in three seconds, the instructor began immediate error correction (mimicking the instruction from earlier). The instructor said, “This word is \_\_\_\_\_”, then prompted the student to read it with her, “Say it with me, \_\_\_\_\_” and finally prompted the student to read the word independently by saying, “Now your turn. Read the word”. Following the error correction for that word, the card was moved a few cards back in the pile so that it was repeated soon after the correction. The instructor progressed through the entire word set in this manner.

Following the instruction of the words in the set, the instructor implemented the reading racetrack. The reading racetrack consisted of the student rapidly reading the sight words in a game board type layout and moving a place marker around the track to keep their place. For each session, the researcher had two reading racetracks prepared. The first track contained words from the sight word set that the student was currently working on but had not yet mastered, in a random order. The second track consisted of words from the current set as well as words that the student had mastered from previous sets (for word list one, two different race tracks were used, however both consisted completely of words from that word set). On each reading racetrack, each word was written in a randomized order so that the student would not learn the words based on their order on the racetrack. The first few times the student used the reading racetracks, the instructor began by using hand-over-hand prompting, pointing to the first word on the track and prompting the student to read it by saying, “read the word” or “what word”. If the student responded correctly, the instructor helped the student move their place marker and prompted them to read the next word, and so on, while working quickly to fade the help

from the instructor. If the student read the word on the reading racetrack incorrectly, the researcher again employed the immediate error correction procedure in the same way as the flashcards.

If the student had been provided instruction for a specific word set, during the subsequent instructional sessions for that word set, rather than beginning with explicit instruction of the words, the instructor began with shuffling the cards and presenting them to the student and providing error correction if needed.

In baseline sessions, as well as intervention sessions, if the student became distracted (i.e., talking about something off topic, looking around the room, or getting out of his seat) the instructor would provide a redirection (“please sit down and read the word” or “eyes on me! Read the word” etc.) to get the student back on task. During the baseline phase, the student only received praise for hard work, on-task behavior, and staying appropriately in his seat; no feedback was provided on correctly or incorrectly read words. During the intervention phase, the immediate error correction functioned as the student’s feedback, but additionally included praise for hard work, on-task behaviors, and staying appropriately in his seat.

### **Interrater Reliability and Treatment Fidelity**

In order to assess interrater reliability and treatment integrity, each assessment and instructional session were audio-recorded. To determine interrater reliability, a second independent observer listened to 40% of the audio-recordings of the assessment sessions and scored the student’s responses. The observer was given the list of words assessed during that session and then marked the response as either correct or incorrect when listening to the audio-recording. Agreements and disagreements between the

researcher/instructor and the independent observer were determined for the sessions sampled. For each session, percent interrater reliability was calculated by dividing the total number of agreements by the total number of agreements plus disagreements and multiplying by 100%. The overall interrater reliability was 100% across all sessions.

To determine whether or not the intervention was delivered with fidelity, a script was developed in the form of a checklist. The independent observer listened to 40% of the audio-recorded sessions and scored the treatment fidelity based on the checklist. The observer recorded whether the researcher implemented each step according to the checklist or not (based on presentation, error correction, and feedback). The percentage of steps implemented correctly was calculated by dividing the steps implemented correctly by the total number of steps for the intervention. The mean treatment integrity was 100%.

### **Data Analysis**

Assessments were scored and data graphed daily in order to assess levels and trends in data from day to day. Graphed data were visually inspected for trends in the data, variability within the data, as well as the change in level from baseline to intervention. When examining trends in the data, researchers looked specifically for upward trends in baseline that may suggest a threat to internal validity. When deciding whether baseline data points were stable, the researchers were looking for limited variability in the baseline data points, as well as the absence of any upward trends in the data.

When researchers looked at the data to determine whether or not there was a treatment effect, they performed a visual analysis of the difference in level between the

baseline phase and the intervention phase. When looking at the levels in the data, the researchers calculated the mean of the data points in each phase (baseline, intervention, and maintenance). From the levels in baseline and intervention, researchers looked at the variability of the data points about the mean, considering that higher variance can relate to the instability of the data in the phase.

For an additional measure of maintenance at the end of the study, the flashcards with the target sight words from each word list were shuffled together and presented to the student in a mixed assessment of maintenance. Each word was scored with their appropriate word list. There is only one data point for this assessment, included as the final data point in each graph, marked with a triangular data point. This presentation of the sight words in a mixed list order gives a small indication as to the generalization of the students' newly acquired sight word knowledge.

## CHAPTER 3: RESULTS

### **Results**

For sight word list 1, the mean number of words read correctly during baseline was 1.67 words and the variability in baseline is low. During intervention, a rapid increase in number of correctly read words was seen, moving from an average 1.86 correct words out of 10 in baseline to 9.33 during intervention. This change in mean also

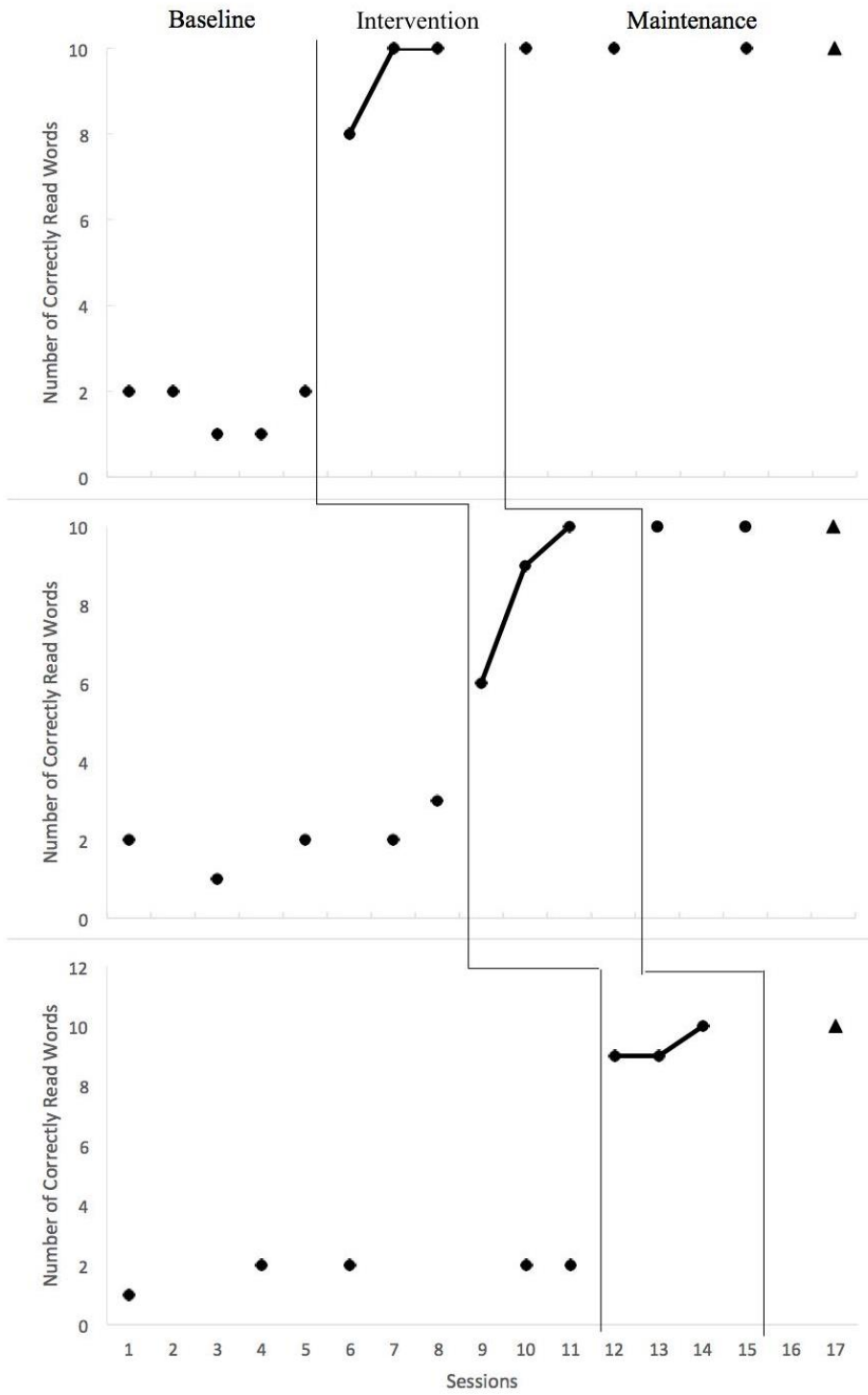


Figure 3.1. Number of Correctly Read Words per session by the participant across three different word lists.



Table 3.1 Descriptive Statistics

List	<u>Baseline</u>	<u>Intervention</u>	<u>Maintenance</u>
	Mean	Mean	Mean
1	1.66	9.33	10
2	2	8.33	10
3	1.8	9.33	10*

presented visually in a rapid change in level. While the baseline data for tier 1 could be interpreted as having a slight upward trend with the last two data points in baseline, the final data point did not exceed the amount of earlier data points, so the researchers proceeded to the intervention phase. The immediate change in level following the first instructional session shows that the treatment effect was much greater than any trend that may have been present in baseline. Additionally, there are no overlapping data points between the baseline and intervention phases, which again suggests a strong treatment effect. The maintenance data for word list 1 shows an mean of 10 words out of 10 were maintained over the remaining sessions.

For sight word list 2, the mean of correctly read words in baseline was 2 words. While the final data point from baseline for this word list showed a very slight upward trend, the researchers chose to move to instruction based because the significant jump in tier 1 between baseline and intervention suggested that the jump would exceed the one-point increase at the end of baseline. Additionally, because there was no real potential for a drop in “learned words”, it was unlikely that we would see the increase in baseline fall

back down. Furthermore, because this is not a continuous skill and each word was distinct, the student inadvertently learning one word would not indicate that the student would learn another word on the list without instruction. The increase following intervention showed a much bigger increase in correct number of words read than the upward trend in baseline would have suggested. This word set again showed a considerable increase in number of correctly read words compared to baseline, beginning with an average 2 correct words out of 10 and ending intervention with 8.33 correct words out of 10. This presented as a moderate change in level from baseline to intervention. The difference in trend when comparing the baseline phase to the intervention phase is considerable. The trend in the intervention phase is more gradual than the immediate step seen between the baseline and intervention phases in tier 1, but there is still a total lack of overlapping data points seen in tier 2. Maintenance for word list 2 is also at a mean of 10 words read correctly out of 10 for the maintenance probes.

The final list, sight word set 3, followed a similar pattern as the prior two-word lists. Beginning with a mean number of words read correctly at 1.8 words out of 10, word list 3 ended with 9.33 words correct out of 10. Sight word list 3 also shows a rapid increase in correctly read words when compared to baseline, resulting in a large change in level between phases. The data in baseline was very stable, showing a very small amount of variability or trend. In the intervention phase, tier 3 showed the smallest variability of the three tiers. Maintenance data collected for sight word list 3 also demonstrated maintenance of the sight word knowledge; however there were fewer maintenance points able to be collected for tier 3 due to time constraints.

The data collected for each sight word list demonstrates a positive treatment effect based on the considerable upward trends in the intervention data. In addition, the significant change in level shown between the baseline and intervention data demonstrates a significant treatment effect. In each of the word lists, there are no overlapping data points between the baseline and intervention phases, again showing a significant treatment effect. Experimental control was demonstrated by the lack of any significant trend in the baseline data for any of the three-word lists, as well as the stability shown in the baseline data after the instructional intervention was implemented.

#### CHAPTER 4: DISCUSSION

##### **Discussion**

This study was originally designed with a sentence reading component, with the intention of determining whether or not the student's newly acquired sight word knowledge was able to generalize to the students' reading of sentences in books, and assignments. In order to collect baseline data on the students' sentence reading, the student read a collection of sentences that included the target sight words. However, after two lessons, it was evident to the researchers as well as the student that the student was learning the target sight words from the context of the sentences for baseline. Because this sentence generalization measure was not the primary intention of the study, the researchers discontinued the use of this measure after two lessons. To account for the target sight words that the student had already learned from the sentences, another list of target sight-words was formulated and used, discarding the initial first sight word list that had been partially learned.

The current research study focused on evaluating the instructional intervention of direct instruction using flash cards combined with a reading racetrack component and its effects on sight word acquisition for a student with autism. Word recognition is recognized as one of the two fundamental cognitive processes required for a student to become a skilled reader (Spector, 2010) and has also been a specific area of impairment identified for students with autism (Åsberg & Dahlgren Sandberg, 2012). By working to improve sight word acquisition for a student with ASD, the researchers hoped to find an effective way to teach word recognition to these students.

This research study showed a positive treatment effect based on a direct instruction program using flashcards used in combination with a reading racetrack component with this 4th grade student that has been diagnosed with autism spectrum disorder (ASD). The findings of this study are consistent with the previous study by Crowley et al. (2012) which the researchers intended to replicate, showing a positive treatment effect based on the intervention implementation.

The outcomes demonstrated in this study suggest that direct instruction flashcards used with a reading racetrack component can be an effective instructional intervention to improve sight word identification in students with autism. This data is consistent with many previous studies that investigated this intervention with students of different ages with a variety of other disabilities (Ruwe et al., 2011; Erbey et al., 2011; Kaufman et al., 2011; Green et al., 2010; Crowley et al., 2012). This study also extends the research literature on this subject by providing a new take on the experimental design for this type of research, avoiding the prolonged baseline measurements, while still demonstrating experimental control as well as a positive treatment effect. In addition, using the

multiple-probe experimental design allowed for a more prolonged collection of maintenance data, which has not been seen in previous research.

One of the reasons that this intervention seemed to be so successful for this student in particular was the reading racetrack. The reading racetrack component was a particularly motivating piece of the intervention for this student. He particularly enjoyed “racing” himself to read the words quickly and accurately, even requesting for the researchers to time him so that he could try to beat his times. The student also appeared to be motivated by the variety of fun erasers that he was able to choose from for his “game piece” when moving around the racetrack. The flashcards however, were not a particularly motivating piece of the intervention, but were seen to be better than individual word lists. Initially, the student was given the entire word list to read, with the previous and upcoming words both covered while he read the target word shown. This proved to be difficult for the student when the 3 second time frame was up. The student would become frustrated at the researcher for moving on to the next word when he hadn’t finished trying to sound out the previous word yet. In the next lesson, researchers presented the words on flashcards, one target word per card, and the student’s frustration was almost completely erased.

By demonstrating this significant increase in sight word acquisition for this student with autism, there is a hope that the student’s overall reading ability would also increase. One limitation to the current research is the lack of measures regarding generalization of this new sight word knowledge. The current study does not address the application of sight word knowledge to other locations or sight word recognition when

the sight word is embedded in a text. These considerations clearly indicate the need for continued research in this area.

In the present study, direct instruction flashcards combined with a reading racetrack component appears to be an effective method for instruction of sight words to students with autism. This method allows for words to be taught as well as maintained over time. For this reason, this technique may be useful for special educators who need a simple but effective method to teach sight words to their students. The present study indicated the usefulness of this technique with a student with autism that dealt with difficulties working in a general education classroom due to his struggles to control his behaviors. The participant in this study was also dealing with a variety of medication changes throughout the course of the study, but the participant was still able to gain sight word knowledge during the study.

### **Limitations**

This study was limited in terms of the number of participants as well as the timing of the study. Because the researchers mainly recruited from the reading center, the access to students with diagnosed ASD was limited, resulting in the focus on only one student. Although the intervention seemed to be quite effective for this student, as mentioned previously, further replication with this intervention and population is needed. Additionally, due to the limited participant pool, the researchers worked quite closely with the parents of the participant for scheduling. At the beginning of intervention for the 3rd tier, the participant's mother informed the researchers that she would only be bringing the student to meet for three more days. Luckily, the primary researcher was

able to negotiate one extra meeting to collect the mixed maintenance data, but this change in scheduling did limit the maintenance data able to be collected for the 3rd tier.

Another limitation to consider when looking at the data collected in this study is that of the lesson scheduling. Based on the parent's preferences for days to meet each week, the intervention phase for each tier typically began on the last meeting day of the week, which in turn resulted in the first assessment data point for each tier being collected about 3 days after the first instruction for that word list took place. This may have had an effect on the first data point for each tier. If the researchers had been able to adjust scheduling for the lessons so that the assessment data for the instruction was taken the very next day, the intervention may have been seen as even more effective.

### **Implications for Future Research**

Due to the large amounts of variability in student abilities in students diagnosed with autism, it would be beneficial to continue research in this area for students with autism of different ages and ability levels. Crowley et al (2012), provides some data on a student with alternative communication needs, but there are so many different ability levels within the spectrum of autism diagnoses that it necessitates continued research.

Additionally, as previously mentioned, the generalizability of this newly gained sight word knowledge is unknown. Further research should look at the student's ability to read more difficult words in sentence context, in the hopes that the student would not be able to learn the target sight words through the context of the sentences.

Another idea for continued research would be to examine the components of the intervention to look at the value added by the reading racetrack component. One way this

could be done would be to use an A-B-C design, using phase A for baseline, phase B for flashcards only, and phase C for flashcards plus the reading racetrack. Furthermore, future researchers might also look at the motivating factor of the reading racetrack by comparing it to a different type of motivator, such as a chart move. This could be done using an alternating treatments design to compare the motivational value of the reading racetrack to that of the chart move.

### **Conclusion**

In conclusion, this approach to sight word instruction was very effective for this student with ASD. He showed a significant jump in the level of words he knew after intervention took place. The intervention may have been even more effective if the assessment of the word lists was done the same day or the very next day, however the current schedule of assessment was able to show that the student was able to maintain their newly acquired sight word knowledge, even over a 3-day weekend. This research is important for educators to consider when they are working with students with ASD and suggests an effective technique for instruction of sight words for these students.



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