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THE EFFECTS OF DIRECT INSTRUCTION FLASHCARDS AND COMPUTER TIME TO TEACH SIGHT WORDS TO AN ELEMENTARY STUDENT WITH A LEARNING DISABILITY AND ADHD: A FAILURE TO DEMONSTRATE A FUNCTIONAL RELATIONSHIP

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Abstract: *The purpose of this study was to use Direct Instruction (DI) flashcards to teach high use sight words. The participant was a second grade student with a learning disorder and Attention Deficit Hyperactive Disorder (ADHD). The study was conducted in an elementary resource room in a low-income elementary school located in the Pacific Northwest. The behavior measured was number correct for high frequency words. An ABAB design was employed to evaluate the effectiveness of DI flashcards. The results showed mastery of 137 out of 150 high frequency words over time. In addition, the number of correct sight words increased over time. This outcome was replicated during the return to a second baseline. The lack of a reversal when DI flashcards were withdrawn was discussed.*

Key Words: *DI flashcards, high frequency words, sight words, resource room, learning disabilities, intellectual disabilities, elementary school student, ADHD*

Introduction

Reading can be seen as one of the most vital and important skills that students can learn in school, reading is essential for learning across multiple subject areas to take place. Learning is less likely to occur in social studies, math, or spelling without a solid foundation in reading (Kameenui, 1998). By the end of third grade children are expected to learn academic content through reading (Adams, 1990; I. Liberman & A. Liberman, 1990). If students are unable to read fluently and comprehend what they read, they will have difficulty in all academic areas. More than one-third of children have difficulties with reading (Adams, 1990; I. Liberman & A. Liberman, 1990; S. Shaywitz, Escobar, B. Shaywitz, Fletcher, & Makuch, 1992). Children with inadequate reading skills tend to fall much further behind their peers who are able to build upon existing literacy skills. Research has shown that a students reading ability in the first, third, and fifth grades remains a strong predictor of an individual's success in later grades (Cunningham & Stanovich, 1997; National Reading Panel, 2000).

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Review of Literature

The use direct instruction flashcards has been successful in teaching academic skills to a wide range of students. This has involved students with intellectual disabilities and developmental delays (Cole, McLaughlin, Neyman, & Johnson, 2012; Crowley, McLaughlin, & Kahn, 2013; Green, McLaughlin, Derby, & Lee, 2010; Hayter, Scott, McLaughlin, & Weber, 2007; Ruwe, McLaughlin, Derby, & Johnson, 2011), preschool students with and without disabilities (Chandler, McLaughlin, Derby, & Rinaldi, 2012; Delong, McLaughlin, Neyman, & Wolf, 2013; Fitting, McLaughlin, Derby, & Blecher, 2013; Mangundayo, McLaughlin, Williams, & Toone, 2013), elementary students with learning disabilities (Erbey, McLaughlin, Derby, & Everson, 2011; Glover, McLaughlin, Derby, & Gower, 2010; Kaufman, McLaughlin, Derby, & Waco, 2011; Lund, McLaughlin Derby, & Everson, 2012; Mann, McLaughlin, Derby, Williams, & Everson, 2012; McGrath, McLaughlin, Derby, & Bucknell, 2012), students with severe behavior disorders (Brasch, Williams, & McLaughlin, 2008; Pierce, McLaughlin, Neyman, & King, 2012), and general education students (Skarr, Zielinski, Ruwe, Sharp, Williams, & McLaughlin, 2014; Mann et al., 2012; Walker, McLaughlin, & Weber, 2012). Employing DI flashcards involves using a model, lead, and test procedure. Error cards are placed three or four from the top of the stack to they can be reviewed again (McGrath et al., 2012, Skarr, McLaughlin, Derby, Meade, & Williams, 2012; Walker et al., 2012). The two most common subject matter areas where DI flashcards have been implemented have been sight words in reading (Kaufman et al., 2011; McGrath et al., 2012; Ruwe et al., 2011) followed by mathematics (Brasch et al., 2008; Hayter et al., 2007; Mann et al., 2012; Walker et al., 2012)

A learning disability is a neurological disorder; it is a learning disability that results from a difference in the way a brain develops (Heward, 2012; Swanson & Hoskyn, 1998). Children with learning disabilities have normal or above normal intelligence, and no sensory deficits. To qualify for services, these students must have difficulty in areas taught in the common schools. With appropriate support and intervention, a child with a learning disability can succeed academically and be successful in life (Heward, 2012). The important thing for parents and teachers to remember is that children with disabilities need to have their learning catered toward their strengths and that knowledge of their weaknesses will allow for the better understandings of strategies that will be best suited for the child's learning needs (Heward, 2012). Combining a learning disability with ADHD can present unique issues for the schools (Barkley, 2006). Comorbid LD and ADHD can make classroom instruction very difficult for both student and teacher. Finally, these two issues can present problems for parents in working with the child and his education (Barkley, 2006).

The purpose of this study was to evaluate the effects of a DI flashcard system to increase sight-word reading for a single student with a learning disability and ADHD. The words were chosen from a pretest of 150 high frequency words used in the school district. The words read incorrectly for the pretest were placed on DI flashcards. Another purpose was to determine if the use of DI Flashcards combined with a computer consequence could be effective for teaching a student to with

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reading problems to identify high frequency words. The final purpose was to carry out a direct replication of McGrath et al. (2012) with a different student and academic year.

Methodology

Participant and Setting

There was one participant in this study. Our participant was selected by the first and fifth author because he had shown consistent low accuracy in curriculum based reading assessments, specifically with 2nd grade core words. The student displayed a lack of skills in basic phonics and frequently guesses at words or used pictures to help figure out a word he did no know. He also had significant delays in the areas of adaptive behavior, social skills, cognitive functioning, and communication. He had been diagnosed with ADHD. He had been enrolled in special education since preschool. He received specially designed instruction in the areas of math, reading, and writing due to his learning disability. He was labeled as learning disabled by the interdisciplinary team in his elementary school. The family pediatrician diagnosed the child with ADHD in the first grade. The participant had been into a foster home immediately after birth, then adopted when he was 3.5 years of age. Little was known about his biological mother, though it was known that she did not receive any prenatal care. There was no documented drug or alcohol exposure.

The study took place in the participant's resource room. He received specially designed instruction 3.5 hours a day. The classroom served 37 children throughout the school day. During the study, typically three to five other students were present in the classroom. The first author worked individually with the student, for 15 minutes, at an empty table away from other students. This was the same classroom employed in the McGrath et al. (2012) study employing DI flashcards and a reading racetrack procedure.

Materials

Flashcards, with 50 words were printed in lower-case letters. Two sets of 13 cards and two sets of 12 cards were developed. Four data sheets were developed (one for each set) to record corrects and errors. Also, an additional data sheet for the entire list of 150 words was developed.

Dependent Variable and Measurement

A single dependent variable was measured in this study. It was the number of sight words read correctly by our participant. A correct response was defined as the participant saying the word correctly when presented a flashcard containing that particular sight word. He was required to do so within 3s. If the student self-corrected within 3s, it was also scored as a correct word. A "+" was placed next to each word presented on the data sheet(s). These data were also gathered as a pre-and posttest for all of the high use words.

Experimental Design and Conditions

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A single subject ABAB design (Barlow, Nock, & Hersen, 2008; Kazdin, 2011; McLaughlin, 1983) was used to evaluate the effectiveness of employing DI flashcards and computer time. A description of each condition follows.

Baseline 1 and 2. During baseline, typical classroom procedures were in place. The first author went through the deck of DI flashcards with the participant. No instruction or feedback was provided. The first author scored each word on the data sheet by set. The participant was given a reward for participating at the end of each session. Baseline was in effect twice for a total of six sessions.

DI flashcards 1 and 2. Four sets of words were created by the first and last authors. The set of words was determined by taking words the participant missed on a pretest of the 150 high frequency words. Two sets of 12, and two sets of 13 words were created from the words missed on the pretest.

At the beginning of each session, the first author went through the flashcards for the current set with the participant. The first author made a pile of correct responses and a stack of errors. For errors, a model, lead, test format was employed, using the flashcards to review the words on the cards that were in error. This included, I say it, we say it, and you say it. If the word was again missed, this procedure was employed until the participant could correctly pronounce the sight word. DI flashcards were in effect twice for a total of nine sessions.

Reliability of Measurement

Interobserver agreement was conducted 33% of the sessions. An interobserver independently marked when the student got a word correct or incorrect. The procedures and expectations were clear, if the student did not get the word within 3s or read the word wrong, it was counted as incorrect. Any difference in results was defined as disagreement. The number of agreements divided by agreements plus disagreements and then multiplying the ratio by 100 to get the agreement percentage calculated agreement. The mean agreement score was 100%.

Findings

Total Words

The number of total words read correctly for the participant during baseline is shown in Figure 1. The mean baseline-1 was 20.6 corrects (range 20 to 21 total sight words). The number of corrects increased during the first DI flashcard condition (M = 41; range 39 to 45 total words correct). A replication of baseline resulted in an increase in the number of words correct for all words (M = 45.3, range 44 to 46 total words correct).

Correct Words by Set

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The number correct by set can be in Figure 2. For Set 1 words during baseline-1, the mean was 5.8 (range 5 to 6 words correct). For Set 1 words during first DI flashcard condition, the mean number correct increased to 9.9 with a range of 9 to 10 words. For Set 1 during baseline-2 the mean was 11.3 with a range of 1 to 12 words correct. A return to DI flashcards increased student performance (*M* = 13.6; range 11 to 12 words. For Sets 2, baseline-1 performance ranged from 5 to 6 words correct with a mean of 5.8 words. DI flashcards resulted in an increase to an average of 10.25 correct sight words with a range of 9 to 11 words correct. A replication of baseline (Baseline-2) generated in increase in performance (*M* = 11.3; range 11 to 12 words). A return to DI flashcards resulted in a small decrease in performance (*M* = 10.8; range 9 to 12 words). For Set 3 in baseline 1, the mean number correct was 4.3 with a range of 3 to 5 words. When DI flashcards were in effect, a large increase in student performance was found (*M* = 10.25; range 9 to 12 words). A return to baseline further increased the participant's performance for Set 3 (*M* = 11.3; range 11 to 12 words). An increase was found when DI flashcards were employed (*M* = 12; range 11 to 13 words). With Set 4 words, baseline-1 produced low performance (*M* = 4.6, range 4 to 6 words correct). When DI flashcards were employed, performance increased (*M*= 11.25; range 10 to 12 words). The return to baseline produced a slight decrease in performance (*M* = 11, range 10 to 12). A replication of DI flashcards resulted in an additional increase in student performance (*M* = 12.4; range 11 to 13 correct sight words).

Pre and Posttest Outcomes

Before intervention, a pretest of 150 high frequency words was given, the participant who was able to read 68.67% correct (103 out of 150 read correct). After intervention the participant was able to read 91.33% correct (137 out of 150 words read correct).

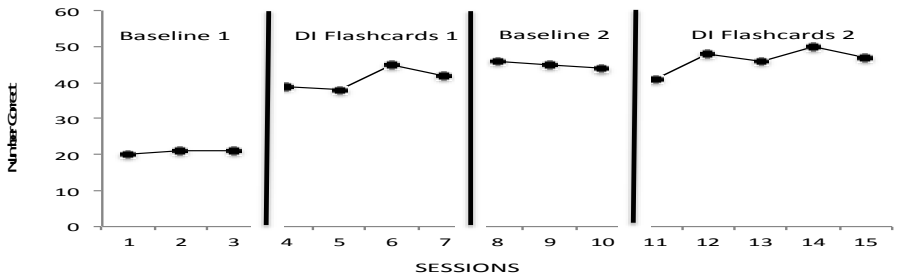

Figure 1. Number of total correct words for during Baseline and DI flashcards + Extra Computer Time reward.

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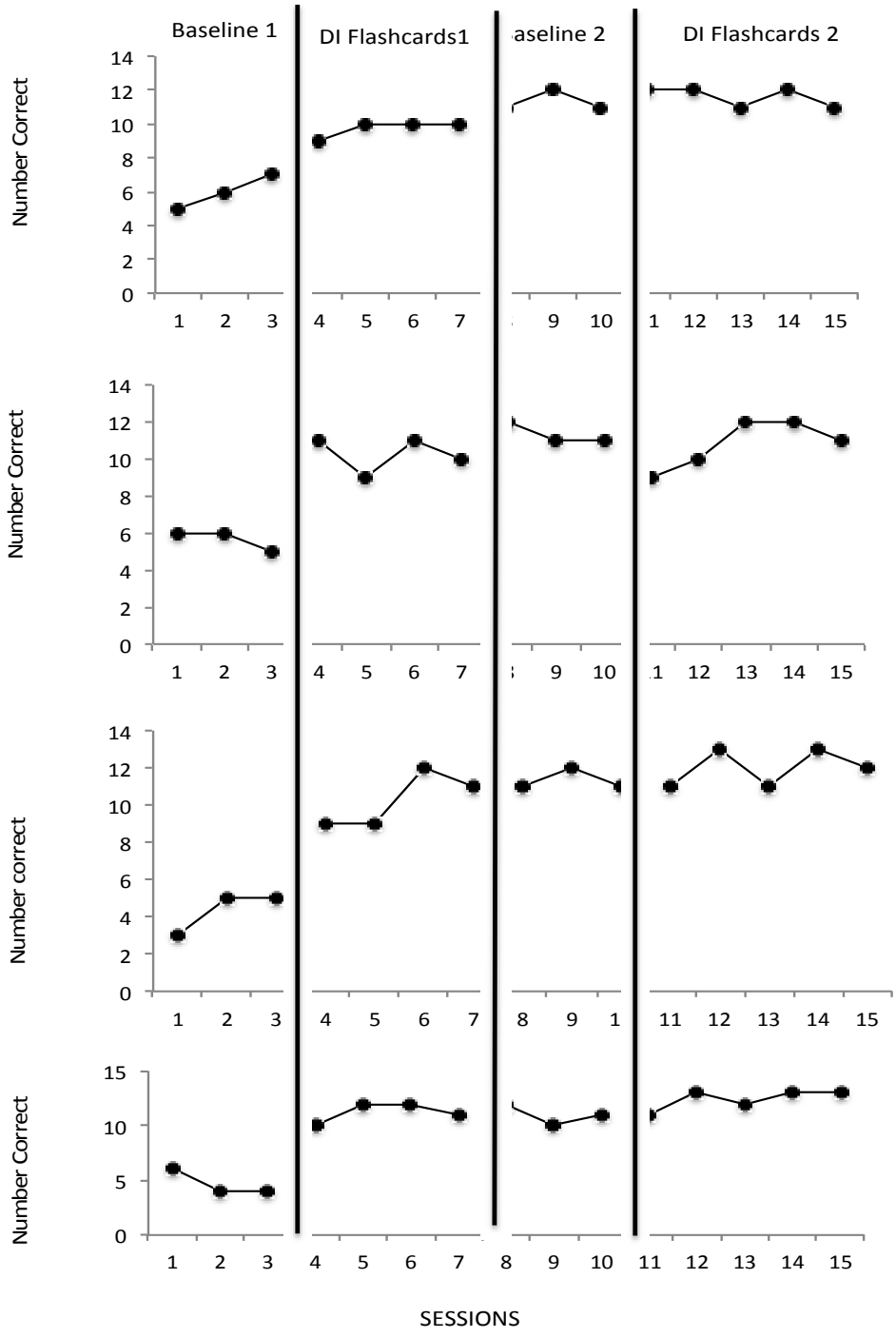

Figure 2. The number correct for each set (Sets 1-4) during baseline and DI flashcards.

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Conclusions

In evaluating the effects of a DI flashcard procedure with a computer consequence for high frequency words, after the first baseline, student performance continued to increase regardless of whether DI flashcards or baseline-2 were in effect. Increases between the pre- and posttest also documented a large improvement in student performance.

At first, our participant was clearly unmotivated when being able to be taught using DI flashcards. He looked at it as extra work, on top of all the other work being required of him in the resource room. Even though, the first author and participant had developed a good relationship built prior to formal data collection, the student was still be reluctant to work with the first author. The participant would often respond to the words with errors. He would guess at the word, for example say "either" when the word was "set." Our participant had phonetic skills but seldom employed those skills when he was unsure of the word.

During DI flashcards, the first author also presented the flashcards as a competition as well as employing extra computer time as a reward. Both the procedures quickly became highly motivating when his number of corrects increased. During DI flashcard procedure, the participant would say things like "I'm going to beat you" or "You're going down" as a part of the competition, showing his confidence. As his performance improved, the participant became more confident when completing the flashcards. It was clear he became more and more motivated over the course of the study. This was observed in the classroom by both the first, fourth, and last author

Suggestions and Recommendations

In order for the participant to maintain and generalize the skills taught in the intervention, he was allowed to take home each set of flashcards to practice at home. The procedures during DI flashcard conditions were consistent and he appeared to enjoy these aspects of DI flashcards. Also, since these high frequency words are found in a majority of texts, he was able to master words he would encounter each day. Employing phonemic skills was also encouraged participant to assist him in sounding out words as a way to improve his decoding. These decoding skills are essential to reading (Cunningham & Stanovich, 1997; Kameenui, 1998; National Reading Panel, 2000; Shapiro, 2011).

There were several limitations in the study. During the middle data collection, high stakes state testing began. This greatly changed the daily schedules for our student. Our participant did not attend the resource room for multiple consecutive days. On those days, data collection did not take place. However, the number of words correct during intervention remained consistent when he returned to the resource room after high stakes testing had been completed. Another limitation was during the pretesting, the student became tired and made less effort during the later half of the assessment using the 150 high frequency words. The participant began guessing and therefore

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missed many words. Therefor, during baseline-1, it became apparent; that our participant new a number of words that he missed on the pretest. The largest limitation was the clear failure of the participant's performance to decrease during the return to baseline. This took place for three of our four sets. Employing a multiple baseline design across sets would have been more appropriate. That would have removed the need for a reversal. However, since at four sets received the DI flashcard procedure on the same day, a reversal design was required (Kazdin, 2011). By simply using more sessions of baseline in Sets 2 through 4 would have solved this issue. When we have done this in our prior work (Brasch et al., 2008;Green et al., 2011; Crowley et al., 2013; Kaufman et al., 2012; Mangundayo et al., 2013; McGrath et al., 2012), a functional relationship was found. However, we have found differential effects when we have employed DI flashcards with very young students (Chandler, McLaughlin, Neyman, & Ehlers, McLaughlin, Derby, & Rinaldi, 2012, Higgins, McLaughlin, Derby, & Long, 2012), but not with older elementary or secondary students. However, the failure of the skill to reverse warrants some caution, even though one could make the case that our participant had maintained his skill to the point that DI flashcards were no longer needed. Also, the effects of allowing DI flashcards to be taken home by our participant require further analysis. We have found that students will employ an effective procedure at home even when they are instructed no to do so (Malone & McLaughlin, 1997). Finally, since DI flashcards were paired with access to classroom computer time, we do not know about the separate effects of DI flashcards or the use of a computer-time reward. Subjectively we felt that the use of computer time improved our participant's willingness to complete his work using DI flashcards.

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