A COMPARISON OF SIMULTANEOUS PROMPTING AND STRATEGIC INCREMENTAL REHEARSAL IN THE SIGHT WORD ACQUISITION IN STUDENTS WITH INTELLECTUAL DISABILITES

by

MARY ELIZABETH SWILLEY

(Under the Direction of Scott Ardoin)

ABSTRACT

Simultaneous prompting (SP) and strategic incremental rehearsal (SIR) are flashcard interventions used to teach word recognition to students. Extensive research exists for SP and its effectiveness in teaching students with intellectual disabilities, but there is little research that exists for using SIR as an instruction strategy with children with intellectual disabilities. The current study compared the effects of SP and SIR on sight words acquisition in three students with intellectual disabilities.

INDEX WORDS: Simultaneous prompting, Strategic Incremental Rehearsal, Flashcard Interventions

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INTRODUCTION

The ability to read and discriminate words is an important skill that sets the foundation for success in a student's academic career (Catts & Hogan, 2003). Researchers remain focused on finding the best tools to teach students this crucial skill. Choosing a method of instruction to use in the classroom may be difficult for teachers, due to the vast quantity of tools and methods available in the literature today. Researchers determined that the use of flashcards and drill and practice are an easy, direct way to help teach word recognition to students (Browder & Xin, 1998). Flashcards provide a simple way to present stimulus sets in an instructional context. They can be used for practicing skills such as math facts (Brasch, Williams, & McLaughlin, 2008) and sight words (Kupzyk, Daly, & Andersen, 2011). Using flashcards is also a cheap and relatively easy instructional practice for teachers to engage with their students.

Flash Card Methodology in Special Education

Researchers continue to search for and evaluate the most effective and efficient evidence-based instructional practices to teach children with developmental disabilities (Ledford, Lane, Elam, & Wolery, 2012). It is of upmost importance to find procedures that allow for skill acquisition and generalization in order for the students to master goals and objectives set by their Individualized Education Plan (Swain, Lane, & Gast 2015). Methods to promote skill acquisition and generalization that have strong evidence and support in the research literature include response prompting procedures, such as constant time delay (CTD), simultaneous prompting (SP), progressive time delay, graduated guidance, most to least prompting, and system of least prompting (Ledford et al., 2012; Swain et al., 2015). Researchers demonstrated

repeatedly that these procedures are effective and adaptable in instructing various discrete and chained responses (Wolery & Schuster, 1997). Although there are considerable differences among these three procedures, they are frequently used to provide instruction to individuals with special education needs. Specifically, SP is considered a "near errorless" procedure for teaching targets in academic contexts and involves conducting probing and instructional trials (Swain, Lane, & Gast, 2015). Probing trials involve presenting the target stimulus to the student and stating the discriminative stimulus (SD), "What word?" After the student has an opportunity to respond, no error correction or feedback is given during probing trials. Instructional trials involve presenting the target stimulus and stating the SD while immediately prompting the correct target stimulus.

Simultaneous Prompting (SP)

SP is used to teach multiple skills sets in academic settings such as sight words (Swain, Lane, & Gast, 2015). Swain et al., (2015) used an adapted alternating treatment design across two comparison conditions, CTD and SP. The four participants ranged in age from 8-11 years old, were diagnosed with moderate intellectual disability or autism spectrum disorder with comorbid moderate intellectual disability and received services in self-contained classroom at least part of the school day. Results indicated that both SP and CTD were shown to be effective in teaching sight words to the participants. Sessions through criterion data indicated that two of the participants required fewer sessions to criterion as compared to SP. One participant required fewer sessions to criterion for SP as compared to CTD. For the final participant, both procedures resulted in equal sessions to criterion. SP was shown to be lower in mean training time to criterion for all participants. In trials through criterion, SP was more efficient for one participant

with 24 less trials than CTD. Participants in this study had no prior experience with SP, but they did have experience with CTD.

Morse and Schuster (2004) conducted a review of 18 articles on SP to evaluate its effectiveness, previous research, and suggestions for future research. Participants in the study included 74 individuals who ranged in age from preschool-age (0-5 years old) to adult (20 years old or older), with 66 of these participants having an intellectual disability. Based upon the studies reviewed by Morse and Schuster (2004), it was concluded that SP is an effective and errorless learning procedure, with its effectiveness being demonstrated in in both 1:1 and small group settings. Furthermore, maintenance data were reported in 17 investigations and generalization data were reported in 15 investigations. For both maintenance and generalization, the majority of participants scored 50% or higher suggesting that SP procedures extend beyond task acquisition.

Strategic Incremental Rehearsal (SIR)

In addition to flashcard procedures being regularly used to teach students with disabilities sight words, flashcards are also regularly used to teach academic skills to nonreferred students. Incremental Rehearsal (IR) is a flashcard procedure for which substantial research exist supporting its use in teaching sight words (MacQuarrie, Tucker, Burns, & Hartman, 2002; Nist & Joseph, 2008; Kupzyk et al., 2011; January, Lovelace, Foster, & Ardoin, 2016) and math facts (Burns 2005) to nonreferred students. IR involves modeling of an unknown item with feedback, followed by the presentation of the unknown item, student response and feedback, followed by presentation of a known item, student response, and feedback. The unknown item is then presented again, succeeded by the previous known item and a new known item, with the student being allowed to respond and receive feedback after each response. This procedure is repeated

until the unknown item is presented with nine known items. Next the instructor moves the unknown word to the first known position because it is now considered a known. The last known item is removed, and a new unknown item is now presented. This procedure is repeated until all of the unknown words are taught. Using a modified multi element design with no baseline, Nist and Joseph (2008) compared the effectiveness and efficiency of three flashcard procedures (interspersal, IR, and typical drill and practice) to teach sight words to first graders without any identified disability. Typical drill and practice procedures involved presenting the flashcards to the students, modeling the word one time, and asking for the student to repeat the word. After all flashcards were modeled, the instructor presented the flashcards again and asked the student to read the words aloud. Verbal praise was given each time an unknown word was read accurately. Interspersal procedures involved presenting unknown flashcards in a drill type format, while interspersing known cards in between unknown cards. The instructor would first model all unknown flashcards and asked the participant to repeat the word. Next, the instructor began to intersperse the known flashcards with the unknown flashcards. One known flashcard was presented followed by three unknown flashcards. The participant was asked to read each word aloud without a model. The instructor corrected each incorrect response and gave verbal praise for each correct response. Results indicated that participants learned more words in the IR condition. They suggest this may be due to not only the number of times a word is rehearsed but also the actual folding in of the unknown words which could be more helpful to the student.

In an effort to improve upon the efficiency of IR procedures, Kupzyk et al., (2011) developed SIR. SIR procedures allow for the student to practice the unknown targets repeatedly until the student responds correctly before additional unknown items are added. It is meant to control for an overloading of unknown stimulus items presented to the student within one

session. SIR involves an antecedent prompt with prompt fading. The student is presented with the first stimulus item, and then immediately prompted to respond correctly. After a correct response, the next unknown stimulus is presented, and the student is prompted immediately to respond correctly. This procedure is repeated with a prompt delay (e.g., 3 seconds). If the student responds correctly to the stimulus item before the prompt, the next word is presented. After the student responds correctly to both of the stimulus items before the prompt, another unknown item is introduced with the same procedure described above. The introduction of unknown words contingent on the student's responding is a benefit of SIR and increases the opportunities to respond to the unknown stimulus items (Kupzyk et al., 2011).

In the first comparison of IR and SIR, an ABAB design was used to examine the effectiveness of the two interventions for teaching sight words to four first grade students without any identified disabilities. Kupzyk et al., (2011) found both IR and SIR resulted in increases in words read correctly for all participants, but that the participants read more words correctly in the SIR condition. SIR also resulted in an accelerated increase of responding and higher response rates during instruction and maintenance sessions.

January et al., (2016) also compared IR to SIR. Participants were three second graders and one first grader without any identifying disabilities. The researchers used an alternating treatment design and presented both interventions within one session each day, with no delay in time between each intervention. Results from this study were consistent with the Kupzyk et al., (2011), in that three out of the four participants learned more words in the SIR than IR condition. All participants also retained a greater percentage of words and were provided with more opportunities to respond during the SIR condition. While these studies suggest SIR is an

effective method for teaching nonreferred students sight words, researchers have yet to evaluate the effectiveness of SIR for teaching students with disabilities.

Purpose

The purpose of this study was to compare the effects of SP and SIR on sight word acquisition in students with developmental disabilities. Since the effects of SIR have not been demonstrated with students in the special education population and the effects of SP in this particular classroom have not been demonstrated, we wanted to determine the effectiveness of both flashcard methods for the students.

METHODS

Participants

Participants were three male elementary students in a public elementary special education classroom for students with low incidence disabilities. Two participants were in the fourth grade, and one participant was in the fifth grade. Bob was 10 years old and was diagnosed with severe intellectual disability, autism, and a speech-language impairment. John was eleven years old and was diagnosed with moderate intellectual disability and speech or language impairment. Ian was twelve years old and was diagnosed with moderate intellectual disability and speech-language impairment. Participants were previously exposed to instruction with flashcards before the study, during individual 1:1 works sessions in their classroom setting. Participants received special education services and received supports such as visual schedules, token boards, and prompting for academic instruction and behavior.

Setting and Materials

Sessions were conducted in an empty workroom across the hall from the students' original classroom or at an empty table in the classroom enclosed with a divider. The researcher sat at the table beside the student. Words were gathered from the third-grade level Dolch word lists (https://sightwords.com/sight-words/dolch/#lists) and Fry word lists (www. sightwords.com/sight-words/fry/#lists). Seventy-five words were chosen and printed onto (5 in. by 8 in.) index cards. In order to the replicate the number of words normally taught in a 1:1 instructional session in their classroom, four target words were chosen for each session. These

targets were first assessed for participant's knowledge of the words, and unknown words were then randomly assigned to each condition.

Dependent Variable and Measurement

The dependent variable was the total number of correctly read words presented during each assessment session. Words were presented to the student and either scored correct or incorrect. Words were scored correct if the student read the word correctly within 8 s. Words were scored incorrect if the student did not read the word within 8 s or read the word incorrectly. If the student corrected an incorrect response within 8 s, it was scored as correct.

Design

An alternating treatments design was used to compare the effectiveness of SP and SIR. The order of instruction sessions was randomized each week and counterbalanced to control for sequence effects. Instructional sessions took place to teach the student sight words with each flashcard method across four consecutive days per week.

Procedures

Screening. An initial screening session was conducted to identify known and unknown sight words. Seventy-five words were chosen from the Dolch and Fry word lists and were presented to each student. The researcher scored each target word as correct or incorrect. After all sight words were presented to the student, the sight words scored incorrect were designated to an unknown pile. These unknown words were re-presented during a second pre-screening session to ensure that unknown words were in fact unknown. The researcher provided reinforcement such as verbal praise, "Thanks for working", and tokens

*Instruction***.** In the participants' normal 1:1 work session in their classroom, the teacher presented a total of four words and students received tokens for their token board on an FR1

schedule and edible reinforcers were exchanged for ten tokens. Instructional sessions for both conditions were both fixed at 12 min. The sessions ended after 12 min elapsed or if all words were presented according to the specific procedure. Sessions were conducted each day Monday through Thursday. No instruction was conducted on Friday due to not being able to conduct assessment on the following day.

Assessment. Assessment sessions were conducted before each instructional session and assessed targets taught in the SP session or the SIR session the previous day. During each session, the researcher randomized the previously taught target words, presented the cards one at a time to the student, and recorded if the word was read correctly or incorrectly. The researcher gave tokens for on-task behavior and verbal praise such as "Thanks for working" on an FR1 schedule. Sessions ended after all four target words were presented.

Simultaneous Prompting (SP). SP sessions consisted of teaching four target sight words that were collected from the Dolch and Fry word lists and randomly selected from the pool of unknown words determined in prior screening sessions. The researcher reinforced on-task behavior, gave verbal praise such as "Thanks for working", and gave a token on an FR 1 schedule with the student's token board. The participant exchanged ten tokens for an edible reinforcer.

Prior to the beginning of the session, the teacher obtained the student's individual flashcards determined by previous screening sessions and shuffled the cards. The teacher secured the student's attention by saying, "We're going to do some work and work for cool things." The researcher presented the first flashcard to the student and stated the SD, "What word?" Following the SD, the researcher immediately prompted the correct word. If the student expressively identified the word correctly, the researcher gave a verbal praise such as, "Thanks

for working", and placed a token on the token board. If the student did not expressively identify the word correctly within 8 s or gave an incorrect response, the researcher stated the SD, "What word" and immediately prompted the correct word. This procedure was repeated until the student expressively identified the correct word. After the student gave a correct response, the researcher gave a verbal praise such as, "Thanks for working" and placed a token on the token board. In order to replicate the natural environment of a classroom 1:1 work session, the target words were presented five times each. The instruction session ended after all target words were presented five times each or if 12 min elapsed.

Strategic Incremental Rehearsal (SIR). Each session consisted of teaching four unknown words that were collected from the Dolch and Fry word lists and randomly selected from the pool of unknown words determined in prior screening sessions. The presentation of unknown words was contingent on student responding. The researcher reinforced on-task behavior, gave verbal praise such as "Thanks for working", and gave a token on an FR 1 schedule with the student's token board. The participant exchanged ten tokens for an edible reinforcer. The first word was presented while the therapist simultaneously modeled the word. The student was then prompted to repeat the word correctly. If the student read the word correctly, the researcher gave verbal praise such as "Thanks for working" and gave a token for their token board. If the student read the word incorrectly, error correction and prompting of the correct word was provided, such as "No the word is ___, say ____." After the student repeated the word correctly, the therapist gave the student verbal praise such as "Thanks for working" and gave a token for their token board. If the student did not respond within 8 s, the student was then prompted again to repeat the word correctly. When the student repeated the word correctly, the researcher gave verbal praise such as "Thanks for working" and gave a token for their token board. After U1 was

presented, U2 was presented following the identical procedure. The procedure was then repeated again for U1 and U2. After this repeated procedure, U1 was presented with an 8-s delay to prompt. If the student read the word before the prompt, the researcher gave verbal praise to the student such as "Thanks for working" and gave a token for their token board. The researcher then moved to U2. If the student read the word before the prompt, the researcher again gave verbal praise to the student such as "Thanks for working" and gave a token for their token board. After the student read both words (U1 and U2) before the prompt, U3 was presented. If the student did not read U1 and U2 correctly before the prompt, then the procedure was repeated until no prompt was needed. U3 was presented while the researcher simultaneously modeled the word. Praise and or error correction and feedback were given contingent on the student's response. After U3 was presented, U1 and U2 were randomized. U1 and U2 were presented with the 8-s second prompt delay along with praise and or praise and error correction. Next U1, U2, and U3 were then randomized again and presented with the 8-s prompt delay following praise and or praise and error correction contingent on the student's response. After the student correctly read U1, U2, and U3 before the 8-s delay prompt, the researcher presented U4 and simultaneous modeled the word. If the student read the word correctly, the researcher set U4 aside and randomized U1, U2, and U3. U1, U2, U3 were presented with the 8-s prompt delay procedure. Once the student read the word correctly, the researcher then randomized U1, U2, U3, and U4. The researcher presented U1, U2, U3, and U4 with the 8-s prompt delay procedure and praise and or praise and error correction was given contingent on the student's response. The session ended after all four unknown words were presented and this procedure was followed or if 12 min elapsed.

Phase 2. In this phase, the same procedures described above for both conditions were employed for all participants, with a variation on the selection of target sight words. Four new words were randomly assigned to the SIR condition, and another four words were randomly assigned to the SP condition. These words were used in each instructional session in that particular condition. The participants were assessed on these words each assessment session. Words that were scored incorrect during the assessment session continued to be presented during the instructional session. Words that were scored correct in two consecutive assessment sessions in that specific condition were replaced with two new words.

Interscorer Agreement and Procedural Integrity

Each session was videotaped, and an independent observer watched sessions to determine whether the student correctly or incorrectly read the word. The observer acquired an identical data sheet to the therapist in the session and scored correct or incorrect contingent on the student response. Interobserver agreement was calculated by dividing the total number of agreements by total number of agreements plus disagreements, then multiplying by 100. Interobserver agreement was taken on 33% of all of the sessions. The overall mean agreement was 100% across all participants.

During each condition, therapists followed a strict protocol specific to the particular condition. The protocol was organized into a checklist that was carefully introduced and explained to each therapist. Each session was recorded on a laptop with the screen covered. Another observer watched the recording of the sessions to score the procedural integrity of the therapist conducting the session. The observer watched 33% of the recorded sessions and scored procedural integrity of each observed session. The observer scored the therapist by using a checklist that the therapist used to follow the protocol. The observer either scored the therapist

correct or incorrect among the completion of each step of the protocol. Notes were also made to record whether the therapist added additional prompts or omitted any steps. The overall mean procedural integrity was 100% for SIR and 100% for IR across all participants and across both instructional and assessment sessions.

RESULTS

Results for all three participants are presented in the figures below. Figure 1 presents results from Ian and John. Figure 2 presents results from Bob. In Phase A, neither flashcard intervention resulted in considerable differences among the participants. Given their performance, the continuation of the first phase would not likely have resulted in significant learning or differentiation between conditions. Figures 4 and 5 represents the cumulative words learned in Phase B for all participants.

Ian. During sessions one through three, Ian did not attend to stimuli and vocally responded with unrecognizable utterances. We added a contingency statement for an additional tangible reinforcer, a sticker, following session three. Ian received the sticker when he attended to and attempted to read the target on the flashcard. In sessions one through 14, there were no increases in correctly read words. The results were flat until session 15 in Phase B. Ian read two words correctly in the SIR condition. Mean performance across both phases in SP was 0% and in SIR was 6.25%.

John. In Phase A, there was no clear differentiation in the two conditions. John correctly read one word in one assessment session in SP and in SIR. In Phase B, John read one word correctly in three assessment sessions in the SIR condition. In the final SP assessment session for Phase B, John read two words correctly. Mean performance across both phases in SP was 12.5% and in SIR was 12.5%.

Bob. In Phase A, there were no differences in the two conditions. John read one word correctly in two assessment sessions in the SIR condition and read one word correctly in one assessment session in the SP condition. In Phase B, there was an increasing trend in words read correctly in the SP condition, but then the trend fell flat in sessions 15 through 17. SIR remained flat at zero throughout all of Phase B. Mean performance across both phases in SP was 15% and in SIR was 6.25%.

DISCUSSION

Researchers extensively studied flashcard interventions, such as SP, with children with intellectual disabilities in order to determine the effectiveness of the intervention. SP has been used to teach multiple skill sets in a variety of academic settings. Researchers conducted interventions with SIR with children who do not have an identified disability. Both have been shown to be effective within the specific population (Morse and Schuster, 2004; Kupzyk et al., 2011). The purpose of this study was to evaluate the effects of SP and SIR in teaching students with intellectual disabilities sight words and determine if either intervention would result in greater rates of learning.

In Phase A, new words were taught during each instruction session and followed the original protocol for SIR and SP. Results were variable for John and Bob in both conditions, and results for Ian remained flat at zero.

In Phase B, two sets of words were assigned to each condition, SIR and SP. These same sets of words were used during each following instructional session. These words were assessed, like Phase A, the next day. In order for an old word to be replaced with a new word, the participant needed to correctly read the word in two consecutive assessment sessions. This word would then be considered a learned word. Only two participants, John and Bob, read words correctly in two consecutive assessment sessions. John learned one word in the SIR condition, and Bob learned two words in the SP condition.

There were several limitations of this study that should be acknowledged. First, assessment and instructional sessions were conducted at different times each day. The timing of

when sessions were conducted depended on the behavior of each student and the amount of staff in the classroom. Second, sessions were not conducted in the same location every day. Location, including the particular table and room, depended on the availability of that table or room. Third, there was a testing threat among the two conditions in the assessment session. The effects of teaching and assessing the words in SP affected the SIR condition. Participants memorized words that were taught in previous sessions in one condition and applied those words to assessment sessions in the other condition. Fourth, since the SIR protocol involves introducing a new word contingent on the student responding correctly without a prompt, participants were often only exposed to the first two words assigned to that session. While in SP, participants were exposed to all four words assigned to that condition. Fifth, the students acquired an extensive learning history with SP in their classroom environment prior to the commencement of the study. Since SP involves a prompt dependent answer, and participants were accustomed to relying on the instructor to prompt the correct answer; this could have affected their performance in the SIR condition, due to there not being a prompt for each answer.

In consideration of the limitations and findings of this study, there are several avenues for future research. The present study focused on the original protocol for SIR in Phase A, but in Phase B a new protocol, repeatedly teaching the same words, was administered. Future research should consider comparing effects of Phase A of SIR and Phase B of SIR only. This would help researchers to determine if repetition of the same words within SIR would be advantageous to children with intellectual disabilities. Future studies should also consider extending the instructional sessions longer than 12 min. Although, the length of the session might be dependent on the various abilities to attend for a longer time. If sessions were longer than 12 min, the participants would receive a greater number of exposures to words which would likely better

support acquisition of target words. Researchers should also consider examining the specific characteristics of SIR that would benefit children with intellectual disabilities in acquisition of target items. Future studies should look at continuing this study with other subjects and skills within this population.

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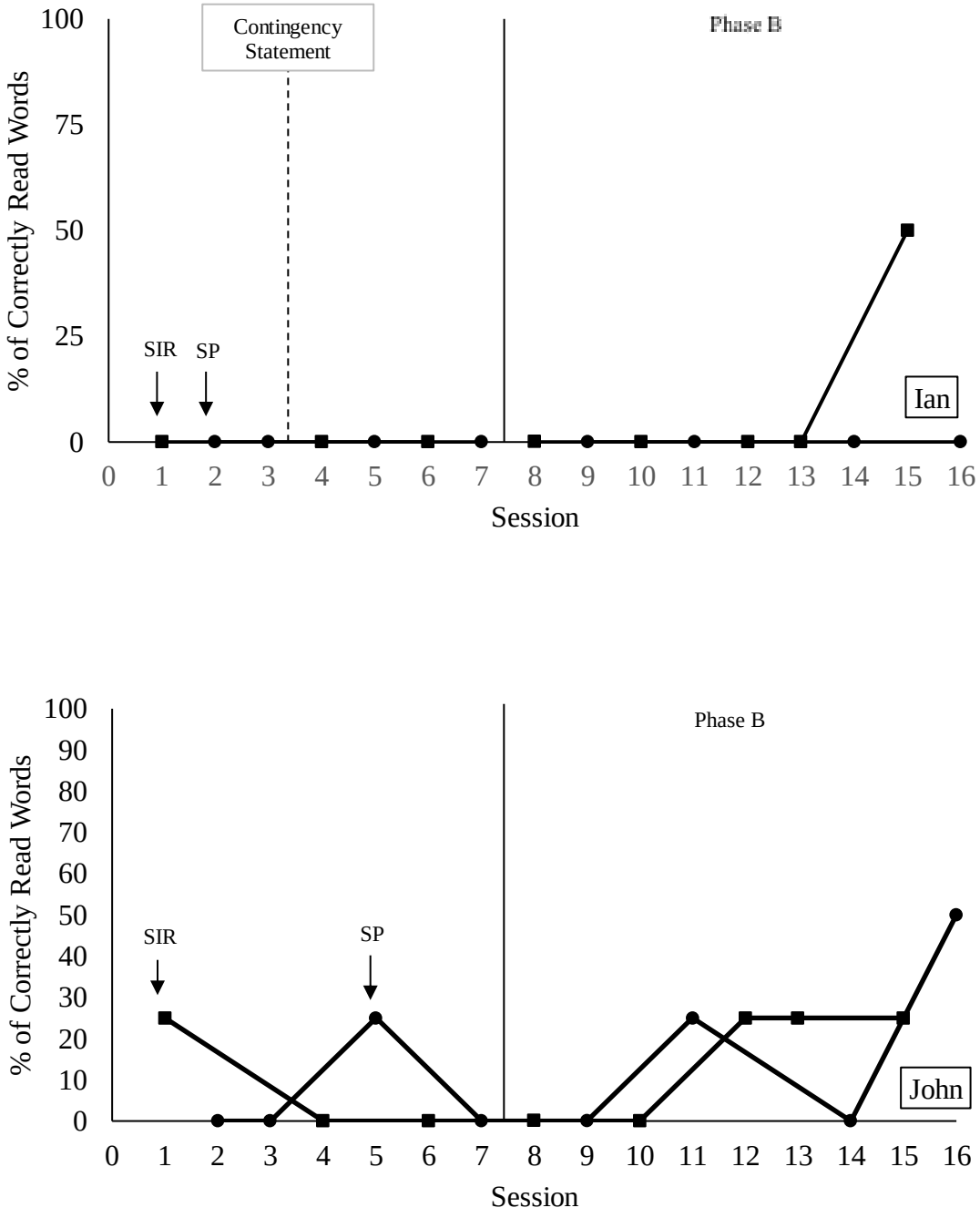

Figure 1. Percentage of correctly read words under each condition for Ian (top graph) and John (bottom graph). Data from phase A (different words) of the study are shown before the condition line, and data for phase B (same words) are shown after the condition line. SP = simultaneous prompting; SIR = strategic incremental rehearsal

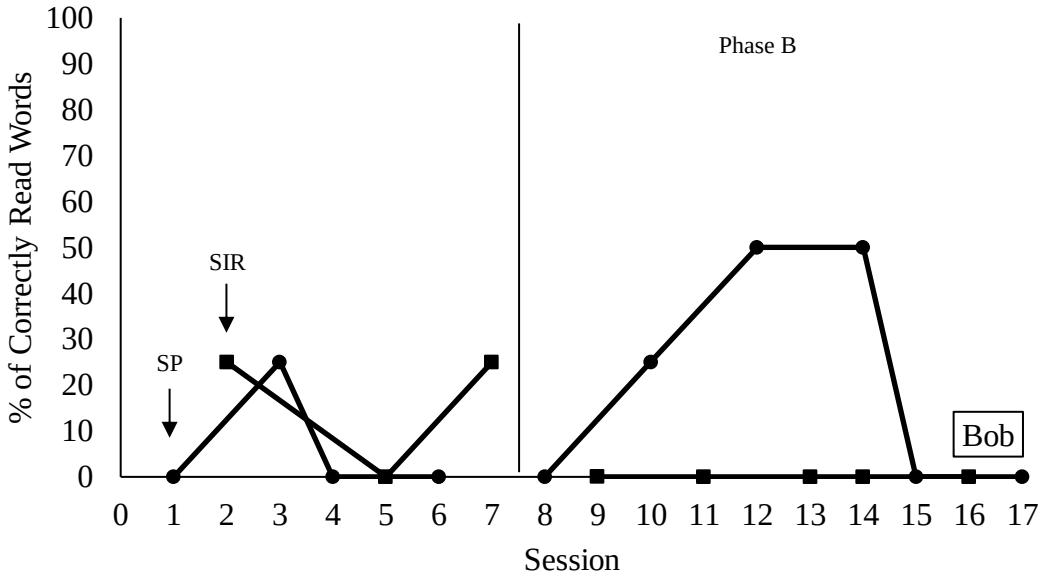

Figure 2. Percentage of correctly read words under each condition for Bob. Data from phase A (different words) of the study are shown before the condition line, and data for phase B (same words) are shown after the condition line. SP = simultaneous prompting; SIR = strategic incremental rehearsal

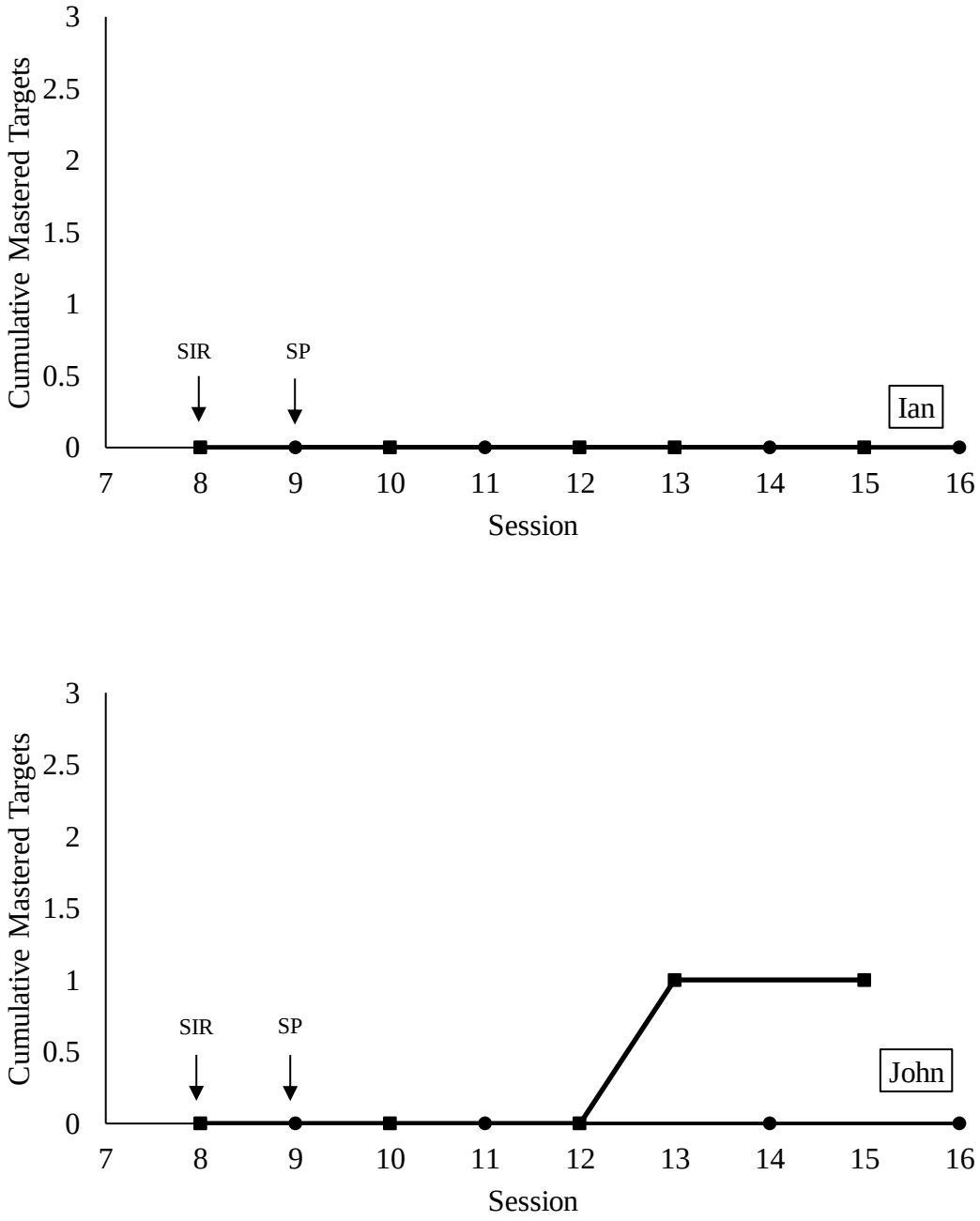

Figure 3. Cumulative number of words learned under each condition for Ian (top graph) and John (bottom graph). Data from phase B (same words) are shown. SP = simultaneous prompting; SIR = strategic incremental rehearsal

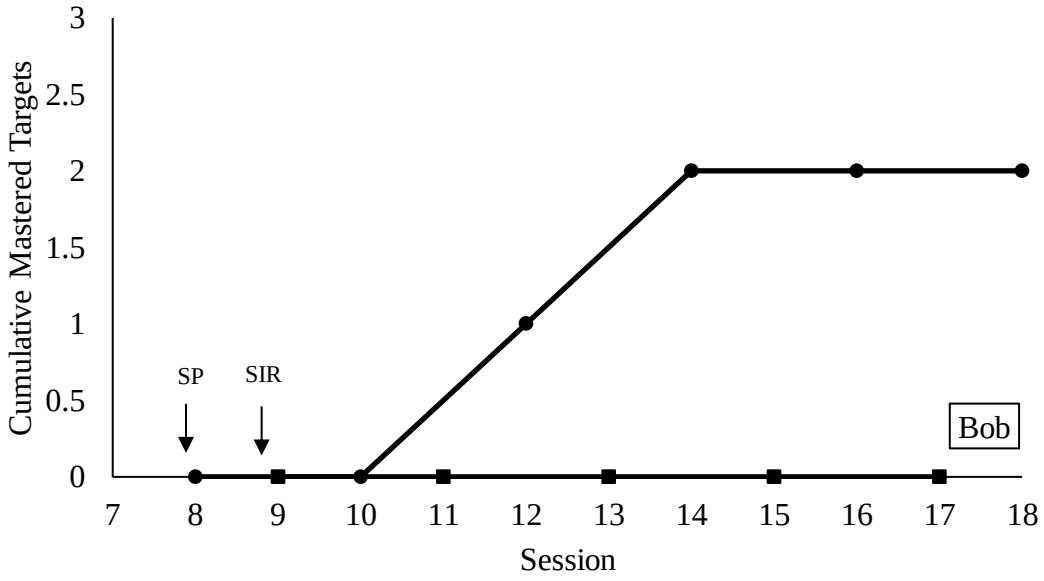

Figure 4. Cumulative number of words learned under each condition for Bob. Data from phase B (same words) are shown. SP = simultaneous prompting; SIR = strategic incremental rehearsal