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# A Comparison of Progressive Time Delay to Response Repetition to Teach Sight Words via Tele-education

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**Abstract**

Educational policies emphasize early literacy skills, which includes sight word acquisition. Many studies have assessed sight-word interventions, often with at-risk learners or students with disabilities. However, to our knowledge, no study has directly compared the two following sight word approaches well-documented in the literature: progressive time delay and response repetition. Additionally, considering the significant effects of COVID-19, educators are now required to explore other instructional modalities. Thus, this study directly compared progressive time delay to response repetition for sight word acquisition via a tele-educational platform. Three typically developing children between the ages of 4 and 6 participated. Results demonstrated that both procedures were effective, but progressive time delay was slightly more efficient. We discuss implications of the findings for sight word instruction and tele-educational models moving forward.

*Keywords:* progressive time delay, response repetition, sight words, literacy, tele-education

## Introduction

In the past several decades, educational policies in the U.S. have prioritized literacy skills for students in primary and secondary schools. In 2002, the No Child Left Behind Act (NCLB; No Child Left Behind Act, 2002) was signed into law; which heavily highlighted the importance of teaching literacy. Within this law, two different literacy initiatives were outlined: Early Reading First and Reading First. The Early Reading First initiative aimed to support preschoolers in developing early reading skills before kindergarten. The Reading First initiative focused on using scientifically-validated reading instruction for students in kindergarten through the 3rd grade. Generally, NCLB emphasized reading competencies and quality reading instruction for young learners from preschool through the 8th grade. In 2015, an updated version of the law was signed known as the Every Student Succeeds Act (ESSA; Every Student Succeeds Act, 2015). As part of this new act, an initiative called Literacy Education for All Results for the Nation (LEARN) was established. LEARN widened the focus of previous initiatives by focusing on evidence-based reading and writing instruction for learners from birth to grade 12. Moreover, LEARN emphasized a collaborative and individualized approach to comprehensive literacy instruction by applying principles from Universal Design for Learning (UDL; Every Student Succeeds Act, 2015)

Considering the central role of literacy within the educational system, schools have adopted programs to ensure appropriate instruction and adequate progress for learners. Typically, literacy instruction is embedded into classroom activities through both formal and informal methods. For example, early learners may encounter a print-rich environment that includes books, signs, games, or photos around the room; these environmental stimuli are not necessarily

incorporated into explicit instruction, but may be used to provide relevance to letters and words and increase motivation (Neuman, 2004). At other times, attention may be given to letters, words, and their respective meanings through story-time, writing activities, or play-based interactions (Pyle et al., 2018). Depending on the age of the learner and student-specific needs, particular interventions, reading programs, or curricula may even be implemented by classroom teachers or reading instructors.

As outlined by the National Institute of Child Health and Human Development (2000) there are several key skill areas within the domain of literacy such as phonics, phonemic awareness, vocabulary, fluency, and reading comprehension. One important literacy skill, related closely to the skills of vocabulary and fluency development, is sight word recognition. Sight words are high frequency words that often do not follow typical phonetic patterns (e.g., "who" or "are"). To progress within literacy instruction, learners must learn several sight words. In fact, several common sight word lists, such the Dolch list (Dolch, 1936) or Fry list (Fry, 1980), identify roughly 200-300 commonly used sight words that beginning readers should learn.

To identify effective teaching procedures several different sight word studies have been conducted, mostly with at-risk learners or learners with disabilities (Browder et al., 1984; Bryant et al., 1982; Butler, 1999; Lee & Vail, 2005; McGrath et al., 2012, Thorkildsen & Friedman, 1986; Wolery et al., 1990; Yaw et al., 2011). As one method of teaching, sight word instruction may involve specific teaching packages or curricula. For example, Cullen et al. (2013) used a computer-assisted instructional program known as *Kurzweil 3000* to teach sight words to four fourth graders with mild disabilities. As part of the teaching package, students were required to type, highlight, read, spell, match, and drag words to fill in blanks. All four students attained mastery within 2-7 sessions.

In another study, Crowley et al. (2013) used a combination of Direct Instruction flashcards and a game-like format known as Reading Racetracks to teach words to two elementary-aged boys with autism. Both students demonstrated an increase from average baseline levels of 0% to an averaged range of 66.6% to 100% correct during intervention. Van Norman & Wood (2008) used a peer tutoring intervention that incorporated pre-recorded words to teach sight words to six at-risk kindergarteners. All six participants demonstrated an increase in word recognition between pre- (0% correct) and post-tests (range of 8% to 96% correct).

Other ways to target sight word instruction may include the use of a specific instructional technique, as opposed to a larger teaching package, such as a prompting or error-correction procedure (Alig-Cybriwsky et al., 1990; Barbetta et al., 1993; Koury & Browder, 1986; Rivera et al., 2002; Winstead et al., 2019). One error correction procedure that has been implemented to teach sight words is response repetition (RR; Belfiore et al., 1995; Ferkis et al., 1997). For example, Marvin et al. (2010) used a response repetition procedure to teach sight words to four students with reading delays. All four participants demonstrated an increase in correct responding (up to 90-100%) after introducing the intervention. Another commonly used procedure to teach sight words is progressive time delay (PTD; Browder et al., 2009). Winstead et al. (2019) used a progressive time delay to teach sight words to students with moderate to severe disabilities as well students at risk for academic failure. All six participants mastered the sight words within 5 to 10 sessions.

To determine which procedures are the most effective and efficient, it is important for researchers to compare instructional procedures to one another. In an attempt to better understand the differential effectiveness of certain procedures, many studies have compared specific prompting or error-correction procedures for sight word acquisition. For example, Klaus

et al. (2019) compared progressive time delay to simultaneous prompting to teach three learners with autism sight words. For two learners, both procedures led to mastery and were equally as efficient, while neither procedure was effective for the third learner. In another study, Kodak et al. (2016) compared various error-correction procedures on sight words acquisition for five children with ASD. The conditions included single response repetition, multiple response repetition, differential reinforcement alone for independent responses, demonstrating the correct response after incorrect responses without requiring a student response, and a prompt delay which involved modeling the correct response after an incorrect response along with active student responding. Overall, most of the conditions were effective across learners, but the demonstration condition was the most or second most efficient intervention for four of the participants, while the multiple response condition was the most or second most efficient intervention for three of the participants.

Though literacy skills are typically taught through in-person interactions, the COVID-19 pandemic has required schools throughout the world to consider alternative teaching procedures and modalities. UNESCO (United Nations Educational, Scientific, and Cultural Organization) estimates that between February of 2020 and February of 2022, school closures affected more than 250 million learners around the globe (UNESCO, 2022). Some schools have maintained a certain level of in-person instruction; however, many have adopted either a hybrid or completely remote model (Bonderud, 2021). Although several different terms have been used to described alternative, remote modalities (e.g., distance learning, remote instruction, virtual instruction, e-learning, or telehealth), for this paper, the term *tele-education* will be used to refer specifically to the use of internet and communication technologies (e.g., computers, tablets, or phones) to teach students from a distance (Curran, 2006; Nicolau et al., 2020).

Within the sight-word literature, progressive time delay and response repetition are two of the most common instructional techniques for teaching sight words. However, no study has directly compared these two procedures. Considering the importance of identifying efficacious procedures through direct comparison, as well as the current impact of COVID-19 on instructional modalities, the purpose of this study is to compare the effectiveness of progressive time delay to response repetition on sight word acquisition for three typically developing participants through a tele-educational platform.

## Methods

### Participants

Three neurotypically developing, elementary-aged students participated in this study. Prior to the study, the participants were not assessed for letter identification, word identification, nor phonics skills. However, before the study, the participants' parents did provide anecdotal information regarding their child's general literacy skills.

Luna was a 4.9-year-old girl living in Florida, who was entering kindergarten. At the start of the study, parents reported that Luna could identify letters as well as their corresponding sounds. Before the study, Luna began learning some sight words through preschool and home instruction. During the study, parents reported that she was not involved in any sight words instruction.

Pepper was a 5.3-year-old, girl living in North Carolina. At the start of the study, parents reported that Pepper could identify some letter as well as some corresponding sounds. Prior to the study, Pepper had learned some sight words through preschool and home instruction. During the majority of the study, Pepper was not receiving any sight word instruction from home or

other educational mediums. During the last set of the study, Pepper received some sight word instruction through virtual, kindergarten sessions.

Fran was a 6-year-old, girl living in Georgia. Parents reported that Fran could identify letters and had strong phonics skills. According to parent reports, Fran could identify several age-typical sight words. At the beginning of the study, Fran was not receiving additional sight word instruction. During the second set, Fran began sight word instruction through her in-person, 1st grade classroom.

**Setting and Materials**

The lead researcher (first author) conducted all sessions via telehealth using Zoom™ video conferencing. The researcher presented each sight word as a digital flashcard on a gray background using PowerPoint® software. Each flash card was centered on the slide in size 138 black text, using lowercased Calibri font. Between trials, a gray slide was displayed on the screen. Based on a widescreen display (a ratio of 16:9), each flashcard covered 24% of the slide (e.g., 4in x 6in of a 13.3in x 7.5in slide).

During daily probes (implemented during baseline, intervention, or maintenance), slides were displayed in full screen. During intervention trials, two different PowerPoints covered each half of the screen. The left half of the screen displayed the target stimuli while the right half of the screen displayed the token board. The token board covered 52 % of the slide (e.g., 6in x 8.5in of a 13.3 x 7.5 in slide)

**Targets**

The researcher taught Luna 12 sight words and taught Pepper and Fran eight sight words. The researcher divided the sight words (referred to as subsets) into sets (see Table 1) with each set consisting of eight stimuli (two target stimuli and two control stimuli assigned to the

progressive time delay condition; 2 target stimuli and 2 control stimuli assigned to the response repetition condition,). The sight words were selected from the Dolch list of sight words (Dolch, 1936). To avoid differences in word length as a potential confound, only 4-letter words were selected from the Dolch list.

**Table 1**

*Target Stimuli for Participants*

| | | Set 1 | | Set 2 | | Set 3 | |
|---|---|---|---|---|---|---|---|
| Participant | Stimulus Type | PTD | RR | PTD | RR | PTD | RR |
| | Target | cold | draw | they | make | done | help |
| P1 | | open | work | come | find | with | both |
| | Control | away | ride | read | keep | goes | once |
| | | soon | very | your | want | know | many |
| | Target | look | jump | they | read | | |
| P2 | | want | find | help | open | | |
| | Control | that | away | draw | must | | |
| | | some | make | call | into | | |
| | Target | cold | draw | five | were | | |
| P3 | | grow | very | done | both | | |
| | Control | ride | find | kind | call | | |
| | | walk | take | many | only | | |

*Note:* Participants 2 and 3 completed only two sets.

**Dependent Variables**

The main dependent variable was the number of sets that reached mastery criterion which was determined during probe trials. Mastery criterion was set at 100% correct responding for all trials of a subset for four consecutive daily probes. *Correct responding* was defined as vocalizing the target word within 5s of its presentation. *Incorrect responding* was defined as (a)

vocalizations that did not correspond with the target word within 5s of its presentation or (b) not responding within 5s of presenting the target word.

The second dependent variable was participants' maintenance of skill taught which was also determined by daily probes. The third measure in this study was the efficiency of teaching across the two conditions. Efficiency was measured by the number of sessions for a participant to reach mastery, and the time of intervention for each of the two conditions. Finally, the researchers measured participants' responding during teaching trials (described below). During teaching trials participants could engage in correct responses, incorrect responses, prompted correct responses, or prompted incorrect responses. Correct and incorrect responses had the same operational definition as responding during probe trials. *Prompted correct responses* were defined as stating the target word within 5s of the researcher providing an echoic prompt. *Prompted incorrect responses* were defined as (a) vocalizations - within 5s of the researcher providing an echoic prompt- that did not correspond with the target word or (b) not responding within 5s of the echoic prompt

**Trial Types**

***Probe Trials***

Probe trials began with a gray slide presented in full screen. The researcher then presented a word on PowerPoint and provided the participant with an instruction (e.g., "What word is this?" or "What's this word?"). The participant was given 5s to respond to the instruction. After the participant responded, the researcher provided neutral feedback (e.g., "Ok", "Thanks" or "Alright") regardless of the correctness of the participant's response.
While the researcher delivered neutral feedback, the next PowerPoint slide was simultaneously presented, (i.e., a gray screen with no words), signaling the end of the trial. Though there was no

programmed reinforcement during probe trials, the researcher provided intermittent praise for general attending behavior from the participant (e.g., looking or sitting calmly).

### *Teaching Trials*

During teaching trials, two different PowerPoint presentations were displayed on each half of the screen. The presentation on the left displayed the target words, while the presentation on the right displayed the token board. At the beginning of teaching trials, no words were displayed on the presentation to the left - only a gray screen was displayed. The researcher then presented the target word and provided an instruction (e.g., "What word is this?" or "What's this word?". The researcher gave up to 5 seconds for the participant to respond to the instruction. Consequences for participant responses varied depending on the teaching condition (e.g., in PTD, simple feedback for incorrect responses such as, "No that's not it"; in RR, corrective feedback such as, "No it's _____. Say _____5 times").

### **Daily probes**

Daily probes were conducted during baseline, intervention, and maintenance. During baseline there were a total of 32 probe trials (described above); 8 trials for the progressive time delay condition, 8 trials for the response repetition condition, and 16 trials for the control condition. During the intervention condition there were a total of 24 probe trials (described above); 8 trials for the progressive time delay condition, 8 trials for the response repetition condition, and 8 trials for the control condition. During the maintenance condition there were a total of 24 probe trials (described above); 8 trials for the progressive time delay condition, 8 trials for the response repetition condition, and 8 trials for the control condition.

The daily probe was divided into two portions; the first portion being stimuli assigned to the progressive time delay condition and the second portion being stimuli assigned to the

response repetition condition. The order of these two portions was based on the order of the teaching conditions from the previous session. Finally, the researchers randomized the trial order within each daily probe.

**Baseline and Maintenance**

Each participant completed two baseline sessions before intervention. Maintenance consisted of 3 sessions approximately one week following intervention (range of 6-11 days after intervention, across all participants). During baseline and maintenance, the researcher implemented one daily probe (see above) per session.

**Intervention**

Intervention sessions were conducted 2-4 days per week and lasted approximately 10 mins per session. An intervention session began with the researcher implementing a daily probe, except on the very first intervention session where no daily probe was implemented. Next, the researcher implemented one of the two teaching conditions, followed by a short break (e.g., 1 minute), followed by implementing the other teaching condition. The order of the teaching conditions was randomized prior to the session.

Intervention sessions involved both teaching conditions (i.e., PTD and RR) unless the participants reached mastery criterion on one condition first. The order of teaching conditions was randomized by a coin flip. During intervention sessions, a 3-level token board was used. Tokens were given on a FR1 schedule for independent correct responding. The dark gray, light gray, and yellow sections corresponded to 0 to 10 tokens, 11 to 25 tokens, and 26 to 32 tokens respectively. If the participant earned enough tokens to finish in the yellow section they could earn a “big prize” (e.g., toy, additional recreational time or a highly preferred snack). If the participant earned enough tokens to finish in the light gray section, they could earn a “small

prize" (e.g., small toy, or a small edible). If the participant earned enough tokens to finish in the dark gray section they earned no prize. The prizes were determined based upon discussions with the researcher and the parents of what was preferred to the participant.

**Progressive Time Delay (PTD)**

During the PTD condition the researcher implemented a total of 16 teaching trials (described above). In this condition the researchers implemented a progressive prompt time delay with a 2s time increase. The delay started at 0s and progressively increased by 2s with a maximum delay of 6s. The criterion to move to a more delayed prompt was 2 consecutive correct responses (prompted or independent). The criterion to move a less delayed prompt was 1 incorrect response (prompted or independent). Regardless, of the delay the prompt type that was implemented was an echoic prompt.

The researcher provided praise and a token for independent correct responses from the participant. The researcher provided only praise for prompted correct responses. However, during the first 2 teaching trials for a target stimulus; praise and a token was provided for prompted correct responses. The researcher provided feedback (i.e., "No that's not it") for incorrect or prompted incorrect responses.

**Response Repetition (RR)**

During the RR condition the researcher implemented a total of 16 teaching trials (described above). During this condition the researcher provided no prompts. The researcher provided praise and a token for correct responses. For incorrect responses, the researcher stated, "No it's _____". Say _____ five times" while holding up five fingers. The researcher then bent down each finger as the participant repeated the word. While the participant repeated the target word five times, the target word remained on the screen. After the participant finished saying the

word five times, neutral feedback was provided such as., “OK” or “Alright”. If the participant stated the word more than five times, the researchers stated, “Just five times”. If the participant did not state the word enough times, the researcher stated, “Keep going”. Tokens or praise were not provided for incorrect responses. Analogous to the PTD condition, after each trial, the researcher displayed a gray slide during the inter-trial interval.

**Experimental Design**

This study used an adapted alternating treatment design (AATD) replicated across sets for each participant. Within an AATD, targets are assigned to different sets within different conditions (Sindelar et al., 1985). This design allows for comparisons between different intervention procedures. In this study, a control condition was also included to assess changes in words that were not specifically targeted within intervention

**Interobserver Agreement (IOA)**

During the study, the researcher recorded participant responding on each trial. Post hoc, a second observer recording participant responding for 35% of daily probe sessions (range 31% to 40% across participants) and 33% of intervention sessions (range 31% to 35% across participants). IOA was calculated by dividing the number of agreements (i.e., both observers recording the same response on a trial) by the number of agreements plus disagreements (observers recording different responses on a trial), multiplied by 100. Overall IOA was 98% for daily probe sessions (range 93% to 100% across participants) and 94% for teaching sessions (range 90% to 100% across participants).

**Treatment Fidelity**

A second observer rated the researcher on their correct implementation of the study procedures. For daily probe sessions, correct behavior included 1) Presenting the auditory

instruction (i.e., “What’s this word?”) while simultaneously displaying the visual stimulus (i.e., digital flashcard), 2) allowing up to 5 seconds for the participant to respond, 3) providing neutral feedback (e.g., “Alright” or “OK”) after the participant’s response and 4) terminating the trial by presenting a gray screen. For PTD sessions, correct behavior included 1) presenting the auditory instruction while simultaneously displaying the visual stimulus, 2) providing the appropriate time-delay prompt, 3) waiting up to 5 seconds for the participant to respond, 4) delivering praise and/or a token for correct responses, 5) providing feedback for incorrect responses, and 6) terminating the trial by presenting a gray screen. For RR sessions, correct behavior included 1) presenting the auditory instruction while simultaneously displaying the visual stimulus, 2) waiting up to 5 seconds for the participant to respond, 3) delivering praise and a token for correct responses 4) providing corrective feedback for incorrect responses (i.e., “No it’s_____. Say_____ 5 times”), 5) displaying five fingers and lowering a finger for each response repetition, and 6) terminating the trial by presenting a gray screen. Treatment fidelity was calculated for 35% of daily probe sessions (range 29% to 40% across participants) and 33% of intervention sessions (range 30% to 35% across participants). Correct implementation was 99% for daily probe sessions, 98% for intervention sessions, and 98.5% overall**.**

## Results

### Mastery Criterion and Maintenance

Figures 1-3 display participant responding during daily probes across baseline, intervention, and maintenance. Across the x-axis are sessions and across the y-axis are percentage of correct responding during the probe trials. Stimuli assigned to the progressive time delay condition are depicted by closed circles, stimuli assigned to the response repetition

condition are depicted by open squares, and control targets are depicted by open triangles. Each panel represents a different set.

**Figure 1**

Luna's Probes

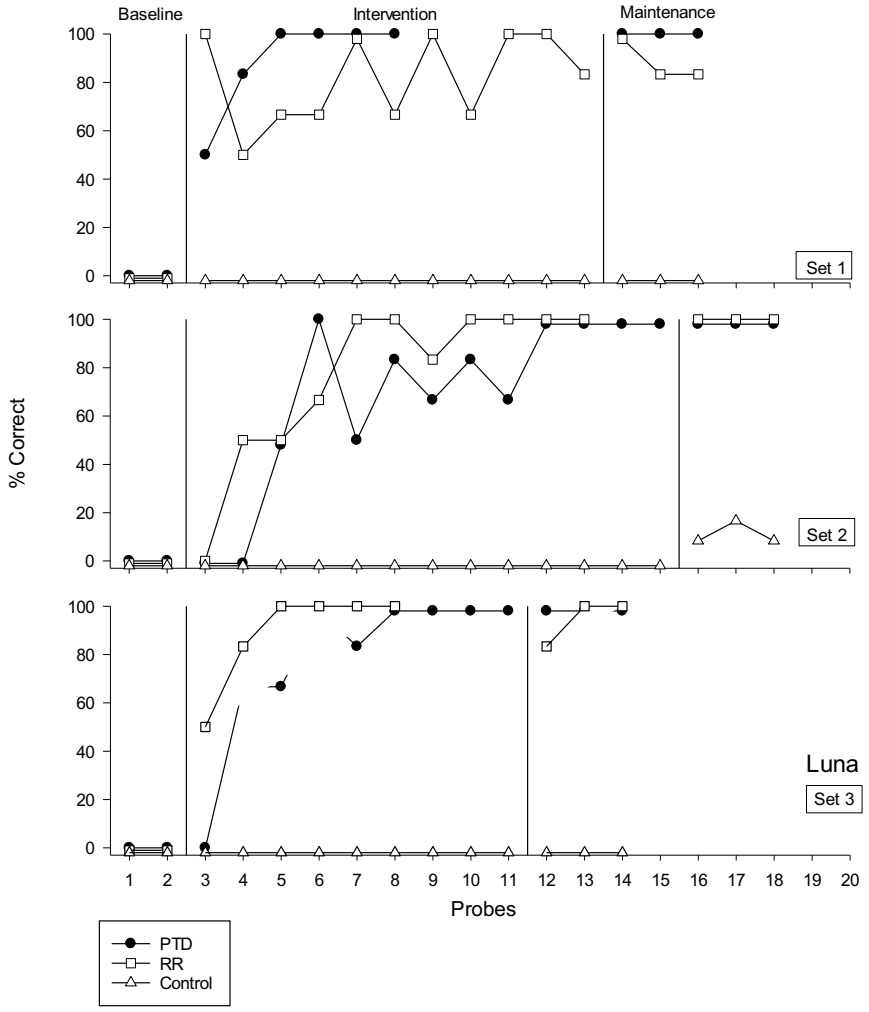


Figure 1: Responding during probe trials across baseline, intervention, and maintenance for Luna. Closed circles denote words assigned to the progressive time delay condition, open squares represent words assigned to the response repetition condition, and open triangles represent words assigned to the control condition.

Figure 1 represents Luna's responding during daily probes. Luna reached mastery criterion on all three sets for the PTD condition and reached mastery criterion for two of the

three sets for the RR condition. For the first set, Luna displayed 0% correct responding on all probe trials across the two baseline sessions. Luna reached mastery criterion first with the PTD condition and the researchers provided an additional five sessions for Luna to reach mastery criterion with the RR condition; however, Luna never reached the mastery criterion for the RR condition. During the assessment of maintenance, Luna's average correct responding was 100% for the PTD condition (100% across sessions) and was 88.9% for the RR condition (range 83.3% to 100%, across sessions). For the second set, Luna displayed 0% correct responding on all probe trials across the 2 baseline sessions. Luna reached mastery criterion first with the RR condition and then reached mastery criterion 2 sessions later with the PTD condition. During the assessment of maintenance, Luna had 100% correct responding for targets assigned to both the PTD and RR condition. For the third set, Luna displayed 0% correct responding on all probe trials across the 2 baseline sessions. Luna reached mastery criterion first with the RR condition and then reached mastery criterion 3 sessions later with the PTD condition. During the assessment of maintenance, Luna had 100% correct responding for targets assigned to the PTD condition, had an average correct responding of 94.4%for the RR condition (range 83.3% to 100% across sessions). Across all sets and across all conditions, Luna's average correct responding for the control condition was 1.8%

Figure 2 represents Pepper's responding during daily probes. Pepper reached mastery criterion on both sets for the PTD and RR condition. For the first set, Pepper displayed 0% correct responding on all probe trials across the three baseline sessions. Pepper reached mastery criterion first with the RR condition and then reached mastery 1 session later with the PTD condition.

**Figure 2**

Pepper's Probes

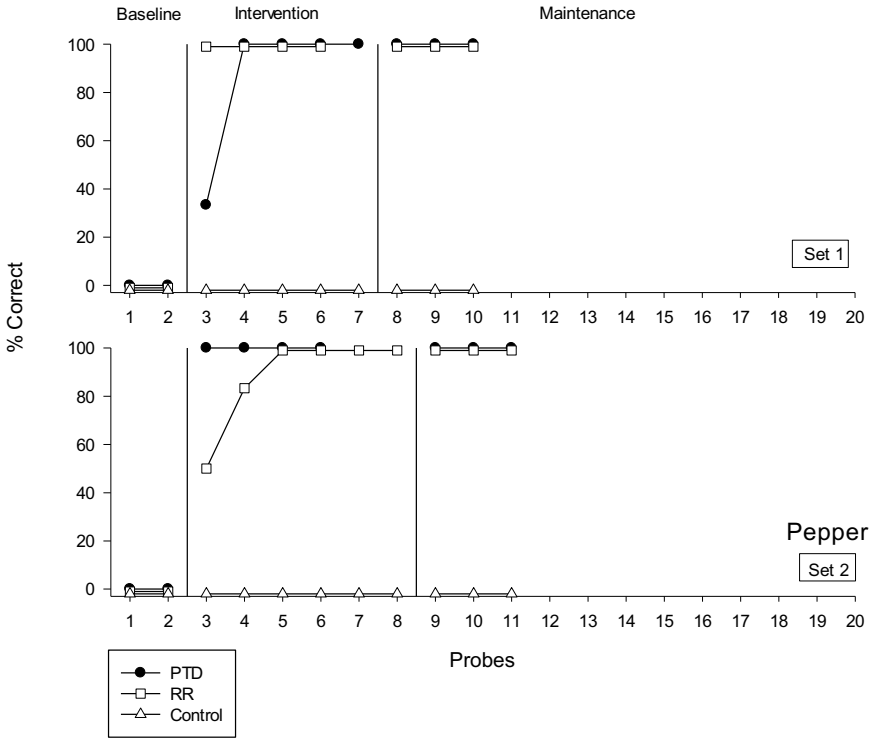


Figure 2: Responding during probe trials across baseline, intervention, and maintenance for Pepper. Closed circles denote words assigned to the progressive time delay condition, open squares represent words assigned to the response repetition condition, and open triangles represent words assigned to the control condition.

During the assessment of maintenance, Pepper had 100% correct responding for targets assigned to both conditions and displayed 0% correct responding for targets assigned to the control condition. For the second set, Pepper displayed 0% correct responding on all probe trials across the 2 baseline sessions. Pepper reached mastery criterion first with the PTD condition and then reached mastery criterion 2 sessions later with the RR condition. During the assessment of

maintenance, Pepper had 100% correct responding for targets assigned to both the PTD and RR condition and displayed 0% correct responding for targets assigned to the control condition.

**Figure 3**

Fran's Probes

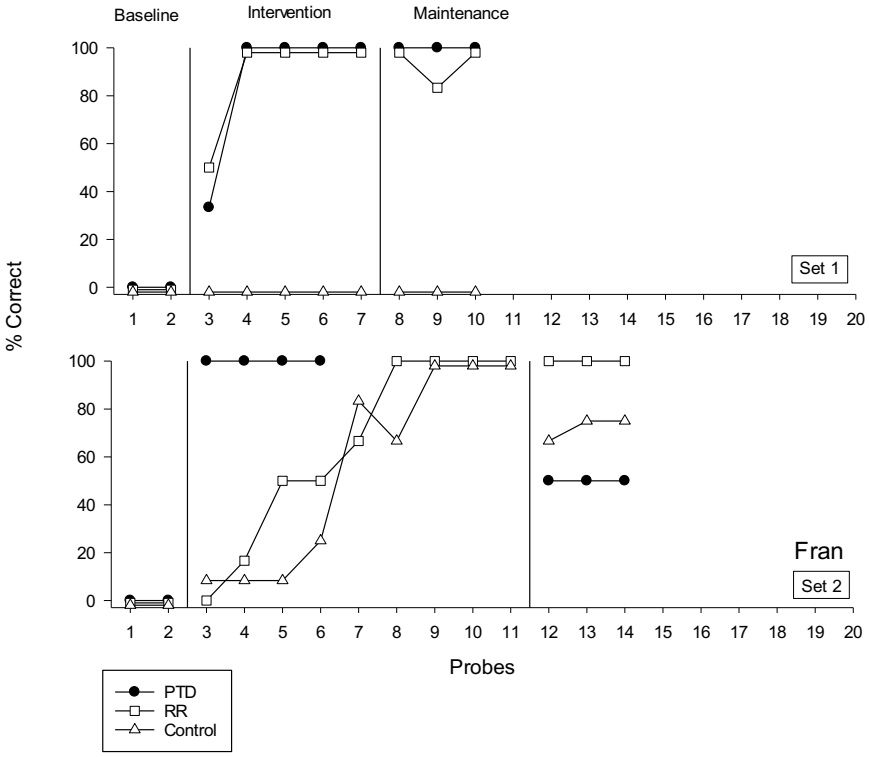


Figure 3: Responding during probe trials across baseline, intervention, and maintenance for Fran. Closed circles denote words assigned to the progressive time delay condition, open squares represent words assigned to the response repetition condition, and open triangles represent words assigned to the control condition.

Figure 3 represents Fran's responding during daily probes. Fran reached mastery criterion on both sets for the PTD and RR condition. For the first set, Fran displayed 0% correct responding on all probe trials across the two baseline sessions. Fran reached mastery criterion within both conditions at the same time. During the assessment of maintenance, Fran had 100% correct responding for targets assigned to PTD, 94.4% (range 83.3% to 100%) correct

responding for targets assigned to RR and displayed 0% correct responding for targets assigned to the control condition. For the second set, Fran displayed 0% correct responding on all probe trials across the 2 baseline sessions. Fran reached mastery criterion first with the PTD condition and then reached mastery criterion five sessions later with the RR condition. During the assessment of maintenance, Pepper had 100% correct responding for targets assigned to the RR condition, 50% correct responding for targets assigned to the PTD condition (50%, across sessions), and displayed an average of 80.6 % (range 66.7% to 100%) correct responding for targets assigned to the control condition. It was confirmed by the researcher that in the middle of the study, Fran began learning the control words in her 1st grade classroom.

**Efficiency**

Table 2 depicts the number of sessions, trials, and total time for each participant to reach mastery criterion for each individual set and across all sets for the two teaching conditions. For Luna, across all three sets and both conditions the PTD was more efficient in terms of sessions, teaching trials, and teaching duration. The PTD was found to be more efficient than the RR condition because Luna never reached mastery criterion on the first set of RR. However, Luna was more efficient on the second and third set of the RR condition in terms of sessions, trials, and teaching time. For Pepper, across the two sets and both conditions the PTD was more efficient in terms of sessions, teaching trials, and teaching duration. However, when analyzing each set there are mixed results in terms of efficiency; with RR are being more efficient in set 1 and PTD being more efficient in set 2. For Fran, across both sets and conditions the PTD was more efficient in terms of sessions, teaching trials, and teaching duration. In Set 1, there was no difference in terms of the sessions and trials to master; but the RR teaching condition was more efficient than the teaching duration for PTD. In Set 2, PTD was more efficient in terms of

sessions, trials, and duration. Thus, across all participants and all sets the data indicate that PTD is more efficient in terms of sessions, trials, and teaching duration.

**Table 2**
*Efficiency Measures for Each Participant*

| Participant | Set | Sessions to Mastery (PTD) | Sessions to Mastery (RR) | # Teaching Trials (PTD) | # Teaching Trials (RR) | Teaching Duration in Hours: Minutes: Seconds (PTD) | Teaching Duration in Hours: Minutes: Seconds (RR) |
|---|---|---|---|---|---|---|---|
| Luna | 1 | 6 | 11* | 96 | 176 | 0:21:11 | 0:37:18 |
| | 2 | 13 | 11 | 208 | 176 | 0:42:09 | 0:28:19 |
| | 3 | 9 | 6 | 144 | 96 | 0:24:43 | 0:14:03 |
| Luna's Total | | 28 | 28* | 448 | 448+ | 1:28:03 (average 0:29:21/set) | 1:19:40+ (average 0:26:33/set) |
| Pepper | 1 | 5 | 4 | 80 | 64 | 0:14:18 | 0:10:11 |
| | 2 | 4 | 6 | 64 | 96 | 0:10:55 | 0:15:13 |
| Pepper's Total | | 9 | 10 | 144 | 160 | 0:25:13 (average 0:12:37/set) | 0:25:24 (average 0:12:42/set) |
| Fran | 1 | 5 | 5 | 80 | 80 | 12:23 | 11:43 |
| | 2 | 4 | 9 | 64 | 144 | 12:57 | 34:38 |
| Fran's Total | | 9 | 14 | 144 | 224 | 0:25:20 (average (0:12:40/set) | 0:46:41 (average 0:23:31/set) |
| Total Across Participants | | 46 | 52 | 736 | 832 | 2:18:36 | 2:31:45 |
| Average Across Participants per Set | | 6.6 | 7.4 | 105.1 | 118.9 | 19:48 | 21:41 |

*Note.* *Indicates conditions in which mastery was not obtained for at least one set.

**Responding During Teaching**

Table 3 displays participant responding during each teaching condition per set and across all sets. For Luna, across all three sets in the PTD condition, 87.4% of her responses were independent correct, 9% were prompted correct, 3.4% were independent incorrect, and .2% were prompted incorrect. In the RR condition, 92.7% of Luna's responses were correct while 7.3% were incorrect. For Pepper, across both sets in the PTD condition, 91.4% of her responses were independent correct, 8% were prompted correct, .6% were independent incorrect, and 0% were prompted incorrect. In the RR condition, 94.8% of Pepper's responses were correct while 5.2% were incorrect. For Fran, across both sets in the PTD condition, 83.2% of her responses were independent correct, 14.8% were prompted correct, 2% were independent incorrect, and 0% were prompted incorrect. In the RR condition, 88.2% of Fran's responses were correct while 11.8% were incorrect. Overall, across all participants, 92% of responses were independent correct in the RR condition compared to 87.3% in the PTD condition.

**Table 3**

*Participant Responding During Teaching*

| Participant | Set | % Independent Correct (PTD) | % Prompted Correct (PTD) | % Independent Incorrect (PTD) | % Prompted Incorrect (PTD) | % Overall Correct (Prompted + Independent, PTD) | % Overall Incorrect (Prompted + Independent, PTD) | % Correct (RR) | % Incorrect (RR) |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 91.7 | 7.3 | 1.0 | 0 | 99.0 | 1.0 | 91.5 | 8.5 |
| Luna | 2 | 89.9 | 7.2 | 2.4 | .5 | 97.1 | 2.9 | 94.9 | 5.1 |
| | 3 | 80.6 | 12.5 | 6.9 | 0 | 93.1 | 6.9 | 91.7 | 8.3 |
| Luna's Average | | 87.4 | 9 | 3.4 | .2 | 96.4 | 3.6 | 92.7 | 7.3 |
| Pepper | 1 | 87.5 | 11.3 | 1.2 | 0 | 98.8 | 1.2 | 93.8 | 6.2 |
| | 2 | 95.3 | 4.7 | 0 | 0 | 100 | 0 | 95.8 | 4.2 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Pepper's Average | | 91.4 | 8 | .6 | 0 | 99.4 | .6 | 94.8 | 5.2 |
| Fran | 1 | 85.0 | 12.5 | 2.5 | 0 | 97.5 | 2.5 | 93.8 | 6.2 |
| | 2 | 81.3 | 17.2 | 1.5 | 0 | 98.5 | 1.5 | 82.6 | 17.4 |
| Fran's Average | | 83.2 | 14.8 | 2 | 0 | 98 | 2 | 88.2 | 11.8 |
| Average across participants | | 87.3 | 10.4 | 2.2 | .07 | 97.7 | 2.3 | 92.0 | 8.0 |

However, when adding in *prompted* correct responses within the PTD condition, the average percentage of correct responses across participants increases from 87.3% to 97.7%. This indicates that on average, in the RR condition, more responses were independent correct while in the PTD condition, more responses were overall correct (prompted and independent correct responses combined).

## Discussion

The main purpose of this study was to compare the effectiveness of two commonly used instructional procedures in sight word instruction. As stated previously, both PTD and RR were effective procedures for teaching sight words. With regards to effectiveness the results showed, with the exception of one set for Luna, that both PTD and RR led to mastery within 4 to 11 sessions. With regards to efficiency, PTD was slightly more efficient in terms of average sessions to mastery, number of teaching trials, and duration of teaching. Third, in terms of independent correct responding during teaching trials the results indicated that on average, participants responded correctly to most trials in both conditions, with slightly higher independent correct responding in the RR condition. Given these results both procedures can be recommended for use within academic settings because both PTD and RR led to mastery of the target words within a relatively short amount of instructional time (i.e., 20 minutes per set).

These findings confirm previous literature that recognizes the effectiveness of both PTD and RR for sight word acquisition (Klaus et al., 2019; Kodak et al., 2016; McCurdy et al., 1990; Worsdell et al., 2005).

In terms of clinical implications, this study provides support to sight word teaching methods commonly referred to as "traditional flashcard drill methods" (Nist & Joseph, 2008). Although it is common for instruction within elementary classrooms to involve a multitude of teaching approaches with different forms of active responding (Cremin & Burnett, 2018), some learners may still benefit from flashcard approaches that utilize a single instructional technique, as demonstrated by this study. Considering that this study involved the use of flashcards with one technique in each condition, caution should be taken to apply the findings of this study to instructional techniques that do involve repeated exposures to flashcards

An additional clinical implication of this study relates to modality—i.e., the use of a tele-educational platform for teaching sight words. With current limitations for in-person instruction due to the COVID-19 pandemic, there is an ongoing need to identify efficacious, user-friendly, remote teaching methods. To the author's knowledge, this is the first study that demonstrated the use of a tele-educational platform to teach sight words to young learners. In addition, the educational tool (i.e., Microsoft PowerPoint®) and videoconferencing platform (i.e., Zoom) used in this study, are two common programs that are readily available for instructors and students with access to WiFi-compatible, screen-based devices. The programs used in this study may be useful for academic institutions around the world as they continue to explore effective tele-educational models. Schools may even adapt instruction by exploring other features within these educational platforms. From a global perspective, it is worth mentioning that not all schools have equal access to digital resources such as WiFi, tablets, or computers (Goudeau et al., 2021). As

such, care and consideration should be given when determining the generalizability of tele-education models to other educational settings. A final clinical implication relates to participant responding during teaching sessions. When comparing percentage of independent correct responses between conditions, all participants had more independent correct responses in the RR condition. This suggests that in some contexts, error correction procedures as opposed to prompting procedures, may be more expedient for acquiring independence with the target skill. On a related note, errorless teaching procedures emphasize early prompting to reduce errors and frustration (Schmeck & Grove, 1976). However, as demonstrated by this study, it is possible that errors along with error-correction procedures may lead to faster skill independence without any accompanied frustration; as noted by the primary researcher there were no visible signs of annoyance throughout the RR condition. In contrast, there were instances of frustration in the PTD condition when the researcher prompted participants immediately before they responded. For example, statements such as, “Hey! I was about to say that.” were made. Hence, for some learners, it may be that error-correction procedures are more effective than prompting procedures for facilitating skill acquisition and reducing frustration during the teaching process.

This study extends upon previous research in three different ways. This is the first comparative sight word study to directly compare PTD to RR. Other sight word studies have compared each procedure to either other instructional techniques or, variations of the same prompting or error-correction procedure (Belfiore et al., 1995; Carrol et al., 2015; Ferkis et al., 1997; Kodak et al., 2016; McCurdy et al., 1990; Worsdell et al., 2005). Considering that this is the first study comparing PTD to RR and the small number of participants involved, further comparisons should be conducted with larger samples. Secondly, this study replicates previous findings in that each respective procedure is an effective approach to teaching sight words

(Winstead et al., 2019; Marvin et al., 2010). Third, unlike many sight word studies in the literature (Browder et al., 2009), the participants in this study were typically developing children with no identified reading delays. This suggests that teaching procedures that have been effective for at-risk students, English language learners, and students with disabilities may also be effective for typically developing students.

Within this study, there are several limitations that should be noted. First, during the study there were some instances of technological interruptions from either the researcher or the participant. Though these moments were highly infrequent, these interruptions extended the teaching time and required some teaching trials to be repeated. Similarly, there were times when participants were distracted by other stimuli within their home (e.g., animals, siblings, or toys in the room). Considering the remote nature of this study and the difficulty of controlling in-home variables, these distractions did sometimes interrupt or extend the teaching time. Because these distractions were not common within and across sessions, the researchers infer that the distractions did not significantly influence the results of the study. However, in the future, attempts can be made to communicate with a parent or guardian about finding a quiet, distraction-free space during the study.

Additionally, this study only included three participants. Due to scheduling difficulties with other potential families, additional participants were not included for this study. Considering the small sample size, the results should be interpreted with caution. The patterns observed may not necessarily be reflective of preferred or effective learning approaches for other students. However, the results demonstrate a potential approach to efficaciously teaching sight words through a tele-education model. Future research can expand on this study by including a

larger sample size. Larger samples sizes would inform educators about pedagogical practices that are effective across a broad group of learners.

Another limitation is that the time interval between sessions was not controlled for. While participants generally had 3-5 sessions per week, sometimes these sessions were more spaced apart, while at other times, there were two sessions within a day for several consecutive days. Within the study, these differences were difficult to avoid as scheduling was based on the child's availability. Still, these differences may have contributed to variable skill acquisition between sets and participants. Future research can control for this variable by standardizing the interval between sessions or creating more stringent parameters.

To incorporate parent input, the researcher asked parents which 4-letter words they would like their child to learn. Nonetheless, this study did not formally assess social validity from either the child or parent. This information would be helpful for determining whether or not parents valued the intervention procedures and the study outcomes. Relatedly, child preference for each intervention was also not evaluated. Future studies could take social validity data and consider child preference for each respective teaching strategy. It may be that learners prefer one teaching strategy over another. Future studies could even consider whether learner preference for a particular strategy is indicative of the most effective or efficient teaching approach for that learner.

Finally, for Set 2 with Fran, the control words were almost mastered. This indicates that for that particular set, variables external to the study were contributing to skill acquisition. As confirmed by the researcher with Fran's parents, Fran began simultaneously learning the control words for Set 2 in her 1st grade classroom. Interestingly, Fran still mastered the words in the RR and PTD condition before she could master the control words. This suggests that the teaching

procedures of this study may have been more effective and efficient than the sight word instruction in Fran's classroom. Future research could more formally compare one or both of these procedures with certain teaching approaches found in school classrooms. Along those lines, future studies can compare larger teaching packages or curricula with regards to literacy skills. This may provide a stronger comparison of teaching approaches most commonly found within educational settings.

This study demonstrated that learners between the ages of 4 to 6 were able to master and maintain sight words via a tele-educational platform. Additionally, each word set was mastered within approximately 20 minutes of instructional time. Considering the importance of early literacy skills and the need to adapt to the current restrictions of the COVID-19 pandemic, this study makes an important contribution to the literature. Although this study specifically focused on sight words, the strategies in this study could be used to teach other early literacy skills such as letter recognition or phonics. It is hoped that future studies will continue to explore effective strategies for teaching literacy skills via tele-educational models. Moreover, it is hoped that future studies will continue to explore ways to teach a variety of academic skills via tele-education.

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