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A Comparison of Different Modeling Techniques to Establish Token Reinforcers in Classroom Settings

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ABSTRACT

Prior research has supported the use of reinforcer-based methods in school settings. Video based modeling methods for establishing conditioned reinforcers without the need for explicit pairing with primary reinforcers can help to extend the use of these resources into new contexts. The use of video based conditioning has potential applications in school settings to increase academic skills without the use of more costly-to-implement reinforcer systems. However, conditioning of this kind might be restricted by the need to individually condition stimuli with different participants. The current study evaluated effects of video based conditioning on relative rate of sight word reading across two experiments. In Experiment 1, token preference was conditioned via individual video presentation. In Experiment 2, video presentation was evaluated in a small group format. Participants included children between the ages of 4-12, and responding was evaluated using a concurrent-choice assessment embedded within a multiple baseline across participants design. The results of Experiment 1 indicated only marginal differentiation of responding to the different tokens. Results of Experiment 2 found differentiation of preference for 2 of the 3 participants. A consistent preference hierarchy was obtained across both participants, which slightly favored Video Observational Conditioning over Video Modeling and an unconditioned (neutral) token.

CHAPTER ONE:

INTRODUCTION

With the rising demand for qualified academic performance in the job market, American students need to be prepared to meet higher standards of education than ever before (Duncan, 2010). However, only 47% of Americans believe the current United States (US) educational system works well (Gallup, 2017). This has led the US Department of Education to evaluate policy changes to improve secondary education (US Department of Education, 2017). To this end, it behooves education researchers to evaluate experimental data to find solutions for improving teaching methods. Applied Behavior Analytic perspectives, which view academic performance as operant behavior, might offer both a source of novel interventions and a framework for evaluating them.

One of the primary methods in which Applied Behavior Analysis has been used in classroom settings is the use of reinforcement contingencies in the acquisition and emission of important academic behavior. Indeed, the use of reinforcement-based methods of instruction has been identified as best practice in the use of special education teaching (Odom, Rogers, & Hatton, 2010; Odom & Wong, 2015). Despite this, the use of reinforcement-based methods is sometimes contentious due to concerns about intrinsic motivation and long term side effects of "reward-based" instruction (Akin-Little, Eckert, Lovett & Little, 2004; Deci, Ryan, & Koestner, 2001; Kaplan, Katz, & Flum, 2012). As a result, certain teachers might be unwilling to use tangible reinforcement-based interventions. Additionally, due to concerns of underfunded

classrooms, teachers might be unable or unwilling to provide additional outside tangible rewards (Center on Budget and Policy Priorities, 2017). This presents the need for alternative forms of reinforcement interventions that can be used to increase academic responding. If effective methods of conditioning tokens without the use of primary reinforcement could be identified, such tokens could come to act as motivators to drive academic responding. Prior research into modeling interventions has shown potential for increasing the value of previously neutral stimuli, and using it to increase responding in academic contexts (Greer, Singer-Dudek, Longano, and Zrino, 2008). Greer et al. (2008) evaluated a method of increasing the reinforcement value of peer-delivered praise of academic tasks in a school setting. In this study, four male students (aged 3-7) who demonstrated initial insensitivity to praise as reinforcement participated. A peer was recruited to model performance of a task beside the participant. Performance of the task was obscured from the participants' view using a divider, but the experimenter delivered praise contingent on the peer's performance in a way that was salient to participants. Following successive trials of such Observational Conditioning, praise came to increase responding in different assessment context. This demonstrated a preference change as the result of conditioning.

Extensions of such observational conditioning methods could expand into analyses using video presentation of their methods. Prior extensions of other modeling procedures into video presentation have been evaluated (Burton, Anderson, Prater, & Dyches, 2013; Horne, Low, Fleming, & Dowey, 1995). Using a video based instruction method allows researchers to provide self or peer based modeling of appropriate target behavior. Prior modeling techniques have shown the ability to change the value of stimuli (Singer-Dudek, Oblak, and Greer 2011; Tsai and Greer 2006). The application of these techniques using a video-based method is a

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logical next step for analysis (Meuret & Samaha, 2016). The implementation of a video-based intervention to establish conditioned reinforcers, in the manner as described in Greer et al. (2008), could open the possibility of a conditioned reinforcement alternative to traditional reinforcement.

However, the implementation of an intervention in a school setting must necessarily account for the fact that schools are an inherently collective learning environment. While video presentation has been effective in situations where teachers could provide one-on-one interaction with the participants, teachers must often work in contexts where their attention is divided across multiple students in a classroom (National Education Association, 2019). This underscores the need for video-based interventions that can target student interventions school-wide (Ennis, Hirsch, MacSuga-Gage, & Kennedy, 2017). Ennis et al. (2017) argue that school-based interventions that do not plan for change across multiple students in the environment are of little practical use to school settings. Interventions that use video to target multiple students at once have shown some success at extending the use of video based conditioning to whole class or whole school interventions (Horne, Lowe, Fleming, & Dowey, 1995).

Thus, the purpose of this study, which contained two experiments, was to evaluate a video-based conditioning procedure to increase the value of potential reinforcers. Video-based conditioning might act as an effective method to generate increased responding in the presence of modeled stimuli, and thus can cause neutral tokens to act as conditioned reinforcement. The benefits of this system are in the increase of academic responding with an easy to use, socially acceptable form of reinforcement. Effects of this conditioned reinforcement were evaluated using sight word reading as an academic skill of interest. Experiment 1 evaluated and compared two video-based procedures as a method of conditioning the use of a neutral token to act as a

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reinforcer for sight word reading performance. This experiment aimed to determine whether a video-based observational conditioning method could be used to increase participants' preference and performance in a sight-word reading task.

In Experiment 2, the video based conditioning procedure that resulted in the highest performance during Experiment 1 was evaluated. During Experiment 2, the same procedures were evaluated, but during conditioning sessions, the conditioning was shown to students in a group setting, rather than to individual students. The focus of this Experiment was to evaluate whether this form of conditioning could work in a classroom-type setting where multiple students would be present in the classroom all at once. Responding was then evaluated to determine whether the students who received conditioning in this method displayed comparable preference changes to the students who received conditioning individually in Experiment 1.

CHAPTER TWO:

RELEVANT LITERATURE

Conditioned Reinforcement

The concept of conditioned reinforcement has academic roots in Skinner (1938) with the discussion of chain schedule reinforcement. In a chain schedule, or "chaining," a stimulus becomes paired with the stimuli that immediately preceded and followed the stimulus in the chain. As an example, consider the well-understood phenomenon of rat feeder training in which the click of the food hopper comes to maintain responding even in the absence of food delivery. In broad terms, a stimulus is considered to be a form of "conditioned reinforcement" if it develops reinforcing properties only after being paired with another reinforcing stimulus. This is to distinguish it from "naturalistic" or "primary" reinforcement if a consequence serves to reinforce behavior in the absence of any other learning history (Williams, 1994). One of the principle advantages of using a conditioned reinforcer is the conditioned reinforcer may be more socially valid than the primary reinforcer with which it has been paired. Praise, for example, is a commonly used form of reinforcement that is often classified as a conditioned reinforcer due to its associations with more naturalistic forms of reinforcement such as food, warmth, or affection (Dozier, Iwata, & Thomason-Sassi, 2012). As a result, conditioned reinforcement can be more easily generalized for use in different settings, including use in classrooms.

Conditioned reinforcement can be described in an antecedent paradigm, in which the entirety of the intervention occurs prior to the behavior, and pairing is implemented without the

occurrence of operant behavior on the part of the participant. Research on antecedent conditioning has been expanded into academic interventions on key classroom activities (Pereira & Winton, 1991). These have largely been evaluated using antecedent self or peer modeling of behavior.

Conditioned Reinforcement in Academic Settings. Applications of modeling interventions in academic settings have implications for increasing performance of key behavior that will result in future academic success. Modeling-based techniques have been shown to increase the occurrence of modeled skills (Burton, Anderson, Prater, & Dyches, 2013; Horne, Low, Fleming, & Dowey, 1995). Additionally, by changing or increasing stimulus preference, teachers can gain access to socially appropriate forms of reinforcement, as well as look for novel ways to condition preference for academic stimuli.

Interventions to increase relevant academic skills using conditioned reinforcement have already been identified. For example, Tsai and Greer (2006) evaluated three preschool-aged children diagnosed with a developmental disability in a delayed multiple baseline design in which participants observed peer confederates receiving access to books contingent on work task completion, and subsequently began to engage in maintenance tasks when books were delivered contingent on responding. The findings of Tsai and Greer (2006) demonstrated effects of a peer-based observation method on increasing word reading frequency by using a stimulus pairing procedure to condition increased reinforcer value for books. Additional studies have evaluated similar findings, such as increasing early language development (Sundberg, Michael, Parington, & Sundberg, 1996) and appropriate worksheet completion (Longano & Greer, 2006). With this in mind, there is ample opportunity for these principles of behavior to inform potential strategies

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for increased academic performance in students, in a manner that is socially acceptable and is reasonable for a teacher to implement in the course of normal class settings.

Observational Learning to Teach Novel Forms of Reinforcement

So far, the process of conditioned reinforcement has been discussed in terms of the relation between an initially neutral stimulus and an already established reinforcer. However, similar value-increasing effects have been shown without the need of introducing an already-established reinforcer into the conditioning paradigm (Greer & Singer-Dudek, 2008). Such forms of conditioned reinforcement are interesting because of their potential use in situations where a primary reinforcer is unavailable or inappropriate.

As an example, Greer and Singer-Dudek (2008) demonstrates this phenomenon through the use of observational conditioning to condition a plastic disk, or a small length of string, to function as a form of reinforcement. Participants included preschool students between the ages of 3-5. During initial assessment, participants correctly responded to tasks when correct responding resulted in the contingent delivery of food items, but contingent delivery of plastic disks did not result in responding. During observational conditioning, the peer model and participant sat next to each other, but responding was obscured such that the response that the peer model made could not be observed, but the participants could observe that plastic disks were delivered following correct responding. After the observational conditioning sessions, the participant engaged in correct responding when correct responding was made contingent on the delivery of plastic disks alone. These findings demonstrated that reinforcing characteristics for novel stimuli could be conditioned via observational procedures.

Observational Conditioning. In behavior analysis, observational conditioning has been used in interventions where peers or other models with proficiency in a behavior are used to help

shape a desired target behavior. Individuals are made to observe situations in which a model demonstrates correct responding and the correct responding is reinforced. This kind of observational conditioning has been used as part of a package intervention in some therapies for skills training in individuals with developmental disabilities.

As an example, Werts, Caldwell, and Wolery (1996) conducted a training assessment in which peer models without disabilities modeled a specific academic response chain to 7-8 year old individuals with disabilities (i.e., spelling name, simple addition using calculator, etc.). During the observational conditioning conditions, the typically developing peers engaged in the target response chain while being observed by the peers with developmental disabilities, and were praised at the conclusion of the chain. The individuals with disabilities were then asked to engage in the chain. A multiple baseline design was arranged, and results indicated that correct responding in the target response chains was greater following observational conditioning trials than it was following baseline probes. Posttest probes conducted with different materials indicated that these improvements generalized to other related tasks.

While modeling techniques have used video presentation, less research has been done on video based interventions drawn from Observational Conditioning techniques. Prior research such as Meuret and Samaha (2016) evaluated an advertisement-based video modeling method to increase preference for specific stimuli. However, this modeling technique did not use the methods described by Greer and Singer-Dudek (2008). Greer and Singer Dudek (2008) presented a confederate, who modeled a response (which was obscured), and received a stimulus after their response. The findings of Greer and Singer-Dudek (2008) have shown effectiveness at increasing preference for neutral stimuli, but have thus far been restricted to in vivo

presentations. Therefore, there is room to evaluate the use of techniques inspired by Greer and Singer-Dudek (2008) in the use of a video presentation of observational conditioning.

Functionally, video and in-vivo observation can be seen as identical, other than that video modeling depicts the peer model in a video or digital format instead of using a live model. Using a video based presentation of observational conditioning techniques has some potential advantages. For example, during in vivo modeling, the model might go off script, or fail to respond as intended. This does not happen in video modeling as the use of editing software allows the video creator to control what images are displayed to participants. In addition, having access to a video observation procedure means that this video can be copied and presented as many times as desired, without having to retrain models to engage in the target responses.

Video Modeling. The technique of video modeling follows similar principles of reinforcement that are observed in observational conditioning. By pairing the presentation of a neutral stimulus with socially-mediated reinforcement resulted in increased preference for that stimulus. Video modeling interventions have typically been able to increase target responses by showing a self or peer model engaging in the target behavior correctly.

Prior research, such as Plavnik and Ferreri (2011), has suggested that the use of a video observational learning procedure is effective. In their study, four English-speaking children (aged 4-6) and diagnosed with Autism Spectrum Disorder (ASD) participated. Participants observed video models of peers requesting and obtaining specific tangibles. After the implementation of this video based observation, participants engaged in increased requesting responses in the presence of reinforcing stimuli.

Burton, Anderson, Prater, and Dyches (2013) evaluated a school-based video self-modeling intervention for students diagnosed with ASD (aged 13-15). Through a structured self-

monitoring intervention, participants observed modeled successful completion of math skill story problems. Results of the study indicated that all participants improved their math skills over the course of the intervention.

Sight Word Reading

For this study, sight word reading was selected as the dependent variable. The reason for this selection was to find a socially significant behavior to evaluate effects of these conditioning techniques on, for later application in academic settings.

One of the first goals of the education curriculum is to develop a baseline of vocabulary literacy that can serve as a foundation for future reading skills (K12 Reader, 2018). Early education skills for reading and vocabulary skills are based around the concepts of word recognition (i.e., ability to identify words) and word comprehension (i.e., ability to identify meaning of words; Gabig, 2010). The development of effective teaching methods is necessary for ensuring students meet these goals.

One such intervention is the presentation of words in the form of sight word reading instruction. Sight word reading instruction is a method of teaching reading skills using flash card presentation and a contingent stimulus (such as corrective feedback) for correct and incorrect responding (Yaw, Skinner, Skinner, Maurer, Cihak, & Wilhoit, 2014). This method is often used to teach early word recognition, and can make up the bulk of a new reader's vocabulary (Ravitch, 2007).

Sight word reading also benefits from being a quantifiable behavior that can be observed and independently measured. This allows it to be effectively used as part of a three-term contingency in which the behavior of interest is reading, which may allow it to fit within a behavior analytic framework.

The Dolch sight word reading list is the currently used list of sight words target for reading practice (Meadan, Stoner, & Parette, 2008). It is divided into a number of words per reading level grade, and consists of common words that are expected to be learned at that level. As it can be considered a socially significant assessment, the Dolch list was used to create the target words for assessments.

Concurrent preference

Preference in concurrent-choice contexts can be affected by differences in reinforcer quality, with more behavior allocated toward higher quality reinforcers (Herrnstein, 1961). As such, the use of this Matching Law analysis has been an effective tool in identifying preference for reinforcers (Baum, 1974). Research involving the use of concurrent-chains procedures has shown this procedure to be effective at identifying differences in preference across multiple stimuli using relative response rates (Gomez & Shahan, 2012; Koehler, Iwata, Roscoe, Rolider, & O'Steen, 2005; Schmidt, Hanley, & Layer, 2009). Thus, reinforcement assessments of this type demonstrate differences between relative and absolute preference, as a stimulus that a participant is willing to work to obtain may not be contacted in the presence of a more powerful form of reinforcement. For the purposes of this study, demonstrating the relative effects of reinforcement between two or more choices provides an illustration of relative preference across the choices (Roscoe, Iwata, & Kahng, 1999).

Summary

Reinforcement-based methods have shown benefits to increasing academic behavior in school settings. The use of observational-based conditioning of novel stimuli to act as reinforcers has applications for increasing behavior without the use of additional primary reinforcers. Prior research using conditioned reinforcement in educational settings have not

focused on the application of these training procedures using a video-based instruction method, nor have they evaluated these methods in the presentation of video-based conditioning to a group of children simultaneously. This study aims to evaluate the use of video-based observational learning to condition tokens to function as reinforcers, and to evaluate the use of said video-based methods in a group context. Applications of these methods to conditioned reinforcement may increase the use of reinforcement-based interventions in school settings.

CHAPTER THREE:

GENERAL METHOD

Participants and Setting

Three participants (Red, aged 5; Dawn, aged 7; and Iris, aged 5) were included in

Experiment 1 and three participants (Whitney, aged 9; Steven, aged 9; and Wally, aged 7) were

included in Experiment 2. Participants were recruited through the assistance of a local behavior

intervention company, with which they were affiliated. Recruitment was conducted by providing

fliers advertising the study to all parents of readers that attended the behavior company. All

participants with the exception of Dawn and Iris were diagnosed as having high functioning

ASD. Dawn and Iris were diagnosed as typically developing. Dawn and Iris attended public

school appropriate to their age. Red, Whitney, Steven, and Wally attended a specialty school

associated with the behavior intervention company. All participants had prior experience with

reading, but did not have any prior experience with video modeling studies, and did not receive

reading interventions outside of their normal classroom activities. All sessions were between 5-7

min in length depending on length of conditioning trials, and were conducted 1-3 times a day,

and 2-3 times a week. Sessions were conducted in a quiet section of the subject's school, or the

early intervention clinic, containing a table and chairs.

Materials

Materials for both Experiment 1 and 2 included index cards that displayed words drawn

from the Dolch Sight word reading list at the participant's reading level. For Experiment 1,

Dawn was assigned words from the 1st-grade Dolch sight word list, while Iris and Red were assigned words from the Kindergarten Dolch sight word list. For Experiment 2, Whitney was assigned words from the first-grade Dolch list, Steven was assigned words from the 3rd-grade Dolch sight word list, and Wally was assigned words from a modified pre-K Dolch word list that his teacher was using with him. In all cases, sight words were assigned based on the reading level reported by each participant's parent or teacher. Words were displayed as 3"x5" paper flashcards with the target word clearly written on them. Additionally, the study materials also included small, laminated paper squares with arbitrary symbols, which acted as tokens. These tokens depicted one of three shape and color combinations on them (blue circle, red star, yellow triangle), as well as three small glass jars in which tokens were placed when delivered. A pencil and blank piece of paper was also freely available during all arrangements. Reinforcement conditioning model videos were also created for the participants. These videos were 15-s in length and were created using both male and female peers within 2 years of each participant's age. Videos were recorded and displayed to the participants through the use of digital recording materials (phone camera, computer editing software, and laptop screen).

Response Measurement and Reliability

The primary dependent variable of both Experiment 1 and 2 was the rate of correct word reading in 5 min sessions. Data were collected on the number of responses that occurred when the conditioned stimulus (henceforth referred to as a "token") was made contingent on word reading, as well as the number of responses that occurred when a neutral token was made contingent on word reading.

Trained observers used a smartphone application (Countee) to record the frequency of the target responses and the delivery of conditioned and neutral tokens. A second observer

independently recorded data for the purposes of interobserver agreement (IOA). Observers were doctoral level graduate students with a history of ABA research. To calculate IOA, each session time was divided into 10-s intervals. Agreement was calculated by dividing the smaller number of responses within each interval, by the larger number or responses, and averaging the fractions across the session. Treatment integrity was assessed by the use of a treatment integrity questionnaire (see Appendix A) which collected data on the number of tokens delivered during assessment, as well as the presentation of videos during video conditioning sessions.

For Experiment 1, reliability were assessed for 33% of reinforcement assessment sessions and integrity was assessed for 33% of assessment and conditioning sessions. Mean percentage agreement across participants was 95% (range, 94% to 96%, across sessions) during reinforcement assessment sessions. For responding to the Video conditioning token, average agreement was 94.6% (range 94.4% – 94.7%). For the observational token, average agreement was 96.2% (range 95.8% – 96.7%). For the neutral token, average agreement was 95.4% (range 93.5% – 97.9%). Treatment integrity was 100% across assessment and 100% during video presentation sessions.

For Experiment 2, reliability were assessed for 33% of reinforcement assessment sessions and integrity was assessed for 33% of assessment and conditioning sessions. Mean percentage agreement across participants was 96.5% (range, 95.4% – 98.4%, across sessions) during reinforcement assessment sessions. For responding to the observational token, average agreement was 96.9% (range 95% – 99.1%). For the neutral token, average agreement was 96.9% (range 95.8% – 97.7%). Treatment integrity was 100% during assessment sessions and 100% during video presentation sessions.

Experimental Design

During both Experiments 1 and 2, evaluation was conducted using a nonconcurrent multiple baseline across participants design with an embedded concurrent operant. The purpose of the multiple baseline design was to compare each participant performance within and across all participants included in the study. This design assessed the rate of correct word reading responses that occurred prior to and following the use of stimulus conditioning. In both studies, post-conditioning performance was also compared to a neutral-stimulus control condition using concurrent operant presentation of tokens.

Preassessment and Exclusion Criteria

For Preassessment, each participant was presented with flash cards depicting all of the listed words for the Dolch sight words of their reading level. The number of cards presented differed depending on the level of Dolch words. For Kindergarten level reading, 52 words were presented, for 1rst and 3rd grade, 41 words were presented, for the modified pre-K Dolch words list 23 words were presented. Each flashcard depicted a different word, and participants were asked to read the word correctly within 4 s of presentation. If the participant correctly read 80% or more of the sight words presented, he or she was accepted into the study. The purpose of this pre-assessment was to determine whether the participants had the capacity to read the sight words prior to intervention. Participants were also excluded if they did not demonstrate compliance with instructions during initial meetings. These instructions were simple, and included requests that the participants sit down, read each word, and turn over the card when finished reading. Compliance was not formally assessed, but all participants complied with all delivered instructions during preassessment.

CHAPTER FOUR:

EXPERIMENT 1

The purpose of Experiment 1 was to evaluate effects of observational conditioning versus Video Modeling conditioning to establish tokens as conditioned reinforcers for sight-word reading. Relative reinforcer value was assessed via relative rate of reading for each token.

Preassessment

During preassessment, participants were shown flashcards depicting all of the words for their assigned Dolch level, as described above. Based on the words correctly read, flashcards were selected for assessment for the remainder of Experiment 1. As a result of this assessment, Dawn received 3 piles of 12 cards (36 total), Iris received 3 piles of 15 cards (45 total), and Red received 3 piles of 16 cards (48 total). The purpose of this assessment structure was evaluate baseline rate of reading performance for each of the word banks that would be used during assessment.

Baseline Word Reading

During baseline word reading, participants were presented with word flashcards in a free operant arrangement and asked to identify the words on the card. Flashcards consisted of 3x5'' white index cards with a single word clearly written in the middle of each one in black marker. Three separate piles of word flashcards were presented to the participants concurrently, and each was placed in front of a small jar with a picture of a token on it. Participants were instructed that they would receive a token for each word that they correctly read, and that the type of token

would depend on the pile they selected to read from. Tokens were delivered contingent on each instance of correct word reading. Tokens were presumed to all be neutral during baseline as they had not yet been conditioned. The same token style (combination of color and symbol) was used throughout the study. After reading the word, the participants were instructed to move on to the next word in the pile, and that they "could read as many or as little of these words as they wanted" for 5 min. If participants ever read through the entirety of a word pile or mixed up the word pile, the researcher silently corrected the pile so they resembled their initial arrangements.

Video Conditioning

During video conditioning, participants were presented with two kinds of video conditioning methods: Video Observational Conditioning and Video Modeling. While viewing each video, the participants were seated at a table at which the video was displayed via 13'' laptop screen. Prior to beginning the video, the participant was asked to watch the video for its entirety. No programmed consequences were delivered for participants at this time except that if they looked away from the video for 5 consecutive s or more (defined as head and eyes turned away from video), the video was reset and the researcher stated "please watch the video." For the purposes of treatment integrity, duration data were collected by the researcher on the amount of time the participant directed their head and eyes towards the video.

Video Observational Conditioning and Video Modeling videos were interspersed in an ABBA video presentation such that both video types were shown, with the first and last video shown during training being the same. Each of the sessions began and ended with a different conditioning video type to the previous conditioning trial. In total, each of these conditioning trials took a minimum of 1 min of continuous viewing. Following each conditioning session,

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conditioned stimulus assessments were conducted.

Video Observational Conditioning. In this video, the camera depicted a confederate and researcher seated at a table. The image of the video depicted the two individuals in profile, such that they were seen from one side, and above the waist such that their upper arms and shoulders are visible, but not the table or their hands. Behind the figures, a jar featuring a symbol of the token was elevated and clearly visible to the camera. The researcher prompted the confederate to engage in a response (i.e., "touch the shape"). The confederate's response was not visible to the camera, but the researcher stated "good job" and placed a token in the jar, and the confederate indicated excitement. This sequence occurred twice during the video. The length of the video was 15 s, but was played twice during each conditioning trial, so a total of 30s of viewing time.

Video Modeling. During this condition, participants were shown videos that depicted a confederate receiving the unconditioned token. In this video, the researcher and confederate were seated at a table, with a jar on the table that clearly depicted the token symbol used in this condition. At the beginning of the video, the researcher handed the confederate a token. The symbol on the token was clearly visible to the camera. The confederate was filmed at shoulder level such that their hands and the token are clearly visible. The camera focused on the confederate as they smile and manipulate the token and upbeat music played. The length of the video was 15 s, but was repeated as described with Video Observational Conditioning.

Neutral. The neutral token was never presented to the participant outside of the context of assessment. As a result, it remained a neutral token for the entirety of Experiment 1. This token did not have its own condition.

Concurrent Operant Assessment

During the assessment condition, the participants were concurrently presented with three flash card word lists in the same manner as described in baseline. Participants were freely allowed to respond to any of the flash card stacks, and received a token contingent on correct reading of each flashcard, with a different token being provided for each list. A jar with the token symbol on it was present behind each stack of flashcards, to act as a discriminative stimulus to indicate the type of token that was available contingent on correct responding. Contingent on correct reading, a token was placed in the respective jar associated with that word. Preference of each type of token was assessed via relative rate of responding to each flashcard pile during each 5 min session.

Concurrent-operant ratio schedules like this one tend to be sensitive to small differences in relative preference but may erroneously suggest that lower-preferred options have no value when they actually have only slightly less value (Roscoe, Iwata, & Kahng, 1999). To prevent such false-negative results, we evaluated preference using a response restriction assessment (Hanley, Iwata, Roscoe, Thompson, & Lindberg, 2003). Response restriction assessments have been used to evaluate the allocation of responding as reinforcing tokens become removed from selection. Our assessment was conducted in the following manner: Once preference for a token was established, the highest-value token and its associated stack of flash cards were removed from selection and preference was assessed for the remaining tokens in the same manner (Hanley et al., 2003). Heretofore, these phases will be referred to as Response-Restriction 2 (indicating two responses available), and Response-Restriction 1 (indicate only one option available). As a result of this arrangement, the number of responses that a participant could make was necessarily reduced by 1/3rd as that many flashcards were removed from selection. Thus, as Dawn began

with 36 total cards, she was reduced to 24, then 12. As Iris began with 45 total, she reduced to 30, then15, and Red reduced from 48, to 32, to 16 words over the course of Response Restriction.

Sessions in this phase continued until either one token was consistently associated with the highest raw rates across three consecutive sessions, or stability had been reached as judged by visual inspection (whichever came first). In the latter case, preference was determined using the average rate of responding across the entire phase.

Procedural Alteration. In the course of Experiment 1, the following procedural alteration was made. Initially, participants responded to the flashcards by freely manipulating and turning over loose flashcards. However, during assessment with Red, a procedural alteration was implemented in order to account for disruptive behavior occurring during session (namely, throwing cards). To prevent such behavior, holes were punched in the cards, and the cards were clipped together using binder rings. This prevented further disruptive behavior from Red over the course of assessment and resulted in clearer preference.

The binder rings were then implemented for all other participants concurrently. This will henceforth be referred to as "the Procedural Alteration." While this change did not result for any changes in responding for Iris (as the Procedural Alteration was implemented for her early in baseline), it did suppress responding for Dawn. As this change in responding prevented clear analysis of her responding when assessed in relation to her baseline conditions, the Procedural Alteration was removed for her for the remainder of Experiment 1. The points at which the Procedural Alteration was implemented (and removed, in the case of Dawn) are noted on Figures 1-5 with the designation "rings."

Post Reinforcement Assessment

This condition was identical to the baseline condition and was conducted after the conclusion of the assessment conditions. The purpose of this assessment was to evaluate the maintenance of effects of this training in the absence of continued conditioning. Only three sessions were conducted in this phase.

CHAPTER FIVE:

EXPERIMENT 1 RESULTS

Figure 1 depicts the raw reading rate across participants for each of the tokens. The notation "rings" indicates that the flash cards had been modified using the Procedural Alteration (see Procedural Alteration, above).

The response-restriction procedure involved having a different number of response alternatives across some phases (e.g., 3 responses in Baseline and Video Conditioning, 2 in Phase 3, 1 in Phase 4, and so on). As seen in Figure 1, raw rates tended to increase as responses were restricted but this might simply be because participants allocated a certain fixed rate nearly equally across the available alternatives. To facilitate visual analysis of level changes across phases while controlling for the number of options, a correct reading rate was calculated by multiplying the raw rate values by total number of available responses divided by 3. Figure 2 depicts these data. Thus, their rate is normalized to the rate expected for three concurrently available word piles.

For all participants, the most preferred token was that associated with Video Observational Conditioning. Contrary to our expectations of obtaining exclusive preference given the use of concurrent ratio schedules, we obtained only modest differences in response allocation. To facilitate visual analysis, we calculated mean rates (Figure 3). Generally, the conclusions drawn from these means are consistent with the conclusions drawn via visual observation of the rate of responding seen in Figure 1. Dawn's mean responding has been

included here (Figure 3) to illustrate her preference hierarchy based on mean rate of responding.

For Dawn, preference was determined based on mean responding after establishing a stable rate of responding because none of the tokens met the criteria of being higher than the other two for three consecutive sessions (Figure 3). For Dawn, mean responding during baseline was comparable across conditions, with a slightly higher mean for the token that would end up being used for Video Modeling. During baseline, the mean rate was 5.3 responses per minute (RPM) for Observational Conditioning, 5.7 RPM for neutral, and 6.6 RPM for Video Modeling. After implementation of the intervention, Observational Conditioning rate maintained at around 5.4 RPM, while neutral dropped to 5.1 RPM, and Video Modeling dropped to 4.5 RPM. From this, it was determined that Observational Conditioning was the most preferred. Similarly, the rate of responding was highest for the Video Modeling token when the neutral and Video Modeling tokens were compared alone. In the Response Restriction 2 condition, mean responding for neutral was 6.1 RPM, while Video Modeling was 6.5 RPM.

During Response-Restriction 2 (after the most preferred token from the previous phase was removed), Dawn responded most consistently to the task resulting in the Video Modeling token, and met the criteria for three consecutive conditions in which this token resulted in the highest rate of responding. During the last three sessions of Response Restriction 2, Dawn's rate of responding to Video Modeling was 8.5 RPM, 8 RPM, and 7 RPM, while rate of responding to neutral was 7.5 RPM, 5.5 RPM, and 5.7 RPM. During Response-Restriction 1 (when only the neutral token was available), Dawn continued to respond at the same corrected (Figure 2) rate of reading as during previous conditions. During Post Reinforcement Assessment, the neutral token was the most preferred.

For Iris, the Video Observational Conditioning token reached the criteria of highest in

three consecutive sessions first. During the last three sessions of VidCon, Iris' rate of responding to Observational Conditioning was 2.8 RPM, 4.2 RPM, and 3 RPM, Video Modeling was 2.2 RPM, 0 RPM, and 2.8 RPM, while rate of responding to neutral was 0 RPM, 3.2 RPM, and 2.8 RPM. During Response Restriction 2, Iris reached the preference criteria of three sessions with the Video Modeling token first. During the last three sessions of Response Restriction 2, Iris' rate of responding to Video Modeling was 1.8 RPM, 2 RPM, and 2 RPM, while rate of responding to neutral was 1.7 RPM, 1.9 RPM, and 1.6 RPM. While these values were close, the Video Modeling token reached criteria first, and was thus determined to be the second highest preference in the hierarchy. During Response Restriction 1, overall rates of responding actually increased slightly for Iris, and this increase was observed in the corrected rate as well (Figure 2). During Post Reinforcement Assessment, no clear preference was indicated for any of the tokens, and Iris' rate of responding again reduced, and she engaged in some problem behavior during assessment (i.e., attempting to elope).

For Red, initial responding was highly undifferentiated, but became clearer after the implementation of the Procedural Alteration. After the Procedural Alteration, Red responded exclusively to the tokens that had been conditioned using Video Observational Conditioning, resulting in that token meeting the criteria for preference first. During that period, rate of responding for Video Observational Conditioning increased from 8.8 RPM, to 17 RPM, while no responses occurred on the remaining two tokens. During Response Restriction 2, the Video Modeling token reached the criteria for preference first. During the last three sessions of Response Restriction 2, Red's rate of responding to Video Modeling was 7.5 RPM, 5.5 RPM, and 5.2 RPM, while rate of responding to neutral was 3.5 RPM, 2 RPM, and 3.9 RPM. Red responded at a similar rate to the neutral token During Response Restriction 1 (Figure 2). No

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clear preference was observed during Post Reinforcement Assessment.

Figure 4 depicts the rate of responding for each participant as a proportion of control. The purpose of this analysis was to more clearly reveal differences between preference for the two video conditioning tokens and the control token. Proportion of control was calculated by dividing the rate of responding for each session by the rate of responding to the equivalent neutral token session. Thus, any rate of responding above 1 can be considered to be a greater degree of preference as compared to the unconditioned neutral token, and any responding at or below 1 can be considered to be an indifference or preference for the neutral token over the conditioned tokens.

For Dawn, 25% of baseline Video Observational Conditioning tokens and 75% of Video Modeling tokens were above the proportion line. In assessment, the value for Video Observational Conditioning tokens increased to 67% which suggests an increase in stimulus value during conditioning. For Video Modeling tokens, points above 1 were 17% of proportion during initial assessment, but increased to 70% when Video Modeling was compared to the neutral token alone. This suggests an effect of conditioning for Video Observational Conditioning after the implementation of Video Modeling. Effects were moderate for Video Modeling. However, when proportion of control was evaluated for the comparison between Video Modeling tokens and neutral tokens, Video Modeling suggested more of an effect.

For Iris, 43% of baseline Video Observational Conditioning tokens and Video Modeling tokens were above the proportion line. This increased to 50% for Video Observational Conditioning, but decreased to 40% for Video Modeling. However, when Video Modeling was assessed against the neutral token along, this increased to 80%.

For Red, 50% of baseline Video Observational Conditioning tokens and 56% of Video

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Modeling tokens were above the proportion line. This increased to 64% for Video Observational Conditioning and remained stable for Video Modeling. For all three participants, there was an effect of conditioning on the rate of responding to these tokens as compared to the neutral tokens as a result of conditioning. This might suggest that effects of video conditioning resulted in a preference shift towards these tokens during training. See Figure 5 for a bar graph depicting these data across conditions.

Figure 6 depicts the rate of responding for each participant as a proportion of baseline. For this analysis, the rate of responding for each session was divided by the mean rate of responding to the baseline. Thus, any rate of responding above 1 can be considered as an increase in rate compared to baseline, and any responding below 1 can be considered a reduction in performance as compared to baseline. For Dawn, reading rate as compared to baseline began high, but decreased over the course of the assessment period. Similarly, for Iris, rate of reading as a proportion of baseline was low during assessment (40% for Video Observational Conditioning and 10% for Video Modeling). For both participants, this suggests that rate of reading was not improved by the intervention. Although preference for tokens shifted towards Video Observational Conditioning tokens, overall rates of responding were unchanged or reduced in these participants. Rates of reading did increase for Red, especially after implementation of the Procedural Alteration, however, suggesting an effect of conditioning. Dawn and Iris seemed to respond to the reading task based on prior learning history, (declaring themselves "finished" after reading "all the words") which might account for this behavior. This is discussed more fully below.

CHAPTER SIX:

EXPERIMENT 1 DISCUSSION

Overall, the results of Experiment 1 modest but consistent shifts in preference toward the tokens associated with Video Observational Conditioning, Video Modeling, and the neutral token for all three participants. However, the degree to which this effect occurred varied across participants and conditions.

For Dawn, the hierarchy was more clearly observable in the mean and proportion of control analyses than via visual analysis of overall reading rate. As noted, the proportion of baseline analysis revealed that the overall rate of reading did not increase as compared to baseline in the course of the intervention. This phenomenon might be related to the small effect observed over the course of the study. As there was no change in the rate of reading between baseline and intervention assessments, no real increase or decrease in responding was observed for any token – rather, the relative rate to which each participant responded to the tokens was changed. This can likely be attributed to the dependent variable chosen for this study – namely, reading.

While we expected that the rate of sight word reading would be sensitive to the delivery of conditioned tokens, our data suggested participants generally read at the same rate across most conditions and conditioning produced only modest differences in reading rates. Such insensitivity might result from classroom histories. Due to the expectations placed by the school during reading assignments, students are often expected to read all of the words placed in front

of them, and can only be considered "done" once they have completed all their work. This is especially true due to the fact that participants had to be capable of reading for inclusion in the study, necessitating that they would be familiar with previous sight word training in their classrooms.

Indeed, over the course of the study, participants routinely read from all the presented lists, and occasionally emitted vocalizations that potentially explained their behavior. Iris, for example, would frequently emit responses such as "I already read this list so I have to read the next one" or "I read them all, and now I am done" at which point she would frequently stop responding entirely.

It is possible that a conditioning effect could be developed fairly quickly, given that mean rates of responding shifted for all participants within 2-3 video conditioning trials. However, Post Reinforcement Assessment suggests that this conditioning effect fades quickly when conditioning is withdrawn – an effect which is consistent with prior evaluations of observational conditioning (Livingston, Samaha, Slattery, & Gauert, in prep).

For Red, the conditioning trials appeared to potentially influence responding in small ways. For example, after roughly 7 presentations of the conditioning videos, Red began to mimic vocabulary from the video sessions during his assessment. For example, upon receiving a token, he would mimic the hand clapping and cheering that the model did after the token was delivered. He would also approximate the sound of the music played during Video Modeling sessions with humming and tongue twanging.

A limitation of this experiment was the implementation of the Procedural Alteration. While Red's responding after the implementation of the Procedural Alteration suggested clear preference for the Video Observational Conditioning token, the degree to which conditioning

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effects were obtained is obscured by the difference between this modification and baseline. It is furthermore unclear whether different patterns of responding would have been obtained for Dawn if the Procedural Alteration had been implemented during baseline.

Overall, the findings of Experiment 1 do not clearly suggest an effect of conditioning, which might be attributed to an effect of prior reading experience across participants. However, there might be some potential for developing an effective form of video observational conditioning which emulates the design and effectiveness of Greer and Singer-Dudek (2008), but requires less time and material investment.

CHAPTER SEVEN:

EXPERIMENT 2

The purpose of Experiment 2 was to evaluate effects of Video Observational Conditioning as a method to increase the reinforcing effect of a token using sight word reading in a group setting. Video Observational Conditioning was selected as the target intervention in Experiment 2 because it was the highest in the preference hierarchy during Experiment 1 across all participants.

Assessing the use of video presentation in group settings might be necessary in order to account for the expectations of the school environment, which is necessarily a group. As teachers might not always have the time for one-on-one presentation of a video, or in situations where a class-wide intervention is needed, effects of presentation to a group should be evaluated (Ennis, Hirsch, MacSuga-Gage, & Kennedy, 2017). While video modeling interventions have typically been used in single subject interventions, less research exists on group behavior video interventions (McNiff, Maag, & Peterson, 2019).

Direct interventions on individual students have shown benefits to academic skills in the past (Burton, Anderson, Prater, & Dyches, 2013), but they have focused on individualized presentation of the videos. However, Plavnick and Dueñas (2018) demonstrated some success when videos were displayed in a group. Participants included four individuals diagnosed with ASD who observed video modeling of appropriate social interactions with peers in a group. All participants were reported to have shown an increase in social interactions skills over the course

of the intervention. To extend research into school settings, accounting for group presentation might be essential.

During this Experiment, participants experienced token conditioning in a group context, and data analyses were conducted within this group using individual data. Participants were compared to their own baseline responding as well as to each other's responding, however, the intervention was presented to all participants simultaneously. As a result, baseline performance was compared by having each participant start baseline at a different point, and start intervention at the same point. This represents a modified version of the concurrent multiple baseline across participants approach typically seen in literature (as well as in Experiment 1). This arrangement was meant to control for the effects of exposure and time in baseline. By staggering the start of baseline for each participant, each participant spent a different amount of time in this condition. However, as all of the participants started intervention at concurrently as a necessity of group presentation, this design did not control for the effects of outside variables that would have been introduced at that point in the design. Due to this procedural change from a standard multiple baseline across participants method, the design of the graphs in Figure 7 is altered to indicate the change.

Preassessment

Preassessment was conducted by presenting each participant with all of the Dolch words for their reading level, as described above. Wally had limited prior experience with reading, and so a modified Dolch list used by his teacher was instead used during preassessment. Based on preassessment Whitney received 2 piles of 18 words (36 total), Steven received 2 piles of 20

words (40 total), and Wally received 2 piles of 10 words (20 total).

Baseline Word Reading

This condition was identical to the one described in Experiment 1. Participants received tokens contingent on correct reading. These tokens were again all delivered contingent on responding, but were considered neutral during baseline, as they had not yet been conditioned through video presentation. In Experiment 2, the number of piles and token options were two instead of three.

Video Observational Conditioning

This condition was identical to that in Experiment 1 however, the Video Observational Conditioning was presented to all participants simultaneously in a group. Participants sat at a long table in their classroom, and observed the presentation of the video twice (30 s continuous viewing). All participants in the group were within 2 years of age of each other, and the model in the video was within 2 years of the average age of the participants in the group. As the group contained two male and one female participant, two videos were made and the gender of the model alternated based on the gender distribution of the group (i.e., 1/3 of all presentations of the conditioning videos were presented with the female model).

Concurrent operant assessment. During this condition, participants were able to respond to either of the two concurrently available tokens in a concurrent operant assessment. Performance was assessed as relative rate of responding to the two tokens. Sessions were conducted until stability of responding was achieved, at which point preference was determined by the relative rate of responding for each token. Response Restriction did not occur in this design, as only two concurrently available choices were being evaluated, and their relative

preference could be more easily compared.

Post Reinforcement Assessment

This condition was conducted identically to the baseline condition, in which no further conditioning trials were implemented prior to each assessment. However, tokens were still delivered contingent on correct reading.

CHAPTER EIGHT:

EXPERIMENT 2 RESULTS

Figure 7 depicts the rate of responding for each participant in the group across participants. Whitney engaged in largely undifferentiated responding during baseline, then showed a consistent preference for the Video Observational Conditioning token throughout assessment, with the exception of two sessions where preference was equivalent across the two tokens. During the last three sessions of Assessment, Whitney's rate of responding to Observational Video Conditioning was 3.4 RPM, 3.4 RPM, and 3 RPM, while rate of responding to neutral was 0 RPM, 0 RPM, and 3 RPM. This preference maintained during Post Reinforcement Assessment. During Post Reinforcement Assessment, Whitney continued to show preference for the Video Observational Conditioning conditioned token, despite no longer being shown the video.

Steven engaged in fairly undifferentiated responding during baseline. When assessment began, Steven's responding to the Video Observational Conditioning token was consistently higher than the neutral token. While his responding fluctuated, any change in rate of responding was reflected on both data paths. For each session, Video Observational Conditioning was higher that the neutral token, and never overlapped. During the last three sessions of Assessment, Steven's rate of responding to Observational Video Conditioning was 16.6 RPM, 20 RPM, and 14.6 RPM, while rate of responding to neutral was 16 RPM, 16.2 RPM, and 12 RPM.

During Post Reinforcement Assessment, rates of responding to each token became slightly more differentiated, and might suggest a downward trend.

For Wally, baseline responding was largely undifferentiated. During assessment, responding between the neutral and Video Observational Conditioning tokens was largely undifferentiated, with one session in which of responding to Video Observational Conditioning was slightly higher than the neutral token. During the last three sessions of Assessment, Whitney's rate of responding to Observational Video Conditioning was 1.4 RPM, 1.4 RPM, and 1.8 RPM, while rate of responding to neutral was 1.6 RPM, 1.6 RPM, and 1.8 RPM. This suggests no effect. During Post Reinforcement Assessment, responding remained comparable to assessment.

Figure 8 depicts the proportion of control for Video Observational Conditioning as compared to the neutral token. For Whitney, there were only 20% of baseline sessions in which the Video Observational Conditioning token was above 1 (indicating preference for this token as compared to the neutral token). This preference increased to 60% of sessions during assessment, suggesting an increased preference after the implementation of conditioning sessions.

For Steven, 57% of baseline sessions showed Video Observational Conditioning above 1. This number increased to 100% during assessment, suggesting an effect of conditioning. For Wally, 25% of baseline sessions indicated responding towards the Video Observational Conditioning token above 1. This value changed to 20% during assessment, indicating no effect of conditioning towards increasing overall preference as compared to the neutral token. However, the number of sessions in which the Video Observational Conditioning token was below zero also reduced from 75% to 60%. Overall, Wally's responding was the most

indifferent towards Video Observational Conditioning. See Figure 9 for a bar graph depiction of these data across conditions.

Figure 10 depicts the proportion of baseline of reading rate across participants. Like in Experiment 1, there was not a clear increase in rate of responding, with the exception of Whitney. This again suggests a lack of increase in overall rate of responding, as much as a skewing of preference towards the Video Observational Conditioning token.

CHAPTER NINE:

EXPERIMENT 2 DISCUSSION

Two out of three participants preferred the Video Observational Conditioning token as compared to the neutral token. This finding replicates and extends the results of Experiment 1, showing the effectiveness of Video Observational Conditioning delivered in a group format. Unlike results of Experiment 1, conditioning appeared to have a more robust effect on the rate of reading. Results of this study suggest that Video Observational Conditioning could be developed and implemented to condition tokens as reinforcers to maintain academic responding.

Whitney initially showed reluctance to respond over the course of each session. Based on observation, it appears that reactivity occurred after the count in at the start of the session, and that she stopped responding because she was aware she was being observed. To combat this, the researcher conducted a few pre session exposure trials to the condition prior to the start of data collection, then silently counted in for the purposes of data collection so as not to alert her. In this manner, Whitney began to respond during sessions.

Steven had the highest prior experience with reading, and so had a much higher initial reading rate than all other participants. However, unlike Dawn in Experiment 1, this high rate of reading did not apparently result in undifferentiated responding. Over the course of Experiment 2, Steven modified the rate of his responding to control the rate of delivery of the tokens (i.e., dragging out a word or speeding up). This resulted in the slight variance in reading rate obtained, but did not alter relative preference across the tokens.

Wally had the least experience with reading, and had a low rate of reading overall. It is possible that Wally's very limited reading history and skills could help account for his low overall rate. Like Iris from Experiment 1, Wally had a tendency to stop reading once he had read through both piles once. This resulted in more undifferentiated responding as compared to the other two members of the group.

While there were some concerns that participants would not watch the conditioning videos in the group setting due to the added potential of distraction posed by other participants, this did not appear to be the case over the course of Experiment 2. In Experiment 2, there was a greater degree of differentiation between the neutral and conditioned token for two of the three participants, as compared to Experiment 1. This suggests that video based presentation of an intervention is appropriate for group settings. Indeed, this assumption is supported by other recent research that has evaluated interventions based on group video presentation (McNiff, Maag, & Peterson, 2019). McNiff, Maag, and Peterson (2019) demonstrated that group video presentation of lining up skills resulted in decreased latency to perform the skill in a class setting across the entire group.

One notable aspect of this study is the difference in responding between the two choice and three choice concurrent operant arrangement. Effects of conditioning were more apparent in Experiment 2 as it was in Experiment 1. This might serve to underline the difficulty in parsing preference in the three choice concurrent operant, as responses to tokens might have been divided in the presentation of the three choices. Indeed, some research suggests that relative rates of responding become more insensitive when more than two choices are concurrently available (Navakatikyan, Murrell, Bensemann, Davidson, & Elliffee, 2013).

CHAPTER TEN:

GENERAL DISCUSSION AND FUTURE DIRECTIONS

Across both Experiment 1 and Experiment 2, a preference hierarchy was obtained that valued Video Observational Conditioning tokens above neutral tokens. This suggests a potential effect of conditioning towards increasing the relative value of tokens. However, clear differentiation of responding was only obtained intermittently. In Experiment 1, Red showed a clear differentiation of responding between the Video Observational conditioning token and the Video Modeling/Neutral tokens after the implementation of the Procedural Alteration. Likewise, in Experiment 2, Whitney and Steven showed differentiation between the video Observational Conditioning token and the Neutral token. However, as Dawn, Iris, and Wally showed somewhat indifferent responding to the tokens over the course of the experiments, conclusions cannot be drawn about the strength of the conditioning effect.

Ultimately, the findings of this study do not support the conclusion that video based techniques were sufficient to obtain consistent preference differentiation across all participants. Therefore, when appropriate for the setting, the use of traditional token economies (wherein tokens are backed up by primary reinforcers) is recommended. However, replication of the preference hierarchy across participants provides some answer as to the degree to which video conditioning methods might shift preference.

In order to better assess the effects of conditioning, future research could attempt to replicate this study across groups, or evaluate the effectiveness of our Video Observational

Conditioning for a task with less prior learning history than sight word reading. Observations during the course of the assessment indicated that participants frequently switched their responding once they were "done" with a specific stack of sight-words. Switching from one stack to another once reaching the end of a stack might have reduced the clarity of responding. Thus, it is recommended that any research that evaluates this question identify a task that has no clear start or end point (such as passing a block through a tube). Future studies might also consider implementing a changeover delay to prevent frequent switching.

An important contribution of this study is the expansion of methodologies outlined in Greer and Singer-Dudek (2008) to a video format. The development of a preference hierarchy suggests some effect of conditioning through the use of video, which opens the use of this technique to novel contexts due to the reduced time and resource cost as compared to in vivo conditioning. Previous interventions that used a form of video conditioning often showed participants interacting with, earning, or requesting access to reinforcers. However, these videos did not use the method described in Greer and Singer-Dudek (2008). Future studies can expand on the findings of these experiments in order to evaluate the application of a Video Observational Conditioning method.

The assessment of acquisition rate of reading using tokens as reinforcers was outside the scope of this study. The findings of both Experiment 1 and 2 suggest that a conditioned token might be capable of maintaining rates of reading for already mastered word lists, and thus might still have applications in school settings. However, the evaluation of acquisition rate might be a useful measure for identifying the effects of conditioning in academic skills. Future studies should look into evaluating the relative effects of acquisition and maintenance using conditioned

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token reinforcement.

In this study, the use of sight word reading was a somewhat insensitive measure. This is potentially the result of the individual learning histories of each participant. Indeed, participants often showed variation in the behavior they emitted over the course of the assessment (i.e., Red throwing cards, Iris announcing she was done). While these behaviors might have occurred regardless of consequences in assessment, they might have not have occurred had a more valuable reinforcer been available. It is possible that this variation is the result of conditioned reinforcement being used in the absence of primary reinforcers. Future studies should look to evaluate whether reading rate can be altered by the use of primary reinforcers, or if the relative value of reinforcer results in different patterns of responding in a similar arrangement.

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Measurement scale influences in the evaluation of sight-word reading interventions.

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Table 1. Dolch Sight Words - Kindergarten

all	do	no	she	well
am	eat	now	so	went
are	four	on	soon	what
at	get	our	that	white
ate	good	out	there	who
be	have	please	they	will
black	he	pretty	this	with
brown	into	ran	too	yes
but	like	ride	under	
came	must	saw	want	
did	new	say	was	

Note. These sight words were retrieved from http://www.sightwords.com/sight-words/dolch/
This table was created drawn from the listed words.
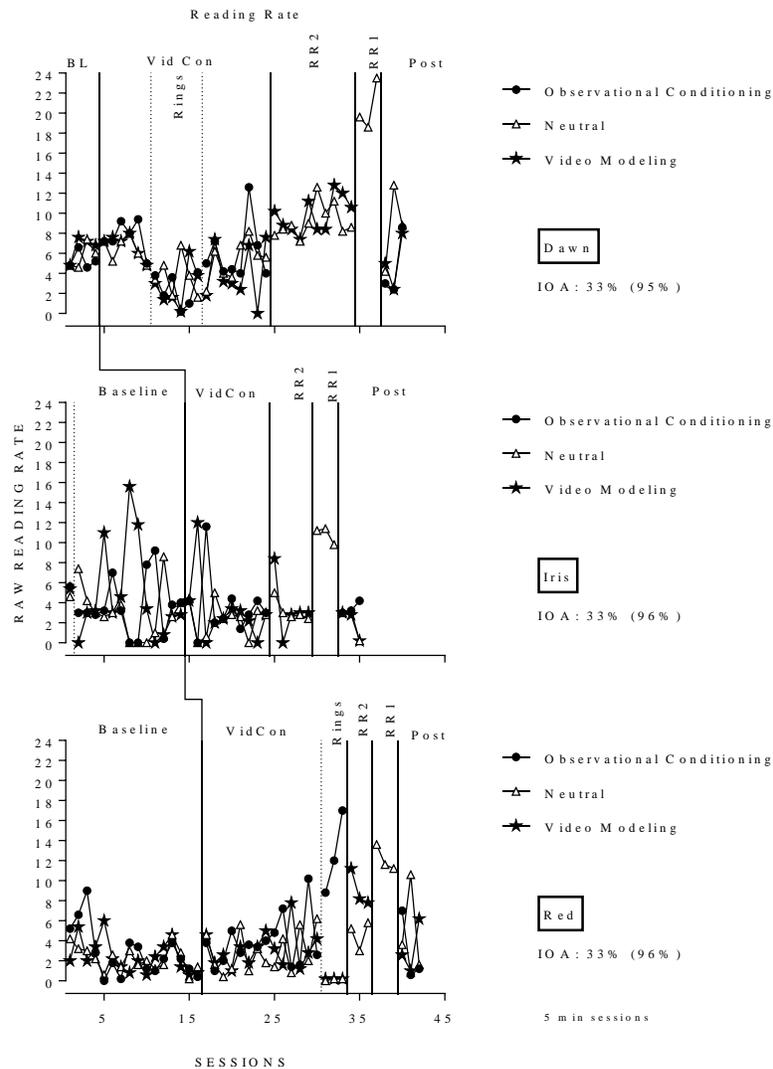
Figure 1. The raw reading rate of each participant across sessions in Experiment 1. All participants showed undifferentiated rate of reading during baseline (BL), and rate of reading was highest for tokens conditioned using Video Observational Conditioning, with Video Modeling as the second highest rate of reading when assessed after conditioning (VidCon). Note: the same tokens were used consistently across baseline and intervention, so the shape design is carried through the entire set. Response Restriction 1 (RR1) and 2 (RR2) evaluated responding for the remaining tokens after the highest preference stimulus was removed from selection. "Rings" indicates the procedural change made during assessment. "Post" indicates Post Reinforcement Assessment.
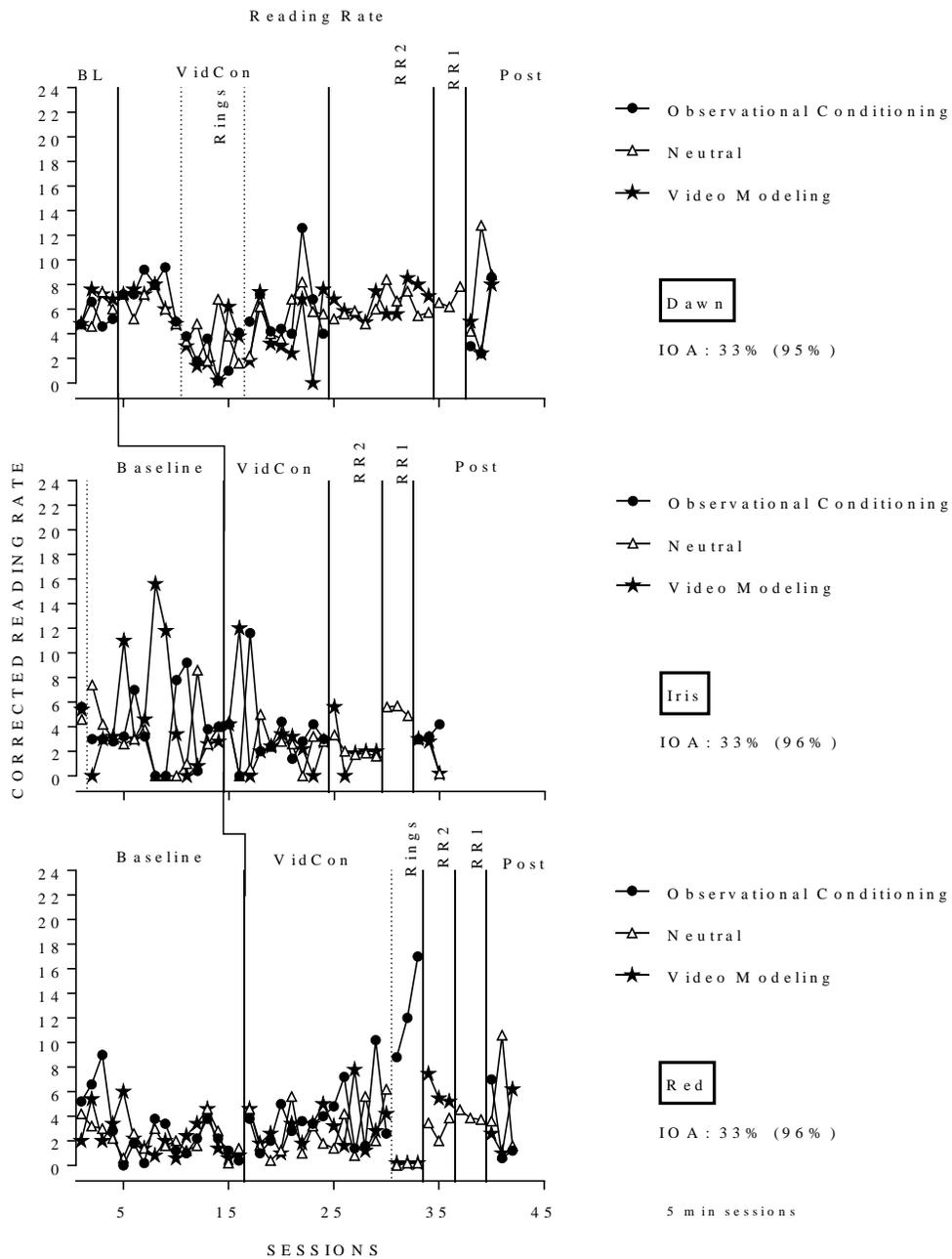
Figure 2. The corrected reading rate of each participant across sessions. This corrected rate is normalized based on the assumption of three concurrently available choices. Note: the same tokens were used consistently across baseline and intervention, so the shape design is carried through the entire set. Baseline is indicated by "BL," and conditioning is indicated by "VidCon." Response Restriction 1 (RR1) and 2 (RR2) evaluated responding for the remaining tokens after the highest preference stimulus was removed from selection. "Rings" indicates the procedural change made during assessment. "Post" indicates Post Reinforcement Assessment.
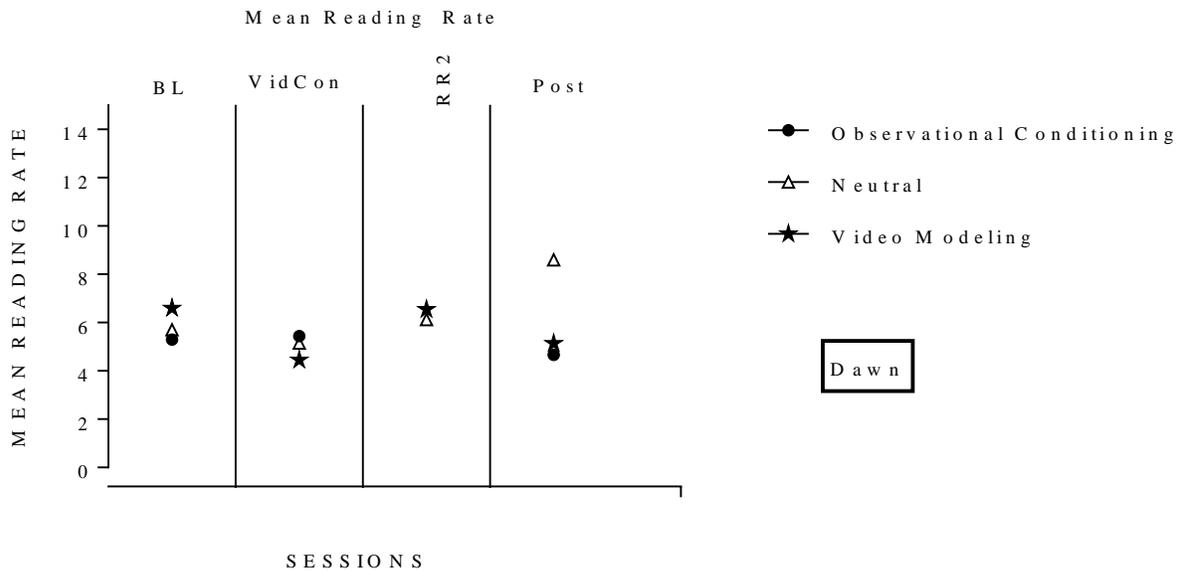
Mean Reading Rate

Figure 3. The mean reading rate of Dawn in Experiment 1. These data were graphed as an average, generally supporting preference being highest in Video Observational Conditioning. Note: the same tokens were used consistently across baseline and intervention, so the shape design is carried through the entire set. Baseline is indicated by "BL," and conditioning is indicated by "VidCon." Response Restriction 2 (RR2) evaluated responding for the remaining tokens after the highest preference stimulus was removed from selection. "Rings" indicates the procedural change made during assessment. "Post" indicates Post Reinforcement Assessment.
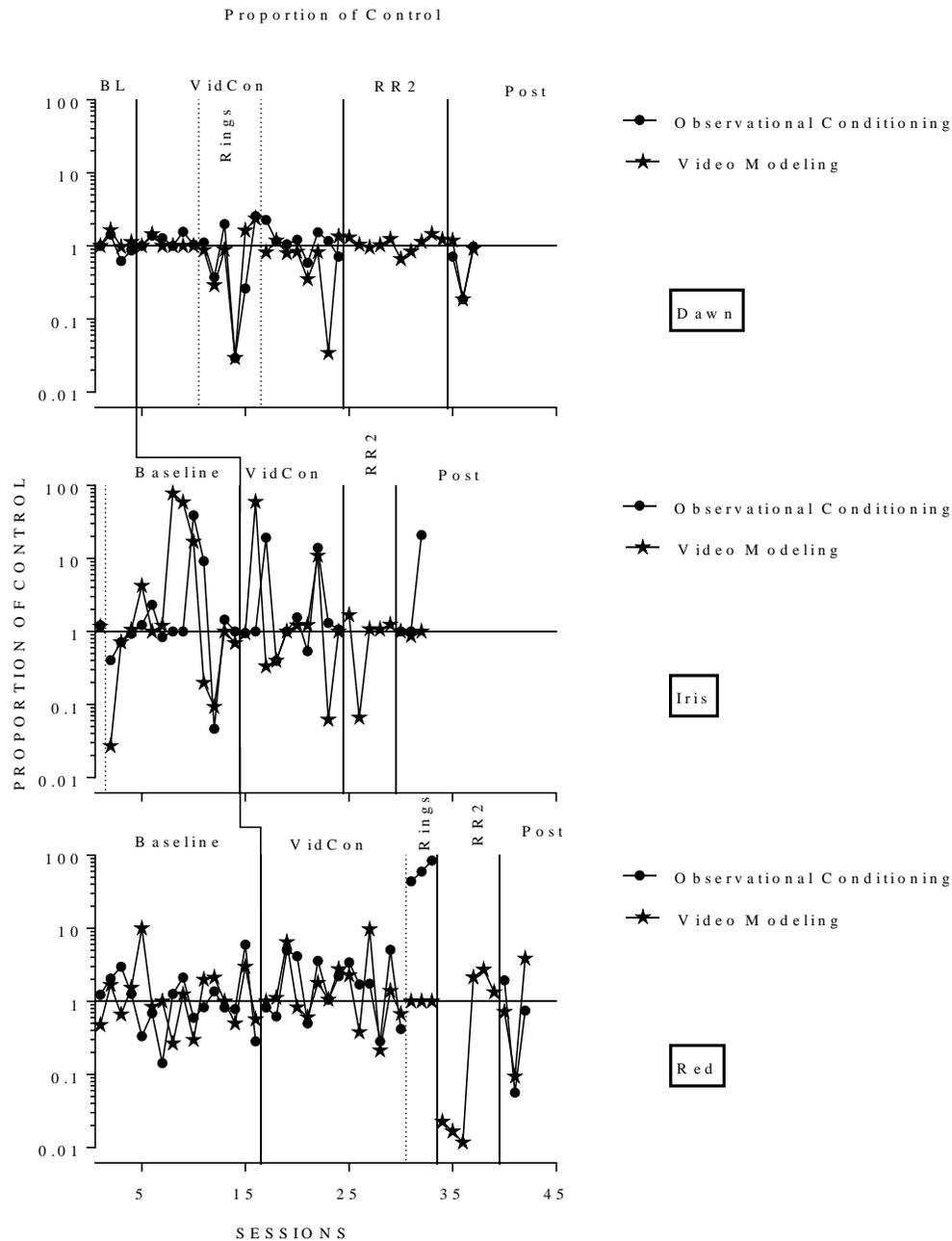
Figure 4. Results of Experiment 1 graphed as proportion of control. Results of this analysis suggest that the effect of the video conditioning procedures resulted in greater rate of responding to the conditioned token as compared to the neutral token, suggesting an effect of conditioning on preference. Note: the same tokens were used consistently across baseline and intervention, so the shape design is carried through the entire set. Baseline is indicated by "BL," and conditioning is indicated by "VidCon." Response Restriction 2 (RR2) evaluated responding for the remaining tokens after the highest preference stimulus was removed from selection. "Rings" indicates the procedural change made during assessment. "Post" indicates Post Reinforcement Assessment.
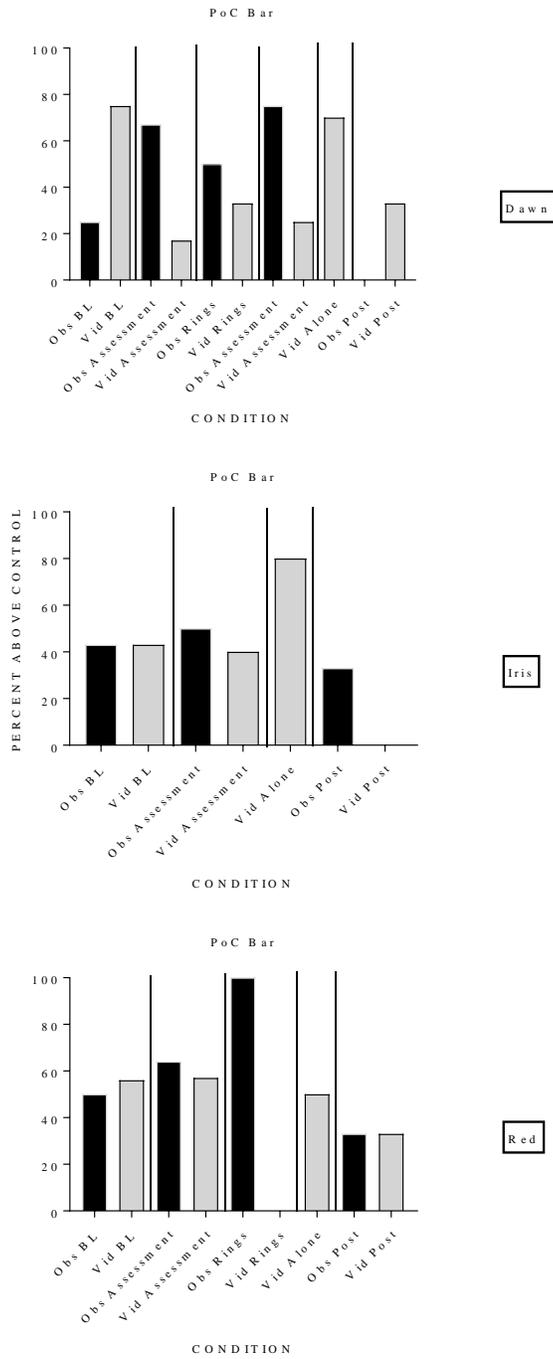
Figure 5. Proportion of control data depicted as percent of conditions in which the value was over 1 for the conditioned token. "Obs" indicates "Video Observational Conditioning," "Vid" indicates "Video Modeling," "BL" indicates Baseline, "Rings" indicates the Procedural Alteration, and "Post" indicates Post Reinforcement Assessment.
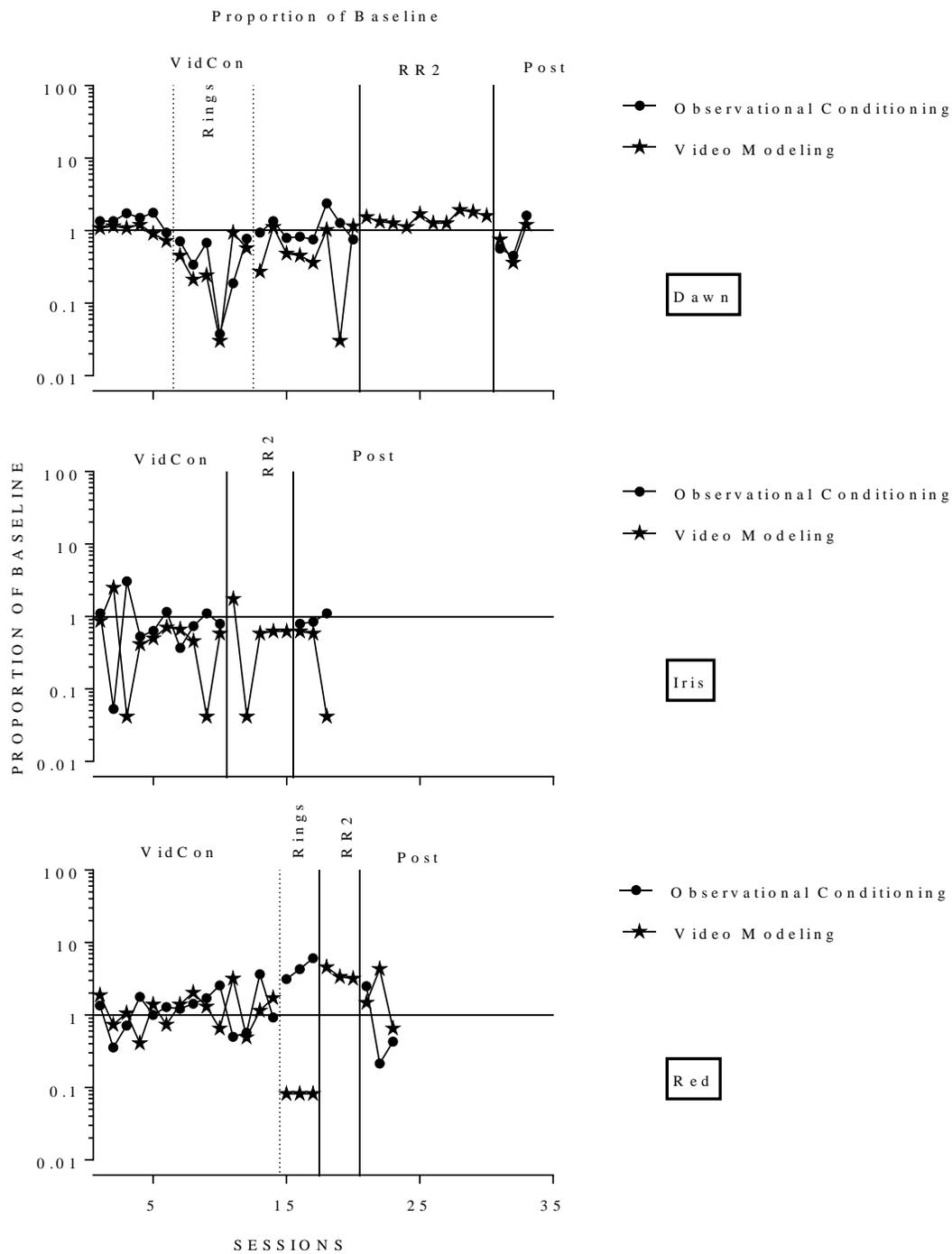
66

Figure 6. Results of Experiment 1 depicted as proportion of baseline. Results of this analysis suggested low effect of token conditioning on overall reading rate as compared to baseline, suggesting that performance was skewed towards preferred token, but did not increase overall.
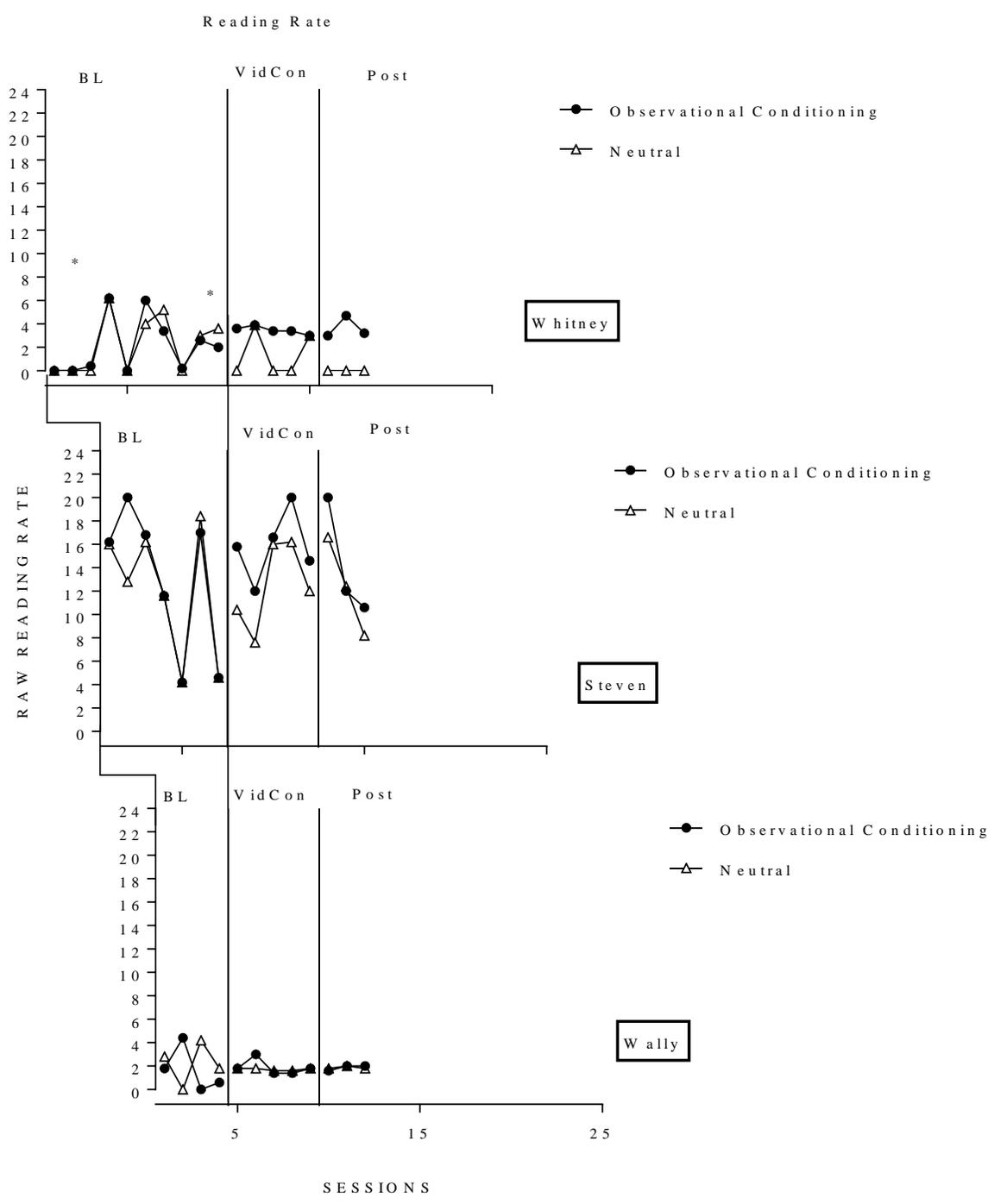
Figure 7. The reading rate of each participant across sessions in Experiment 2. All participants showed undifferentiated rate of reading during baseline, and rate of reading was highest for tokens conditioned using Video Observational Conditioning, with the exception of Wally, who showed no effect. Note: the same tokens were used consistently across baseline and intervention, so the shape design is carried through the entire set. Baseline is indicated by "BL," and conditioning is indicated by "VidCon," and "Post" indicates Post Reinforcement Assessment.
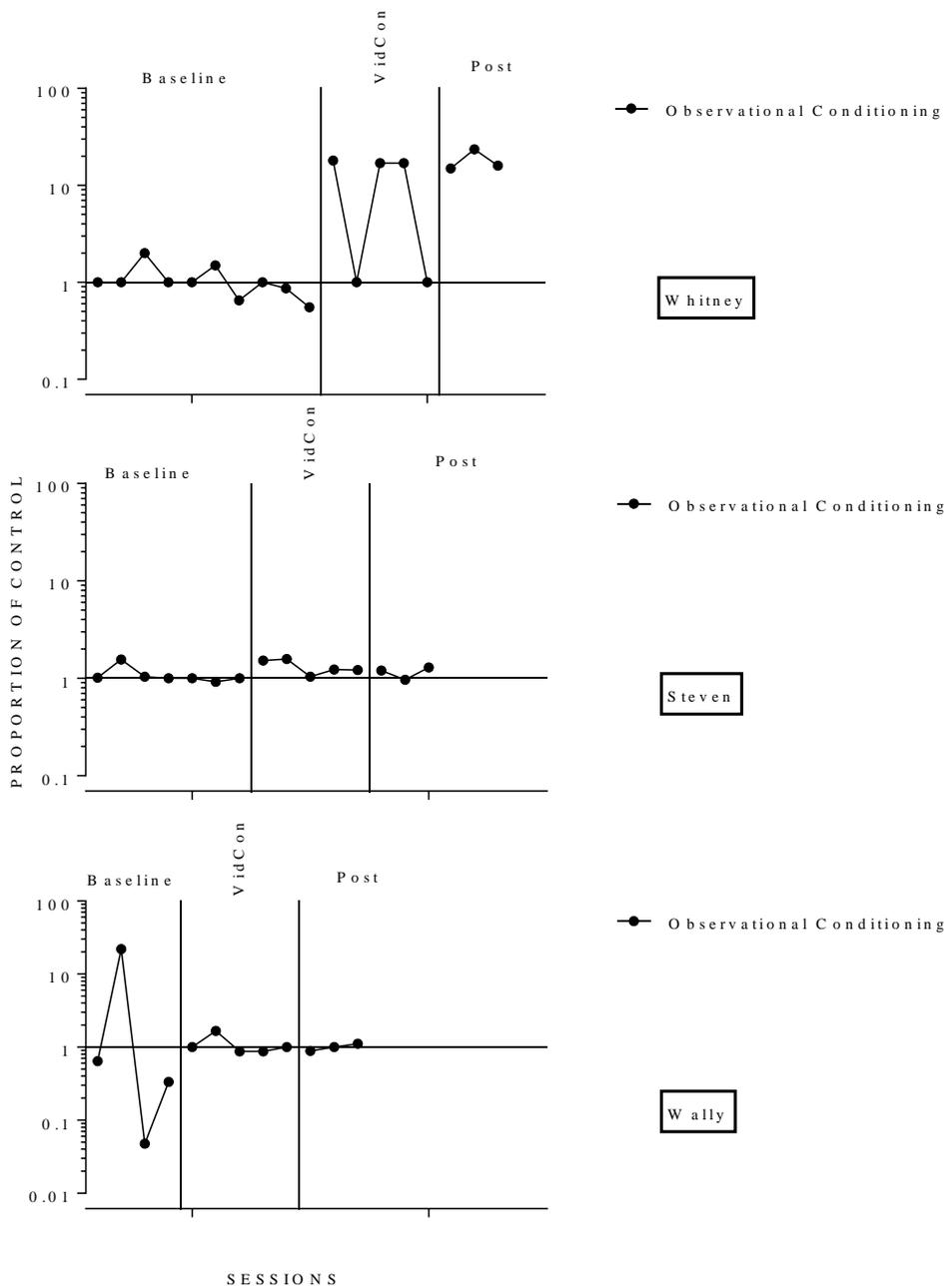
Figure 8. Results of Experiment 2 graphed as proportion of control. Results of this analysis suggest that the effect of the video conditioning procedures resulted in greater rate of responding to the trained tokens as compared to the neutral token, with the exception of Wally, suggesting an effect of conditioning on preference. Note: the same tokens were used consistently across baseline and intervention, so the shape design is carried through the entire set. Baseline is indicated by "BL," and conditioning is indicated by "VidCon," and "Post" indicates Post Reinforcement Assessment.
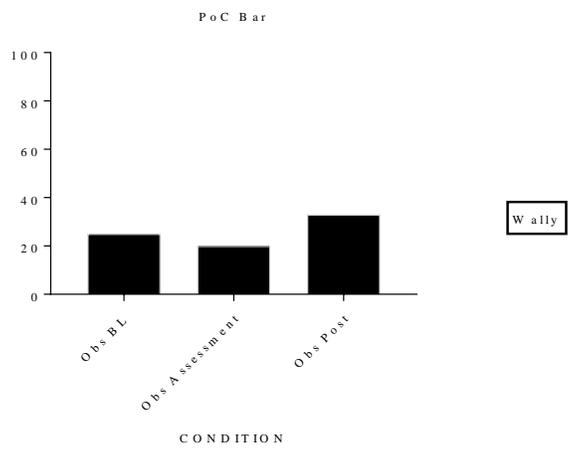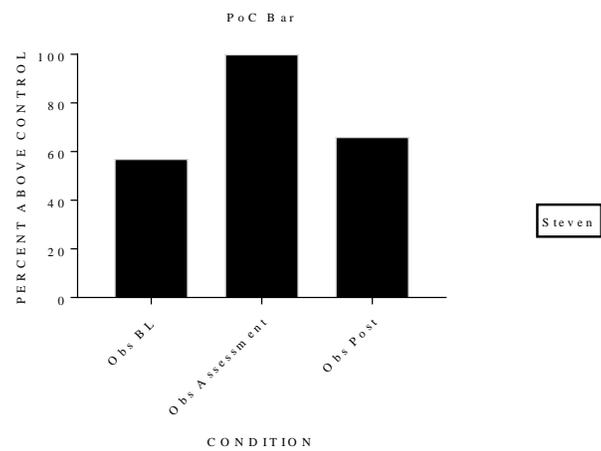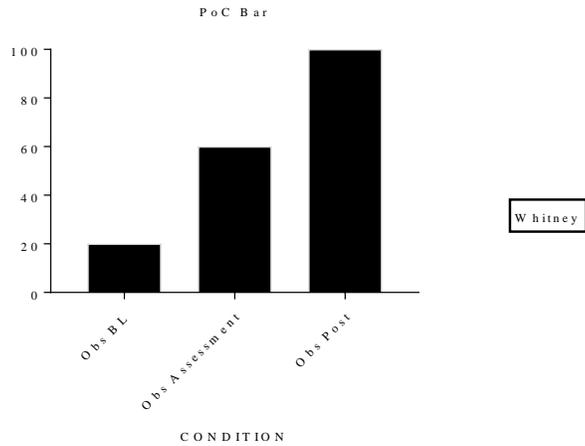
Figure 9. Proportion of control data depicted as percent of conditions in which the value was over 1 for the Video Observational Conditioning token. "Obs" indicates "Video Observational Conditioning," "Vid" indicates "Video modeling," "BL" indicates Baseline, "Rings" indicates the Procedural Alteration, and "Post" indicates Post Reinforcement Assessment.
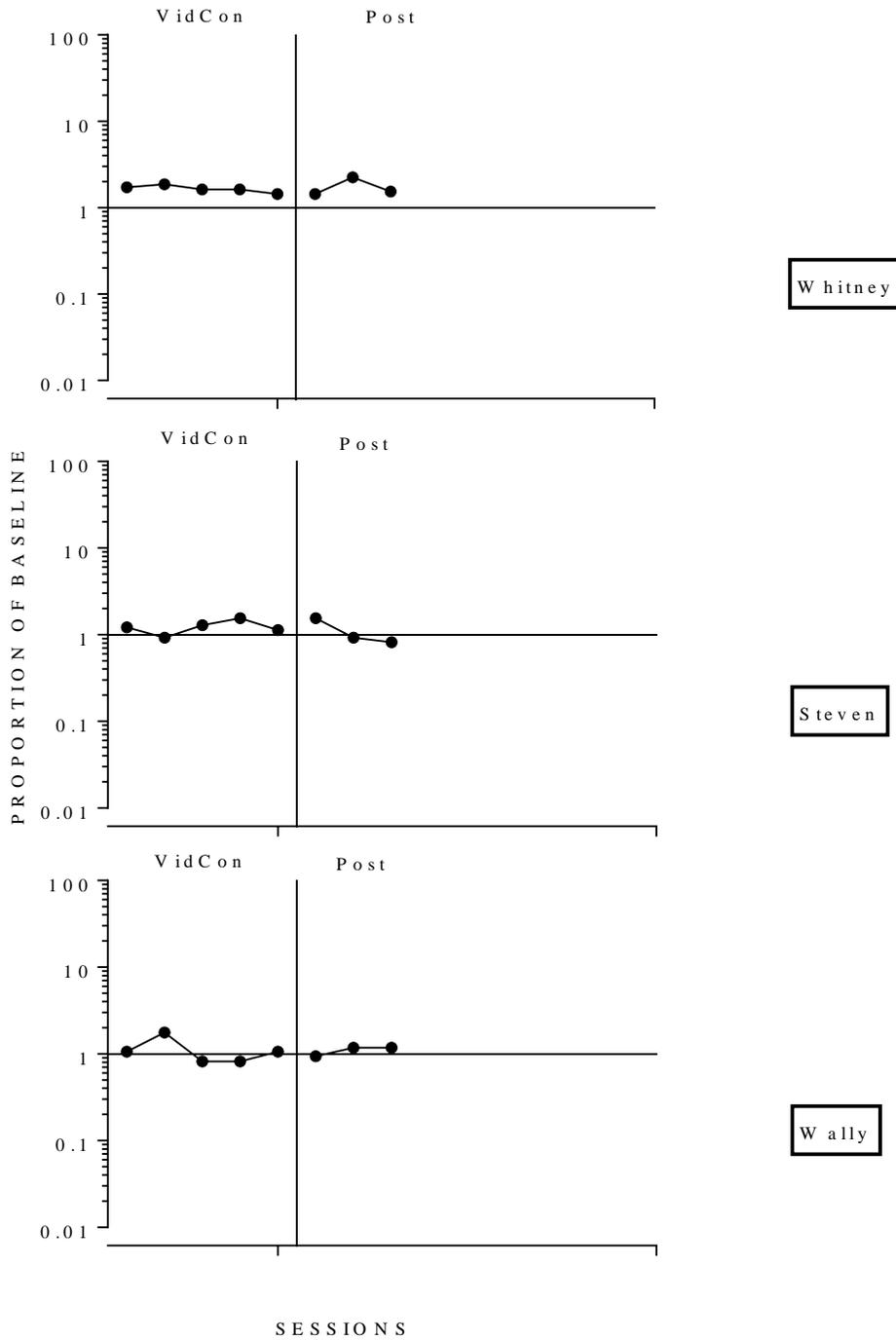
70

Figure 10. Results of Experiment 2 depicted as proportion of baseline. Results of this analysis suggested low effect of token conditioning on overall reading rate as compared to baseline, suggesting that performance was skewed towards preferred tokens, but did not increase overall. "VidCon" indicates video conditioning, and "Post" indicates Post Reinforcement Assessment.

Treatment Integrity

Session #: _____

Date: _____

Name: _____

Participant identifier: _____

Video presentation

1) Present the appropriate video to the participant (Y   N)
2) Present screen to the participant and ensure that audio is audible (Y   N)
3) Play video for its entirety (Y   N)
4) If the participant turns head or eyes away for 5 s or more, restart video (Y   N   NA)
5) Present each video for 30 s total before assessment session (Y   N)

Assessment

Which condition is being assessed? _____

Participant received token for each correctly identified word (Y   N)

Words read: _____

Tokens received: _____

Video Modeling: Red star token

Video Observational Conditioning: Blue circle token

Neutral: Yellow triangle