5-2019

An Evaluation of Conventional and Progressive Discrete Trial Teaching when Teaching Receptive Labels

Elizabeth Wong
ewongautpar@aol.com

An Evaluation of Conventional and Progressive Discrete Trial Teaching when Teaching Receptive Labels

by

Elizabeth K. Wong

A Thesis

Submitted to the Graduate Faculty at

St. Cloud State University

in Partial Fulfillment of the Requirements

for the Degree of

Master of Science

in Applied Behavioral Analysis

April, 2019

Thesis Committee
Kimberly Schulze, Chairperson
Eric Rudrud

Abstract

This study evaluated the effectiveness and efficiency of conventional DTT and progressive DTT when teaching receptive labels to three children all diagnosed with autism spectrum disorder. The conventional DTT approach used a conventional approach, which is a method of balancing the trial order and location of at least three stimuli in a teaching session. In contrast, the progressive approach DTT allowed the teacher to be flexible and assess in the moment the trial order. Using an alternating treatment design replicated for three sets and three participants, the results showed that progressive DTT was the most efficient and effective procedure for two of three participants to acquire receptive labels and to maintain the skills after intervention.

Keywords: counter-balancing; receptive labels; Discrete Trial Teaching

Table of Contents

Chapter Page

Chapter I: Introduction and Literature Review

Children with autism spectrum disorder (ASD) have difficulty developing new skills including receptive language. Their learning may be interfered by aberrant behaviors as well as not having the basic skills to respond to their environment appropriately (Grow & Leblanc, 2013). When basic receptive language skills are not developed, a child misses many important learning opportunities resulting in delays in overall development and subsequent acquisition of the spoken language (Grow & Leblanc, 2013). A majority of early intensive behavior intervention (EIBI) curriculum generally focuses on generating receptive language skills in order to teach children with ASD how to appropriately respond to another person's spoken language (Grow & Leblanc, 2013). Recommended programs to teach these skills are receptive instructions, receptive labels of objects, receptive labels of actions, and receptive labels of concepts (Leaf & McEachin, 1999). By establishing a proper and effective method for teaching receptive language skills, children can gain the necessary skills to respond efficiently and appropriately to other people and their environment

Teaching receptive language skills in EIBI programs is typically taught through the process of discrete trial teaching (DTT) (Lovaas, 2003). DTT involves many trials, with each trial having a very clear beginning and end (Leaf & McEachin, 1999). This technique is composed of three components implemented by the instructor. First, the instructor provides a discriminative stimulus (S^D), which is typically a short and clear instruction (e.g., "What animal is it?", "Copy me"). Second, the learner has an opportunity to respond to the instruction. Third, the instructor provides a consequence based upon the learner's response. If the learner responds correctly, the instructor typically provides reinforcement and if the learner responds incorrectly,

the instructor typically provides feedback (e.g., “No that’s not it, “Try again”). An optional forth step is the instructor providing a prompt to assist the learner in providing a correct response to the instruction (Smith, 2001). The prompt occurs either simultaneously with the instruction, or just after the instruction and before the individual responds.

Leaf, Cihon, Leaf, McEachin, and Taubman (2016) recently described two types of DTT: conventional DTT and progressive DTT. Conventional methods of DTT commonly includes strict procedures within implementation such as types of instructions given and stimuli placement. The instructor follows predetermined protocols with little to no flexibility or individualization based upon the learner’s responding (Leaf et al., 2016). Whereas, within progressive DTT, rather than the instructor adhering to a protocol, they are given the flexibility to assess and analyze what is occurring in the moment with the learner (Leaf et al., 2016). In addition, the instructor should assess the current functions of behavior and environmental interactions which allows them to alter and individualize curriculum and treatment strategies (Leaf et al., 2016).

A common recommendation for teaching receptive skills is to utilize counterbalancing. Originally recommended by Green (2001), the guidelines are to present an array of at least three different stimuli at the onset of teaching conditional discriminations. The target skill (S+) is rotated and balanced among the left, middle, and right positions equally. In each teaching session, the auditory and/or visual instruction is alternated in a balanced and predetermined manner (e.g., rotate between three instructions, three times during a 9-trial session). The position of the target stimuli should never be presented in the same position in the comparison array for more than two consecutive trials (Green, 2001). For example, if the instructor was teaching a

student to receptively label three items (e.g., car, ball, dog) the teacher would ensure that they had three trials for car, three trials for ball, and three trials for dog. The teacher would predetermine the order of these trials and would ensure that no targeted trial occurred on back to back trials. Despite how the learner may respond, the teacher must follow the predetermined protocol. These guidelines provide a straightforward and clear procedure for teachers. Yet, there are concerns that protocol driven interventions limit some children from making the most progress as well as preventing the behavior analyst from becoming better assessors (Leaf et al., 2016).

This approach was further developed by Grow and Leblanc's (2013) recommendations for instructors when teaching receptive language skills. According to Green (2001) and Grow and Leblanc (2013), the rationale behind counterbalancing the target sample is to prevent faulty stimulus control and over selectivity when teaching receptive language skills to children with ASD, which could arise from certain arrangements of trials and trial sequences. Stimulus control occurs when the learner responds specifically and reliably under a particular antecedent stimulus condition and not in other conditions (Green, 2001). A common practice that may create unwanted stimulus control is repeated presentation of each target stimulus. According to Green (2001), by repeating the sample the learner may not discriminate among the different sample stimuli or among different comparison stimuli. Deviating from the arranged trials in a balanced manner could lead to extraneous stimulus control and interfere with the development of the desired sample stimulus over the array of comparison stimuli (Green, 2001).

However, according to Leaf et al. (2016), counterbalancing does not ensure the prevention of faulty stimulus control and can still lead to error patterns (e.g., side bias). For

example, in a 3-array comparison if the target stimulus is prevented from being placed in the same position two times in a row, the learner may learn to change their response on the next trial (Leaf et al., 2016). Second, if faulty stimulus control has already been established, counterbalancing may not establish the desired stimulus conditions (Leaf et al., 2016). Counterbalancing enforces strict protocols and does not necessarily prevent faulty stimulus control. For example, if faulty stimulus control has already occurred and the learner selects the stimulus on the right of every trial, this would result in 33% of trials being consequated with reinforcement (Leaf et al., 2016). In addition, this does not allow the teacher to adjust according to the learner's response during a session. Given the previous example, if the teacher was allowed to assess and change their strategy in the moment, the teacher would ensure that the probability of a trial ending in reinforcement for the incorrect response pattern was 0% by never placing the target on the right (Leaf, 2016).

Leaf et al. (2016) also recommended other guidelines for a progressive approach to DTT. This approach allows the teacher to implement a flexible procedure in which the instructor assesses a variety of variables to determine which stimulus to target on the next trial (Leaf et al., 2016). A few variables the instructor should take into consideration are the child's current motivation, responsiveness, behavior that may signal emotional states and contingencies, the child's responding on previous trials as well as the child's current repertoire, and what the child is doing in the moment (Leaf et al., 2015; Leaf et al., 2016). One of the recommendations is to select the target for a trial and the placement of stimuli based upon the learner's responding. A progressive approach to DTT does not require the instructor to follow a counterbalanced set of trials. The target for each trial would be determined based on the instructor's assessment and

based on several other considerations, rather than a predetermined protocol prescribed to the instructor. One variable to consider when selecting the target for the next trial is how the learner has been responding on previous trials of the target stimuli (Leaf et al., 2016). For example, if the learner has responded correctly on a few consecutive trials of the same target, this can signal the teacher to present a different target on the next trial (Leaf et al., 2016). If the learner continues to respond incorrectly on a target stimulus, the instructor may need to make adjustments on the next trial. The instructor may judge on the next trial that the learner will most likely respond incorrectly, so provides a prompt and also decides on the level of prompt. An additional consideration is the number of times target stimuli are presented, in which the teacher can determine the number of times each target stimuli is delivered (Leaf et al., 2016). By observing how the learner is responding on a trial-by-trial basis, the teacher is not bound to deliver a predetermined target stimulus, rather the teacher may switch targets according to the information from the previous trial

There is a growing literature base on the counterbalancing method when teaching receptive labels to children with ASD (Grow, Carr, Kodak, Jostad, & Kisamore, 2011; Grow, Kodak & Carr, 2014; Gutierrez et al., 2009; Vedora & Grandelski, 2015). To date, there are no studies comparing the effectiveness and efficiency of the implementation of progressive DTT and conventional DTT in which the trial order was examined. Therefore, the purpose of this study was to evaluate the efficiency and effectiveness of the two procedures. In the current study, there were three different conditions. In Condition A, the teacher implemented counterbalancing, a conventional approach of DTT in which the teacher delivered target stimuli according to the guidelines suggested by Green (2001) and Grow and Leblanc (2013). In

Condition B, the stimuli positions were counterbalanced; however, the order of the target stimulus was left to the teacher's discretion and was constrained to deliver each target stimulus three times. In condition C, the stimulus position was counterbalanced; however, the number of trials delivered, and order of each target presented was under the teacher's discretion. Thus, the three teaching conditions were predetermined (A), constrained progressive (B), and unconstrained progressive (C).

Chapter II: Methods

Participants

Three children with a diagnosis of an ASD participated in the study. Alexander, Hank, and Reid were 6, 5, and 6 years of age, respectively. All three participants spoke in full sentences and displayed low aberrant behaviors. Each participant had a previous history with discrete trial teaching and was currently receiving behavioral intervention which included programming for teaching receptive labels.

Setting

This study took place at either at a private clinic or a private school that provides behavioral intervention for children diagnosed with ASD. Sessions were conducted in a room which had a worktable, 4 small chairs, and the researcher's chairs and tables. Within the instructional area, materials included the pictures for the target stimuli, token board, and a treasure chest filled with a variety of toys. The token board was only present during the teaching conditions. Sessions for each child were conducted two to four times per week, with each session lasting no more than 20 minutes.

Materials

Materials used during the study were picture cards printed on 4 in by 6 in. paper. Table 1 displays the labels taught in each training sets. There were three training sets and each set consisted of three unknown picture cards for a total of nine picture cards per participant (see Appendix D, Table 1). Depending on the participant, the targets were either picture cards of movie characters (Alexander), sports mascots (Reid) or sport team logos (Hank). The targets were selected based on the participant's early intervention goals and by interviewing the

participant's clinical supervisor. During sessions, the lead teacher had a separate data sheet for each condition. Each data sheet included instructions on how to use that data sheet, followed by a scoring key. See Appendix A for an example of the data collection sheet(s).

Dependent Measure

Acquisition rate. The primary measure of the study was the acquisition of each target skill taught in each teaching condition through daily probe trials. Daily probe trials consisted of taking the total number of correct trials and dividing it by the total number of trials and multiplying by 100 to determine the percentage of correct responses per probe session. The teacher scored a correct response when the participant touched the first picture card corresponding to the S^D within 5 s of the sample presentation. An incorrect response was scored if the participant touched a picture card that did not correspond to the S^D or if the participant did not respond within 5 s.

Efficiency data. Efficiency data was collected to determine the efficiency of each target method. This was measured by the number of sessions required to meet the mastery criteria for the receptive labels in each condition. The mastery criterion was three consecutive sessions with 100% correct independent responses during probe trials. The percentage was calculated by summing the total number of correct probe trials and dividing the number by the total number of probe trials and multiplying by 100 in each session.

Daily Probes

Daily probes occurred during baseline, intervention, and maintenance conditions. Each probe session consisted of six total trials; two for each target. The comparison array was counterbalanced across trials so that the correct comparisons were present in each location;

alternating among the left, middle, and right positions an equal amount of times. The order of targets within the probe trials was also pre-determined ahead of time. The presentations of each target stimuli were based on procedures recommended by Green (2001) and Grow and Leblanc (2013).

A probe trial consisted of the teacher presenting the 3-array comparisons in a horizontal line in front of the participant. The teacher began by delivering an instruction to select the target stimulus (e.g., “Touch ball”). The teacher then gave approximately 5 s for the participant to respond. If the participant selected a correct response within 5 s, the teacher responded with neutral feedback (e.g., “Thanks” or “Thank you”). If the participant did not respond within 5 s, the teacher responded with neutral feedback (e.g., “Thanks” or “Thank you”). If the participant selected an incorrect response or no response, the teacher again provided neutral feedback (e.g., “Thanks” or “Thank you”). The teacher delivered verbal praise for engaging in appropriate behavior such as sitting at the table and/or engaging in any appropriate behavior anytime during the round. If the participant engaged in any interfering or inappropriate behaviors, the teacher would deliver corrective feedback.

Teaching Trials

Following the daily probe, the participant had a short break followed by teaching trials. Teaching trials consisted of the intervention based on the conditions described below. The responses were recorded as either correct, incorrect, or no response. The teacher delivered an instruction to select the target stimulus for the first trial (e.g., “Find ball”). If the participant selected the correct stimulus from the 3-array comparison, the teacher delivered verbal praise (e.g., “Great, you got it!”) and placed a token on the token board for an independent correct

response, then continued with the next trial. If the participant selected the incorrect response/no response on a trial, the teacher implemented an error correction procedure by providing corrective feedback and would point to the correct target stimuli (e.g., “That wasn’t it, it’s this one”)

Baseline and Maintenance

The baseline condition consisted of one probe session. There was a daily probe session for each one of the conditions: predetermined conditioned, followed by a short break, constrained condition followed by a short break, and unconstrained session followed by another short break. Maintenance sessions occurred seven days after mastery criterion was met and conducted in the same manner as baseline. Maintenance sessions occurred for three consecutive sessions. Participants’ responses during the teaching procedure and maintenance sessions was measured until mastery criterion was met (100% correct responses for three consecutive sessions). If the participant reached mastery criterion on one of the conditions but had not reached mastery criterion on the other conditions; the participant had up to five sessions to reach mastery criterion from the start of the first condition being mastered. If the participant had not mastered the condition after the five sessions, the condition would end and would move onto maintenance.

Intervention

Predetermined condition. In this condition, the teacher implemented a conventional approach of DTT according to the guidelines suggested by Green (2001) and Grow and Leblanc (2013). The teacher had a data sheet in which each target stimuli placement and order was predetermined and counterbalanced. In each set, each stimulus was targeted for three trials for a

total of nine trials. During the predetermined condition, the teacher had to follow the exact protocol of which target stimuli to deliver and did not have the flexibility to change the target stimuli. The delivery of each target stimulus was never presented on two consecutive trials. For example, if the teacher requested "ball" on the first trial, they would not request "ball" on the second trial. The target stimulus on the next trial was always different from the previous trial. See Appendix A for an example of the data collection sheet which illustrated how each target stimulus was counterbalanced on the three visual comparison stimuli in the array and the rotation of the discriminative stimulus (i.e., the bolded stimulus) during the receptive identification program.

Teacher constrained progressive condition. In this condition, the teacher implemented a constrained progressive approach of DTT as recommended by Leaf et al. (2016). Within this approach the researcher had a total of nine teaching trials and *had to* ensure that each target stimuli received a total of three teaching trials. For example, if the researcher was teaching the participant to receptively label a picture of an apple, a banana, and an orange, the teacher was required to implement three trials of an apple, three trials of a banana, and three trials of an orange. The teacher, however, had discretion of the order each of the teaching trials, across the three stimuli, were implemented. For example, the teacher was allowed to implement three trials of apple, followed by three trials of banana, or tree trials of orange; or the researcher could have implemented one trial of an apple, three trials of a banana, and two trials of an orange, etc. The order of the trials was not predetermined (see Appendix B for an example of how this condition was implemented).

Teacher unconstrained progressive condition. In this condition, the teacher implemented an unconstrained progressive approach of DTT as recommended by Leaf et al. (2016). This approach the researcher delivered a total of nine teaching trials with complete flexibility of how many trials they needed to implement per target as well as the order of targets during each session. For example, the researcher was teaching the participant to receptively label a picture of an apple, a banana, and an orange. The researcher could implement all nine trials of orange in one session and not target the other targets within a given session. The researcher also had the freedom to intersperse the number of trials across the three targets (see Appendix C for an example of the data collection sheet which illustrates how to counterbalance the placement of the three visual comparison stimuli in an array).

Reinforcement System

A token economy system (Kazdin & Bootzin, 1972) was used throughout the intervention sessions. The token board had a total of 27 tokens and was broken down into three parts. The first part (located on the bottom of the token board) was colored green with six tokens, the second part (located in the middle of the token board) was colored brown with 15 tokens and the third part (top of the token bard) was colored blue with six tokens. When earning tokens, tokens would first be placed in the first part. Once the first part was filled, tokens would be placed in the second part until filled. Upon completion of the second part, the tokens would then be placed into the third part of the board. Prior to each teaching sessions, the participants were informed of the three different levels of the token board and were told what type of reinforcement they could earn for each section of the token board. Tokens were delivered for each independent correct response of the target stimuli. If they only reached the bottom of the token board (i.e., green

section), they would not receive any reinforcement, if they reached the middle part (i.e., brown section) they could look inside the treasure chest but could not take a toy home. If they reached the top of the token board (i.e., blue section), they could take a toy home from the treasure chest. Additionally, if the participant had reached mastery criterion for one of the conditions prior to the other conditions, the lead teacher would continue the token board from where they had left off from the remaining conditions. The lead teacher would place the number of tokens on the board according to the opportunities given prior to teaching the next condition. This did not require the participant to restart the token board for the remaining teaching conditions.

Experimental Design

To measure the effects of the trial order of the target stimuli when teaching receptive labels, the researchers utilized an alternating treatment design with a baseline probe for all three sets and across participants. The design consisted of three phases: baseline, intervention, and maintenance. Within this design, there were three sets: the first set was implemented by one lead teacher, the second set a different lead teacher, and for the third set, the teacher alternated. The order of the conditions probed and taught were randomized for each session.

Interobserver Agreement and Treatment Integrity Measure

In order to assess for proper implementation of the probe sessions during baseline, intervention, and maintenance conditions, treatment integrity was measured by a second independent observer. The independent observer recorded the learner's response which included correct, incorrect, or a no response. Inter-observer agreement (IOA) was considered correct if both observers scored the same response occurring on the same trial. Interobserver agreement was calculated by dividing the total number of agreements by the total number of agreements

plus disagreements and multiplying it by 100 for the percentage. Interobserver agreement was taken in at least 33% of all sessions. Agreements during baseline, intervention, and maintenance conditions IOA were 100%.

To assess treatment fidelity, the teacher's performance was rated by a second independent observer during 33% of all teaching sessions. The teacher's behavior of correct steps consisted of : (a) placed the comparison array in the correct locations according to the data sheet, (b) provided the correct instruction (e.g., applied only to predetermined condition), (c) provided approximately 5 s for the participant to respond and d) provided social praise and a token board for correct responses or provided corrective feedback for incorrect responses, and (d) provided three trials for each target (e.g. applied only to the constraint condition). Treatment integrity was calculated by dividing the total number of correct and incorrect responses by the number of correct responses and multiplying it by a 100 for the percentage. Total treatment fidelity for both teachers was 100% across all sets.

Chapter III: Results

Alexander

Figure 1 (see Appendix D) displays the results for Alexander when teaching receptive labels of Disney characters and mascots. During baseline, the percentage of labels Alexander correctly identified remained low for all three conditions, (range, 0 to 16.67%). For Set 1, Alexander met mastery criteria for all three conditions. In terms of efficiency, the number of sessions needed to meet the mastery criteria for predetermined, constrained, and unconstrained were five, three, and three, respectively. Alexander displayed high percentages in maintenance, averaging 100% for constrained, 94% (range, 83 to 100%) for unconstrained, and 89% (range, 66 to 100%) for predetermined.

For Set 2 (i.e., second teacher), Alexander reached mastery criteria for all three conditions. In terms of efficiency, the number of sessions needed to meet the mastery criteria for predetermined, constrained, and unconstrainted were three, four, and three, respectively. Alexander also displayed high percentages in maintenance averaging 100% for predetermined and unconstrained conditions, and 94% for the constrained condition.

In Set 3 (i.e., alternating teacher), Alexander reached mastery criterion for all three conditions. In terms of efficiency, all three conditions met mastery criteria within three teaching sessions. During the assessment of maintenance, Alexander maintained high percentages, averaging 100% for predetermined, with both the constrained and unconstrained condition averaging 94% (range, 83 to 100%).

Hank

Figure 2 (see Appendix D) displays the results for Hank when teaching receptive labels of mascots and Disney movie characters. During baseline, the percentage of labels Hank correctly identified remained low for all three conditions (range, 0 to 16.67%). For Set 1, in terms of efficiency the predetermined condition met mastery within four sessions, constrained condition in seven sessions, and unconstrained in five sessions. During the assessment of maintenance, Hank maintained at 100% across all three conditions for all maintenance sessions.

In Set 2, Hank did not reach mastery criterion in the predetermined condition. During the predetermined condition, teaching stopped after 13 sessions and never reached above 66%, except for one probe of 100%. However, Hank reached mastery criterion for the constrained and unconstrained conditions. In terms of efficiency, the constrained and unconstrained condition met mastery within eight and nine sessions, respectively. During the assessment of maintenance, Hank did not maintain responding in the unmastered predetermined condition which averaged 72% (range, 50 to 100%). Interestingly, Hank scored 100% on the third data point of maintenance. Hank did not maintain responding during the constrained condition which averaged 50% (range, 33 to 100%). Responding maintained during the unconstrained conditioned maintenance with an average of 94% (range, 83 to 100%).

In Set 3, Hank met mastery criterion for all three conditions. In terms of efficiency, the predetermined condition was mastered within 12 sessions, the constrained condition within seven sessions, and unconstrained six sessions. During the assessment of maintenance for the predetermined condition, maintenance averaged 88% (range, 83 to 100%), and 100% for the constrained and unconstrained.

Reid

Figure 3 (see Appendix D) displays the results for Reid when teaching receptive labels Superheroes and sport team logos. During baseline, the percentage of labels Reid correctly identified remained low for all three conditions (range, 0 to 16.67%). For Set 1, Reid reached mastery criteria for all three conditions. In terms of efficiency, the predetermined condition met mastery within seven sessions. During the constrained and unconstrained conditions, mastery was reached within 3 sessions During the assessment of maintenance, Reid displayed high percentages in the predetermined, and constrained conditions averaging 94% (range, 83 to 100%), whereas in the unconstrained condition 100% was maintained for all sessions.

In Set 2, Reid reached mastery criteria for all three conditions. In terms of efficiency, Reid met mastery within three teaching sessions for all three conditions. During the assessment of maintenance, Reid displayed high percentages, 100% for all three conditions.

In Set 3, Reid met mastery criteria for all three conditions. In terms of efficiency, the unconstrained condition met mastery criterion in three sessions, whereas the constrained was within four sessions and predetermined within six sessions. During the assessment of maintenance, the predetermined and constrained condition maintained at 100% for all sessions. The unconstrained condition maintenance averaged 94% (range, 83 to 100%).

Table 2 (see Appendix D, Table 2) displays the participant's results for the number of sessions to meet mastery criterion across sets. More sessions were required to reach mastery for predetermined than constrained or unconstrained; however, differences across sets were slight for Alexander. More sessions were required to reach mastery for constrained versus unconstrained; however, differences were slight for all three children.

Chapter IV: Discussion

The purpose of this study was to evaluate the efficiency and effectiveness of the implementation of progressive DTT and conventional DTT when teaching receptive labels for three participants diagnosed with ASD. This was done by evaluating the trial order for each condition. All three participants reached the mastery criterion across all three training sets in the constrained and unconstrained conditions with the exception of one training set in the predetermined condition. Two participants, Alexander and Reid, met the mastery criterion for all training sets across all three conditions when learning receptive labels. They also had high percentages of correct responses during maintenance probe trials across all three conditions and sets with a response of above 95%. One participant, Hank, did not reach mastery criterion in the predetermined condition with one of the sets (second teacher) nor did he show maintenance with one set in the constrained condition. During the maintenance probes, on average across all three sets, Hank correctly responded above 80% in the predetermined condition and constrained condition, and above 95% in the unconstrained conditions. Also, Hank mastered Set 1 fastest in the predetermined condition. Thus, results were less clear for Hank. Overall, across all three participants the unconstrained required the fewest sessions to meet mastery criterion followed by constrained and predetermined. Also, across all three participants they had high percentage rates of correct responses during maintenance probe trials for the targets in the unconstrained condition, followed by constrained and lastly predetermined. Thus, the results showed the progressive approach of the unconstrained condition as generally the most effective and efficient method.

There are several implications from this study for clinicians, researchers, and teachers in the field when teaching receptive labels to individuals diagnosed with ASD. In previous comparative studies, most of the studies' evaluations have compared conventional DTT ways to counterbalance stimuli (Grow et al, 2011; Grow et al., 2014; Gutierrez et al., 2009; Vedora & Grandelski, 2015). There are zero studies when comparing conventional DTT to progressive DTT when teaching receptive labels. This study contributes in evaluating the effectiveness of the progressive DTT approach.

Second, children with ASD have difficulty developing receptive language and the majority of EIBI curriculum primarily focuses on teaching receptive skills through the process of DTT, typically taught through protocol driven approaches. Research has shown the conventional approach of counterbalancing has become increasingly popular amongst therapist in the field of ASD intervention (Grow et al., 2011; Leaf et al., 2016). This restricts the teacher from utilizing and fine tuning their analytical skills (Leaf et al., 2016). This study suggests that a qualified teacher may implement a procedure that requires in-the-moment assessment, whereas a teacher not as skilled or qualified may best implement protocol driven techniques. Therefore, teacher out in the field may not have not have the opportunity to consistently learn how to make analytical decisions according to the learner.

Third, for one of the participants (Hank), the predetermined condition took the most sessions to meet mastery criterion or did not meet it. However, the progressive approach (Sets 2 and 3) took the least amount of sessions to meet mastery criterion. The variability in Hank's data may suggest the labels taught using the progressive approach were mastered more quickly due to the teacher having the flexibility of assessing in the moment and given the ability to choose

which trial to target each stimuli (i.e., looking at previous data) as well as assessing the child's current repertoire (i.e., current motivation) (Leaf et al., 2016). Thus, this study suggests children with ASD may learn receptive skills more efficiently and effectively by taking into consideration the individual learner; thus, maximizing the child's time and learning. In addition, the present study indicates that counterbalancing the target stimuli may not be best suited for every learner as recommended by Grow et al. (2011).

Fourth, the protocol driven recommendations from Grow et al. (2011) were established to prevent the development of faulty stimulus control, error patterns or over-selectivity. These error patterns did not occur for any of the participants. Also, during the Progressive DTT conditions, one of the variables the teachers took into consideration when selecting a target was based on the participant's response to the previous trial. The teacher could assess and adjust in the moment to prevent faulty stimulus control and/or over-selectivity from occurring by determining which target stimulus to deliver. Thus, this study allowed the teacher's in the progressive DTT approach to regularly assess these variables and make changes accordingly.

This study had a few limitations which future researchers may want to examine. One potential limitation of the study is the history of the participants' exposure to DTT. All three participants were older and had a previous history with DTT when learning receptive labels. To avoid this in the future, this could be conducted on learners that are younger with limited or no prior history with any type of DTT. Second, the participants present in the study had limited interfering stereotypic and problem behaviors. Therefore, it is unknown if results would have a similar outcome with children of different learning abilities. Future researchers may wish to examine the effectiveness of the procedures with children more impacted with interfering

behaviors. Third, maintenance probes were taken 7 days after participants had met mastery criterion, which was not very long. Fourth, this study lacked generalization data with other skills such as other target stimuli, matching, receptive instructions, and expressive identification. It may be beneficial for future research to evaluate the effects of counterbalancing and progressive DTT amongst different learning skills.

Despite these limitations, the results of the study demonstrated when using the progressive DTT approach (i.e., unconstrained and constrained conditions) rather than counterbalancing when teaching receptive labels, all three participants diagnosed with ASD acquired and maintained the skill effectively and efficiently, thus, providing clinicians and researchers with empirically based research and further assessing a more flexible approach depending on the individual learner.

References

Green, G. (2001). Behavior analytic instruction for learners with autism: Advances in stimulus control technology. *Focus on Autism and Other Developmental Disorders*, *16*, 72-85.

Grow, L. L., Carr, J. E., Kodak, T., Jostad, C. M., & Kisamore, A. N. (2011). A comparison of methods for teaching receptive labeling to children with autism spectrum disorders. *Journal of Applied Behavior Analysis*, *44*, 475-498.

Grow, L. L., Kodak, T., & Carr, J. E. (2014). A comparison of methods for teaching receptive labeling to children with autism spectrum disorders: A systematic replication. *Journal of Applied Behavior Analysis*, *47*, 600-605.

Grow, L. L., & LeBlanc, L. (2013). Teaching receptive language skills: Recommendations for instructors. *Behavior Analysis in Practice*, *6*(1), 56-75.

Gutierrez, A., Hale, M. N., O'Brien, H. A., Fischer, A. J., Durocher, J. S., & Alessandri, M. (2009). Evaluating the effectiveness of two commonly used discrete trial procedures for teaching receptive discrimination to young children with autism spectrum disorders. *Research in Autism Spectrum Disorders*, *3*, 571-579.

Kazdin, E., & Bootzin, R. R. (1972). The Token Economy: An Evaluation Review. *Journal of Applied Behavior Analysis*, *5*(3), 343-373.

Leaf, J. B., Cihon, J. H., Leaf, R., McEachin, J., & Taubman, M. (2016). A progressive approach to discrete trial teaching: Some current guidelines. *International Electronic Journal of Elementary Education*, *9*(2), 361-372.

Leaf, J. B., Leaf, R., McEachin, J., Taubman, M., Ala'i-Rosales, S., Ross, R. K., & Weiss, M. J. (2015). Applied behavior analysis is a science and, therefore, progressive. *Journal of Autism and Developmental Disorders, 46*(2), 720-731.

Leaf, R., & McEachin, J. (1999). *A work in progress: Behavior management strategies and a curriculum for intensive behavioral treatment of autism*. New York, NY: Different Roads to learning.

Lovaas, O. I. (2003). *Teaching individual with developmental delays: Basic intervention techniques*. Austin, TX: Pro-Ed.

Smith, T. (2001). Discrete trial training in the treatment of autism. *Focus on Autism and Other Developmental Disabilities, 16*(2), 86-92.

Vedora, J., & Grandelski, K. (2015). A comparison of methods for teaching receptive language to toddlers with autism. *Journal of Applied Behavior Analysis, 48*(1), 188-193.

Appendices

Appendix A: Pre-determined Condition/Probe Trials

Predetermined Condition Data Sheet
(PROBE TRIALS)

Participant Name: Scorer:
Date: _____ Circle One (Primary/IOA)

Instructions:

1. Arrange the stimuli according to each trial
2. Deliver each target trial that is **bolded and highlighted**
3. Circle/mark the child's response on each trial (+ for correct, - for incorrect, NR for no response in 5 seconds of the instruction)
4. Provide neutral feedback on each trial regardless of accuracy (e.g., "ok," "thanks," etc.)

Trial	Left	Center	Right	Response		
1	RAPUNZEL	**FIONA**	CINDERALLA	+	-	NR
2	FIONA	CINDERALLA	**RAPUNZEL**	+	-	NR
3	**CINDERALLA**	RAPUNZEL	FIONA	+	-	NR
4	**RAPUNZEL**	FIONA	CINDERALLA	+	-	NR
5	FIONA	**CINDERALLA**	RAPUNZEL	+	-	NR
6	CINDERALLA	RAPUNZEL	**FIONA**	+	-	NR

Appendix B: Teacher's Constrained Choice Condition

Teacher's Constrained Choice Condition (TEACHING TRIALS)

Instructions:

1. Arrange the stimuli according to each trial.
2. **Procedure: Each target stimuli can ONLY be delivered a maximum of 3 times. You can choose the order delivery of each target stimuli.**
3. Circle/mark the child's response on each trial (+ for correct, - for incorrect, NR for no response in 5 seconds of the instruction).
4. Track the number of each target by placing a tally in the highlighted boxes.
5. For incorrect responses provide corrective feedback AND point to the correct stimulus (e.g., "No, it's this one).

Trial	Left	Center	Right	Response		
1	RAPUNZEL	FIONA	CINDERALLA	+	-	NR
2	FIONA	CINDERALLA	RAPUNZEL	+	-	NR
3	CINDERALLA	RAPUNZEL	FIONA	+	-	NR
4	RAPUNZEL	FIONA	CINDERALLA	+	-	NR
5	FIONA	CINDERALLA	RAPUNZEL	+	-	NR
6	CINDERALLA	RAPUNZEL	FIONA	+	-	NR
7	RAPUNZEL	FIONA	CINDERALLA	+	-	NR
8	FIONA	CINDERALLA	RAPUNZEL	+	-	NR
9	CINDERALLA	RAPUNZEL	FIONA	+	-	NR
Tally # of times each target is delivered	**RAPUNZEL** **Target 3 times**	**FIONA** **Target 3 times**	**CINDERALLA** **Target 3 times**			

Appendix C: Teacher's Unconstrained Choice Condition

Teacher's Unconstrained Condition (TEACHING TRIALS)

Instructions:

1. Arrange the stimuli according to each trial
2. Procedure: You can choose which stimuli to target on each trial
3. Circle/mark the child's response on each trial (+ for correct, - for incorrect, NR for no response in 5 seconds of the instruction)
4. Tally each target delivered in the highlighted boxes
5. For incorrect responses provide corrective feedback AND point to the correct stimulus (e.g., "No, it's this one)

Trial	Left	Center	Right	Response
1	DORIS	GINGY	PETER	+ - NR
2	GINGY	PETER	DORIS	+ - NR
3	PETER	DORIS	GINGY	+ - NR
4	DORIS	GINGY	PETER	+ - NR
5	GINGY	PETER	DORIS	+ - NR
6	PETER	DORIS	GINGY	+ - NR
7	DORIS	GINGY	PETER	+ - NR
8	GINGY	PETER	DORIS	+ - NR
9	PETER	DORIS	GINGY	+ - NR
Tally # of times each target is delivered	**PETER**	**GINGY**	**DORIS**	

Treatment Fidelity of Trial Order Methods for Teaching Receptive Labels

Scoring Key

+ = Correct

- =Incorrect

Trial	Placing the comparison array in the correct position as indicated	Delivering the correct instruction (applies only in the pre-determined condition)	Providing approximately 5 seconds for the participant to respond	Providing praise/token for correct responses or corrective feedback for incorrect responses	Delivered 3 trials for each target (applies only in the constraint condition)
1					
2					
3					
4					
5					
6					
7					
8					
9					
Total correct					
Percentage					

Appendix D: Figures and Tables

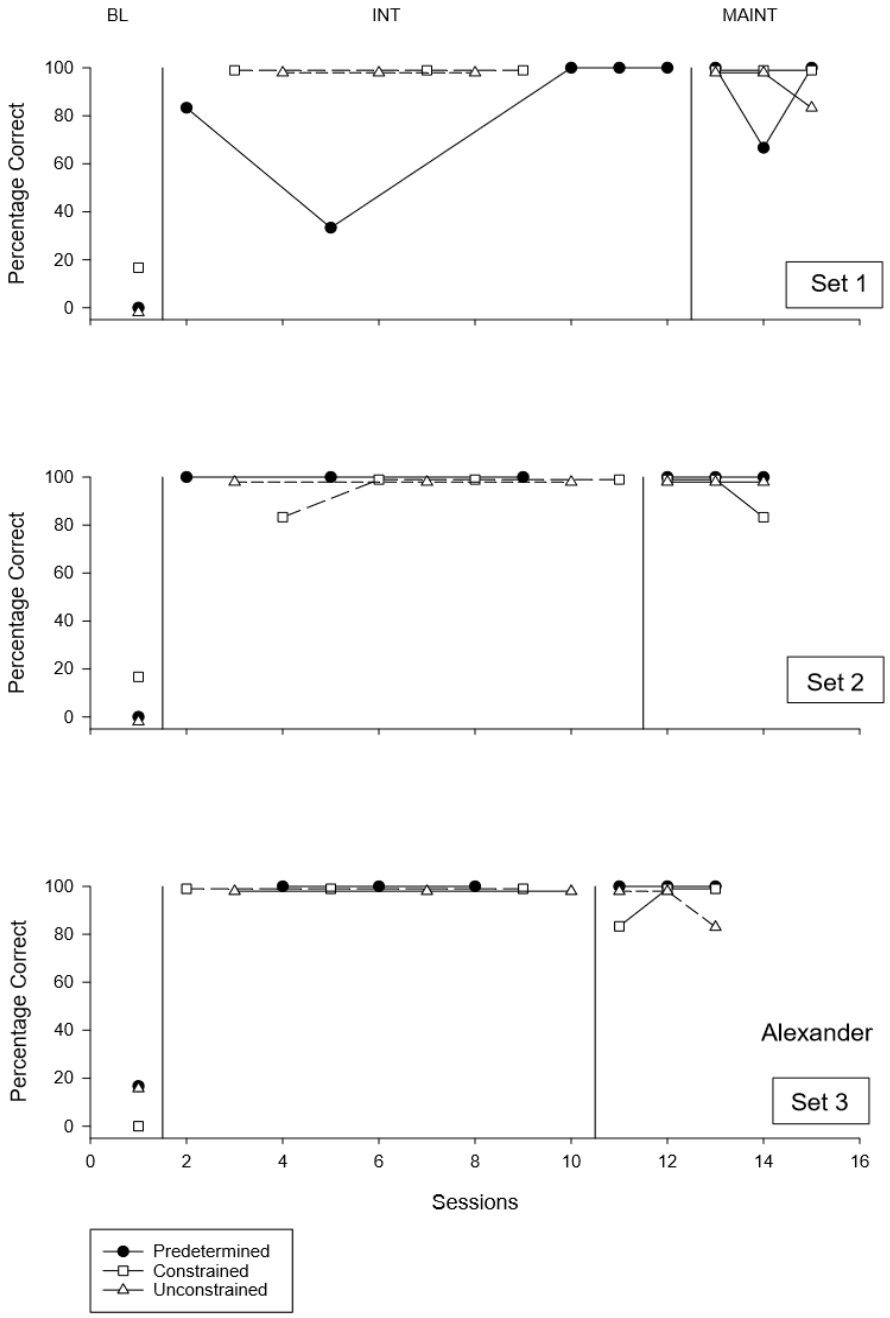

Figure 1. Percentage of Alexander's independent correct responses for the first set, second set, and third set in each condition.

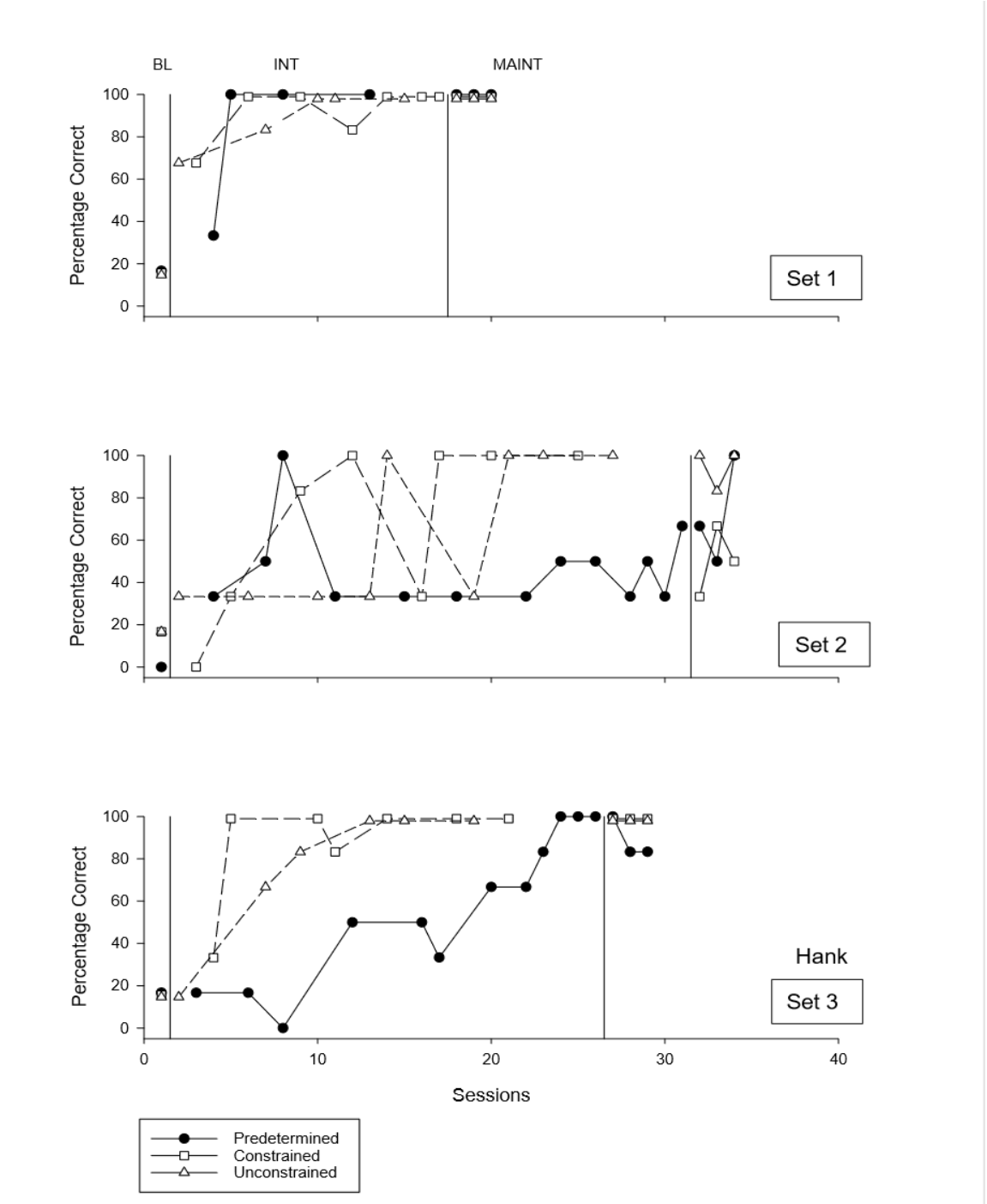

Figure 2. Percentage of Hank's independent correct responses first set, second set, and third set in each condition.

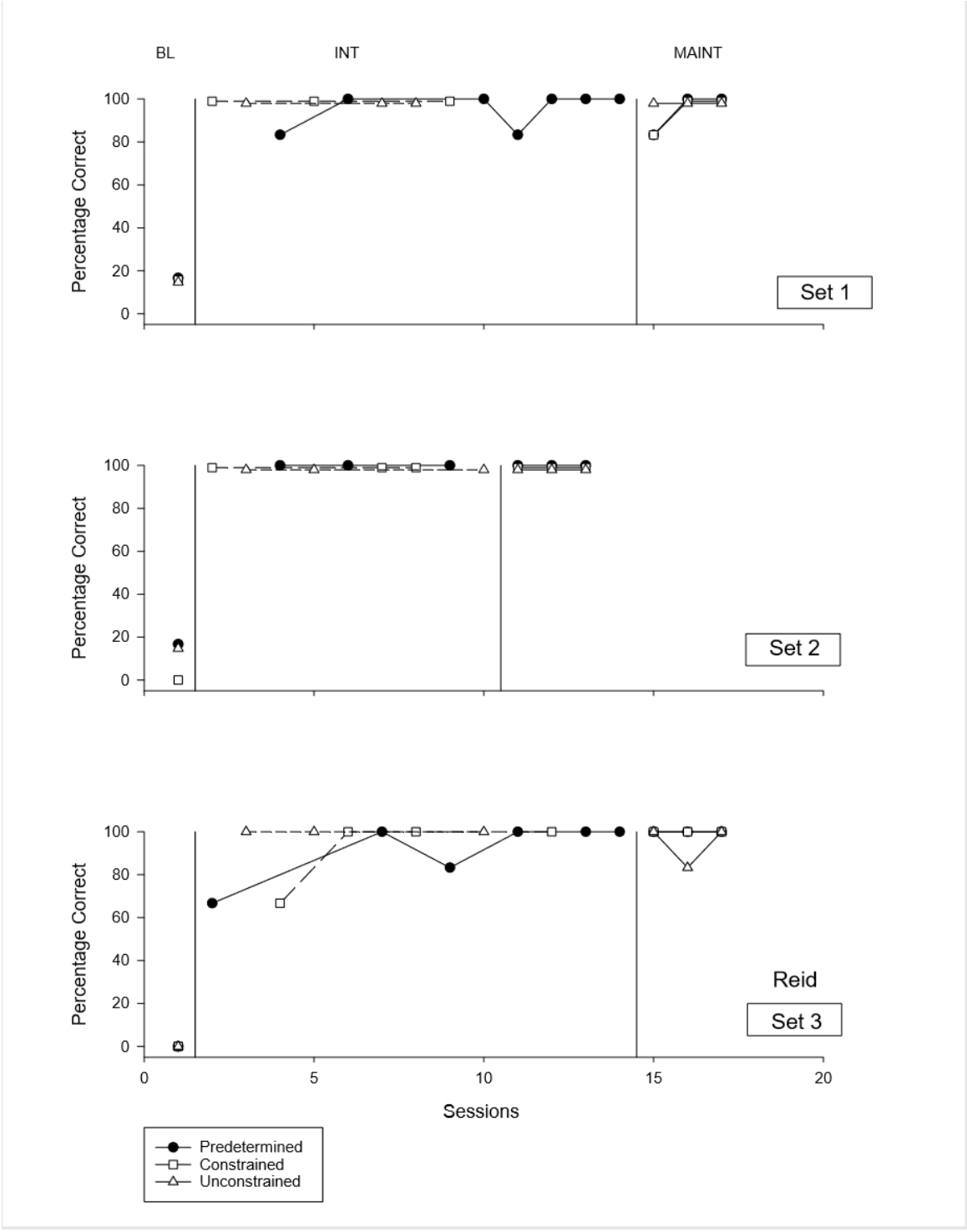

Figure 3. Percentage of Reid's independent correct responses for first set, second set, and third set in each condition.

Table 1

Receptive Labels Taught

Participant	Predetermined	Constrained	Unconstrained
Alexander	Set 1 Proctor, Sarge, Slinky Set 2 Tigger, Roo, Piglet Set 3 Hector, Miguel, Ernesto	Set 1 Weasleton, Otterton, Flash Set 2 Dug, Russell, Fredericksen Set 3 Freddie, Bolt, Toro	Set 1 Doris, Peter, Gingy Set 2 Pooh, Eeyore, Christopher Robin Set 3 TD, Rowdy, Staley
Hank	Set 1 Joe, Rocky, Otto Set 2 Harry, Grizz, Bango Set 3 Miguel, Hector, Ernesto	Set 1 Traveler, Super Frog, Youdee Set 2 Hugo, Boomer, Chuck Set 3 Dug, Russell, Fredericksen	Set 1 Azul, Bucky, Knightro Set 2 Crunch, Benny, Hooper Set 3 Hercules, Pegasus, Hades
Reid	Set 1 Sabretooth Carnage, Phoenix Force Set 2 Ravens, Steelers, Panthers Set 3 Mariners, Blazers, Mets	Set 1 Morgan Le Fay, Magus, High Evolutionary Set 2 Patriots, Saints, Buccaneers Set 3 Panthers, Cowboys, Wolverine	Set 1 Collector, Vulcan, Ares Set 2 Oilers, Capitols, Kings Set 3 Beavers, Falcons, Mustangs

Table 2

Number of Sessions to Mastery Criterion

Participant	Predetermined	Constrained	Unconstrained
Alexander	Set 1 5 Set 2 3 Set 3 3 Total 11	Set 1 3 Set 2 4 Set 3 3 Total 10	Set 1 3 Set 2 3 Set 3 3 Total 9
Hank	Set 1 4 *Set 2 13 Set 3 12 Total 29	Set 1 7 **Set 2 8 Set 3 7 Total 22	Set 1 5 Set 2 9 Set 3 6 Total 20
Reid	Set 1 7 Set 2 3 Set 3 6 Total 16	Set 1 3 Set 2 3 Set 3 4 Total 10	Set 1 3 Set 2 3 Set 3 3 Total 9

*Hank did not master predetermined Set 2
**Hank did not maintain master of constrained Set 2