THE EFFECTS OF DIFFERENTIAL LAG REINFORCEMENT ON ACROSS SESSION VARIABILITY OF LEISURE ACTIVITIES

Thesis

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By

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ABSTRACT

Variability has been shown to increase when delivery of reinforcement is made contingent upon it. A multiple baseline across participants design was used to examine the effects of an across session lag schedule on the choice of leisure activities of three elementary students diagnosed with autism. During baseline, two participants showed low levels of variability when choosing a leisure activity and one participant displayed a pattern of within session switching. Variable responding increased for all participants when the lag schedule of reinforcement was utilized and continued during fading. During follow-up, one participant continued to respond to the visual stimulus on a Lag 2 schedule without receiving a reinforcer and one participant returned to repetitive responding. This study supports research findings that lag schedules of reinforcement are effective in increasing variability in students with autism. Additionally, it addresses the limitation of frequent switching by utilizing an across session lag schedule.

Keywords: lag schedule of reinforcement, variability, autism, leisure activities, restriction, stereotypy, response allocation
DEDICATION

I dedicate this to my vivacious daughter, Ellison and my charismatic son, Griffin.
You two have shown me that with God I’m capable of achieving anything. My wish is that I can teach both of you the same lesson.

"Be the change you wish to see in the world."

Mahatma Gandhi
ACKNOWLEDGEMENTS

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I would also like to thank Jonathan Ivy who guided me through this entire process. His supervision and expertise helped me remain focused and challenged me to a level I did not think I could reach. Thank you for your time and support. My deepest gratitude and sincerest appreciation to Janette Long for helping me collect data. She willingly arranged her schedule week after week to help me complete this. I couldn’t have done it without her help and flexibility. Thank you to Dr. Nancy Neef who gave me the confidence and knowledge to complete this project. My deepest gratitude to Leigh Ann Shepherd and Lindsay Sessor, who helped me navigate this process and reminded me there was a light at the end of the tunnel. It was all worth it since it resulted in our friendship.
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VITA

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FIELDS OF STUDY

Major Field:  Education

Special Education, Applied Behavior Analysis
TABLE OF CONTENTS

Abstract............................................................................................................................... ii
Dedication .......................................................................................................................... iii
Acknowledgements.......................................................................................................... iv
Vita..................................................................................................................................... vi
List of Tables ................................................................................................................... ix
List of Figures ................................................................................................................ x
Chapter 1: Introduction .....................................................................................................1
  Purpose of the study ........................................................................................................ 14
  Research Questions ....................................................................................................... 14
Chapter 2: Methods .........................................................................................................15
  Participants .................................................................................................................... 15
  Setting .......................................................................................................................... 17
  Materials ..................................................................................................................... 18
  Dependent Variable and Response Measurement ................................................... 18
  Preliminary Analysis Procedures .............................................................................. 19
  Treatment Analysis Procedures ................................................................................ 21
    Baseline ...................................................................................................................... 22
    Stimulus Discrimination Training ........................................................................... 22
vii
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Across Session Lag</td>
<td>23</td>
</tr>
<tr>
<td>Across Session Lag-Reinforcement Fading</td>
<td>25</td>
</tr>
<tr>
<td>Follow-up</td>
<td>26</td>
</tr>
<tr>
<td>Experimental Design</td>
<td>26</td>
</tr>
<tr>
<td>Procedural Integrity</td>
<td>27</td>
</tr>
<tr>
<td>Interobserver Agreement</td>
<td>27</td>
</tr>
<tr>
<td>Chapter 3: Results</td>
<td>29</td>
</tr>
<tr>
<td>Chapter 4: Discussion</td>
<td>35</td>
</tr>
<tr>
<td>Considerations and Limitations</td>
<td>39</td>
</tr>
<tr>
<td>Guidelines for Future Research</td>
<td>41</td>
</tr>
<tr>
<td>References</td>
<td>43</td>
</tr>
<tr>
<td>Appendix A: Parental/Guardian Consent for Participation</td>
<td>47</td>
</tr>
<tr>
<td>Appendix B: Verbal Assent Form</td>
<td>51</td>
</tr>
<tr>
<td>Appendix C: Momentary Time Sampling Data Sheet</td>
<td>53</td>
</tr>
<tr>
<td>Appendix D: Multiple Stimulus without Replacement Data Sheet</td>
<td>55</td>
</tr>
<tr>
<td>Appendix E: Fading Schedule</td>
<td>57</td>
</tr>
<tr>
<td>Appendix F: Procedural Integrity Data Sheet, Baseline</td>
<td>59</td>
</tr>
<tr>
<td>Appendix G: Procedural Integrity Data Sheet, Intervention</td>
<td>61</td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table 1: Available Leisure Activities by Participant ........................................................21
LIST OF FIGURES

Figure 1: Activity Selection. ...............................................................................................30

Figure 2: Response Allocation on Varied Activity...............................................................31
CHAPTER 1: INTRODUCTION

The average American adult spends approximately 5 hr a day engaged in leisure activities (Aguiar & Hurst, 2007). Leisure activities are an important part of our lives, but defining what constitutes a leisure activity can be challenging. Most people would agree that leisure activities are what we do when we have free time or time that is not constrained by the requirements of work. The challenge with defining leisure activities is that what functions as a leisure activity for one person may not function as a leisure activity for someone else. In this regard, leisure activities are highly idiosyncratic. For example, some people engage in exercise as a leisure activity, while other people may consider exercise aversive. No matter how one defines leisure activities, they are an integral part of daily life.

Learning to engage in leisure skills begins at an early age and can affect many areas related to health and well-being, such as developing social skills, maintaining relationships, mental health, and physical fitness (Aguiar & Hurst, 2007; Cipani & Spooner, 1994). For example, a student who enjoys reading might start or join a book club where shared interests are talked about with peers. This may lead to new friendships and involvement in other social events. In this way, leisure skills can function as a
behavioral cusp; once a student obtains the skills needed to participate in a certain activity, access to new environments and opportunities become available. Engagement in leisure activities can lead to personal relaxation, entertainment, physical activity, happiness and a sense of community with others (Aguiar & Hurst, 2007; Cipani & Spooner, 1994).

Meaningful leisure activities refer to activities that provide the individual with access to experiences that lead to socially significant behavior changes. Preferred leisure materials have been shown to function as effective reinforcers for students with autism (Betz, Higbee, & Reagon, 2008; Petursdottir, McComas, McMaster, & Horner, 2007). For example, Boyd, Conroy, Macil, Nakao, and Alter (2007) observed an increase in the amount of social engagement by students with autism while high preference leisure activities were present, as compared to low preference activities. For an individual to be fully integrated into a community, meaningful leisure skills must be acquired and maintained throughout childhood and into adulthood.

When examining the allocation of leisure time, it is helpful to conceptualize engagement with a particular activity as a choice. Choice exists when an individual is presented with multiple concurrent response options. The individual must be capable of performing each alternative and have the opportunity to come in contact with the natural consequences of the chosen alternative (Cooper, Heron & Heward, 2007). With respect to leisure, individuals are often given the choice of engaging in activities that result in socially significant behavior changes (e.g., reading a book) and activities that may be
relatively more preferred, but which do not result in meaningful changes (e.g., spinning an object). When presented with two leisure activities in which the relative quality of the reinforcer differs, intervention is often necessary so that the individual will choose the more meaningful activity, even if it is less preferred. An individual may choose to spend time on an activity that is not age appropriate or choose to engage in the same activity repetitively. Leisure skill deficits can lead to limited exposure to new or varied environments, a lack of opportunity to gain different short and long term reinforcers, and restricted exposure to novel learning opportunities.

Engagement in meaningful leisure skills is particularly challenging for individuals with autism, many of whom exhibit repetitive or ritualistic selections and/or patterns of behavior with leisure materials. One of the defining features of autism is repetitive or stereotyped behavior including conversation, body movements, echolalia (repetitive vocalizations), set routines, and circumscribed interest in particular objects (American Psychiatric Association, 2000; Boyd et al., 2007; Lee & Sturmey, 2006; Miller & Neuringer, 2000). Repetitive or ritualistic behaviors can affect many if not all areas of the individual’s life, including engagement with leisure materials (Tarbox, Tarbox, Ghezzi, Wallace, & Yoo, 2007).

Children who engage in stereotyped patterns of behavior are less likely to come in contact with the multitude of natural reinforcers available in their environment. Honey, Leekam, Turner, and McConachie (2006) examined the relation between engagement during leisure time, repetitive behavior, and language development. The parents of 117
typically developing children and 79 children with autism completed a questionnaire based on observations of their child during free time. The survey results showed that parents who reported that their children engaged in high levels of repetitive behavior (e.g., arranging toys in rows or patterns, spinning or rocking self, flicking fingers near eyes, and etc.) also reported a lack of imaginative play (e.g., engaging in make believe games, inventing stories, pretending toys are real household objects, and etc.). There were also reports of a correlation between expressive and receptive language difficulties and a lack of play skills. Parents who reported that their children engaged in spontaneous play (e.g., independently initiating a play sequence) did not report weaknesses in imagination or language that many individuals with autism possess. The findings highlight some of the potential ramifications of stereotyped responding. That is, children who repetitively engage in the same or similar leisure activities may be missing out on naturally occurring learning opportunities. Another concern related to repetitive or ritualistic responding is that the amount and variety of reinforcers available to the individual may be limited (Miller & Neuringer, 2000). Engaging repeatedly with the same activity gives the individual the opportunity to contact the reinforcers associated with that activity, however the opportunity to be exposed to other reinforcers may be missed.

Variability refers to responding in a way that differs from recent, previous responses. Engagement in stereotypy often displaces variability (Miller & Neuringer, 2000) and it is often necessary to decrease stereotypy in order to increase adaptive
behaviors (Tarbox et al., 2007). When an individual allocates time to stereotypy, the amount of time that is left to be allocated to meaningful activities is reduced. Such patterns of responding are readily observable during non-structured free time. Furthermore, when an individual repetitively chooses to engage in stereotypy it can result in a majority of that time being spent alone. In such a situation, free time is not being utilized to learn, improve social skills, or engage in activities that could lead to social involvement. Individuals with circumscribed interests or intense preoccupations with a certain topic or activity often require interventions in order to learn functional hobbies or adaptive skills (Boyd et al., 2007).

The Autism Society of America states that, “individuals lacking appropriate leisure skills often require constant structure of their time, a task not feasible to accomplish in the home environment” (“Stress”, n.d., para. 2). Deficits in the area of leisure skills can put continuous stress on the individual, the family, and the relationships family members have with the individual with autism.

Because many individuals with autism rarely engage spontaneously in new activities, systematic intervention is often necessary. It is important when intervening that a balance between giving the individual the ability to choose a preferred activity, and engagement with an activity that will benefit the individual the most is found. The intervention often includes providing additional reinforcers for choosing to engage with less preferred activities (Hanley, Iwata, Roscoe, Thompson, & Lindberg, 2003). Once engagement occurs the individual has the opportunity to contact natural reinforcement,
which thereby increases the chance of the activity becoming more highly preferred (e.g., building a Lego car so that it can be driven or making a beaded bracelet so it can be worn). Engagement with leisure activities must be reinforcing for a child to remain engaged. Once a child chooses to remain engaged with a leisure skill, it can help gain access to new activities, skills, and environments. When a student with a disability learns a functional skill, whether it is teeth brushing or building a model airplane, it increases independence (Dyer, Schwartz & Luce, 1984).

Many factors can influence an individual’s willingness to engage with a new activity. Hanley et al. (2003) stated, it is “appropriate to view preference as merely a convenient description of response allocation that is a product of historical and current environmental events” (p. 74). Because the individual’s history of responding can have an effect on the response to intervention, it is important that it be taken into consideration. Many students with autism receive intervention services from a very young age and these interventions can create a history of responding that can have implications on future interventions. For example, many students are given bins, which contain work tasks. Students are taught that each task inside the bins must be completed before getting up from the table. Later, if the child is presented with leisure materials in similar bins, the child may respond to the leisure activities as something that must be completed instead of choosing the activity of highest preference. Saunders, McEntee, and Saunders (2005) found that an organizer or prosthesis, such as bins, can signal to the participant that the response chain must be completed to gain access to a reinforcer.
Completing the activity in the first bin or slot acts as a discriminative stimulus for the participant to move to the second response, which produces the discriminative stimulus for the third response and so on until the reinforcer is delivered. In this situation, it is possible that the student could be responding to the leisure activities as work tasks; not as an activity that could be enjoyable or relaxing. If this is the case, an intervention may be necessary in which the environmental stimuli signal to the individual that work time is over and free time has begun.

Neuringer (2004) reviewed studies involving animals and humans that made the delivery of reinforcement contingent upon increased variability. Previous research has shown that patterns of response repetition and variability can be influenced by the history of reinforcement. Miller and Neuringer (2000) examined the effect of contingent and non-contingent reinforcement on variability with typically developing children and adults, and adolescents with autism. The intervention used a contingency designed to increase variability, where only sequences that were emitted infrequently were reinforced. The results of the study showed that participants with autism displayed lower variability than typically developing adults in all of the conditions. The intervention resulted in an increase in varied responding that continued even after the reinforcement contingency was removed. Miller and Neuringer showed that directly reinforcing variability could expand response repertoires.

Another challenge to consider when selecting an intervention is that repetitive and ritualistic behavior often produces automatic reinforcement (Lovaas, Newsom &
Hickman, 1987). Many studies have addressed this issue by removing the choice altogether or punishing the response if engagement in stereotypy occurred (Green & Striefel, 1988; Koegel, Firestone, Kramme, & Dunlap, 1974; Tarbox et al., 2007).

Koegel et al. (1974) used punishment to determine if a decrease in stereotyped play would result in an increase in appropriate play. The intervention included a combination of physical restriction, slapping, and shouting “no” whenever the participant engaged with materials in a stereotyped manner. A decrease in stereotyped behavior and an increase in spontaneous play during the intervention were observed. However, as soon as a reversal occurred, participants’ stereotyped behavior returned to pre-intervention levels. In other words, the intervention was successful, but did not have long lasting effects. Additionally, concerns can be raised about social validity of the procedures.

Removing preferred activities from the environment is another approach that has been investigated. Green and Striefel (1988) used a free operant condition in which six activities were available for the participant to choose. During intervention, the activity that the participant allocated the most time to during the previous session was removed. Data were collected on how time was allocated in each session as the number of activities from which to choose decreased from six to two. Results showed that when a highly preferred activity was removed more time was allocated to one or two less preferred activities.

Tarbox et al. (2007) examined if response blocking would decrease the reinforcing quality of highly preferred leisure materials that were used in a stereotyped
manner. An initial preference assessment was conducted to determine the most highly preferred leisure item for each participant. During intervention, blocking was implemented whenever high preference items were used in a stereotypical manner. The results showed that blocking decreased stereotypic mouthing of leisure items, but did not decrease the preference for the leisure items. The intervention resulted in decreased levels of stereotypy. However, preference for the problematic materials did not appear to decrease as a result of the intervention. Although this intervention and many of the interventions mentioned above have been successful, this type of approach restricts or removes the individual’s choice.

An alternative treatment approach is to alter the environment so that reinforcement is made contingent upon varied responding. Researchers such as Neef, Mace, Shea, and Shade (1992), for example, examined how variables that influence choice (e.g., quality of reinforcer and rate of reinforcement) could be altered to change response allocation. Applying this type of approach to leisure activity selection may reduce the need to restrict response options. If preference is conceptualized as response allocation, then removing the individual’s choice (e.g., Tarbox et al., 2007) should be avoided to the greatest extent possible (Cooper et al., 2007). When time is allocated to low preference activities because high preference activities have been removed, it can appear that the problem has been resolved (e.g., Hanley et al., 2003). However, it is not always possible to remove the high preference activity from all environments. When the
high preference activity is made available again, it could result in the reappearance of the ritualistic pattern of responding.

A lag schedule addresses the problems described above by directly reinforcing variability. A lag schedule of reinforcement can be used to alter the environment so that reinforcement is made contingent upon varied responding (Cammilleri & Hanley, 2005; Lee, McComas, & Jawor, 2002; Lee & Sturmey, 2006; Napolitano, 2001), without restricting or blocking choice. When using a lag schedule, reinforcers are delivered when the participant engages in a target behavior that varies from a set number of prior behaviors. For example, on a Lag 2 schedule of reinforcement, if the participant is presented with four options and chooses to play on the computer and then do a crossword puzzle, reinforcement would be delivered if he then chose anything except the computer or crossword puzzle.

Goetz and Baer (1973) used differential reinforcement of incompatible behavior to increase variability with block building. The participants were three typically developing preschool girls whose teachers had expressed concerns about repetitively building the same or similar block structures. During baseline, each participant made block structures and the teacher sat quietly and did not comment on what was built. In the second phase, the teacher praised the student when she constructed a form that differed from other forms she had built during the current session. Once diversity of block form had increased, praise was delivered only when the student built a form that had already been built during that session. The study ended with the participant returning
to the conditions of the second phase, where praise was delivered contingent on building new forms. The results showed that variability and novel creations increased when social reinforcement was delivered contingent on building block forms that differed from all other forms within the session. Goetz and Baer did not refer to the schedule of reinforcement as a lag although it could be conceptualized as one.

Napolitano (2010) extended this research by including individuals with autism. The study used the same procedures as Goetz and Baer (1973), with the addition of pairing tangible reinforcement with praise and adding direct teaching sessions if variability did not occur initially. The results showed that a combination of reinforcement on a Lag 1 schedule for block forms that differed and additional teaching resulted in greater response variation than was displayed in baseline.

In a similar study, Lee et al. (2002) demonstrated that a lag schedule of reinforcement was effective in increasing variability for 3 participants with autism. The purpose of the study was to examine if the lag intervention produced a larger variety of appropriate and varied verbal responses to the question, “What do you like to do?” Differential reinforcement of an appropriate response (DRA) was implemented during baseline. The participant received a reinforcer for any response that was appropriate. During intervention, a Lag 1 requirement was added in which reinforcement was delivered only if the response was appropriate and varied from the previous response. Generalization probes were conducted throughout the study to determine if the participants were varying their responses in other settings or with people other than the
experimenters. Results showed that two of the three participants increased the variety of their appropriate responding during the initial intervention and then again during the reintroduction of the intervention. Generalization occurred in other settings and with other people, but only when the DRA/Lag 1 intervention was in effect. Lee and Sturmey (2006) extended Lee et al. (2002) by controlling the stimuli present in the environment to ensure that novel responses were attributable to the lag schedule rather than to the availability of preferred stimuli. The findings demonstrate that adding preferred stimuli to the participant’s environment was not enough to increase variable responding.

A lag schedule of reinforcement was also effective in increasing variability with leisure activities for typically developing students. Cammillari and Hanley (2005) used a lag schedule to alter the environment so that participants would make more diverse selections of academic and leisure activities during free time in a classroom setting. The participants were identified by their teacher as routinely choosing to engage in activities within the same skill set (e.g., repetitively building with blocks or completing math problems). Although both participants did increase the number of novel activities that they engaged in during the intervention phase, a high level of switching occurred within each session. This pattern was a concern to experimenters. When frequent switching within a session occurs, the student is often not engaging with the activity until completion or until a natural stopping point. For example, if a student puts two beads on a bracelet and then moves on to another activity, a completed product is not available to
wear or give to a friend. When a student frequently switches activities, the opportunity to experience the reinforcing qualities of each activity is diminished.

A number of interventions have been successful in increasing the variability of responding by students with autism; however, it has often been at the cost of the individual’s ability to choose. A lag intervention allows for preferred activities that are chosen repetitively to be present in the environment. However, it sets up a contingency in which a novel choice produces additional reinforcement. Studies that use reinforcement to increase variety of responses have proven successful with children with ASD (Lee et al. 2002; Lee & Sturmey, 2006). A study with students who were typically developing also proved successful (Cammilleri & Hanley, 2005), except the reinforcement schedule used resulted in students frequently switching activities. One potential means of addressing this problem is to use a lag schedule across sessions. Activity selection could be reinforced such that choosing to engage with an activity that varied from the previous session increases. Reinforcing response variability across session could increase the diversity of leisure skills selection, without producing rapid within session switching. Using a lag schedule across sessions has not yet been experimentally investigated.

A lag schedule across sessions is not a traditional lag schedule, but rather a second order schedule. When using a first order Lag 1 schedule, the first response would be considered novel due to the fact that it has not been previously made during the current session. It would result in reinforcement. Each subsequent response would be
looked at as it relates to the previous response and reinforcement would be contingent on the prior responses emitted during that session. However, in a second order lag schedule, reinforcement is not contingent on each individual response within the session. Rather, behaviors that occur within a session were viewed as one unitary response. The choice of a particular activity would result in the delivery of a reinforcer when it differs from the activity selected a majority of the time during X number of previous sessions.

**Purpose of the study**

The purpose of this study was to increase the variety of meaningful leisure activities chosen by students with ASD during naturally scheduled free time. A reinforcement-based intervention was employed to shift response allocation from repetitive selection of activities to a varied selection of activities that were socially meaningful for the individual.

**Research Questions**

The study addressed the following questions:

1. Will a lag schedule of reinforcement result in an increase in the variety of leisure activities that students with ASD choose during free time?

2. Will a lag schedule of reinforcement across sessions result in students remaining engaged with one activity per session?

3. Once the intervention is removed, will the students continue to engage in varied responding or will the original pattern return?
CHAPTER 2: METHODS

Participants

Three individuals participated in the study. All of the participants had a prolonged history of rigid or ritualistic preference with respect to selection of leisure activities. Under a free operant arrangement (e.g., free time), the participants would interact with a narrow set of leisure activities.

Shirley was an 11-year-old girl with a diagnosis of autism and mild to moderate delays in intellectual functioning. When Shirley was given free time she would rapidly flip through the pages of a teen magazine. She would not read articles, but would look at pictures and at times scratch the pages. The preference for magazines was observed at home and school for over three years. She would participate in other leisure activities when prompted, but she needed constant adult or peer supervision to remain engaged. When participation with less preferred activities was prompted, an increase in inappropriate behavior was observed, such as shouting, kicking, and digging her fingernails into the skin on her hands and legs. When magazines were not available and she was not prompted to engage in another activity, she often engaged in verbal or motor stereotypy.
Fawn was a 12-year-old girl with a diagnosis of autism, attention deficit hyperactivity disorder, and mild to moderate delays in intellectual functioning. During free time, Fawn would exclusively choose coloring books (i.e., Color Wonder) that involved popular cartoon characters. The school-based treatment team was concerned about the age appropriateness of this activity. She would choose other activities when prompted by an adult, but would not continue the activity independently. As soon as she colored all of the pages of one book, she would request the same book or a similar book. If this activity was blocked or restricted, Fawn would engage in vocal or motor stereotypy and climb on or under furniture.

Lee was an 11-year-old boy with a diagnosis of autism. When given free time, Lee frequently drew “clues” or sketches from a popular children’s television show, which was created for toddlers and young children. For the past four years, Lee almost exclusively chose this activity during free time. When drawing, Lee would make the noises from the show and draw the picture in the same order as taught on the show. The school-based treatment team was concerned that this was not an age appropriate leisure activity. Lee would participate in different activities if prompted, but would often become upset and refuse to participate. If this activity was blocked or restricted, Lee would cry, refuse to talk to others, and refrain from the alternative activity as soon as the adult left the area.

Before the start of the study, the institutional review board of a large university and the school district where the study took place approved the research procedures.
Parental permission for inclusion in the study was obtained in written form for all three participants (see Appendix A). The experimenter read a verbal script to each participant explaining the study, and all three participants verbally agreed to participate (see Appendix B).

**Setting**

All sessions were conducted in a 22 ft by 18 ft special education classroom. The classroom, located in a public suburban school, was where the participants spent at least half of their school day. Sessions were conducted during recess or “free time” which was scheduled in the early afternoon. The experimenter conducted up to three sessions each day. Sessions lasted 5 to 10 min for each participant.

Different areas within the classroom were used throughout the experiment. The arrangement of the classroom varied according to the procedures. The preference assessments were conducted at a kidney shaped table at the back of the room. This area was cleared of all distractions (e.g., instructional materials unrelated to the study). The table had two chairs positioned across from each other. The stimulus discrimination training sessions were conducted at two desks, spaced evenly apart. The desks faced in the same direction with one chair at each desk. The classroom setup for baseline, intervention, fading, and follow-up sessions was the same as with stimulus discrimination training, except four desks were used.
Other students and teacher assistants were in the room during the sessions, but remained at the back of the classroom engaged in quiet activities. They were instructed not to interact with the student during each session.

**Materials**

Leisure items and putative reinforcers were identified for each participant through preference assessments. Pictures were taken of all leisure materials. Each picture was mounted on a 3x5 index card and the name of the activity was written across the bottom. The index cards and colored construction paper were used throughout baseline, stimulus training, intervention, fading, and follow-up. Pen, pencil, data sheets (see Appendix C), and a timer were used for data collection.

**Dependent Variable and Response Measurement**

Leisure activity selection served as the dependent variable. Leisure activity selection was determined by recording the desk and corresponding activity that the participant chose. The participant selected an activity by sitting in one of the desks. Selection was measured using momentary time sampling with a 10 s interval. Each desk was given a letter corresponding to the location. At the end of each 10 s interval, the observer would look at the student and record one of five mutually exclusive behaviors (i.e., desk a, b, c, d, or out of area). If the participant was not sitting at one of the four desks, the observer would give a prompt, “Please have a seat at a desk” and would record the interval as out of area.
After the termination of each session, data were analyzed using two methods. First, the total number of intervals in which the participant was engaged in each leisure activity was calculated. This sum was then divided by the total number of intervals, which was 60, and then multiplied by 100 (see Figure 1). Second, data were analyzed to determine percentage of variable responding. Responding was considered varied if a selection was made that was different from the selections made in the previous two sessions. The number of intervals in which the participant selected an activity that varied from the previous two sessions was totaled for each session. The total was divided by the total number of intervals per session, which was 60, and then multiplied by 100 (see Figure 2).

**Preliminary Analysis Procedures.**

**Preference Assessments.** Multiple stimulus without replacement (MSWO) preference assessments (DeLeon & Iwata, 1996) were conducted to identify preferred leisure activities and putative reinforcers. The experimenter, who had extensive history with the participants, selected stimuli based on direct observations of the participants in their natural classroom setting. A separate MSWO was conducted for leisure activities and putative reinforcers. The selected items for each participant were age appropriate alternatives to the activity for which a rigid preference had been observed.

Prior to the initial preference assessment, the participant was given the opportunity to interact with the leisure items for 5 min. At the start of each MSWO preference assessment, an array of five items was presented. Items were placed evenly
spaced in a row, and their order was randomly determined prior to each trial. The participant was instructed to “Pick one.” Once a selection was made, the participant was given 30 s to interact with the item (in the case of leisure activities) or enough time to consume the item (in the case of edibles). The experimenter removed the item that was selected and re-presented the array. The sequence continued until all stimuli were chosen or 30 s elapsed and the participant had not chosen an item. The experimenter recorded the order in which the items were chosen and if an item was not selected (see Appendix D). Sessions were conducted once a day. Reinforcer preference assessments were conducted five times with each participant. Leisure activity preference assessments were conducted three times with each participant.

Data were analyzed by adding the total number of times each item was selected and dividing by the number of times that item was available. The leisure item and reinforcer that was determined to have the lowest preference was not used for the remainder of the study. Possible reinforcers included small edibles, stickers, and high-fives from the experimenter. Table 1 depicts the leisure items that were used throughout the study for each participant. The item that the participant typically chose during naturally occurring free time is listed first. The other leisure activities selected for each participant were activities that he or she had appeared to enjoy previously but no longer engaged in independently or remained engaged only if continuously prompted by an adult.
Table 1. Leisure activities available during baseline and intervention for each participant. The first activity listed beneath the participants’ name is the activity that the student showed a high preference for prior to intervention.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Shirley</th>
<th>Lee</th>
<th>Fawn</th>
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<tbody>
<tr>
<td>Looking at magazines</td>
<td>Drawing on a dry erase board</td>
<td>Coloring in ColorWonder books</td>
<td></td>
</tr>
<tr>
<td>Sketching using stencils clothes, hair and makeup</td>
<td>Building Lego cars</td>
<td>Putting together a puzzle</td>
<td></td>
</tr>
<tr>
<td>Speed stacking</td>
<td>Step-by-step drawings</td>
<td>Stringing beads to make jewelry</td>
<td></td>
</tr>
<tr>
<td>Braiding friendship bracelets</td>
<td>Putting together a puzzle</td>
<td>Cutting and gluing to make collages</td>
<td></td>
</tr>
</tbody>
</table>

**Treatment Analysis Procedures**

At the start of a session, each leisure activity was placed on top of a desk. The desks were identical and arranged in a row at the front of the classroom. They were evenly spaced with about 2 feet between each desk, so the participant could not sit at one desk and reach the materials located on another desk. The order of activities was rotated randomly before the start of each session. A note card with the name of the activity and a picture of the materials was placed at each desk.

The note card was placed on a colored piece of paper. The colored paper served as a visual representation of the condition and contingency (see below). The materials at that desk matched the leisure activity label. The participant was led to the center of the
room where all desks could be easily viewed. The participant was allowed to switch desks at anytime. If the participant stood up and engaged with the materials or stood between desks for more than 10 s the experimenter said, “Please sit at a desk.” This prompt was needed only a few times throughout the experiment when a student was engaging with materials but not sitting. Interaction between the experimenter and the participant was kept to a minimum when sessions were taking place.

**Baseline.** A baseline was conducted to determine the participants’ selection of leisure activity prior to intervention. The leisure activity picture and label were presented on a blue paper that was placed in the upper left corner of each desk. During this phase there was no programmed consequence. The participant was told, “Its free time. You can do (activity one), (activity two), (activity three), or (activity four). You have 10 minutes and can switch whenever you want. It’s free time.” Students were able to engage with whatever activity they selected.

**Stimulus Discrimination Training.** The purpose of the training sessions was to teach participants to discriminate between reinforcement and non-reinforcement contingencies. During this phase, reinforcement was delivered for engaging with an activity associated with green paper. If the participant selected the activity associated with the red paper, reinforcement was withheld. In addition to teaching the participants to discriminate between the contingencies, the training gave the participants experience with the schedule of reinforcement that would be used during the intervention phase.
Two desks were set up with identical leisure activities on each. The activities used were functionally and topographically different from the activities used during all other phases of the study. Using different activities ensured that the reinforcer-activity history established during training would not affect response allocation during the intervention. A piece of paper, green or red, was presented on each desk.

Three training sessions occurred each day. Sessions were 5 min in duration. The experimenter said, “It’s free time. You can do (activity) at the green desk and get (reinforcer) or you can do (activity) at the red desk. You have 5 minutes and can switch whenever you want. It’s free time.” If the participant selected the activity that corresponded to the green piece of paper, a reinforcer was immediately delivered. Once the participant sat down at the desk the experimenter started a timer. When the student remained at the desk that corresponded with the green paper, additional reinforcers were delivered every minute on a fixed time 1 min schedule. If the student selected the activity associated with the red paper, no reinforcer was delivered. A switch from an activity associated with red paper to an activity associated with green paper would result in delivery of reinforcement, if available, after one 1 min interval elapsed. Training continued until the student selected the activity associated with the green paper for at least 80% of two sessions over two days.

Across Session Lag. A second order Lag 2 schedule of reinforcement was used to increase variability of leisure activity selection across sessions. Reinforcement was made contingent upon the participant selecting an activity that was different from the
activity selected during a majority of the previous two sessions. Green paper was used to signal the availability of reinforcement. In the first sessions following baseline, reinforcement was available for selecting an activity that differed from the activity selected during a majority of the final baseline session. For example, if a participant chose looking at magazines for a majority of the final baseline session then that activity would be presented on red paper during the first session of intervention and selection of that activity would not result in delivery of a reinforcer. The participant would receive a reinforcer if any of the other three activities were chosen.

There were two schedules of reinforcement in place during each session. First, a reinforcer was immediately delivered when the participant selected an activity presented on green paper. Second, additional reinforcers were delivered on a 1 min fixed interval schedule as long as the participant continued to select the same activity. The procedures related to switching activities during a session were identical to the stimulus discrimination training condition described above. The reinforcer for Shirley and Lee was a small edible item (e.g., skittle or Hershey Kiss) that could be quickly consumed while engaging in the leisure activity. The reinforcer for Fawn was social attention from the experimenter (e.g., a high-five). The experimenter set the reinforcer on a white index card next to the participant or, in the case of Fawn gave a high five, and walked away. If the participant did not consume the edible within the 1 min interval, an additional reinforcer was not provided until one interval passed after consumption.
The activity chosen for the majority of the session was counted as the high preference activity for that session. According to the Lag 2 schedule if the high preference activity was chosen during the next two sessions it would not result in delivery of a reinforcer.

**Across Session Lag-Reinforcement Fading.** The ultimate goal of this experiment was for participants to choose to engage with a variety of leisure activities because of the natural reinforcers associated with the activity. The experimenter thinned the schedule of reinforcement once the intervention increased the variability of leisure activity selection. The fading schedule was determined individually based on the experimenter’s history with the student. The schedule was thinned for the initial reinforcer and subsequent reinforcer(s) delivered on the fixed time schedule (See Appendix E). The initial reinforcer was thinned by gradually increasing the amount of time that elapsed between the individual’s selection and delivery of the first reinforcer. The reinforcer associated with the fixed time schedule was thinned by increasing the amount of time that elapsed between consumption of the reinforcer and delivery of the subsequent reinforcer. Schedule thinning occurred if, every session the participant continued to select an activity that had not been chosen during the previous two sessions.

The short-term goal for Lee was that he would continue to show a varied pattern of responding with the schedule thinned to delivery of one reinforcer at the end of a 10 min session. The fading schedule used for Fawn and Shirley was the same. The short-
term goal for both participants was that the participant would continue to select a variety of leisure activities with delivery of reinforcer at the mid-point (e.g., 5 min) and endpoint of the session (e.g., 10 min). A pictorial symbol of the reinforcer was placed on each green paper for Shirley to signal that a reinforcer was available. This picture was faded by 25% resolution every three sessions until it was blank. A pictorial symbol of the reinforcer was not present during the final three sessions of this phase. A detailed account of the fading procedure is presented in Appendix E.

**Follow-up.** Follow-up data were collected three weeks after the final intervention session. The follow-up procedures were similar to the procedures used during the across session lag condition, except experimenter-delivered reinforcers were not available. During this phase, activities were presented on colored paper. Green paper indicated that the activity had not been selected for a majority of the previous two sessions. Red paper indicated that the activity had been selected for a majority of the previous two sessions.

**Experimental Design**

A multiple baseline design across participants was used to examine the effects of a lag schedule of reinforcement on across session variability. Participants were exposed to baseline, stimulus discrimination training, and intervention in a staggered fashion. When applying a multiple baseline across participants design, baseline levels of varied responding are established in all participants. The independent variable is applied to one participant while the other participants remain in the baseline condition. This sequence is
repeated with each participant. Experimental control is demonstrated when the data of participants indicates a change during the intervention phase while data of participants in the baseline phase remains stable. (Baer, Wolf, & Risley, 1968).

**Procedural Integrity**

The experimenter and two secondary observers collected data throughout the study. The two secondary observers were a master’s student and a doctoral student. Procedural integrity data were collected a mean of 25% of all sessions for each participant (Shirley M =22.2%, Lee M = 26.7%, and Fawn M = 26.3%). A procedural integrity checklist (see Appendices F and G) created by the experimenter was used to mark the presence or absence of each step of the procedures. Before the start of the study, both secondary observers were told how to fill out the data sheet, how the desks were ordered (e.g., a,b,c, and d), and a timer. Procedural integrity for each participant was assessed during a mean of 30% of baseline sessions (range, 27% to 33%), 31% of intervention sessions (range, 20% to 40%), 18% of fading sessions (range, 15% to 20%) and 20% of follow-up sessions. Procedural integrity was 100% for all participants.

**Interobserver Agreement**

The secondary observers scored sessions during all phases of the experiment using a timer and data sheets that were identical to that of the primary observer. Interobserver agreement (IOA) data collected by the secondary observers were compared with the data collected by the primary observer on an interval-by-interval basis. IOA was calculated by dividing the number of agreements by the number of
agreements plus the number of disagreements and multiplying by 100%. IOA was collected for a mean of 25% of all sessions for all participants (Shirley $M = 22.2\%$, Lee $M = 26.7\%$, and Fawn $M = 26.3\%$). During all sessions, agreement was 100% for Shirley and Fawn and 97% or above for Lee.
CHAPTER 3: RESULTS

The results of the intervention on response variability for each participant are presented in Figures 1 and 2. The top panel of Figure 1 shows the distribution among all of the response options for Shirley. During baseline in which there was no programmed consequence, Shirley selected the magazine for all, but one session ($M = 91.7\%$ of the intervals). The top panel of Figure 2 depicts the percentage of intervals Shirley selected an activity that differed from the previous two sessions. The mean percentage of response variation across sessions was low ($M = 9.1\%$). Shirley selected an activity that differed from the previous two sessions on only one occasion. Overall, Shirley tended to select the same activity across sessions and engaged in the selected activity for the duration of the session.

During baseline, Lee switched activities frequently during each session. The middle panel of Figure 1 shows the response distribution for Lee (dry erase board $M = 34.5\%$, step-by-step drawing $M = 25.7\%$, puzzles $M = 20\%$, and Legos $M = 13.9\%$). Initially, Lee distributed selection relatively evenly across each of the options. However, starting at session 12, he selected dry erase board for the majority of the session. The mean percentage of response variation across sessions was 53.6\%.
Figure 1. The distribution of response allocation for the three participants during each condition of the study.
Figure 2. The percentage of intervals during each session that Shirley, Lee, and Fawn spent on an activity that differed from the previous two sessions.
During baseline, Fawn showed an initial preference for the puzzle. At session 15, response allocation shifted toward Color Wonder for the remainder of baseline. The bottom panel of Figure 1 shows the response distribution for Fawn during baseline (puzzle $M = 71.4\%$, Color Wonder $M = 28.5\%$). The mean percent of response variation across sessions, depicted in Figure 2, was low during baseline ($M = 8.9\%$). Fawn switched activities during a session twice, but otherwise remained engaged at the desk she initially selected.

During intervention, reinforcers were delivered contingent on selecting an activity that differed from the previous two sessions. The top panel of Figure 1 shows variable response allocation across sessions for Shirley once the intervention was introduced (stencils $M = 35.7\%$, magazines $M = 30\%$, speed stackers $M = 27.5\%$, and bracelets $M = 6.4\%$). The top panel of Figure 2 shows that during every session of intervention for Shirley responding differed from the previous two sessions ($M = 98\%$). Shirley switched activities during two sessions of intervention and selected one activity for all remaining sessions.

Once the intervention was introduced, Lee engaged in varied selection across sessions and stable selection within session. The middle panel of Figure 1 depicts response allocation for Lee. Selection was divided evenly across the dry erase board, Legos, and puzzle ($M = 33.3\%$). He did not select the fourth activity, step-by-step drawing, during intervention or any subsequent phase. During each session of the
intervention phase, Lee selected a different activity from the previous two sessions ($M = 99.5\%$).

The bottom panel of Figure 1 shows that during intervention, distribution among the four response options was even for Fawn ($M = 25\%$ on puzzle, Color Wonder, friendship bracelets, and collage). The percentage of intervals in which Fawn selected an activity that differed from the previous two sessions is shown in the bottom panel of Figure 2. Fawn selected a different activity during each session ($M = 100\%$) and did not switch activities during any of the sessions.

Following an increase in response variability during intervention, the schedule of reinforcement was faded for each participant. All 3 participants continued to respond variably throughout the fading phase following the Lag 2 intervention schedule. Prior to fading, the experimenter set an individual short-term goal for the amount and frequency of reinforcement for each participant. Reinforcers were able to be faded to the short-term goal level for Shirley and Lee. However, due to severe challenging behavior, Fawn was unable to complete fading or participate in the remainder of the study.

The reinforcer for Shirley was gradually faded to 5 min between the start of the session and delivery of the initial reinforcer, and to delivery of one reinforcer 5 min later at the end of the session (see Appendix E). The top panel of Figure 1 shows that her pattern of responding during fading was similar to the pattern observed during intervention (magazines $M = 35.7\%$ of the intervals, speed stackers $M = 28.6\%$, stencils $M = 28.4\%$, and bracelets $M = 7\%$). Response distribution for Lee continued to vary as
reinforcement was gradually faded to one reinforcer being delivered at the end of the 10 min session. Similar to intervention, his mean response allocation was evenly distributed among dry erase board, Legos, and puzzle. For Fawn the delay between the selection and delivery of the initial reinforcer was increased to 3.5 min and the delay between the delivery of the first reinforcer and the second was increased to 4.5 min. The bottom panel of Figure 1 shows that the response distribution for Fawn during fading was distributed almost evenly across three activities (Color Wonder and collage $M = 35.7\%$, and puzzle $M = 28.6\%$).

Follow-up sessions were completed three weeks after the final fading session to determine if participants would continue to select different activities. Shirley and Lee each participated in five sessions, however their results varied. The top panel of Figure 1 shows that Shirley returned to exclusively selecting magazines, as she did during baseline. Similar to both the intervention and fading phases, Lee distributed response allocation evenly among dry erase boards, Legos, and puzzle ($M = 33.3\%$). He continued selecting activities according to the Lag 2 schedule with the same pattern he showed during intervention and fading, even though reinforcers were not delivered. During follow-up, the mean percent of response variation across sessions decreased to 0% for Shirley while it remained at 100% for Lee.
CHAPTER 4: DISCUSSION

The results showed that the lag based intervention increased the variety of leisure activities selected for two participants (Shirley and Fawn) who displayed rigid preferences, and reduced within-session switching for one participant (Lee) who showed stereotyped selection. These findings extend previous research in which a lag schedule was successfully used to increase response variability for individuals with autism, (Lee et al., 2002; Lee et al., 2006; Napolitano et al., 2010) by applying the lag schedule to the selection of leisure activities. In Cammilleri and Hanley (2005) the use of a lag schedule to increase response variability resulted in participants frequently switching activities within a session. The authors report that the two participants selected an average of 8 and 11 different activities per 60 min session, respectively. The authors did not report the total number of switches that occurred, but indicated that the levels were high. The current study addresses this limitation by applying a lag schedule across sessions. This second order schedule encouraged variation of activity selection while allowing the participant enough time to gain the natural reinforcers associated with each activity selected. Based on the author’s review of the research, the current study is the first to apply a second order lag schedule. These results provide a preliminary demonstration of
the effectiveness of a lag schedule across sessions and expand the way that a lag schedule is used in applied settings. The present findings are important because choice is a key component of leisure activities. The results of the intervention show that choice can be influenced without restricting response options. Restricting or blocking access may be necessary in situations in which the pattern of responding is extremely restrictive. However, setting up a contingency, such a lag reinforcement schedule, may be less restrictive and more manageable in natural environments.

Before the intervention, the participants originally displayed two different patterns of responding. These patterns presented unique challenges and were problematic for the individuals who demonstrated them. Shirley and Fawn remained engaged with the same activity for most sessions. However, over the course of baseline they each interacted only with a small subset of the items. Repetitively choosing to engage with the same materials and activities can lead to missed opportunities to contact other reinforcers (Miller & Neuringer, 2000).

During baseline, Lee would frequently switch activities during each session, such that he contacted each response option. A pattern of frequent switching can also affect the amount of reinforcement that the individual contacts. Throughout baseline, Lee engaged in behaviors that were often associated with being anxious (e.g., hands shaking, rapid breathing, and talking to himself about switching to the next activity). Once the intervention was introduced, Lee selected and remained engaged with one activity per session. Anecdotally, it appeared that Lee was less anxious. The earlier behaviors were
replaced by behaviors that are often associated with enjoyment (e.g., smiling, wanting to show others his completed product, and laughing.) Throughout intervention Lee engaged with an activity until it was completed or came to some natural conclusion. For example, during baseline, he would put one or two Legos on a car model and then move to another activity. However, during intervention and follow-up, he would build the entire car and then race it around the desk. He would make comments when he completed it, such as, “I did it!” or, “Look what I made!” Selecting to remain engaged with one activity, especially during follow-up, suggests that Lee was contacting the natural reinforcers associated with the activity.

This intervention was successful at increasing response variability. However, over the course of several sessions, a distinct pattern of responding emerged. The participants’ selection of activities followed a sequenced pattern for the majority of the intervention and fading phases. For example, during intervention Lee selected Legos the first session, puzzle the second session, and dry erase boards the third session. This exact pattern was repeated throughout the remainder of the experiment. Basic research has shown that organisms can respond variably to receive the greatest amount of available reinforcement (Machado, 1989, Neuringer, 1992; Page & Neuringer, 1985). By following this pattern of responding, each participant may have been able to optimize performance, and contact the largest number of reinforcers. However, the degree to which responding across sessions can be characterized as variable is up for debate.
Lee et al. (2002) noted the same concern with a pattern of responding that alternated between two responses on a Lag 1 schedule. Variation requirements can directly result in frequent switching (Machado, 1997). Fixed lag schedules may lead to higher order stereotypy where the participants’ responding matches the schedule of reinforcement (Lee et al., 2002). Although a lag schedule may increase response variety, the higher order pattern can become a concern. As mentioned earlier, a leisure activity should be selected because the individual has an interest or preference for it. When an individual engages in higher order stereotypy it is difficult to determine if an activity is selected because it is preferred or because the individual is responding to the pattern.

Previous studies that have used a lag schedule have not indicated to participants the response selection that would be reinforced. During intervention, the colored paper functioned as a discriminative stimulus (SD) that signaled the availability of reinforcement. Using an SD as part of the treatment plan can produce immediate results and could be used to aide in maintenance and generalization of response variability. The current study did not test whether variable responding would continue to occur in the presence of the SD in environments other than the treatment setting. Future studies could be designed to assess variable responding across time, settings, and materials.

The results obtained during the follow-up sessions show that Lee maintained variable responding with a visual stimulus and no additional reinforcers. Shirley did not respond to the visual stimulus when additional reinforcers were not available, but returned to baseline levels of repetitive responding. There are a few possible
explanations for why embedded reinforcers may be necessary for some individuals to respond variably. First, the ritualistic patterns could be controlling the individual’s selection. During the intervention, this pattern could have been disrupted for Lee, but not for Shirley. Second, the embedded reinforcer may be controlling varied activity selection. The individual could be reallocating response selection to a low preference activity in order to contact the embedded reinforcer. Selection of low preference items during intervention may not represent a preference shift; the original preference for the high preference activity could remain. Future research could examine maintaining variable responding once the intervention has been removed by fading reinforcement on a more gradual schedule or using a variable or intermittent lag schedule of reinforcement.

**Considerations and Limitations**

During typical classroom arrangements, anecdotal observations show that Lee would repetitively choose to use the dry erase boards. However, during baseline he responded by selecting each available activity during each session. The arrangement of the environment with desks in a row could have been acting as a behavioral prosthesis for Lee, controlling his selection (Saunders et al., 2005). The use of a visual stimulus during intervention appeared to control activity selection when the experimenter withheld reinforcers.

When evaluating the results of this study, a number of limitations should be taken into account. First, during baseline, a change in response allocation occurred at session 15 for Fawn. This change coincided with the introduction of the intervention for Lee.
Although the change represents a switch from one rigid pattern of responding to another, the timing possesses a possible threat to interval validity. It is doubtful that the intervention for Lee exerted any control over Fawn’s response allocation. Due to scheduling issues, Fawn was not in the same room as Lee during the intervention. However, carryover effect cannot be definitively ruled out.

Second, Fawn was not able to complete the fading procedures or participate in follow-up due to challenging behaviors that occurred during work time. Data would have been more complete had Fawn been able to finish fading and participate in the follow-up phase.

Third, the purpose of the study was to alter response allocation, therefore the dependent variable selected and measured for the current study was selection of leisure activity. During each session, data was collected on the activity the participant selected by recording the desk where the participant sat and the respective materials. The data collected indicate that the study was successful in varying response allocation for all participants. Anecdotally, each participant was engaged with the selected activity throughout each session. However, engagement should have been part of the selection definition. Future research should measure response allocation with selection and engagement as dependent variables to show that once an activity was selected the participant remained engaged throughout the session.
Guidelines for Future Research

As discussed above, repetitive patterns of selection were a concern. Future research should consider using a larger number of activities and a variable or intermittent schedule of reinforcement to address this limitation. Preference probes were not administered during the current study, but future research could assess preference throughout the study to determine if a shift in preference occurred. If an activity remained low preference after the participant had selected it and had the opportunity to contact reinforcers associated to it, then a new activity could be introduced. This would allow the individual to be exposed to a larger variety of leisure activities and a greater opportunity to contact an activity that provided enough natural reinforcement that the individual would select it based on preference, not pattern.

The Lag 2 schedule that was utilized throughout this study may have contributed to the pattern mentioned above. A variable lag schedule could result in a more natural and varied pattern of responding. Increasing the lag schedule throughout the study may allow selection preferences to emerge (Lee & Sturmey, 2006). In order to create an environment in which the individual follows a more spontaneous pattern of response that is based on preference, future research should consider using a larger number of activities and a variable or intermittent lag schedule across sessions (Lee et al., 2002; Lee & Sturmey, 2006).
In order to program for maintenance and generalization, future research should look at whether a shift in preference occurred during the lag intervention. Determining if a shift occurred and when it occurred for each participant would be beneficial information. Reinforcement could be faded in a more timely manner if it was determined that a shift in preference occurred. This would allow for a more natural leisure situation, in which the participant gained reinforcement solely from the activity itself. If a shift in preference did occur there is a better chance at maintenance and generalization because reinforcement would be occurring naturally.

In conclusion, this was the first study to utilize a second order lag schedule to increase variable responding and the results are promising. When it comes to repetitive responding, setting up the contingency for variability by delivering reinforcement dependent on a novel response should be considered, before restricting an individual’s choice. Increasing variable responding with leisure activities is the first step towards increasing leisure skill repertoires in individuals with ASD and could lead to an increase in the number of reinforcers and opportunities to which the individual is exposed and can therefore influence quality of life (Cipani & Spooner, 1994).
REFERENCES


APPENDIX A: PARENTAL/GAURDIAN CONSENT FOR PARTICIPATION
The Ohio State University Parental Permission
For Child’s Participation in Research

Study Title: The Effects of Differential LAG Reinforcement on Across Session Variability of Leisure Activities

Researcher: Nancy Neef and Julie Payne

This is a parental permission form for research participation. It contains important information about this study and what to expect if you permit your child to participate.

Your child’s participation is voluntary.

Please consider the information carefully. Feel free to discuss the study with your friends and family and to ask questions before making your decision whether or not to permit your child to participate. If you permit your child to participate, you will be asked to sign this form and will receive a copy of the form.

Purpose:
This study is being done to determine if reinforcement can increase the variety and amount of time a student spends independently on leisure skills.

Procedures/Tasks:
All the students assigned to Mrs. Payne’s structured communication classroom will be invited to participate in this study.

If your child participates in this study, he or she may be provided a free time session in my classroom for about 10 minutes 3-5 times per week. A researcher (Julie Payne) from Ohio State University will work with each student individually. The instruction provides a strategy that may improve the student ability to choose a variety of appropriate leisure skills. The student will be given various choices of what they would like to do during their “free time”. They will receive reinforcement for choosing and engaging in new leisure skills. Leisure skills that receive reinforcement will be age appropriate.
**Duration:**
This study will take no more than 9 months to complete. However, it is expected that your child will be actively involved for about 3-4 months.

Your child may leave the study at any time. If you or your child decides to stop participation in the study, there will be no penalty and neither you nor your child will lose any benefits to which you are otherwise entitled. Your decision will not affect your future relationship with The Ohio State University.

**Risks and Benefits:**

We do not anticipate any risks, side effects, or discomfort.

The benefits are that your child may receive individual attention and additional practice with behavioral variability, leisure skills, and time on task may improve. This could lead to an increase in the variety of age appropriate leisure activities that they choose during their free time. This increase could lead to more appropriate social interactions with peers and adults as well as more time in less restrictive environments.

**Confidentiality:**

Efforts will be made to keep your child’s study-related information confidential. However, there may be circumstances where this information must be released. For example, personal information regarding your child’s participation in this study may be disclosed if required by state law. Also, your child’s records may be reviewed by the following groups (as applicable to the research):

- Office for Human Research Protections or other federal, state, or international regulatory agencies;
- The Ohio State University Institutional Review Board or Office of Responsible Research Practices;
- The sponsor, if any, or agency (including the Food and Drug Administration for FDA-regulated research) supporting the study.

**Incentives:**

There is no cost for taking part in this study. You and your child will not be paid to participate.

**Participant Rights:**

You or your child may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled. If you or your child is a student or employee at Ohio State, your decision will not affect your grades or employment status.

If you and your child choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights your child may have as a participant in this study.

An Institutional Review Board responsible for human subjects research at The Ohio State University reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.
Contacts and Questions:
For questions, concerns, or complaints about the study you may contact Nancy Neef at 614-688-8107 or Julie Payne at 614-499-4319. If you feel you or your child has been harmed as a result of study participation please contact Nancy Neef at 614-688-8107 or Julie Payne at 614-499-4319.

For questions about your child’s rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact Ms. Sandra Meadows in the Office of Responsible Research Practices at 1-800-678-6251.

Signing the parental permission form

I have read (or someone has read to me) this form and I am aware that I am being asked to provide permission for my child to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to permit my child to participate in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form.

Printed name of subject

Printed name of person authorized to provide permission for subject

Signature of person authorized to provide permission for subject

Relationship to the subject

Date and time

Investigator/Research Staff

I have explained the research to the participant or his/her representative before requesting the signature(s) above. There are no blanks in this document. A copy of this form has been given to the participant or his/her representative.

Printed name of person obtaining consent

Signature of person obtaining consent

Date and time

AM/PM
APPENDIX B: VERBAL ASSENT FORM
“Hello, my name is Julie Payne. I am a graduate student at The Ohio State University and I am starting research that will be used in my thesis.

I am studying a way to help increase the variety of activities you do during free time.

The information you share with me will be a very important part of completing this research project. The results could help you and other kids spend more time on a variety of activities during free time.

This project will take about 10 minutes of your time each day for 3-6 months. Each time you have free time in my classroom you will be able to pick from 4 different activities.

I will be here during your free time and will be writing down what you choose to do.

I will keep your data in the strictest confidentiality.

There are no other expected risks of participation.

Participation is your choice. If you decide not to participate, that is fine. Of course, you can stop any time you want.

Do you have any questions about this?

Do you agree to take part in this project?”
APPENDIX C: MOMENTARY TIME SAMPLING DATA SHEET
Date: _________________
Student:___________________
Observer: ______________________
Session #: ______     IOA Collected:_______
Rely:_____    Time of intervention: __________
Condition: _____________________

Key-
Write the letter for the activity where the student is sitting
- = disengagement- out of seat
s= stereotypy or inappropriate engagement

Activity 1 = a ______________________
Activity 2=  b ______________________
Activity 3= c ______________________
Activity 4= d ______________________

Reinforcer= _______________________

Notes:
APPENDIX D: MULTIPLE STIMULUS WITHOUT REPLACEMENT DATA SHEET
APPENDIX E: FADING SCHEDULE
## Fading Schedule

Participants: Shirley and Fawn (picture for Shirley only)

Goal: Reinforcement delivered at 5 min and 10 min

<table>
<thead>
<tr>
<th>Session</th>
<th>Initial Delay</th>
<th>Time between</th>
<th>Picture fade</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
<td>10s</td>
<td>1:30</td>
<td>100%</td>
</tr>
<tr>
<td>27</td>
<td>10s</td>
<td>1:30</td>
<td>100%</td>
</tr>
<tr>
<td>28</td>
<td>20s</td>
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</tr>
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</tr>
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<td>34</td>
<td>1:40</td>
<td>3:30</td>
<td>50%</td>
</tr>
<tr>
<td>35</td>
<td>2:00</td>
<td>3:30</td>
<td>50%</td>
</tr>
<tr>
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<td>2:30</td>
<td>4:00</td>
<td>25%</td>
</tr>
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<td>3:00</td>
<td>4:00</td>
<td>25%</td>
</tr>
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<td>3:30</td>
<td>4:30</td>
<td>0%</td>
</tr>
<tr>
<td>39</td>
<td>4:15</td>
<td>4:45</td>
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</tr>
<tr>
<td>40</td>
<td>5:00</td>
<td>5:00</td>
<td>0%</td>
</tr>
</tbody>
</table>

Participant: Lee

Goal: reinforcement delivered at end of session (10 min)

<table>
<thead>
<tr>
<th>Session</th>
<th>Initial Delay</th>
<th>Time between</th>
</tr>
</thead>
<tbody>
<tr>
<td>26</td>
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<td>1:30</td>
</tr>
<tr>
<td>27</td>
<td>15s</td>
<td>1:30</td>
</tr>
<tr>
<td>28</td>
<td>25s</td>
<td>2:00</td>
</tr>
<tr>
<td>29</td>
<td>40s</td>
<td>2:00</td>
</tr>
<tr>
<td>30</td>
<td>60s</td>
<td>2:30</td>
</tr>
<tr>
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<td>1:30</td>
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<td>4:00</td>
</tr>
<tr>
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<td>4:00</td>
<td>5:00</td>
</tr>
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<td>6:00</td>
</tr>
<tr>
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<tr>
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</tr>
<tr>
<td>40</td>
<td>10:00</td>
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</tr>
</tbody>
</table>
APPENDIX F: PROCEDURAL INTEGRITY DATA SHEET, BASELINE
## Procedural Integrity - Baseline

Date: ___________________________     Student:_______________________  
Session #: _______________________     IOA day: ______________________  
Time of intervention: ______________     Condition:_____________________

Mark with a + if observed and a - if not observed.

<table>
<thead>
<tr>
<th></th>
<th>Student 1</th>
<th>Student 2</th>
<th>Student 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom is set up with 4 centers</td>
<td>+/-</td>
<td>+/-</td>
<td>+/-</td>
</tr>
<tr>
<td>Centers are labeled on blue paper with corresponding leisure activity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investigator leads student around the room to each center</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investigator presents vocal demand “pick one”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session time starts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investigator interacts minimally with student</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session time stops at ten minutes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Centers are separated, student could not physically be one than one center at a time
Labels are clear, easy to read and materials at the center match the label
Materials and activity are shown to student
Given at the center of the room
Investigator starts the session clock
Ex. answers questions, but does not prompt or encourage
When timer goes off, investigator stops collecting data
APPENDIX G: PROCEDURAL INTEGRITY DATA SHEET, INTERVENTION
**Procedural Integrity - Intervention**

Date: ___________________________  IOA day: _______________________
Session #: _______________________  Condition: _____________________
Time of intervention: ______________

Mark with a + if observed and a - if not observed.

<table>
<thead>
<tr>
<th></th>
<th>P1 +/-</th>
<th>P2 +/-</th>
<th>P3 +/-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom is set up with 4 centers</td>
<td>Centers are separated, student could not physically be one than one center at a time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Centers are labeled on colored paper</td>
<td>Labels are clear, easy to read and materials at the center match the label</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Centers on green paper are novel and appropriate</td>
<td>Novel center was not engaged with during previous session</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Centers on red paper are repetitive or inappropriate</td>
<td>Repetitive center is a center engaged with during previous session and inappropriate are defined at the start of the study Red center(s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investigator leads student around the room to each center</td>
<td>Materials and activity are shown to student from the center of the room</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investigator presents vocal demand “pick one”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session time starts</td>
<td>Investigator starts the session clock</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investigator provides reinforcement on interval schedule</td>
<td>When student is engaged at center with a green label then investigator delivers reinforcement on when timer sounds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investigator interacts minimally with student</td>
<td>Ex. answers questions, but does not prompt or encourage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session time stops at ten minutes</td>
<td>When timer goes off, investigator stops collecting data</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>