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The Effects of a Lag 5 Schedule of Reinforcement on Toy Play Response Variability

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THE EFFECTS OF A LAG 5 SCHEDULE OF REINFORCEMENT ON TOY PLAY RESPONSE VARIABILITY

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ABSTRACT

THE EFFECTS OF A LAG 5 SCHEDULE OF REINFORCEMENT

ON TOY PLAY RESPONSE VARIABILITY

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Variability in behaviors is a necessary part of living and thriving. Variability allows a person to adapt to new settings, problem solve, and survive. Individuals with an autism spectrum diagnosis lack response variability in their behavioral repertoire, which leads to a lack of problem solving and adaptive skills. Rigid toy play is a common symptom of autism spectrum disorder and shows a larger lack of overall response variability. A lag schedule of reinforcement requires the organism to vary their current response from previous responses in order to receive reinforcement. The purpose of the current study was to evaluate the effect of a Lag 5 schedule of reinforcement on variability in toy play responses with stimuli that had a wide range of appropriate toy play responses. A changing criterion design was used to evaluate the effects of a Lag 5 schedule of reinforcement on toy play response variability. Varied toy play responding did increase under lag schedules with the inclusion of training trials. Responding generalized across novel toy sets.

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CHAPTER I

INTRODUCTION

Autism spectrum disorder (ASD) is often characterized by repetitive, stereotyped, and rigid behavior. Individuals with ASD may have repetitive and unvarying body movements, vocalizations, conversations, routines, and have a repeating preoccupation with specific stimuli (Baron-Cohen, 1989). Children with autism often demonstrate behavior that is less variable than typically developing peers as well as those with other cognitive disabilities (Frith, 1972). In order to receive a diagnosis of ASD, the individual needs to display behavior that is restricted and repetitive, such as restricted speech patterns and repetitive motor movements (American Psychiatric Association, 2013).

Variation in all types of responding is important for animals as well as humans; having a variety of behaviors increases the likelihood that an individual can problem solve and adapt to new settings. A rigid responding repertoire leads to a loss of access to reinforcers. Individuals with ASD are more likely than typically developing individuals to engage in repetitive responding that does not deliver an optimal amount of reinforcement. Mullins and Rincover (1985) found that when comparing typically developing children to children with ASD in choice selection with varying schedules of reinforcement, the children with autism often preferred a non-optimal schedule, as they generally did not vary their behavior to make contact with the optimal schedule of reinforcement. This repetitive behavior also leads to a loss of reinforcers in social settings. In conversation, when asked, “How are you?” an individual with ASD may only respond with, “I’m fine.” The social community will continue to ask this question, but if the individual always responds with the same response then the social community may start to punish the response. Almost all conversational questions and statements can set the occasion for

more than one specific response. When an individual with ASD responds the same way to each question, the social community will start to view that individual as an undesired conversation partner and may stop engaging with that particular individual. This lack of variety in the individual's repertoire can be stigmatizing and may result in "failure to adapt" (Neuringer, 2002). Individuals with ASD may display limited play skills, including an inability to appropriately manipulate play materials both independently and in social situations. A deficiency in play skills may result in loss of social sources of reinforcement (Miller & Neuringer, 2000). Increasing response variability in children with autism can provide an alternative to repetitive behavior as well as enable the individual to select and engage in adaptive and variable behaviors.

In applied behavior analysis, the most common method for teaching responding in children with autism is discrete-trial training. Discrete-trial training involves prompting a response and delivering reinforcement. However, these prompting and reinforcement procedures may result in a single response becoming dominant. These procedures are not always effective for increasing variable toy play responses (Lee, McComas, & Jawor, 2002). One way to increase variability in toy play is to directly reinforce response variability. In basic research studies, Neuringer and colleagues have shown that variability in responding can be effectively reinforced and is sensitive to reinforcement contingencies (Page & Neuringer, 1985). Neuringer and colleagues have used lag schedules to promote variability in responding in both basic and applied research. A lag *x* schedule is a schedule of reinforcement where *x* represents the number of prior responses that the current response must differ from before receiving reinforcement. For example, a Lag 1 schedule of reinforcement requires two different responses before the delivery of a reinforcer. A Lag 2 schedule of reinforcement requires three different responses before the delivery of a reinforcer, and so on.

Relatively few studies with lag schedules of reinforcement with human participants have been conducted. The majority of those studies have been focused on increasing response variability of vocalizations and other communicative responses (Betz, Higbee, Kelley, Sellers, & Pollard, 2011; Lee et al., 2002; Lee & Sturmey, 2008; Susa & Schlinger, 2012). Only a few studies have focused on increasing variability or novel toy play responses (Goetz & Baer, 1973; Cammilleri & Hanley, 2005; Napolitano, Smith, Zarcone, Goodkin, & McAdam, 2010; Baruni, Rapp, Lipe, & Novotny, 2014). The most common stimulus used to evaluate varied toy play responses is block sets; even fewer studies have been conducted with stimuli other than block sets. Baruni, Rapp, Lipe, and Novotny (2014) evaluated novel toy play responses using toys including a toy train, airplane, and car. However, those stimuli can produce relatively few appropriate toy play responses in comparison to a set of blocks. To address this limitation, future research should use toy stimuli that have as many or more appropriate toy play responses as a set of blocks. The purpose of the current study is to evaluate the effect of a Lag 5 schedule of reinforcement on variability in toy play responses with stimuli that have a wide range of appropriate toy play responses.

CHAPTER II

LITERATURE REVIEW

Until relatively recently, the idea that variability in behavior could be reinforced was controversial. For many years, it was believed that variability in responding could not be directly targeted and reinforced (Schwartz, 1980). A main argument against the idea that variability is able to be reinforced was that an increase in response variability was not due to a change in reinforcement, but rather variability was a by-product of different schedules of reinforcement (i.e., respondent variability). Page and Neuringer (1985) set out to show that variability, in addition to being respondent behavior, could also be operant behavior. This sequence of six studies not only showed that variability is an operant dimension of behavior, but also reviewed some different schedules of reinforcement that resulted in increases in an organism's response variation. Perhaps the most impressive show of the effect of reinforcement on variability is their study comparing a Lag 50 schedule of reinforcement to a yoked variable-ratio schedule in pigeons. This specific study showed that pigeons are capable of varying their responding to achieve reinforcement on a Lag 50 schedule while also showing that under a schedule of reinforcement where variation was allowed but not required (yoked variable-ratio) a high level of variability was not produced. This suggests that not only can variability be reinforced, but that when variability is not required, variability may not occur. For individuals with ASD and other developmental disorders, this means not only that they can be taught to respond in a varying manner using lag schedules, but that variation needs to be a direct target of the schedule for variability to occur. Page and Neuringer (1985) also demonstrated discriminative control over response variability. Thus, variability is similar to other operant behaviors in that it can be controlled by environmental stimuli.

Both types of response variability, operant and respondent, are adaptive for the individual. If reinforcement is infrequent, it is most beneficial to an organism to vary its behavior to access reinforcement. The variability of an individual's response repertoire also helps in learning new behaviors, as many teaching methods (e.g., successive approximations and trial and error) require responses to vary at least slightly in order to learn the new response. Both types of variability are important; respondent variability can set the boundaries in which reinforcement contingencies for operant variability take place. It is important to know when variability is desired (e.g., playing games at recess) and when it is not desired (e.g., in the classroom).

Response Variability in Children with ASD

Extinction has been previously used to increase response variability (Goezt & Baer, 1973; Lalli, Zanolli, & Wohn, 1994; Betz, Higbee, Kelley, Sellers, & Pollard, 2011). The study by Betz, Higbee, Kelley, Sellers, and Pollard (2011) combined a script training procedure with extinction procedures to see the effects on variation of mand frames. To use extinction as a means of increasing variability in responding, reinforcement was only delivered the first time a specific response topography occurred. After receiving this reinforcement, that specific topography no longer resulted in the delivery of a reinforcer. Script training has been used before to increase verbal repertoires of children with developmental disorders, as well as increase the frequency with which verbal responses occur, both scripted verbal responses and non-scripted verbal responses. Results of this study showed that novel mand frames did not increase during extinction conditions. After script-training procedures, the number of novel mand frames increased. During the return to extinction condition, the number of mand frames emitted was higher than during the previous extinction condition for two of the three participants. The same level of novel mand frames was maintained by both participants in their follow up session and

generalization probe. However, the use of script-training alone was not enough to increase the variability in responding. This study showed that only script-training combined with extinction procedures increased variability in mand frames. Script training combined with extinction is only one way to increase variability in individuals with ASD (Betz et al., 2011). While extinction has been shown to be an effective way to increase novel responses in toy play, limitations exist. Extinction has many known and documented side-effects: aggression, extinction bursts, resistance to extinction, and spontaneous recovery (Cooper, Heron, & Heward, 2007).

Miller and Neuringer (2000) provided evidence that lag schedules can be used to increase response variability in humans as well as animals. Their participants included children with ASD, adults, and typically developing children. What they found was that variability in responding in humans will increase when it is reinforced for both typically developing adults and children as well as children with ASD. Their results also directly contradicted a modern hypothesis that individuals with ASD and other developmental disabilities cannot increase their response variability. Because variability in responding can be reinforced, it suggests that behavioral variability can be controlled with the use of a discriminative stimulus. This control may lead to individuals with ASD being able to behave more appropriately in natural environments as well. The authors of this study suggested that using direct reinforcement to increase response variability is preferred over other methods such as extinction because direct reinforcement results in an increase in variability without the disadvantages of other methods (e.g., aggression; Miller and Neuringer, 2000).

Applications of lag schedules to increase verbal response variability in children with autism and other developmental disorders are well documented. Lee et al. (2002) demonstrated that a lag schedule of differential reinforcement of varied and appropriate verbal responding was

effective at increasing appropriately varied verbal responding to a social question two of three participants. The participants in this study did not require prompts in order to begin engaging in varied responding. However, the participants in this study were only required to participate in a Lag 1 schedule of reinforcement, varying between two different responses before delivery of a reinforcer (Lee et al., 2002). Only varying between two responses may still appear rigid and repetitive, depending on the type of response. However, these results still suggest that variable responding is highly sensitive to lag reinforcement schedules. Other methods have also been examined to see their effects on variability in responding.

Applications of lag schedules to increase verbal variability have been somewhat documented (Esch, Esch, & Love, 2009; Susa & Schlinger, 2012; Heldt & Schlinger, 2012), more so than increasing variability in toy play responses. An extension of Lee et al. (2002) done by Esch, Esch, and Love (2009) examined the effects of a Lag 1 schedule of reinforcement on variability in vocal responding, mainly varying phenomes (e.g., *buh, muh, ub, lee, ah*). The authors examined a Lag 1 schedule of reinforcement with two nonverbal children diagnosed with ASD. Both participants had increases in their vocal response variability (Esch et al., 2009). However, the participants were only under a Lag 1 schedule of reinforcement. While a Lag 1 schedule may be sufficient to permanently increase response variability in some individuals with some responses, higher value lag schedules could prove more clinically and socially valuable. Two studies have examined the effects of a Lag 3 schedule on variability of verbal responding. Both Heldt and Schlinger (2012) and Susa and Schlinger (2012) increased verbal response variability in their participants under a Lag 3 schedule of reinforcement. Heldt & Schlinger (2012) also found that variability in verbal responding maintained after 3 weeks, which suggests

that the increase in variability is able to be maintained following the withdrawal of a lag schedule.

In a study by Cammilleri and Hanley (2005), the effects of a lag schedule of reinforcement on varied selection of classroom activities was evaluated. The participants for this study included two girls, both typically developing. However, both participants had teacher reports of rigid activity selection in the classroom. Two sets of 12 activities each were made available for each session, consisting of academic and skill building activities. Each activity was presented on a note card. Activity choices were prompted every five minutes with the sound of a timer going off. During baseline, no consequences for activity selections were delivered. During intervention, each novel activity selection resulted in the delivery of a card that could be exchanged for two min of teacher attention. For both participants, the number of novel activity selections per session sharply increased. During baseline phases, both participants novel selections went down, but were recovered with the reintroduction of the intervention phase. For both participants, increases in novel activity selections improved almost immediately with the introduction of the intervention phase (Cammilleri & Hanley, 2005).

The results of Cammilleri and Hanley (2005) indicate that lag differential reinforcement contingencies are effective in increasing selection of novel activities. Both participants increased their number of academic and skill building activities. However, as novel activity selections increased, the amount of time spent with each activity dropped markedly. Because their schedule of reinforcement promoted quick changes in activity selections, the participants switched activities quickly many times during a session. Therefore, while this lag differential reinforcement contingency was effective at increasing novel activity selections, the amount of time spent on each activity dropped drastically (Cammilleri & Hanley, 2005). Another limitation

of this study is maintenance was not examined. Clinical applicability needs to be fully examined, and without maintenance or generalization probes, the knowledge of the effects of lag schedules of reinforcement remain incomplete.

Lag Schedules and Toy Play

Another study that looked at the effects of lag schedules on toy play variability was by Napolitano, Smith, Zarcone, Goodkin, and McAdam (2010). This study was an extension of Goetz and Baer (1973), and focused on increasing the variability in play responses of children with ASD. Napolitano et al. (2010) used both tangible and social reinforcement, sessions of brief instruction, and targeted responses that differed from previous responses (i.e. response variability) rather than all novel responses. Napolitano et al. (2010) also included a generalization and maintenance probe.

The participants in this study were six children diagnosed with ASD, between the ages of 6 and 10 years old, and an IQ below 70. Participants' responses were scored in terms of form (variant or invariant) and color (variant or invariant). Each participant had 24 blocks with a total of 23 different building responses possible per session. During baseline, participants were given the blocks and the verbal command "build something." Praise was intermittently delivered at least once per each 10 min session. After baseline, a Lag 1 reinforcement schedule was introduced. During this condition, participants were given the 24 blocks and the verbal command "build something." Tangible reinforcers as well as social praise were delivered following each color or form response that differed from the previous response. Under a Lag 1 schedule, responses needed only to differ from the previous response in order to be reinforced. After reinforcers were delivered, the participants were told to "build differently." For some participants, responding did not improve under the Lag 1 schedule. Training trials were

introduced for those participants. Training trials involved giving the verbal command "build something" and then having the experimenter model building a new form. Then, the experimenter would verbally prompt the participant to imitate the model (e.g., "now you build something different") (Napolitano et al., 2010).

Varied block form and color increased for all the participants. The combination of a Lag 1 schedule with training trials increased diversity of block-building forms. Most participants maintained moderate levels of varied block building in a follow-up session 2 to 3 months after the intervention phase ended. However, only one participant showed significant responding during the generalization probe. Overall, the combination of the training trails with the Lag 1 schedule was sufficient to increase varied block building responses. However, one limitation of this study is that they did not include a baseline comparison for the generalization probe from before the intervention. The authors also noted that increased response diversity in block building may not have any impact on other rigid or repetitive behaviors for the participants of this study (Napolitano et al., 2010).

Most research on increased response variability in toy play focuses on either novel toy play selections or diversity of block building. Just focusing on increasing novel toy play selections led to the negative side effect of decreasing the amount of time each participant spent with the activity. Just increasing novel toy play selections may not have much of an impact on repetitive behaviors. Block building is the target response in most of the research because the toy is easy to have varied responses without many response limitations. However, not all individuals prefer building with blocks and increasing varied appropriate toy play with other common toys (e.g., dolls, cars, trains, stuffed animals) has clinical and social importance. Baruni, Rapp, Lipe, and Novotny (2014) examined the effects of lag schedules on increasing toy play variability in

children with intellectual disabilities. However, unlike the previous studies, which have focused on using blocks to examine response variability, Baruni et al. (2014) used common toys including a train, a car, and an airplane. In addition, this study examined both a Lag 1 and a Lag 2 schedule of reinforcement.

Baruni et al.'s participants for this study were three children who participated in a special education classroom. Two children were male and one was female, all between the ages of 6 and 12 years old. Two participants were diagnosed with ASD and the other participant was diagnosed with cerebral palsy and an intellectual disability. A toy was assigned to each participant based on the age appropriateness of the toy and the relative ease with which discrete responses for engagement with the toy could be recorded. The study collected data on the number of novel toy play responses across sessions and the percent of time with toy engagement within each session. During baseline, each participant was presented with their specific toy and given the verbal command "play." No consequences were delivered for toy play responses. During the Lag 1 schedule condition, each participant was presented with their specific toy and given the verbal command "play." After the first observed toy play response, a preferred edible reinforcer was delivered. After the initial delivery of reinforcement, only responses that varied from the previous response resulted in delivery of the edible reinforcer. Due to time constraints, only two of the three participants moved on to the Lag 2 schedule of reinforcement. This condition was identical to the previous Lag 1 schedule, except that only responses that varied from the previous two responses were reinforced with an edible reinforce (Baruni et al., 2014).

Overall, the lag schedules increased the number of novel responses for each participant, but also decreased the total time spent engaging the toy for each participant. However, because the reinforcers were edible, some participants would stop engaging in play responses to eat their

edible. This result of finding less time spent engaging a toy is similar to the findings of Cammilleri and Hanley (2005). Also, Baruni et al. (2014) did not collect data on response diversity (e.g., novel sequences of previously emitted behaviors). It took some time for each participant to start to vary their toy play responses on the lag schedules. A training trial or phase may combat the length of time it takes for participants to begin to vary their responding as well as increase the likelihood of varied responding occurring. Neither a generalization nor maintenance probe was completed for any of the participants. Previous studies have seen little or varied maintenance and little to no generalization of varied responding.

Research Question and Current Hypothesis

1) This study proposes to extend the findings of Baruni et al. (2014) and examine the effects of a Lag 5 schedule of reinforcement on varied toy play responding.
2) Training trials will be implemented for participants who fail to improve variability under lag contingencies and will involve a model toy play response and a verbal prompt.
3) Generalization and maintenance probes will be conducted.

A total of 5 conditions plus a baseline condition will be conducted; each condition will consist of an incrementally increased lag schedule response requirement. The toy used for each participant will be a toy set that has the opportunity for many appropriate and varied toy play responses. It is predicted that with the inclusion of training trials, varied toy play responses will increase under a Lag 5 schedule of reinforcement. It is also predicted that generalization will occur across stimuli, or novel toy play sets, and that variability in toy responses will maintain after the intervention is withdrawn.

CHAPTER III

METHOD

Participants

Two male children who attend an early intervention classroom for children with autism spectrum disorder (ASD) and other developmental disorders participated in this study. The classroom is located in Central WA. The participants were selected based on their toy play skills and based on the recommendation of the classroom supervisor.

Participant 1 is a 5 year 1 month old male diagnosed with autism spectrum disorder. The VB-MAPP assessment for language placed Participant 1 at a level 3. The VB-MAPP assessment for play skills placed Participant 1 at a level 2. Participant 1 consistently uses 3-5 word phrases to request for items and activities as well as describe his environment. Participant 1 engages in independent play without prompting but does not engage in peer play without prompting. During independent play, Participant 1 frequently lines up toy animals, plays with cars according to their function, and draws using markers. Most of Participant 1's play involves stereotyped play behaviors, such as lining toys up or spreading toys out into a pattern. Participant 1 engages in some stereotyped verbal behavior, such as scripting phrases including "don't say those words" and "don't go outside."

Participant 2 is a 4 year 9 month old male diagnosed with autism spectrum disorder. The VB-MAPP assessment for language placed Participant 2 at a level 2. The VB-MAPP assessment for play skills placed Participant 2 at a level 2. Participant 1 consistently uses 1-3 word phrases to request for items and activities. Participant 2 engages in some peer play without prompting (playing chase) and independent functional play. Most of Participant 2's play behaviors involved

running a car down a track repeatedly or placing balls in a ball game repeatedly. Participant 2 does engage in stereotyped verbal behavior, such as scripting phrases including "no, no, no thank you" and engaging echoic behavior.

Prior to the study, written permission to run the study was obtained from the administration in charge of the classroom, and informed consent was obtained from the parent or guardian of each participant.

Settings

All sessions were conducted during work time in the participants' classroom. The classroom serves up to four students at a time. Each student in the classroom has a designated staff member. The classroom is divided into three separate parts: a table with chairs for snack time, an open area with chairs for free play and circle time, and a series of individual work stations each equipped with a table and two chairs. For this study, the participant and investigator sat slightly apart from the other students in the classroom to prevent distractions from classmates. Each session lasted for a duration of 10 minutes. Each participant could have up to three sessions done per day, with at least half an hour in between each session.

Materials

Two sets of toys were used for each participant. One toy set was used for the intervention and the other toy set was used to assess generalization during the generalization probe. The toy sets were selected based on the participant's history of interaction and familiarity with the sets. The toy sets were novel to the participant so as to avoid a confounding history of reinforcement with the toy. The toy set used for the intervention portion of this study was the Fisher-Price Little People Animal Sounds Farm. The Fisher-Price Little People Lil' Pirate Ship was used to assess generalization and maintenance. Each toy set has multiple individual and moving parts as to

provide a wide variety of appropriate toy play responses. Edible reinforcers were selected from a list of potential reinforcers that was generated from a multiple stimulus without replacement preference assessment.

Dependent Measures

Three dependent variables were examined in this study. These dependent variables were: 1) the total count of novel toy play responses across the entire study for each participant, 2) the total count of novel toy play responses within each session, and 3) the average number of previous responses from which each response varied for each session. The primary investigator assigned each toy play response form a name and response definition based on the toy being used in order to score the novel responses. A toy play response was defined as at least one hand in contact with a toy for a duration of at least 2 s. A toy play response was said to have ended when the participants either removed the toy from their hands or the topography of the toy play response changed significantly. For example, pushing a car down a track and then pushing the same car around a bend would not count as two separate play responses but rather as one: moving car along toy track. However, if the participant pushed a toy car down a track and then parked the car, both responses would be counted as distinct. Novel toy play responses across the study were defined as those that were not previously observed in any prior session. Novel responses within each session were defined as those that were not previously observed for that session. A response was considered to vary from the previous responses if it is topographically different from the previous response, but is still an appropriate toy play response. For example, a first response of pushing a cow followed by a response of rolling the cow over was considered to vary. If the second response was inappropriate (e.g., throwing the toys, attempting to destroy toys) it was considered to not vary. If the second response was pushing a cow again, the response

was also considered to not vary. Each response was coded based on the number of previous responses from which it varied. For example, each response could vary from zero previous responses (i.e., the participant manipulated the toy in the same way), one previous response (e.g., making the horse run and rolling the dog over), two previous responses (e.g., making the horse run, rolling the dog, making a bunny hop), three previous responses, four previous responses, or five previous responses. Responses were coded as a (0), (1), (2), (3), (4), (5), etc. The mean number of novel responses of all trials per session was calculated in order to obtain the average number of previous responses from which the current response varied. A trial consists of one topographically distinct toy play response with or without a prompt.

The primary investigator was responsible for data collection during sessions. In order to ensure reliability of the data collected, a second observer collected data during 21.28% of the sessions during each phase (baseline and each criterion change) for each participant. This second observer was a graduate student at Central Washington University. In order for the secondary observer to be prepared to collect real data, she reached an 80% agreement with the primary investigator during training. Training consisted of a video of a child engaging in toy play responses from which the secondary observer recorded data. This training took place before the secondary observer began to collect data. Prior to each session, the secondary observer was provided with a copy of the operational definitions, data sheet, and current list of all novel responses the participant has engaged in for the duration of the study.

Interobserver agreement was calculated using total count agreement. Total count agreement is found by taking the sum of both observers for the number of observed behaviors and dividing the smaller number by the lager number and multiplying the result by 100. Each

session was videotaped in order for the secondary observer to score the sessions. The average IOA over the study was at 87.53% with a range of 82.31% - 89.33%.

Experimental Design

A changing criterion design was used to assess the effects of a lag schedule of reinforcement on variability in toy play response. The changing criterion design consisted of a baseline phase followed by an intervention phase that was divided into sub-phases based on the criteria for responding. In this study, the criterion levels corresponded to an increase in lag schedule requirement. The first criterion required that toy play responses vary from one previous response, as required under a Lag 1 schedule. The second criterion required that toy play responses vary from the previous two responses, as required under a Lag 2 schedule. The third criterion required that toy play responses vary from the previous three responses, as required under a Lag 3 schedule. The fourth criterion required that toy play responses vary from the previous four responses, as required under a Lag 4 schedule. The fifth and final criterion required that toy play responses vary from the previous five responses, as required under a Lag 5 schedule. The participants remained in each phase until responding had stabilized and the mastery criterion for that phase had been achieved. The mastery criterion required three consecutive sessions that showed stable responding at or above the current lag schedule requirement.

This type of design uses baseline logic based on prediction, replication, and verification to rule out extraneous variables. When responding is stable in a phase or sub-phase, a prediction is made that future levels of responding will not change if the independent variable (IV) is not manipulated. Following the manipulation of the IV, replication occurs when the level of responding is observed to change systematically with the changes of the criterion. Verification of

the prediction in a changing criterion design requires varying the length of each phase of the study. If the criterion is not changed and responding levels do not change, the prediction is then verified (Cooper, Heron, & Heward, 2007). An illustration of changing criterion design is included in Figure 1. Only the mean average of previous responses from which the current response varies per session is shown.

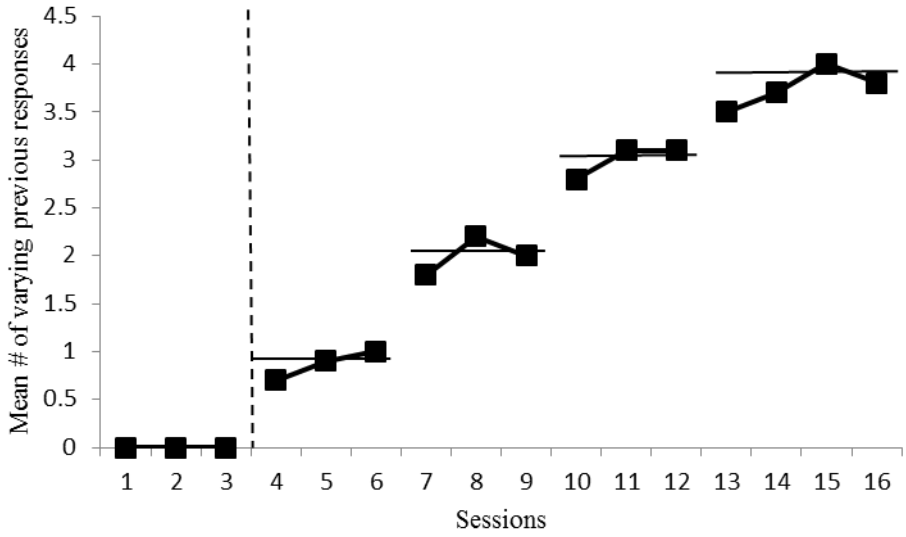

Figure 1. Mean number of previous responses from which the current response varies per session across baseline and intervention phases.

Procedure

Pre-experimental procedures. Permission to conduct this study was obtained from the supervisors of the early intervention classroom. Informed consent was also obtained from the parent or guardian of each of the participants.

Stimulus preference assessment. A multiple stimulus without replacement preference assessment was conducted during snack time for each participant. This assessment was conducted to identify edible items that may be used as reinforcers for each participant. The primary investigator conducted the preference assessment by placing eight edible items on a

paper towel with an equal distance between each item. The array of items was presented to the participant, and he or she was asked to "pick one." The selection was recorded, and each remaining item was rearranged in a different order while the participant consumed the previously selected edible item. The process was repeated until all items were selected. This whole process was completed a total of three times, with each item receiving an average ranking. This ranking provided a list of the highest preferred to the lowest preferred item for each participant. The data sheet used for the multiple stimulus without replacement preference assessment can be found in Appendix A.

Baseline. For each participant, three baseline sessions lasting 10 min were conducted. During this condition, the participant was presented with the target toy set and given the verbal instruction to "play." No consequences for toy play responses were provided during this condition. The session was terminated after 10 min or after observing two instances of object aggression (e.g., throwing a toy, attempting to destroy a toy). The observer recorded the number of novel play responses for the session as well as for the entirety of the study. In addition, the observer scored the toy play responses according to how many previous responses from which the current response varied. The data sheet used to record toy play responses can be found in Appendix B.

Lag 1 schedule. Each session during the intervention had a duration of 10 min. During this condition, the primary investigator began the session by presenting the participant with the Fisher-Price Little People Animal Sounds Farm and giving the verbal instruction to "play." The primary investigator delivered edible reinforcers selected from the results of the preference assessment following the first observed toy play response in the session. Then, the primary investigator delivered an edible reinforcer following responses that meet the requirement of the

Lag 1 schedule of reinforcement. That is, a reinforcer was delivered when the response varied topographically from the previous one response. The response that was reinforced did not need to be novel to the session or the study for that participant. Mastery criterion was met when each response varied from the previous one response for three consecutive sessions. When the mastery criterion was met, the next criterion and next lag schedule was introduced in the following session.

Lag 2 schedule. The Lag 2 schedule proceeded in the same fashion as the Lag 1 schedule, excepting that the edible reinforcer was delivered when the response varied topographically from the previous two responses. Mastery criterion was met when each response varied from the previous two responses for three consecutive sessions.

Lag 3, lag 4, and lag 5 schedules. The Lag 3, Lag 4, and Lag 5 schedules proceeded in the same fashion as the previous lag schedule, excepting that edible reinforcers were delivered when the response varied topographically from the previous three, four, or five responses, respectively. Mastery criterion was met when each response varied from the previous three, four, or five responses for three consecutive sessions.

Prompting variability trials. The primary investigator directly prompted response variability when the participants responding did not vary or improve under the lag schedule for three sessions. During the prompting intervention, the primary investigator presented the participant with the Fisher-Price Little People Animal Sounds Farm and gave the verbal instruction to “play” and then modeled a series of novel toy play responses. After modeling, the primary investigator gave a verbal prompt to imitate the model “now you try.” All other procedures were identical to the lag schedule the participant was currently on. Prompts were used until the participant began to engage in varying toy play responses independently and then

prompts were quickly faded using a least to most prompt hierarchy to avoid prompt dependency. The least to most hierarchy began with the least intrusive prompt, a gestural prompt, which for this study looked like the investigator touching the Fisher-Price Little People Animal Sounds Farm piece that the participant needs to play with. The next level of prompting, a verbal prompt, looked like the instructor giving the instruction "put the horse in the barn" or some other verbal direction of a toy play response. After a verbal prompt, a partial physical prompt was used which looked like the instructor pushing behind the elbow of the participant. The last level of prompting, a full physical prompt, looked like the instructor putting her hand over the participant's hand and engaging in a toy play response. Each lag schedule had a corresponding number of predetermined prompted toy play responses. For example, two toy play prompts were used for Lag 1 prompting trials, and four toy play prompts were used for Lag 3 prompting trials.

Generalization probe. The generalization probe was conducted following the termination of sessions once the participant had achieved mastery criterion for the Lag 5 schedule. However, intervention sessions for Participant 2 were terminated after achieving mastery criterion for the Lag 4 schedule due to time constraints. The generalization session lasted 10 min. This probe was identical to the conditions of the baseline phase. The participant was presented with the Fisher-Price Little People Lil' Pirate Ship and instructed to play. The total number of novel responses was recorded. Each toy play response was also coded according to how many previous responses from which the response varied. No edible reinforcement was delivered.

Procedural Fidelity

The same observer who collected data for IOA also assessed the fidelity with which the primary investigator implemented the intervention. The observer was given a list of all

procedural steps of the intervention in order to assess whether the steps were followed for each phase of the study. Procedural fidelity was calculated by dividing the number of steps performed correctly by the total number of steps and multiple the result by 100. Procedural fidelity was at 100%. The data sheet used to assess procedural fidelity can be found in Appendix C.

Data Analysis

To analyze the data, the primary investigator used visual analysis of the graphed data. This analysis included an examination of the variability, level, trend, and immediacy of change (Cooper, Heron, & Heward, 2007). Variability is a measure of the range between the highest recorded data point and the lowest recorded data point within each experimental condition. The level of data is the average level of responding for each phase and sub-phase and is used to assess changes between phases. The mean level of responding for each condition was assessed to determine the change in level. The trend of the data is the overall data path direction, including increasing, decreasing, or stable trends. Immediacy of change was used to show a functional relationship between the change in responding and the implementation of the lag schedule. The more immediate the change is following the implementation of an intervention, the more certain it is that the independent variable is what caused the change.

CHAPTER IV

RESULTS

Preference Assessment

Before the introduction of the baseline phase, a preference assessment was conducted for both participants. Both participants had the snack food Cheerios rated as their highest preferred food. However, other foods were added to use as reinforcers when Cheerios stopped functioning as a reinforcer. A second preference assessment was conducted for each participant, which included Frito Chips, orange slices, apple slices, M&M's, pretzels, and Cinnamon Toast Crunch. Participant 1 selected possible reinforcers including Goldfish and Frito chips. In addition, attention was used as a reinforcer. The added foods and attention were started on session 15. Participant 2 verbally requested different food items before each session was conducted. Those foods included M&M's, Frito chips, orange slices, apple slices, Cinnamon Toast Crunch, and pretzels. These added reinforcers were started on session 13.

Mean Number of Responses Varying from Previous Responses

Figure 2 shows the outcomes of the baseline and intervention sessions for each participant. Baseline sessions began after the completion of the preference assessment and lasted for three sessions. Participant 1 had an average of 1.08 previous responses from which the current response varied during baseline. Participant 2 had a similar average, at 1.14. No instances of toy aggression or other aggressive behaviors occurred during baseline for either participant. Due to the baseline responding of each participant being slightly above a Lag 1 schedule requirement, the intervention started out at a Lag 2 criterion for each participant.

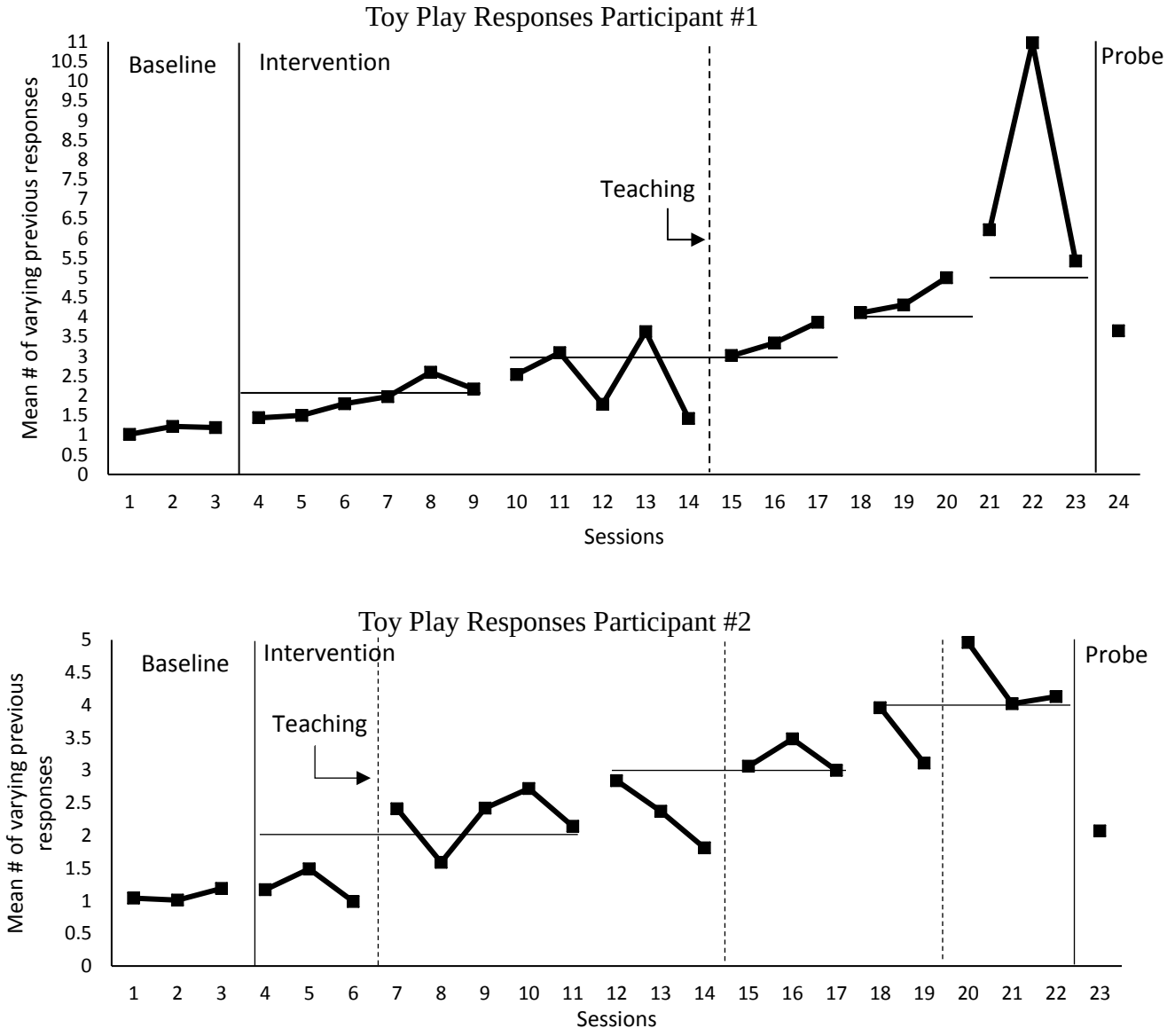

Figure 2. Average number of previous responses from which the current response varies is graphed for each participant.

Following the introduction of the lag schedule, Participant 1 reached mastery criterion for the Lag 2 schedule after six sessions. During the next criterion, Participant 1 needed the implementation of a training trial. The training trial appeared effective as Participant 1 met the mastery criterion for the Lag 3 schedule during the next three sessions. Participant 1 met the

mastery criterion for the Lag 4 schedule during three sessions. Again, Participant 1 met the mastery criterion for the Lag 5 schedule in only three sessions as well. Participant 1 had a high of an average of 10.98 previous responses from which the current response varies during sessions 22.

Participant 2 required a training trial to meet the mastery criterion for the Lag 2 schedule criterion. The training trial appeared effective as the average responding jumped to an average of 2.42. Participant 2 took eight sessions to reach mastery criterion for the Lag 2 schedule. When the Lag 3 criterion was introduced, Participant 2's responding did not improve and required a training trial. The training trial appeared effective and Participant 2 required six sessions to reach mastery criterion for the Lag 3 schedule. When the Lag 4 schedule was introduced, Participant 2's responding did not improve and required a training trial. This training trial also appeared effective and Participant 2 required five sessions to reach mastery criterion for the Lag 4 schedule. After reaching the Lag 4 schedule requirement, the intervention was withdrawn due to services ending for the participant. Participant 2 had a high of an average of 4.96 average responses from which the current response varies during session 20.

Novel Toy Play Responses Per Session

Figure 3 shows the total number of novel toy play responses for each session for each participant. Participant 1 demonstrated a total of 26 novel toy play responses during the first session. Novel toy play responses began to fall during the baseline phase. However, when the intervention was introduced, the number of novel toy play responses per session began to increase. The highest number of novel toy play responses per session occurred during session 17 for Participant 1, with a total of 34 different toy play responses observed. The last six sessions of the intervention showed relatively stable responding in novel toy play responses per

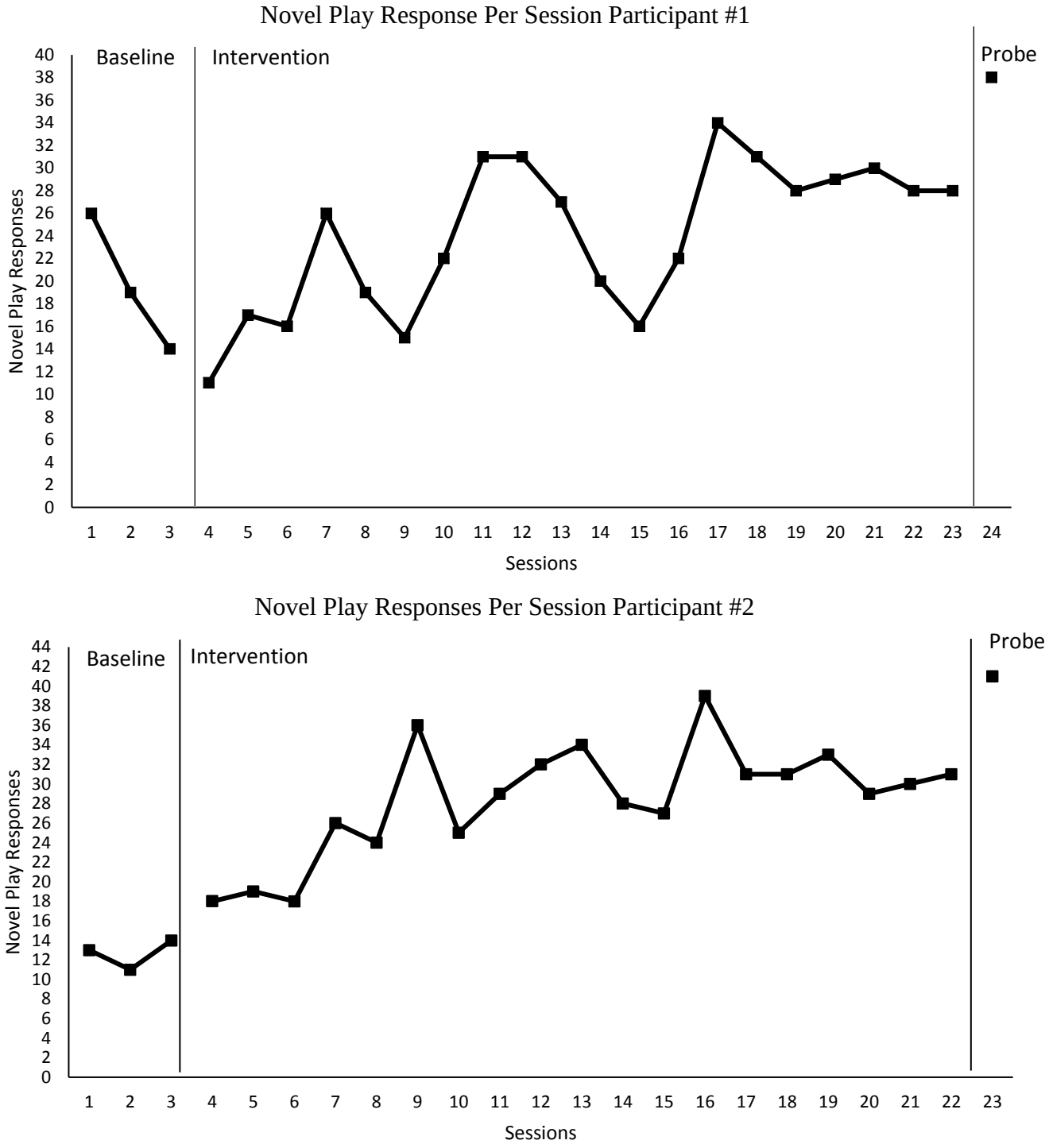

Figure 3. The total number of novel toy play responses observed for each session is graphed for each participant.

session, with an average of about different 30 play responses observed per 10 minute session. Participant 2 showed stable responding during baseline sessions for novel toy play responses per session. Participant 2 had an average of 12 novel play responses during baseline. With the introduction of the intervention, Participant 2 showed a general trend in increasing the number of novel toy play responses per session. Participant 2 had a high of 39 novel toy play responses per session during session 16. Similar to Participant 1, the last six sessions of the intervention had relatively stable responding at approximately 30 novel toy play responses per session.

Novel Toy Play Responses Across the Study

Participant 1 had a total of 235 novel toy play responses across the entire study. Participant 2 had a total of 134 novel toy play responses across the entire study. Appendix D lists novel toy play responses across the entire study for both participants.

Generalization Probe

The generalization and maintenance probe was conducted 1 week and 1 day after the intervention was withdrawn for both participants. Figure 2 shows the results of the generalization and maintenance probe in regards to average number of previous responses from which the current response varies. Participant 1 had an average 3.65 previous responses from which the current response varied during this probe. Participant 2 had an average of 2.07 previous responses from which the current response varied. Both participants responded with a higher average number of previous responses from which the current response varies during the generalization and maintenance probe compared to the baseline sessions.

Figure 3 shows the results of the generalization and maintenance probe in regards to novel toy play responses. Participant 1 demonstrated a total of 38 novel toy play responses

during the probe, compared to 26 during the first baseline session. The total number of novel toy play responses increased after the withdrawal of the intervention. Participant 1's responding in regards to novel toy play responses per session generalized and maintained. Participant 2 demonstrated a total of 41 novel toy play responses during the generalization and maintenance probe, compared to 13 during the first baseline session. Similar to Participant 1, the total number of novel toy play responses increased from the withdrawal of the intervention to the introduction of the generalization and maintenance probe. Participant 2's responding can be said to have generalized and maintained over time.

CHAPTER V

DISCUSSION

For both participants, the results of the intervention were overall positive as varied toy play responding did improve under the lag schedules. However, Participant 1 was the only participant to progress to the Lag 5 schedule requirement. Participant 2 was unable to progress to Lag 5 schedule requirement due to services ending for that participant. Both participants needed the teaching trials, although Participant 2 needed two more trials than Participant 1. Responding for each participant was shown to have maintained and generalized during the generalization and maintenance probe conducted one week and one day after the intervention was withdrawn.

Participant 1 had stable responding during baseline sessions at an average of 1.08 previous responses from which the current response differed. After the three baseline sessions were conduction, the intervention was introduced at a Lag 2 requirement. With the introduction of the lag schedules, Participant 1's responding did begin to improve at a stable rate. Participant 1 met the mastery criterion for Lag 2 schedule after six intervention sessions. When the second criterion was introduced, the Lag 3 schedule, responding began to vary for Participant 1. Participant 1 began engaging in attention-seeking behaviors that including moving the chair away from the session desk and staring at the primary investigator, and holding a farm animal in one hand and staring at the primary investigator. Due to play responses being defined as touching a toy for a duration of at least 2 seconds, Participant 1's data were skewed for those sessions. Because of these attention-seeking behaviors, attention was included as a reinforcer for meeting the lag schedule requirements. In addition, a teaching trial was conducted for that participant after session 14.

The teaching trial conducted for Participant 1 was for a Lag 3 requirement, so four toy play responses were modeled with the verbal prompt “now you try.” The four modeled toy play responses were sliding the chicken, pressing the sheep hay button, opening the yellow stall door, and sliding the rabbit slider on the right side of the barn. Participant 1 did not engage in the responses independently and needed the use of a gestural prompt. After a few uses of a gestural prompt, Participant 1 was able to engage in those behavior independently and met the current Lag 3 schedule requirement. After the training trial, Participant 1 met the mastery criterion over the next three sessions. Responding continued to increasingly vary and met each lag schedule criteria.

When the Lag 5 schedule was introduced for Participant 1, the average number of previous responses from which the current response varied increased significantly. The second session during the Lag 5 criteria was the highest recorded average of previous responses from which the current response varies, at an average of 10.98. While the last session of the intervention did have a significant drop in average responses from which the current response varies, the participant still met the mastery criterion without needing an addition training trial.

Participant 1 did show generalization and maintenance of responding in regards to both the average number of previous responses from which the current response varies as well as total number of novel toy play responses. While the average number of previous responses did decline after the withdrawal of the intervention, the responding was well above baseline levels. However, the total number of novel toy play responses per session was greatly increased. Participant 1 showed a greatly increased number of toy play responses during the generalization and maintenance probe, suggesting that Participant 1 explored the generalization toy set more than the intervention toy set.

Participant 2 had similar responding the Participant 1 during baseline sessions. For the three baseline sessions, Participant 2 averaged 1.14 previous responses from which the current response varies. The first criteria for Participant 2 was a Lag 2 schedule. Once the intervention was introduced for Participant 2, responding did not improve immediately. After three sessions without improvement, a training trial was introduced. Three toy play responses were modeled for Participant 2 with a verbal cue of "now you try." The three toy play responses were opening the white stall doors, sliding the chicken, and pressing the sheep hay button. Participant 2 did not independently engage in these responses, and the primary investigator went up the least-to-most prompting hierarchy until a full physical prompt was used. After the physical prompt was used, Participant 2 began engaging independently in the modeled toy play responses and met the Lag 2 criteria. The teaching trial appeared to quite effective, as the average of previous responses from which the current response varies went up to an average of 2.41. Participant 2 met the mastery criteria for the Lag 2 requirement without additional training.

When the next criterion was introduced, Participant 2's responding did not improve and required another training trial. Four toy play responses were modeled, including dropping a toy in the silo, sliding the rabbit slide on the right side of the barn, lifting up the silo door, and hopping a farm animal (sheep). Participant 2 required a verbal prompt before engaging independently in the modeled toy play responses. After the training trial, Participant 2 met the mastery criteria for Lag 3 schedule and was moved up to the next criterion, a Lag 4 schedule. Participant 2's responding did not improve under the Lag 4 schedule, and another training trial was conducted. This time, the modeled toy play responses included putting a toy animal (cow) on top of the barn, pressing the sheep hay button, dropping a toy into the top of the silo, sliding the rabbit slider on the right side of the barn, and placing a toy animal (sheep) into the yellow

stall using the yellow stall doors. With a gestural prompt, Participant 2 was able to engage in those toy play responses independently. The next three sessions after this training trial all met mastery criteria for the Lag 4 schedule requirement.

Participant 2 showed generalization and maintenance of responding in regards to both the average number of previous responses from which the current response varies as well as the total number of novel toy play responses. Similar to Participant 1, the average number of previous responses did decline after the intervention was withdrawn, though the level of responding was still higher than baseline levels. However, the total number of novel toy play responses did continue to increase after the withdrawal of the intervention. For both participants, the number of novel toy play responses per session reached their highest point during the maintenance and generalization probes. These findings suggest that the total number of novel toy play responses is more likely to maintain and generalize, compared to the average number of previous responses from which the current response. Page and Neuringer (1985) have a likely explanation for this phenomenon; when variability is allowed but not required, variability will not increase. When the intervention was withdrawn, variability was merely allowed but did not result in any reinforcement. However, even though variability was not required, both participants did respond at a higher average of previous responses from which the current response varies, suggesting that it is possible to have these results maintain.

Previous research has also found success in increasing response variability using lag schedules. Baruni et al. (2014) found that using a lag schedule of reinforcement increased the total number of novel toy play responses for each participant. The results of Baruni et al.'s study were similar; the cumulative number of novel toy play responses increased for both participants. However, Baruni et al. were not able to increase varied toy play responses in two of their

participants under a Lag 2 schedule of reinforcement. The results of the current study are somewhat similar; Participant 2 did not increase varied responding under a Lag 2 schedule until the introduction of training trials. However, Participant 1 was able to effectively increase varied toy play responding under the Lag 2 schedule without the inclusion of a training trial (for that specific criterion).

Napolitano et al. (2010) used training trials in addition to lag schedules to increase varied toy play using blocks. The results of that study found that, with the inclusion of training trials, response variation increased using blocks. In that study, the training trials were effective in increasing response variation using blocks. The results of the current study are similar; it appeared as though the training trials were effective for both participants. In fact, without the training trials, Participant 2 may have failed to improve responding under the lag schedules of reinforcement. This result is similar to the Napolitano study; for some participants, responding did not improve until the introduction of teaching trials.

The current study was able to achieve a Lag 4 and a Lag 5 schedule of reinforcement for toy play responding. Previous studies have only reached a Lag 1 to a Lag 2 schedule of reinforcement for toy play responding. The current study appears to be one of the first studies to achieve a Lag 5 schedule of reinforcement with an individual with autism for varied responding. Even previous studies using lag schedules of reinforcement to vary verbal responding achieved only a Lag 3 schedule of reinforcement before the intervention was withdrawn (Heldt & Schlinger, 2012).

Limitations and Future Research

While the results of the intervention package were effective, some limitations remain. Collecting data while also providing reinforcement when the participant reached the criterion for

the current lag schedule was difficult. A form of short-hand is necessary to be able to collect the correct data to accurately reflect the participant's responding. Practicing collecting data in real time would be necessary before implementing this as part of an intervention. Another suggestion would be to have two technicians implement the intervention; one to write down the correct data and another to deliver the reinforcement when the criterion has been met.

Another limitation was observed with Participant 1. During the baseline sessions and the first few sessions of the intervention, Participant 1 had a fairly high rate of responding; about 100 to 150 different play responses during a 10 min period. However, as the intervention continued and Participant 1 made contact with the schedule of reinforcement, the overall rate of responding dropped. The rest of the intervention had about 50-100 different play responses during the 10 min session. This rate of responding was present during the generalization and maintenance probe even when no reinforcement was available. During the probe, Participant 1 had 67 observed play responses during the 10 min session.

Future research should investigate how to effectively implement high lag schedules of reinforcement. Knowing when to deliver reinforcement takes relatively little effort when operating at a Lag 1 or a Lag 2 schedule of reinforcement. However, keeping track of more responses before delivering reinforcement is difficult. While the effects of a higher lag schedule of reinforcement are positive, it may be too difficult an intervention to implement on a consistent basis. Future research should consider the effects of having multiple people implement the intervention as well as look at different ways of recording the data to make it easier to know when to deliver reinforcement.

Future research should also continue to examine the generalization and maintaining of higher lag schedules for toy play response variability. Higher lag schedules of reinforcement may

have positive effects on the generalization and maintenance responding ability. Other considerations are the types of toys used. While most studies have looked at blocks, this study looked at more functional play sets. Future research could include more functional play sets as well as toys that allow for more creative play.

Additional research should also look into different ways to conduct training trials. Only one participant improved responding without consistent use of the training trials. The other participant required a training trial for every increase in criterion. The only verbal directions given during this study were "play" and "now you try." More explicit verbal directions should be researched, such as "play differently." In addition, the effects of a longer duration of training trials should be examined.

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Appendix A

MSWO Data Sheet

Participant:_____ Date:_____ Observer:_____

Item	Trial 1	Trial 2	Trial 3	Sum Total	Rank
1.					
2.					
3.					
4.					
5.					

Observer notes:

Appendix B

Researcher Data Sheet

Coded Response						**Toy Play Response**	**Novel?**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**
0	**1**	**2**	**3**	**4**	**5**	_____	**Session / Study**

Appendix C

Procedural Fidelity Sheet

Observer: _____ Date:_____

Lag Requirement: 1 2 3 4 5	**Score**
Toy set within reach of participant, work space cleared of all else	Y / N
Clear SD given "play"	Y / N
Reinforcement delivered after first toy play response emitted	Y / N
Reinforcement delivered in accordance with lag requirements	Y / N
Prompting trials: modeled predetermined toy play response	Y / N
Prompting trials: after modeling, clear SD "now you try" given	Y / N
Prompting trials: reinforcement delivered in accordance with lag requirements	Y / N
Prompting trials: prompts faded in accordance to prompt hierarchy	Y / N

Total: _____ /8 x 100 = _____%

Appendix D

Novel Toy Play Response List

Participant 1:

1. Place toy in yellow stall using the door
2. Remove toy from yellow stall using the door
3. Hop toy
4. Place toy in white stall using the doors
5. Remove toy from white stall using the doors
6. Place toy in white stall without using the doors
7. Remove toy from white stall without using the doors
8. Place toy on white roof
9. Hold a toy in one hand and move it up the right side of the barn to land on the roof
10. Open and close the white stall doors with one hand
11. Open and close the yellow stall door with one hand
12. Slide a toy with one hand across the desk
13. Hold a toy in one hand in the air
14. Press the sheep hay button with one hand
15. Press the sheep hay button with one hand and open and close the white stall doors with the other hand
16. Open and close the yellow stall door with one hand and open and close the white stall doors with the other hand
17. Press the sheep hay button with both hands
18. Place one toy on top of another toy and hold it in one hand
19. Hold one stack of 2 toys in one hand and hold another stack of 2 toys in the other hand, stack one stack on top of the other stack to make a stack of 4 toys
20. Place a toy on the brown roof
21. Place a toy on the brown chicken level
22. Slide the chicken slider back and forth using one hand
23. Slide the side sliders back and forth using one hand
24. Turn the barn using both hands
25. Drop a toy in the top silo opening
26. With one hand, open the silo door up
27. With one hand, move the silo door up and down
28. Hold a toy in one hand and use the toy to press the sheep hay button
29. Hold a toy in one hand and shake it back and forth
30. Hold a toy in one hand while touching the desk, rotate the toy
31. Hold a toy in one hand while touching the desk, tilt the toy away from self
32. Place hand on a toy in the barn
33. Pick up a toy that is in the white stall and hop it inside the barn
34. Hold a toy in one hand and tap it on another toy on the desk
35. Pick up a toy with one hand and turn it upside down
36. Gather toys with both arms out, sliding arms together

37. With one hand, place a toy in the white stall and move the arm through the barn to let the toy rest behind the barn
38. With a toy in the white stall, reach one hand into the barn and push the toy to the sheep stall
39. Pick up a toy and place it next to another toy, touching it
40. Pick up a toy with one hand and tap it on the desk
41. Pick up a toy and lay it on its side on the desk
42. Holding one toy in each hand with the arm and toy touching the table, spread arms wide so the toys slide across the desk in different directions
43. Pick up a toy with one hand and tap it on the white roof, letting go
44. Using both hands, move the silo so it is touching the barn
45. Using both hands, move the silo away from the barn
46. Pick up a toy with one hand, hold 2 toys next to each other on the table, and place the toy on top of the 2 toys (makes a pyramid)
47. Pick up a toy in one hand and use the toy to slide the side sliders
48. Place a toy on the white roof with one hand and use the other hand to knock the toy off (towards the brown roof)
49. Place one toy on top of another toy, hold it one hand, and tap the stack on the desk
50. Pick up a toy and hop the toy across the table
51. With an open hand, push a toy away from self
52. With two open hands, push toys away from self
53. Hold a stack of 2 toys in each hand, pick one stack up and tap the stack on the other stack
54. Hold a stack of 4 toys with two hands, and shake the stack back and forth
55. Hold a stack of 4 toys with two hands, pick up the stack, and drop the bottom toy on the desk
56. Hold a toy in one hand while it is on the desk, make a “vroom” sound while moving the toy away from self, off of the table
57. Hold a toy in one hand, move the toy in front of the sheep hay stall and tilt the toy towards the stall
58. Place a hand behind the barn by going through the white stall
59. Place a hand between two toys that are touching
60. Pick up a toy and place the toy right side up on the table
61. Pick up a toy and move it through the air in a circular motion
62. Pick up a toy and move it through the air in a back and forth motion
63. Using a toy laying on the desk, move hand over the toy and use fingers to roll the toy over
64. Holding a toy in one hand, slowly hop the toy in a large arc over the table
65. With one hand holding a toy, move the toy through the yellow stall to rest behind the barn
66. Pick up a toy in each hand and place it on child’s belly
67. Place a toy in the white stall using the doors and rotate the toy before setting the toy down
68. Hold a toy in one hand and move the toy into the white stall without using the doors and tap the toy on the ceiling of the barn
69. Holding a toy in one hand, knock another toy over that was standing on the desk

Participant 2:

1. Place a toy in the white stall using the doors
2. Hold a toy in one hand over the white roof and drop the toy
3. Slide the chicken slider back and forth
4. Open and close the white stall doors with both hands
5. Open and close the yellow stall door with one hand
6. With one hand, place a toy on the chicken level and slide the chicken slider back and forth so the toy falls off the level
7. Remove a toy from the white stall with one hand using the doors
8. Place a toy in the yellow stall using the door
9. Remove a toy from the yellow stall using the door
10. Place a toy in the white stall without using the doors
11. Remove a toy from the white stall without using the doors
12. Place a toy on another toy (commonly Farmer on Cow)
13. While holding one toy on the other, hop the stack of toys
14. While holding one toy on the other, slide the stack of toys across the desk
15. Using both hands, turn the barn completed around (180 degrees)
16. Holding a toy in one hand, play the toy on the tip of the pointer finger on the other hand
17. Slide the side sliders using one hand
18. Slide the side sliders using both hands
19. With one hand, slide the silo door up
20. Place a toy inside of the silo, doorway
21. Drop a toy in the top opening of the silo
22. Using both hands, move the silo so it is touching the barn
23. Using both hands, move the silo away from the barn
24. Remove a toy from the bottom door of the silo
25. Reaching a hand down the top opening of the silo, move hand back and forth to make the toys move around
26. Reaching a hand down the top opening of the silo, grab a toy and remove it from the top opening
27. Place a toy on the brown roof
28. Place a toy on the white roof
29. Holding a toy in one hand, move the toy up the right side of the barn, touching the barn
30. With a toy standing on the table, knock the toy over with an open hand
31. With one hand, place the hand over a toy laying on its side on the table and move the hand back and forth so that the toy rolls
32. Holding a toy, tap the toy on the table
33. Holding a toy, tap the toy on another toy (that is not being held)
34. Hold a toy in one hand and tap the toy on the chicken slider so that the slider moves
35. Hold a toy in one hand and use the toy to press the sheep hay button
36. Hop toy
37. With one hand, open the silo door up
38. With one hand, move the silo door up and down