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Original Paper

Using Errorless Learning and Discrimination Training to Teach Early Literacy Skills in a Pre-School Setting

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Abstract

This case study investigates the effects of using an intervention package of errorless learning and discrimination trial training to teach a 4-year old preschool student to read Consonant-Vowel-Consonant (CVC) words. A single case multiple baseline design across three equal instructional sets was used to evaluate the effects of the intervention package. Each set contained six CVC words incorporating words with each of the five vowels. The results of this study indicate that utilizing both errorless learning and discrimination training to teach a preschool student how to read CVC words was effective. In addition, generalization assessments post-intervention showed an increase in (a) mastering new unknown CVC words, as well as (b) book text reading.

Keywords

literacy decoding, phonemic awareness, preschool reading, flashcards, error correction, discrimination training, single case research

1. Introduction

The primary goal of early reading instruction is to teach children the print-to-sound decoding process (Wolf, 2016). Developing reading skills early in a child's education is vital to their overall success in future grades (Turan & Gul, 2008). For instance, when a preschool age student demonstrates the skills of verbally stating letter name and corresponding letter sound, they should be capable of progressing into blending those isolated sounds into words. While it is important to visually discriminate topographical differences of the printed letter (Saunders, Johnston, & Brady, 2000), reading development depends primarily on the understanding that (a) letter names have distinct letter sounds, (b) combining those letter sounds produce words, and (c) decoding those sound patterns results in reading

the printed word (National Institute of Child Health and Human Development, 2000). Adams (1990) stresses the understanding that letters have a one-to-one relationship to sounds in words is foundational to the successful beginner reader.

One critical literacy skills is the understanding of phonemic awareness (Adam, 1990; Ehri, 2005). Although the terms phonological awareness and phonemic awareness are often times used interchangeably, they do have slightly different meanings. Phonological awareness, the larger of the two ideas, is the awareness of various sound aspects of language (as distinct from its meaning) (National Institute for Literacy, 2008). Phonological awareness skills include recognizing words with similar beginning and end sounds, recognizing the number and pattern of sounds in a word (e.g., consonant-vowel-consonant), spelling, and rhyme skills (Turan & Gul, 2008). Turan and Gul (2008) consider phonological awareness skills the most important indicators of early reading skills. Phonemic awareness is more specific, identified as the ability to detect phonemes (individual sounds) in words (National Institute for Literacy, 2008). Furthermore, phonemic awareness involves the ability to hear, identify, and manipulate individual phonemes (sounds) in spoken word production, helping students understand that the letters in written words translate to the sounds in spoken words, serving as a precursor to decoding unfamiliar printed words (Wolf, 2016).

The purpose of this research was to assess the benefits of using discrimination training combined with errorless learning to teach early literacy decoding and letter blending skills in a pre-school setting. This research will help determine whether children of pre-school age who are demonstrating skills of letter recognition and phonemic awareness are capable of progressing into reading and decoding CVC words.

2. Method

2.1 Participant and Setting

In this study, the single participant, Dorothy, was a typically developing 4-year-old female enrolled in a rural preschool half-day program (8:45 am to 12:00 pm). Prior to the study, Dorothy demonstrated an understanding of letter sounds and names and more so, indicated an interesting in being able to read books independently. Sessions usually lasted 10 minutes including both assessment and intervention. The session typically included one teacher (the first author), except for when inter-observer agreement and procedural integrity were measured. The intervention was set up at a separate table away from other students.

The dependent measure was the percentage of Consonant-Vowel-Consonant (CVC) words read correctly during repeated assessment sessions. Eighteen CVC word were identified, resulting in creation of three sets of six words. Each set was taught separately. Set A contained CVC words ending in either /*at*/ (3 words) or /*ad*/ (3 words). Set B contained CVC words ending in either /*eg*/ (3 words) or /*id*/ (3 words). Set C contained CVC words ending in either /*op*/ (3 words) or /*ug*/ (3 words).

Table 1. CVC Instructional Sets A, B, C and Generalization Sets

Set A	Set B	Set C	Generalization Sets	
cat	peg	mop	pet	net
hat	leg	top	sit	dot
bat	beg	cop	vet	cut
mad	did	bug	nut	hit
bad	hid	rug	pot	hut
dad	kid	mug	bit	hot

At the onset of each session, Dorothy was presented the 18 flashcards, containing one CVC word per card, in a randomized order and asked to read the word aloud. She was given approximately 3 seconds to respond to each flashcard as it was presented. If she responded correctly that word was recorded as correct. If she responded incorrectly or stated that she did not know, the word was recorded as incorrect. Once all 18 CVC flashcards were presented, the teacher thanked Dorothy for participating, and the assessment session ended.

2.3 Experimental Design

The experimental design used was a single case multiple baseline design across three equal sets of six words. Once Dorothy demonstrated mastery of a set during assessment (read all six words in the set correctly), the next set of words was introduced and practiced during intervention. For example, once mastery at 100% was achieved for Set A, intervention began for Set B. In this way, intervention was introduced sequentially to each of the three word sets. To establish experimental control, a single case multiple baseline design (a) sequential introduces intervention across the three instructional sets, (b) documents initial baseline stability, (c) achieves acceptable levels of inter-observer agreement and procedural integrity, and (d) documents at least three demonstration of experimental effect (i.e., no treatment-treatment comparisons) (Belfiore, 2018).

2.4 Interobserver Agreement and Procedural Integrity

Two teachers collected procedural integrity during two of the intervention sessions. The purpose of procedural integrity is to ensure that intervention was delivered consistently across the intervention phase. Both teachers were provided a checklist of steps, and asked to check each intervention step as it was appropriately completed. The steps included, teaching verbal prompts, wait time and teacher error correction. Procedural integrity was measured by dividing the number of steps completed correctly by the total number of required steps then multiplying by 100. Acceptable levels of procedural integrity were met with a total mean of 96% (range 92%-100%).

Two teachers collected inter-observer agreement during 15% of sessions. While one teacher administer the flash card procedure, another teacher sat nearby. Both teachers wrote down the words they heard Dorothy read correctly aloud. Acceptable levels of inter-observer agreement were met with a total mean

agreement of 100%. Inter-observer agreement was calculated by taking the number of agreements, dividing it by the number of agreement and disagreement, then multiplying by 100.

2.5 Procedural Steps

2.5.1 Baseline

During baseline, Dorothy was presented with the 18 flashcards, containing one CVC word per card, in a randomized order and asked to read the word aloud. She was given approximately 3 seconds to respond to each flashcard as it was presented. Once all 18 CVC flashcards were presented to Dorothy, she was thanked for participating, and the baseline session ended.

2.5.2 Intervention

Before each intervention, in order to collect valid assessment data, Dorothy was assessed on reading all 18 words aloud and words read correctly were recorded. This assessment prior to intervention was identical to the baseline assessment.

After assessment, intervention was introduced. The first component of the intervention was *errorless learning*. First, each CVC word flashcard was placed in front of Dorothy, and the teacher stated each letter aloud (e.g., "C-A-T") while pointing to that letter. Dorothy followed, saying each letter name aloud while pointing at that letter. Second, the teacher said the sound of each letter aloud while pointing to that letter, followed by Dorothy repeating each letter sound aloud. Lastly, the teacher instructed Dorothy to say the letter sounds faster, "blending" them together. The teacher and Dorothy together blended the sounds, saying the sounds of each letter quickly to form the word. After repeating this blending process together, the teacher and Dorothy together stated the word. This procedure was repeated for each word in the set of six. Then, the entire set was practiced one more time, for a total of two errorless trials per word.

The second component of the intervention was a *discrimination training* game. In this component, the six flashcards were arranging face down on the table. Dorothy was asked to pick any card, turn it over and read it aloud. She was reminded to "sound out" the letters if she did not initially recognize the word. If she stated the word correctly within 3 seconds, the teacher praised her by saying, "good, the word is ____", and the card was removed from the Table. If Dorothy did not say the word correctly or give an answer within 3 seconds, the teacher, "no, let's sound it out together". Together, they would repeat the procedure from the errorless learning component; stating the letter sounds, blending the sounds, and stating the word. The word was returned to the table to be practiced again. This continued until Dorothy read all cards on the table independently, without error correction. Following the game, Dorothy was presented with a sticker to put on her folder. Stickers were provided contingent on participation, and not for word accuracy.

2.5.3 Generalization

Once during baseline and once at the end of the study, Dorothy was presented with a set of 30 CVC words (the 18 words targeted for intervention and 12 additional unknown CVC words) to read aloud to

assess word generalization. Generalization sessions were identical to baseline and intervention assessment procedures. In addition, once during baseline and once at the end of the study Dorothy was also presented with a *Bob Book* (Maslen, 1999) and asked to read it aloud as best she could.

3. Results

Overall, Dorothy showed success across each set of words during the intervention phase (See Figure 1), attaining 100% accuracy for all words in all sets. Set A was unique in the sense that Dorothy mastered two of the words during the baseline phase. After the baseline stabilized across all three sets of words, Set A was introduced to intervention the following session. There was an immediate jump from two words read correctly to three words read correctly indicating the intervention had an immediate effect on her learning, reaching 100% accuracy on the 6th session of intervention.

After Dorothy showed 100% accuracy in reading the words of Set A, Set B was introduced to intervention the following session. After, the intervention was introduced, there was an immediate jump from 0% accuracy to 33% accuracy. The percentage of words read correctly for Set B increased steadily until she showed 100% accuracy on the 5th session of intervention. In addition, Dorothy maintained 100% accuracy in reading Set A words throughout Set B intervention.

Once Dorothy reached 100% accuracy on Set B words, intervention was introduced to Set C. The data for Set C showed an ascending trend, until all words met 100% accuracy during the 9th session of intervention. In addition, Dorothy maintained 100% accuracy in reading Set A and Set B words throughout Set C intervention.

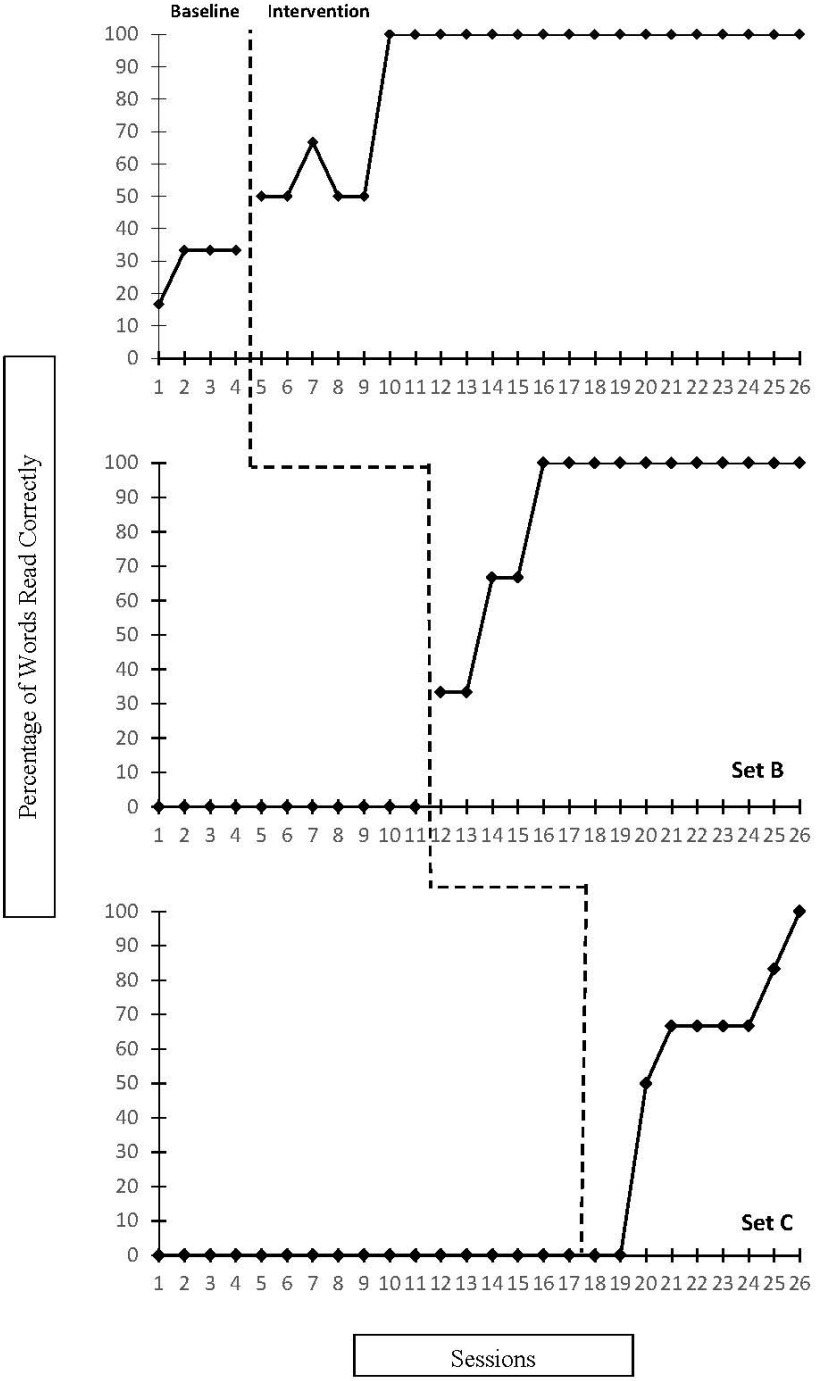

Figure 1. The Percentage Correct in Reading CVC Words Displayed in a Single Case Multiple Baseline Design. Each Data Series Represents Words Read Correctly during Baseline, then Intervention Phases across one of Three Word Lists

3.1 Generalization

Generalization data were collected to assess if the CVC reading skills Dorothy learned during intervention would carry over to reading novel words. The first method used to assess generalization was presenting a set of 12 unknown CVC words (See Table 1). During the baseline generalization probe Dorothy correctly decoded 0 of the 12 new words (0%). At the post-intervention generalization probe Dorothy correctly decoded four of those 12 new words (33%).

A second method used to assess generalization was reading words in text. Dorothy was asked to select a *Bob Book* (Maslen, 1999) which included some of the words she learned during intervention, but mostly novel words. During the baseline generalization probe Dorothy did not read any of the words in the book correctly. At the post-intervention generalization probe she correctly read aloud 43% of the words (33 words read correctly out the total 76 words).

3.2 Social Validity

A 4-question social validity survey was read to Dorothy at the end of the study to assess satisfaction with procedures and outcomes. Dorothy was asked the following questions orally; her answers were recorded (in italics):

1) Was reading practice fun? "*Yes, I love my words*".
2) Do you want to continue learning words like this? "*Yes and I want to read books*".
3) Are you going to keep reading on your own? "*I don't know if I can read on my own*".
4) Do you think your friends would like to learn words like this? *"Only if they know their letters"*.

Anecdotally, during the generalization phase, after reading the *Bob Book* (Maslen, 1999), though somewhat challenging, she stated, *"I want to read stories now"*.

4. Discussion

In this study, Dorothy, a 4-year old, was able to quickly master CVC words when participating in a simple and concise intervention package of errorless learning and a discrimination training game. Of equal importance, once targeted CVC words were mastered at 100%, Dorothy was able to generalize that knowledge to decode (a) novel CVC words and (b) words in an age-level appropriate book.

Assessing each sequential component of the intervention provides some analysis as to its effectiveness. First, the errorless learning trials provided Dorothy with a correct model to the targeted letter name, corresponding letter sounds, and the CVC word. Requiring Dorothy to repeat the correct response after the teacher delivered the prompts guaranteed her correct response in the presence of the stimulus flashcard. The errorless learning component established an immediate history of success with each new target word. After errorless learning trials, the second intervention component, a discrimination training game provided Dorothy the response opportunity to state independently the correct target letter name, letter sound, and CVC word when presented with the corresponding flashcard. The discrimination

training trials also provided corrective feedback for any correct (e.g., “Yes the word is cat”), incorrect (“No, the correct word is cat, what is the word?”), or no response (“The correct word is cat, what is the word?”). This feedback provided labelled reinforcement to the correct student response, or the correct model for the Dorothy to repeat if she responded incorrectly or not at all. Each discrimination training game ended with Dorothy stating the correct response in the presence of the corresponding flashcard. Interventions such as these are brief, but effective in allowing students to be successful, even at an early age of four.

Additionally, the opportunity to work one-on-one with the teacher provided reinforcement for continued participation in this intervention. Lastly, using repeated intervention sessions over time allowed Dorothy to monitor her own learning. Anecdotally, during intervention sessions, Dorothy would talk about her struggles with specific words and letter sounds, as well as her successes with other words and letter sounds, both of which are necessary parts of the learning process.

It is vital for teachers to acknowledge the eagerness or motivation that young children have to learn new information, and present the opportunities to challenge them in their learning. Prior to the implementation of this study, Dorothy indicated that she wanted to learn to read. Dorothy’s motivation to learn to read may certainly have an effect on her academic engagement. Teachers need to (a) be able to recognize the unique interests of children in their classroom, (b) structure academic opportunities to build upon those interests, (c) implement evidence-based strategies that increase student success, and more importantly, (d) create an overall educational environment that challenges their students, regardless of age.

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