

Variable Play Enriches Children's Development:
An Investigation of Variability in Play Behavior
in Children Diagnosed with ASD and Neurotypical Controls

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Abstract

Playing variably contributes to children's social, cognitive, and behavioral development. Variable play behavior can be taught through reinforcement, and children can learn to play variably and repetitively in different contexts. Most neurotypical children learn variable behaviors readily, but individuals with Autism Spectrum Disorder (ASD) tend to behave overly repetitively. Teaching variable behavior can open new doors for people who tend to engage in repetitive actions and can be beneficial in many situations. There is evidence that behavioral variability can be taught using reinforcement, but no direct comparisons have yet been made between children diagnosed with ASD and typically developing children. Throughout the course of the present study, neurotypical children and children with ASD were taught to play repetitively and variably in different contexts. After participants successfully discriminated between the two conditions, their preference for either variable or repetitive play was assessed. Thus far, the data indicate that one neurotypical participant learned to play variably in one context and repetitively in another using reinforcement, variable play behavior can be increased when reinforced with a lag schedule and that discriminative stimuli can control repetitive versus variable play. When given a choice, the same neurotypical participant showed a slight preference for repetitive play sessions. In follow-up research, this preference will be compared to future participants' data to determine if there is a difference in preference for variable or repetitive play between neurotypical children and children with ASD.

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CHAPTER I

Introduction

The purpose of this study was to replicate and extend previous research (Galizio et al., 2020) by assessing preference for variable or repetitive play behavior in children with autism spectrum disorder (ASD) and typically developing controls. As children with ASD tend to behave and play in a repetitive manner, the possibility of teaching them to play variability extends behavioral choices and could even be preferable compared to how children previously behaved. The main research questions address the extent to which variable play behavior can be taught, whether there is a preference for variable or repetitive play, and if that preference is the same in children with and without a diagnosis of ASD.

The ability to behave variably can be adaptive in many situations for humans, as well as nonhuman animals. For example, a squirrel gathering nuts in one location will eventually deplete the resources there. In this scenario, it would be evolutionarily favorable for the squirrel to behave variably and find another place to look for food. In the same way, it would be advantageous for a lion to have variability in its hunting style to capture prey more effectively, and its prey would be more likely to escape if they engage in a variety of evasive maneuvers. As for humans, it is beneficial to behave variably in certain situations, such as looking in more than one place for your keys when they are lost or trying more than one key on a keyring when unlocking an unfamiliar door. As a society, we place value on original works of art, literature, and science. Behavioral variability contributes to learning new and more complex responses to stimuli and has been shown to increase both problem solving and creativity (Neuringer, 2004).

Despite the advantages of behaving variably, some individuals struggle to do so. Some clinical populations, such as individuals diagnosed with ASD, tend to engage in overly repetitive behavior. Excessive stereotypy (i.e., a pervasive pattern of repetitive movements and restricted interests) is even included in the diagnostic criteria for ASD (DSM-V-TR; American Psychiatric Association, 2022). A high frequency of repetitive behavior in individuals with ASD persists even when it would be more beneficial to behave variably. Because of this, being able to reinforce and teach variability can help those with ASD socially, developmentally, and cognitively (Rodriguez & Thompson, 2015; Wolfe et al., 2014). After an individual with ASD learns to behave variably, the adaptation may even become a preferable option as opposed to repetition (Galizio et al., 2020).

Reinforcing behavioral variability is not a new endeavor. Levels of behavioral variability can successfully be controlled and increased using reinforcement techniques (Neuringer & Jensen, 2010). It was even found that reinforcement does not always lead to a loss of variation in responses, as one might expect when rewarding an individual for responding a certain way (Page & Neuringer, 1985). This finding is significant, as behavioral reinforcement is typically characterized by the reinforced behavior increasing, which seems counterintuitive to success when encouraging variability. However, it is well established that behavioral variability can be increased and maintained through reinforcement (Neuringer, 2004). This finding has been shown repeatedly in a variety of subjects, including rats (e.g., Neuringer, 1991; Galizio & Odum, 2022; Wagner & Neuringer, 2006), pigeons (e.g., Page & Neuringer, 1985; Doughty et al., 2013; Galizio et al., 2018; Doughty & Galizio, 2015), college students (e.g., Galizio et al., 2020; Ross &

Neuringer, 2002; Hansson & Neuringer, 2018), and more (e.g., Schusterman & Reichmuth, 2007; Arnold & Newland, 2018; Pryor et al., 1969).

The reinforcement of variable behavior has previously been applied to the ASD community (e.g., Miller & Neuringer, 2013; Brodhead et al., 2015; Silbaugh et al., 2020). It has been noted that teaching variable behavior is most successful when variability is encouraged, as opposed to simply discouraging repetitive behavior (Rodriguez & Thompson, 2015). The encouragement of variability is important to consider when phrasing sentences and prompts while reinforcing an individual. For example, when reinforcing variable play behavior, saying “what if we drive the red car up the ramp this time?,” instead of “stop driving the pickup truck on the racetrack!,” would be much more conducive for the individual to learn a new behavior. Techniques for reinforcing behavioral variability in individuals with ASD were examined by Wolfe et al. (2014), who found that prompting and reinforcing different behaviors is an important aspect of teaching variable behavior. One common procedure is a lag schedule of reinforcement, in which a behavior will only be reinforced if it is different than a certain number of previous behaviors (Galizio et al., 2020). For example, in a lag 1 schedule, a behavior is followed by reinforcement if it differs from the immediately previous behavior, whereas in a lag 2 schedule, the behavior must be different from the previous two behaviors.

It should be noted that behaving variably is not always the most beneficial option for an individual. In some circumstances, such as creating art or when searching for something, variable behavior is favored; however, there are also situations where this is not the case. When going in for a major surgery, the surgeon behaving variably is not preferred when compared to the repetition and practice it took to learn how to operate.

Additionally, individuals with ASD sometimes engage in “stimming,” a term commonly used in the ASD community to describe a “self-stimulating” behavior (WebMD Editorial Contributors, 2021). Stimming usually consists of repetitive motions that help with emotional regulation. Stimming can be observed in those with or without ASD; however, it tends to be more pronounced in autistic individuals. According to Kapp et al. (2021), adults with ASD have expressed that stimming is an adaptive mechanism for them, “and thus [they] objected to treatment that aims to eliminate the behaviour” (p. 1782). Given that repetitive behavior is acceptable under certain circumstances, the ultimate goal in teaching variability should not be to take away something that helps an individual, but rather to teach and provide other options that are beneficial in other situations. Specifically, individuals should learn in which situations variability or repetition would be more effective.

This idea is supported by research showing that individuals can learn when to vary and when to repeat. In other words, behavioral variability can be controlled by signals in the environment, or discriminative stimuli (Denney & Neuringer, 1998). Discriminative stimuli increase the likelihood for a behavior to occur, as the behavior has been reinforced in the presence of that stimulus in the past. The use of discriminative stimuli is a particularly useful strategy when reinforcing more than one behavior. If a certain stimulus is present each time a certain behavior is reinforced, and that stimulus is different for each behavior, then that stimulus will eventually be associated with that behavior. For example, in the presence of one discriminative stimulus (e.g., specific context, colors, instructions, or other environmental signals), variability may be reinforced, whereas in the presence of another discriminative stimulus, repetition may be

reinforced. In these situations, the individual will learn to behave variably or repetitively, depending on which stimulus is present.

In a recent study, Galizio et al. (2020) examined the reinforcement of variable play in preschoolers with ASD using a lag 1 schedule of reinforcement. It was found that children with ASD could learn to play variably and repetitively in different contexts (i.e., in the presence of different discriminative stimuli). After the participants learned when to play variably and repetitively, they were offered a choice between the two discriminative stimuli, which were different colors. It was hypothesized that individuals with ASD would show a preference for repetitive play over variable play, which would be consistent with the diagnostic criteria for ASD. However, after the participants had learned to play variably, some children actually demonstrated a preference for the context associated with variable play. This result indicates that, at least for some individuals with ASD, they may engage in overly repetitive behavior not because they prefer repetition, but because they have not been adequately taught to behave variably. However, this finding was only observed in two out of three participants with ASD (Galizio et al., 2020). One additional limitation of the study by Galizio et al. (2020) is that different playsets were assigned to the variability and repetition conditions, a procedural detail that was included to aid in discrimination. However, even though the two playsets were determined to be similarly preferred in a preference assessment at the start of the experiment, it is possible that there may have been a bias towards one playset that was responsible for the apparent preference for variability by the time choice was assessed. Therefore, more research is needed to verify and explore these results further.

Thesis Statement

The purpose of the present study was to replicate and extend previous research (Galizio et al., 2020) by assessing preference for variable or repetitive play behavior in children with ASD compared with neurotypical children. Three research questions accompanied this study. First, can variability in play behavior be increased when reinforced with a lag schedule? Based on previous studies, it was hypothesized that an increase in varied play behavior would be observed when reinforced. The second question addressed whether or not discriminative stimuli would come to control repetitive versus variable play. It was hypothesized that children would learn to play variably or repetitively in different contexts, by using discriminative stimuli (i.e., colors), which would be consistent with the available literature. To address a limitation from the Galizio et al. (2020) study, the procedure involved using the same playset for both choice conditions, such that the only discriminative stimuli were colors. The final and primary research question was: Will individuals show a preference for variable or repetitive play, and does that preference differ for individuals with ASD compared with neurotypical individuals? It was hypothesized that a preference for either variable or repetitive play would be observed, but it was unknown whether individuals with ASD and neurotypical individuals would have different preferences.

In testing these hypotheses, two independent and two dependent variables were included in the study. The first independent variable distinguished the ASD and neurotypical groups with the presence or absence of ASD symptoms (a between-subjects comparison). The second independent variable was the reinforcement provided for variable versus repetitive play across contexts (a within-subject comparison). The two

primary dependent variables were (1) the levels of behavioral variability across contexts, and (2) the number of choices made for the variable and repetitive play actions.

CHAPTER II

Methodology

Experimental Design

To address the above questions, a study was conducted using a single-case experimental design (SCED), combined with elements of a group design. In a SCED, each subject is exposed to every experimental condition with proper controls and the results are compared within-subject (Kazdin, 2020). Using this approach, a functional, or causal, relationship can be determined within a single subject. For that reason, although group designs typically require a large sample size, smaller sample sizes (e.g., 3-5 subjects) are standard in SCED research. In the present study, each subject received reinforcement for playing variably and repetitively in different contexts. Levels of behavioral variability were compared across contexts within a single individual, consistent with SCED methodology, to show that participants learned to vary or repeat in accordance with the reinforcement contingencies. Data collection is still ongoing for several participants; however, between-subjects comparisons will also be made regarding preference displayed by children with ASD and neurotypical children, utilizing elements of a group design approach. All procedures were approved by the Middle Tennessee State University (MTSU) Institutional Review Board (IRB; see Appendix A).

Participants

The participants in this study included two children in the ASD group, both age three, and two neurotypically developing children, both age five (see Table 1). The children were recruited for the study from Child Development Services (CDS) of

Murfreesboro, a local daycare dedicated to serving the ASD community (see Appendix B). The student investigator and faculty advisor met with parents or guardians to discuss the study (see Appendix C) and complete an informed consent form (see Appendix D). The current sample size of 4 is sufficient to address the first two research questions (i.e., whether variability and repetition can be reinforced in different contexts), which are within-subjects comparisons. However, additional participants will be needed to address the final research question, whether preference for variability differs across participants. To adequately make this between-subjects comparison, the goal is to continue recruiting up to 10 participants in each group, ASD and neurotypical.

Table 1: Participant Information

Participant (Pseudonym)	Gender	Age	M-CHAT-R₁	Group (NT₂ or ASD)
Sally	Female	5	1/20	NT
Will	Male	5	2/20	NT
Liam	Male	3	12/20	ASD
Art	Male	3	12/20	ASD

1. Modified Checklist for Autism in Toddlers, Revised (M-CHAT-R) 2. Neurotypical (NT)

Next, eligibility for the experiment was determined. All parents were given a questionnaire from Autism Speaks, the Modified Checklist for Autism in Toddlers, Revised (M-CHAT-R; Robins et al., 2009; see Appendix E) to ensure that the child was eligible for the study and that they were placed in the correct participant group. Children with scores at or below 2/20 on the M-CHAT-R (low risk for ASD symptoms) were

eligible to participate and assigned to the neurotypical (NT) group. Children who scored above an 8/20 on the M-CHAT-R (high risk for ASD symptoms) were included in the ASD group. If children scored between three and seven (moderate risk for ASD symptoms), information was requested about any existing diagnoses from the parents or guardians. Participants with a documented diagnosis of ASD were included in the ASD group; those without a documented diagnosis were not included in the study.

Throughout the study, verbal assent was obtained from the children (see Appendix F). Especially in the case of the participants with ASD, body language and behavior were monitored to determine whether or not they were willing to proceed with the experiment. If severe challenging behavior (e.g., aggression, self-injurious behavior, etc.) was encountered immediately before or during a session, the session was not continued, and the participant returned to the care of a well-trained CDS staff member that is familiar with the needs of the child. Participants were allowed to withdraw from the study at any time without any repercussions.

Setting and Materials

Sessions were held at CDS in an isolated play area. The participant and an investigator were seated at a table with a playset, and the sessions were video recorded. Data were collected from these videos based on play actions throughout the sessions.

The materials used included five playsets with corresponding figurines (see Figures 1-5), color-coded cards, colored bracelets, colored placemats, colored t-shirts, a timer, and edible reinforcers. The playset and colors assigned to each participant (see Table 2) were determined after a preference assessment was conducted (see Procedures).

The color-coded cards and bracelets are used as discriminative stimuli, with a designated color associated with either the repetitive play or variable play condition. The participant directly interacted with the color-coded items before each session to ensure that they were truly exposed to the stimulus.



Figure 1: Farm Playset

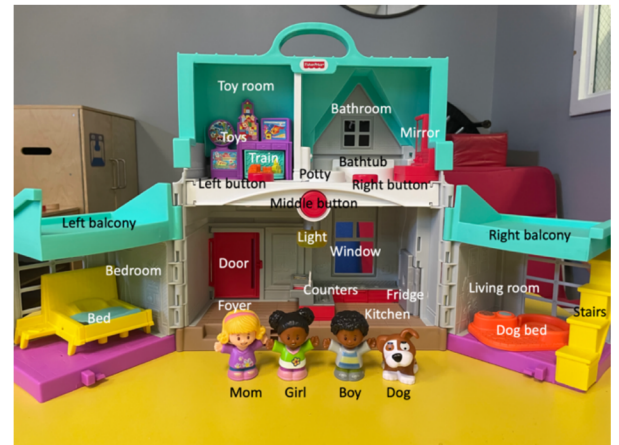


Figure 2: House Playset



Figure 3a: Ice Castle Playset (front)



Figure 3b: Ice Castle Playset (back)



Figure 4a: School Playset (front)

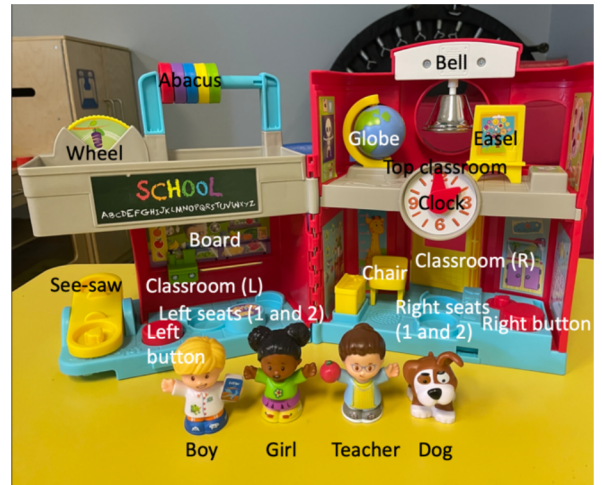


Figure 4b: School Playset (back)



Figure 5: Pirate Ship Playset

Participant (Pseudonym)	Assigned Playset	Baseline Color	Vary Condition Color	Repeat Condition Color
Sally	Pirate Ship	Red	Blue	Orange
Will	School	Blue	Orange	Red
Liam	School	Blue	Red	Orange
Art	Ice Castle	Red	Blue	Orange

Table 2: Participant Playsets and Color Assignments

Procedures

General Procedures

The total timeline for one participant was as follows: one day to obtain consent, one day for the parents to take and return the M-CHAT-R, one day for the preference assessment of playset, three to five days of baseline sessions, ten to twenty days of discrimination training sessions, and around five to ten days of choice sessions. Each session lasted 5 min. In total this would be between seventy to one hundred sessions per participant, depending on how long it took for each child to reach stability. This is approximately 12 to 16 hours of participation over the course of several months, as sessions were not held every day. These sessions were conducted weekdays between 7:30 am and 12 pm, when the children were at the facility. There were other undergraduate students trained to help conduct sessions, video record sessions, and collect data from the videos.

Preference Assessments

Before beginning sessions, a paired stimulus preference assessment was completed to determine which playset the participants used during the discrimination training sessions. Specifically, a series of trials were conducted in which two playsets were placed side-by-side on a table. The participant was instructed to “pick one” and had brief access (30-60 s) to the selected playset. Each potential playset was presented with every other playset twice, counterbalancing the locations on the table. The playsets were then rank ordered based on how often they were selected (see Appendix G). The final experimental playset was not the child’s first choice, but rather their second or third choice, in order to reduce bias during play. Importantly, only one playset was used for all training conditions, which addresses the potential limitation of assigning different playsets to different conditions which was present in prior research (Galizio et al., 2020).

Additionally, a preference assessment was conducted to determine which colors (red, orange, or blue) should be used as the discriminative stimuli for the repeat and vary conditions, and a practice color for baseline. A series of trials were conducted in which the researcher presented the participant with the colored bracelets used in the study and instructed them to “pick one.” Once selected, the participant was allowed to wear the bracelet for a short period of time. Each potential color was presented with every other color four times, counterbalancing the sides on which each one was presented. The colors were then rank ordered based on how often they were selected (see Appendix H). The two colors with the most similar preference were randomly assigned to either the vary or repeat condition, in order to reduce bias during choice. The third color was assigned to baseline.

Session Procedures

All sessions conducted in the study were five minutes long with at least a five-minute break in between (see Appendix I). No more than six sessions were run with the same participant in one day. At the beginning of each baseline and discrimination training session, the participant pulled a color-coded card that was attached to the wall and matched it to the same color bracelet laying on a table. The participant then put the bracelet on and was ready to begin running sessions. For baseline and discrimination training sessions, the experimenters were already wearing the correlating color to the session and the same color placemat was already present under the playset. For choice sessions, after the selection was made, the experimenters put on the correct t-shirt and laid the same color placemat under the playset.

Baseline

Baseline assessments were then conducted. These were five-minute sessions with a five-minute break in between each one. The pre-determined playset was used for these, and the card and bracelet used during baseline did not correlate with either of the colors used for the experimental condition. Additionally, the experimenters wore shirts that correlated with the assigned color. The purpose of these baseline sessions was to expose participants to the playset and determine the participant's level of play variability without the influence of the experimenter. The experimenter did not interact with the participant or the playset in any way during these sessions, and no reinforcement was delivered. A minimum of three baseline sessions was conducted. After that, baseline sessions were conducted until the participant's performance met stability criteria. Specifically, the

proportion of responses meeting a lag 1 schedule (see Data Collection for definitions) had to be similar (i.e., within a 0.25 range) across the last five sessions. Additionally, there had to be no visible trend in the proportion of responses meeting the lag schedule (i.e., no more than three consecutive data points within the last five sessions strictly increasing or decreasing). At the time of this paper, three participants have completed baseline, and one participant (Art) is still in baseline.

Generalization Probes

Generalization probes were then conducted with the participants, which included one session with each of the other playsets that were not the child's assigned playset for discrimination training. The card and bracelet used for these sessions correlated with the baseline colors, and the experimenters wore shirts that matched the assigned color. These were five-minute sessions with at least a five-minute break in between. During these sessions, exactly like baseline, the experimenter did not interact with the participant or the playset in any way, and no reinforcement was delivered.

The initial generalization probes act as a baseline, to see how the child played with the other playsets at the start of the study. At the very end of the study, these sessions with the other playsets will be held again to assess how well the skills learned during discrimination training are translated to other contexts, specifically the other playsets.

Discrimination Training

After baseline assessments and generalization probes were completed, discrimination training began. Similar to baseline, a single card was presented to the child prior to the session, either the vary color or the repeat color. The card color was determined by the condition of the session, which was randomly alternated excluding the situation where the same session occurs more than twice in a row. Additionally, the experimenters wore shirts that correlated with the assigned color for each session. However, whereas during baseline only a single bracelet was available for matching, both the vary color and repeat color bracelets were presented during discrimination training. Participants were required to match the card to the corresponding bracelet to ensure that the color was observed. During each session, the condition determined whether repetitive or variable play was reinforced. Either variable or repetitive play actions (see below) were followed by praise and an edible reinforcer picked prior to the session from available snacks at the facility.

For the vary condition, a reinforcer (praise and small edible) was delivered for the first appropriate play action, defined as the child selecting a figurine, bringing it to a location on the playset, and moving the figurine at the location. Subsequent play actions were only reinforced if the child engaged in play behavior that was different from the immediately previous action in at least two ways [figurine, movement, and/or location], with the stipulation that no dimension [figurine, movement, and/or location] had occurred in three or more consecutive immediately previous actions (i.e., actions that met a lag 1 schedule of reinforcement). For the repeat condition, a reinforcer was delivered for the

first play action and for any subsequent play actions that were the same as the first play action of the session in all three ways.

In both conditions if more than 20 seconds passed without an appropriate action meeting these requirements, the investigator would physically prompt the participant to make an action that would result in reinforcement. Prompting ranged from a light touch on the arm to hand-over-hand physical prompting. Prompted actions meeting the vary or repeat requirements were reinforced.

Sessions were conducted until the following stability criteria were met: (1) a minimum of five sessions was conducted in each condition, (2) at least 75% of responses were made independently (i.e., unprompted) across the last five sessions in each condition, (3) the proportion of responses meeting the lag 1 schedule was similar (i.e., within a 0.25 range) across the last five sessions in each condition, and (4) there was no visible trend in the proportion of independent responses meeting the lag schedule (i.e., no more than three data points of the last five sessions strictly increasing or decreasing in either condition). At the time of this paper, one participant (Sally) has completed this condition,* and two participants (Liam and Will) are currently completing discrimination training sessions.

Choice

Following discrimination training, choice sessions were conducted to determine whether there is a preference for variable or repetitive play. The participant was presented with the two colored cards, each associated with either variable or repetitive play, and the

* Sally was the initial pilot participant, and the appropriate stability criteria had not yet been determined. Therefore, these criteria did not apply for her data.

experimenter instructed the participant to “pick one.” The child chose between the two condition options, and based on that choice, the corresponding behavior was reinforced. Immediately after selection, the participant matched and put on the appropriate bracelet, and experimenters set up the corresponding placemat and put on the colored t-shirts. Up to thirty choice sessions will be conducted to ensure an accurate representation of the child’s preferences, or until a clear preference is observed. At the time of this paper, one participant (Sally) is currently completing choice sessions.

Because Sally was the first participant, up to six choice sessions per day were initially conducted, similar to previous conditions. However, Sally’s selections roughly alternated between the conditions, leading to the question of whether her selections were truly reflective of her preferences. After 20 sessions, the procedure was modified so that only one choice session would be conducted per day. The purpose of the modification was to make each selection more impactful, as there was only one play opportunity each day. A statement similar to “We can only play once today, so choose carefully” was also included prior to the choice. This procedure is intended to be used with all other participants as they reach the choice phase.

Data Collection

All sessions were video recorded. An experimenter viewed these videos and collected data by recording all play actions completed in that session, whether each play action was independent or prompted, whether each play action was followed by a reinforcer, whether each play action met the lag schedule (i.e., different than the previous play action in at least two ways [figurine, movement, and/or location], with the

stipulation that no dimension [figurine, movement, and/or location] had occurred in three or more consecutive immediately previous actions), and whether each independent play action was novel (i.e., had not yet occurred) so far during the session (see Appendix J). For publication of the study, to ensure the reliability of data collection, at least 33% of videos will be scored by two or more experimenters independently. Inter-observer agreement will be calculated by dividing the number of agreements in data collection by the total number of play actions. If inter-observer agreement is ever below 80%, the experimenters will be retrained in data collection procedures and more observers will collect data for that session. Additionally, to ensure the fidelity of the experimenter behavior in sessions, treatment integrity data will be calculated for at least 33% of sessions. Specifically, the data collector will record whether the experimenter delivered a reinforcer and whether that was the correct response for the current condition (see Appendix K). If treatment integrity is ever below 90%, the experimenter will be retrained before they are permitted to conduct additional sessions.

CHAPTER III

Results

Response and Reinforcer Rates

Figure 6 shows response and reinforcer rates across sessions for Sally, Will, Liam, and Art. Response rates were calculated as the total number of independent and prompted play actions divided by the total amount of time per session (five min, unless a session was terminated early). During baseline and generalization probes, response rates were highly variable across participants. Sally reliably responded rapidly, with up to six play actions per min. Response rates for Will and Art were more variable, ranging from zero to seven play actions per min. Liam's response rates were low initially, only occasionally emitting any play actions during baseline and generalization probes. Response rates for all participants were similar or higher during discrimination training. No systematic differences have been observed between the vary and repeat conditions so far for Will or Liam. However, Sally showed a tendency to respond more rapidly during repeat conditions.

Also shown in Figure 6, reinforcer rates were calculated as the total number of reinforcers delivered in a session divided by the total session time. During baseline and generalization probes, reinforcers were not delivered. So far in discrimination training, reinforcer rates for Will and Liam have not yet been clearly differentiated across sessions. However, Sally typically earned more reinforcers per min in repeat sessions than vary sessions, especially during the choice phase.

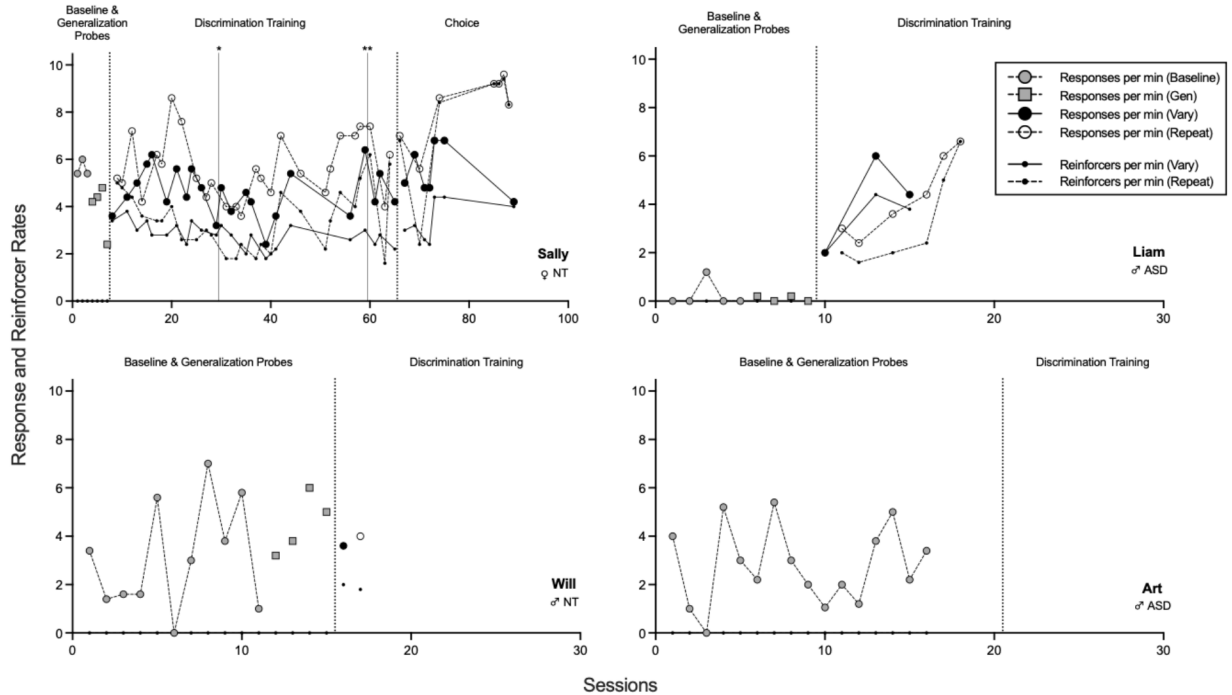


Figure 6: Response and Reinforcer Rates

Note: As shown in the legend, differently shaped and colored data points represent different types of sessions. Grey, black, and white data points show baseline and generalization probe sessions, vary sessions, and repeat sessions, respectively. Finally, square data points show responses per minute and smaller data points show reinforcers per minute.

Proportion Independent

Figure 7 shows the proportion of appropriate play actions that were emitted independently (i.e., unprompted), which was calculated by dividing the number of independent actions by the total number of actions. During baseline and generalization probes, prompts were not delivered, so the proportion independent responses was always one (or zero if no actions were emitted). During discrimination training, proportion of independent responses was initially low, but increased over time with exposure to the contingencies. For Sally, almost all responses were completed independently by the end of discrimination training and during the choice phase.

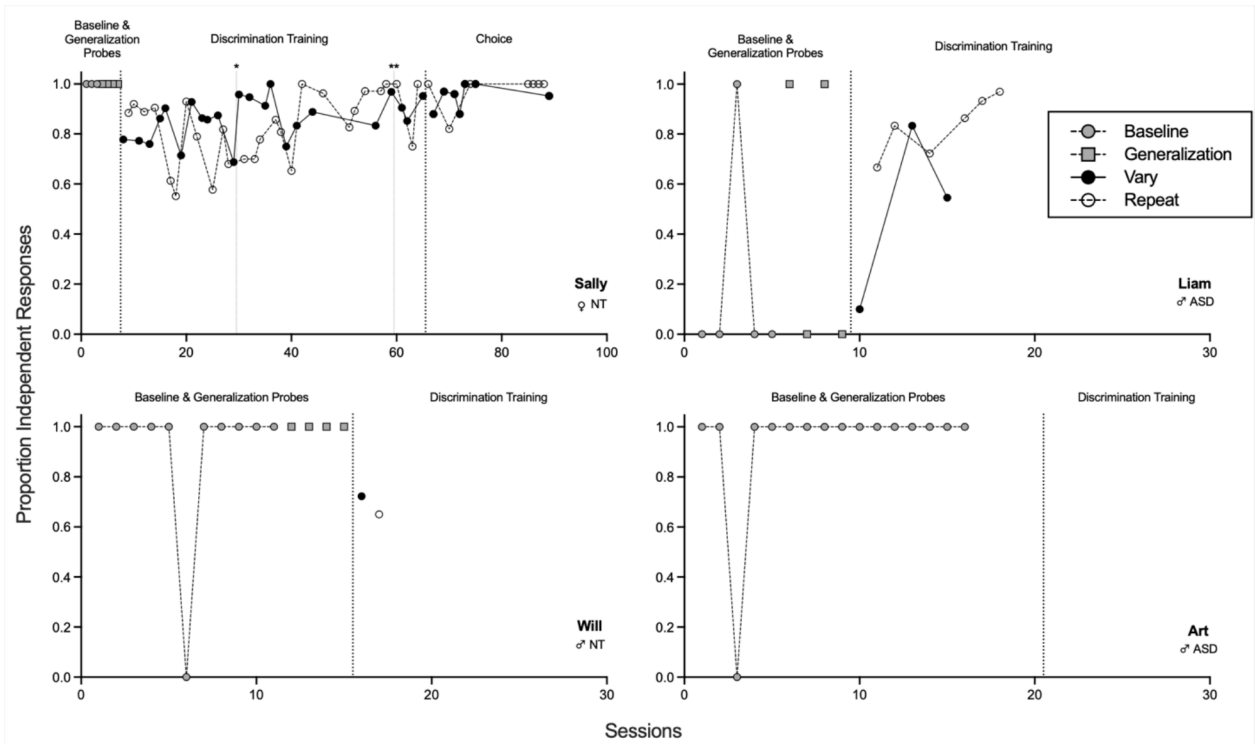


Figure 7: Proportion Independent Responses

Note: As shown in the legend, differently shaped and colored data points represent different types of sessions. Grey, black, and white data points show baseline and generalization probe sessions, vary sessions, and repeat sessions, respectively.

Proportion Meeting Lag

Figure 8 shows the proportion of independent play actions that met the lag 1 schedule, which is indicative of overall levels of play variability. This measure was calculated by dividing the total number of independent actions meeting the lag schedule (i.e., different than the previous play action in at least two ways [figurine, movement, and/or location], with the stipulation that no dimension [figurine, movement, and/or location] had occurred in three or more consecutive immediately previous actions) by the total number of independent play actions, excluding the first play action of the session (which could not be compared to a previous response). Higher values indicate more

variable responding, and lower values indicate more repetitive responding. During baseline and generalization probes, levels of play variability were highly variable. However, with exposure to discrimination training, levels of variability increased during vary sessions and decreased during repeat sessions, as expected. This difference became more pronounced across sessions, which is especially evident for Sally, who has had the most experience.

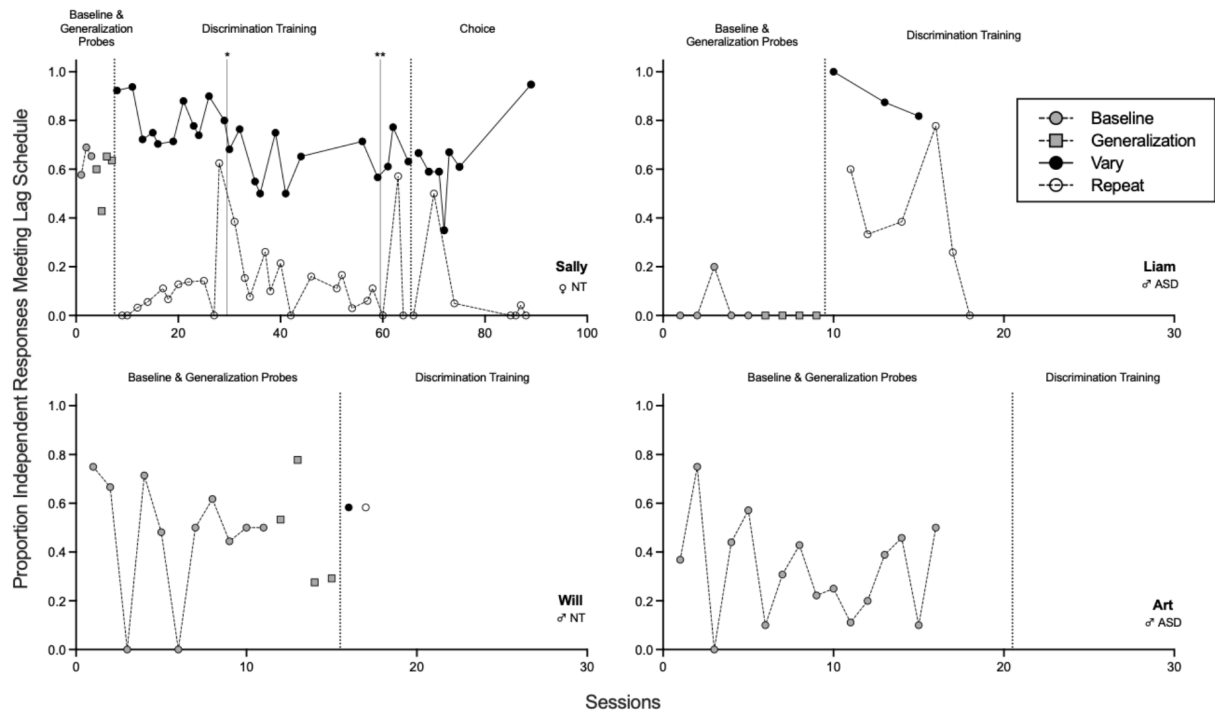


Figure 8: Proportion of Independent Responses Meeting the Lag 1 Schedule

Note: As shown in the legend, differently shaped and colored data points represent different types of sessions. Grey, black, and white data points show baseline and generalization probe sessions, vary sessions, and repeat sessions, respectively.

Novel Responses

Figure 9 shows another measure of play variability, the total number of novel play actions emitted per session. More distinct play actions in a session would be indicative of higher levels of variability. Similar to proportion of independent responses meeting the lag, participants generally responded more variably in the vary condition and more repetitively in the repeat condition, although the difference is less pronounced earlier in training.

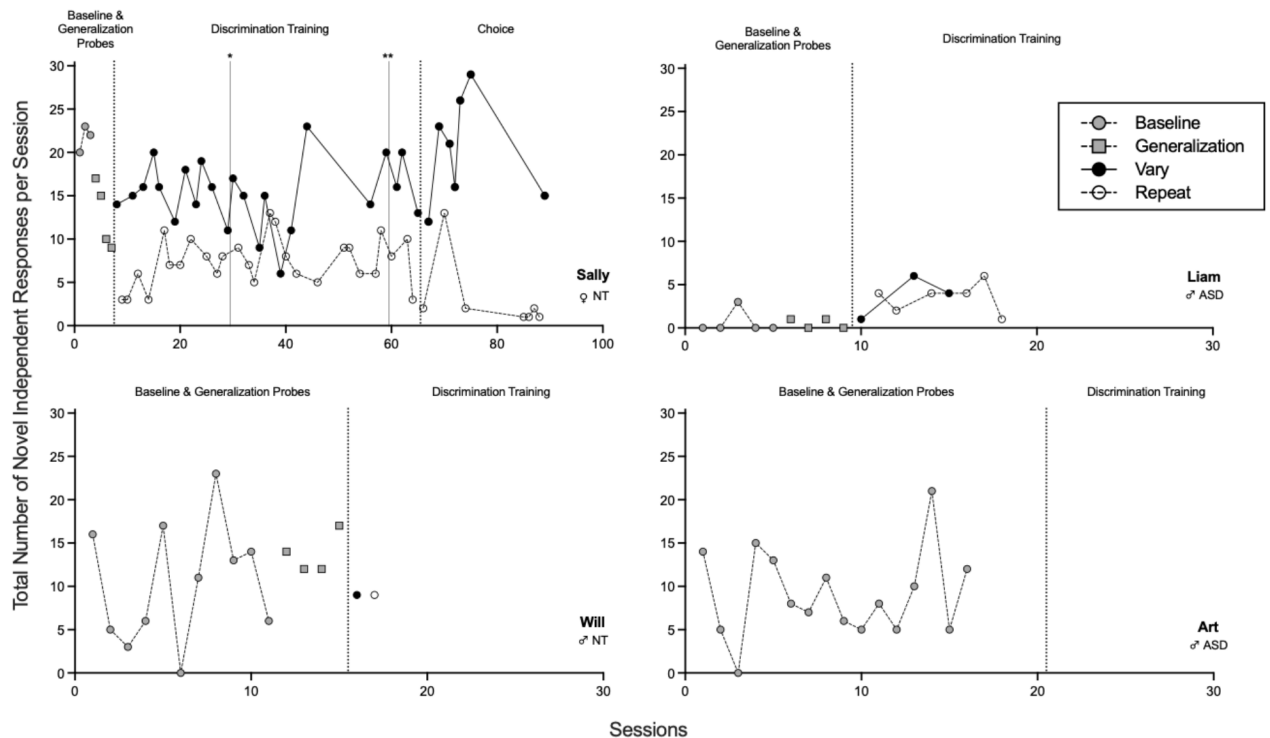


Figure 9: Total Number of Novel Independent Responses per Session

Note: As shown in the legend, differently shaped and colored data points represent different types of sessions. Grey, black, and white data points show baseline and generalization probe sessions, vary sessions, and repeat sessions, respectively.

Choice

Finally, Figure 10 shows choice for the vary or repeat conditions across sessions in the choice phase. So far, only Sally has completed choice sessions. Her responses indicate a slight preference for the repeat condition, having selected 14 repeat sessions and 10 vary sessions total. Of the sessions that were conducted after switching to holding one choice session per day, three of the four days Sally chose the repeat condition.

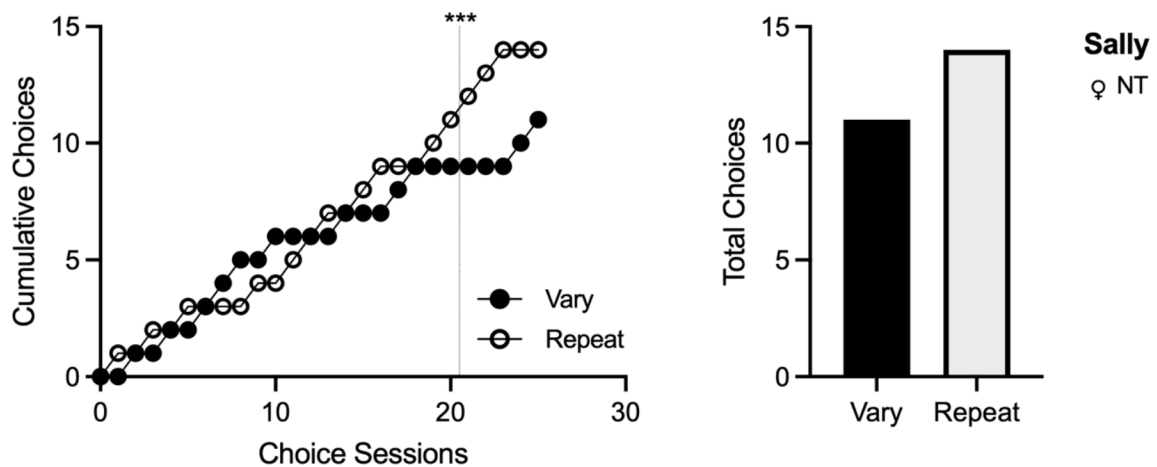


Figure 10: Cumulative and Total Choices for Vary and Repeat Sessions

Note: As shown in the legend, black and white data points show vary and repeat sessions, respectively.

CHAPTER IV

Discussion

The purpose of this study was to replicate previous research (Galizio et al., 2020) in assessing preference for variable or repetitive play behavior in children with ASD, and to extend upon it by adding a neurotypical control group. Three main research questions were asked, with the first involving whether variability in play behavior can be increased when reinforced with a lag schedule. Second, can discriminative stimuli control repetitive versus variable play? Lastly, the final and primary research question addresses whether or not individuals show a preference for variable or repetitive play, and if that preference differs for individuals with ASD compared to neurotypical individuals.

The first question, whether variable play behavior can be increased when reinforced with a lag schedule, is supported by Sally's data. Once discrimination training was started, Sally's proportion of variable responses increased from where she was during baseline and generalization probes (see Figure 8). Unfortunately, enough data have not yet been collected with the other participants that are in discrimination training to be able to observe the effect in Will or Liam's data. These findings are consistent with what has been observed in previous studies. Page and Neuringer (1985) demonstrated that reinforcement is effective at controlling levels of behavioral variability in pigeons, and later on in college students (Hansson & Neuringer, 2018). Additionally, in a recent study Galizio et al. (2020) used a lag 1 schedule of reinforcement to increase levels of variable play behavior in preschoolers with ASD, and the results thus far support this finding.

The second question, whether discriminative stimuli control repetitive versus variable play, is also supported by what is seen in Sally's data. As seen in Figure 8, a vast difference in proportion of responses that meet the lag schedule can be observed between the repeat and vary conditions during her discrimination training. This is exactly what is expected, as the repeat condition should result in responses that do not meet the lag schedule and the vary condition should result in responses that do. The difference in responses creates a divergence in the data that can be observed in Sally's graph, supporting the idea that discriminative stimuli can control repetitive versus variable play. Once again, Will and Liam have not completed enough discrimination training sessions to be able to see this difference in their data.

Galizio et al. (2020) found that preschoolers were able to learn to play variably or repetitively in the presence of different discriminative stimuli (i.e., the color of the card correlating to type of session). However, there was one major difference in the stimulus conditions between that previous study and the current experiment, which may have made discrimination more challenging for participants in the current study. Galizio et al. used two different similarly preferred playsets, one assigned to each condition, which may have made the conditions more distinct. In the present study, only one playset was used across both conditions to reduce any possible bias during choice sessions. However, with more similar stimulus conditions, it may be observed that discrimination training requires more exposure, especially for the participants with ASD. As data collection continues, this concern may need to be addressed. However, if it can be demonstrated that variable behavior can be reliably controlled by signals in the environment, or

discriminative stimuli in the form of colors alone, it will be consistent with foundational literature (e.g., Denney & Neuringer, 1998).

The final and primary question, whether individuals will show a preference for variable or repetitive play, and whether that preference differs for individuals diagnosed with ASD compared with neurotypical individuals, does not have a conclusive answer yet. One neurotypical participant, Sally, is the only child that has been able to conduct choice sessions thus far. Her data indicate a slight preference for the repetitive condition, as she has chosen a repeat session 14 times and a vary session 10 times throughout the choice sessions. Since changing the procedure to include only one choice session per day, she has chosen three repeat sessions and one vary session, which are included in the previously mentioned totals. Without choice session data from the ASD group, the second part of this question involving the difference in preference between groups, cannot be answered. In a study involving three preschoolers with ASD, Galizio et al. (2020) observed that two of them preferred variable play. If a preference for either type of play can be demonstrated, that finding will be even more confident, because the current study involves only one playset, instead of two playsets assigned to different conditions.

Some interesting observations were made throughout the course of the experiment. Sally readily learned to play variably, but surprisingly, initially behaved moderately variably in the repeat condition as well. Anecdotally, Sally found two ways to be earn reinforcement during the repeat sessions while still playing variably in some way. One method was to use different routes to get to the repetitive action and reinforcer, and the second was to play variably and complete the repetitive action every twenty seconds

only when prompted. Across sessions, Sally's discrimination improved, and she began to behave more variably and repetitively in the corresponding conditions. However, due to the winter holiday break, no sessions were conducted for about a month. Upon returning from break Sally was not discriminating as strongly as before, although performance did recover over time.

As for the ASD group, Liam demonstrated very few play actions at all, and even fewer that met the lag schedule, during baseline and generalization probe sessions. However, once the edible reinforcer was added during discrimination training, he seemed highly motivated to receive it and quickly began playing appropriately. Clear discrimination has not yet been seen between the two conditions, but the increased overall play behavior has been interesting to observe.

Two other possible factors that may contribute to differences between the neurotypical and ASD group are age and gender; both neurotypical participants are five years old, one male and one female, while both ASD participants are three years old and male. For children this young, an age gap of two years can be significant in terms of development, and gender differences are also a possibility. As the study proceeds, additional subjects will be included in each group, and participants of varying ages and genders will be intentionally recruited to balance the groups in these respects.

There were several limitations of the current study, including time constraints, establishment of procedures, holiday break, and other complications that come with using children as participants. So far in this project, there has only been time to complete data collection for one neurotypical participant, Sally. However, discrimination training has been started with the other neurotypical participant, William, and one of the participants

in the ASD group, Liam. The other participant in the ASD group, Art, is currently still in baseline and has not yet met the stability criteria. Most of the time spent collecting data was spent with Sally. Because Sally was the first participant for the study, an adjustment period was needed to narrow down the procedures to fit the accommodations of the facility, Child Development Services, the playsets, and play definitions. Many of the initial sessions with Sally helped to develop definitions and identify common play actions on the pirate ship playset that could translate to other participants and playsets. Additionally, as the participants are children in a daycare setting, there were delays caused by holiday break, illness, snow days, and other scheduled and unscheduled absences. This is a typical concern in any longitudinal research involving children, and the schedule was able to be adjusted to accommodate these changes. However, data collection will need to be continued in the future to complete the study.

Future plans for this study and the procedures that were finalized throughout the project are to continue and complete data collection with current participants, and to add additional subjects from CDS as available to increase the sample size for both groups. Data collection will continue throughout 2023 and early 2024, and the entire project should be finalized by summer 2024. This timeline is more than sufficient to complete the study and allows for room for unexpected complications and revisions. When sufficient data are collected from both groups, the results will be prepared and submitted for conference presentations and ultimately a peer-reviewed publication. The author of this thesis will continue to play an integral role in every aspect of this project, from start to finish.

CHAPTER V

Conclusion

The ability to behave variably is adaptive and readily learned for many people, but those with ASD tend to engage in repetitive behavior and may have difficulty learning variable behaviors. Teaching variable behavior can help children with ASD socially, developmentally, and cognitively. In previous research, it has been established that behavioral variability can be taught through reinforcement; however this has not been compared between children with and without ASD. The purpose of the current experiment was to replicate and extend a previous study (Galizio et al., 2020) by reinforcing variable and repetitive play behavior, then offering a choice between the two conditions. Research questions addressed in this study included (1) whether children can be taught to play variably, and (2) if children can learn to play variably or repetitively in different contexts. These questions were assessed in preschoolers with and without ASD.

Preliminary data from several participants support these questions and replicate prior research. The results show that variable play behavior can be reinforced in children, opening up new doors for them in terms of behavioral and creative decisions. This finding is significant for the participants with ASD, as they tend to behave more repetitively than neurotypical individuals and having the ability to teach behavioral variability broadens their decision-making capabilities. For preschoolers and young children, such as the participants in this study, play is an age-appropriate and fun way to teach skills that can be applied to many different settings throughout the rest of their development and lives.

Additionally, it was shown that children can learn when to behave variably and when to behave repetitively, which is an evolutionarily advantageous skill as neither option will be favorable all of the time. These findings support what has been observed in other studies, and confidently demonstrate the effects of colors as discriminative stimuli to control levels of certain behaviors in different contexts. The observation that children can readily play differently in diverse contexts, and switch between the two types of play demonstrates an understanding that the same behavior will not always earn praise in different scenarios. This is important as in daily life there are different expectations in different social settings, and for kids this is also true. The type of play that is acceptable on the playground is not always the same type of play that can take place in the classroom, and being able to discriminate can make a major social difference for a child.

As the study continues, the plan is to further explore participants' preferences for either repetitive or variable play. This final evaluation of play is important, as it gives the children the opportunity to choose the type of session they complete and how they will earn reinforcement. In particular, the researchers are curious as to which style of play the ASD group will prefer after discrimination training sessions. It is well known that those with ASD tend to behave more repetitively, but by addressing this question it can be determined if the variable play learned throughout the study is preferred to repetitive behaviors. Additionally, the preferences of the neurotypical group have already begun to be assessed and will continue to be collected. The comparison of preference for variable or repetitive play between children with and without ASD has not yet been conducted, making the final results of this study a novel addition to the field of behavioral psychology. In summary, in the continuation of the study, additional subjects will be

added and the final research question will be addressed: whether participants show a preference for variable or repetitive play behavior, and whether this preference differs between children with ASD and neurotypical controls.

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Appendix A. IRB Approval Letter



10/7/22

Investigator(s): Paula Collette
Investigator(s) Email: prc2v@mtmail.mtsu.edu

Protocol Title: An Investigation of Variability in Play Behavior in Children with Autism Spectrum Disorder and Neurotypical Controls
Protocol Number: 23-2020

Dear Investigator(s),

The MTSU Institutional Review Board or its representative has reviewed the research proposal identified above and has determined that the study poses minimal risk to participants or that you have satisfactorily worked to minimize risks, and you have satisfactorily addressed all of the points brought up during the review.

Approval is granted for one (1) year from the date of this letter for 20 participants.

Please note that any unanticipated harms to participants or adverse events must be reported to the Office of Compliance. Any change to the protocol must be submitted to the IRB before implementing this change.

You will need to submit an end-of-project form to the Office of Compliance upon completion of your research. Complete research means that you have finished collecting data. **Should you not finish your research within the one (1) year period, you must submit a Progress Report and request a continuation prior to the expiration date.** Please allow time for review and requested revisions. Failure to submit a Progress Report and request for continuation will automatically result in cancellation of your research study. Therefore, you will not be able to use any data and/or collect any data. Your study expires **10/31/23**.

According to MTSU Policy, a researcher is defined as anyone who works with data or has contact with participants. Anyone meeting this definition needs to be listed on the protocol and needs to complete the required training. **If you add researchers to an approved project, please forward an updated list of researchers to the Office of Compliance before they begin to work on the project.**

All research materials must be retained by the PI or faculty advisor (if the PI is a student) for at least three (3) years after study completion and then destroyed in a manner that maintains confidentiality and anonymity.

Sincerely,

Aleka Blackwell and William Langston
Chairs, Institutional Review Board
Middle Tennessee State University

Appendix B. Permission Letter from Child Development Services



September 14, 2022

To Whom It May Concern:

This letter is to serve as permission for Paula Collette to conduct her research at our facility, Child Development Services of Murfreesboro located at 947 Park Ave, Murfreesboro, TN 37129. We have met with Paula and the faculty representatives and are aware of all activities Paula plans to conduct throughout her research. This letter is to also serve as notice that CDS of Murfreesboro will remain responsible for each participants' welfare during the time of research. We anticipate the research to be completed before the end of March 2023, however, we are willing and able to extend that timeframe if needed. We have no terms or conditions for the researchers or participants throughout the study.

Thank you,

Owen DiNicolangelo
Vice President, Director
Co-founder CDS of Murfreesboro

Appendix C. Recruitment Script

Recruitment Script for Initial Contact with Parents/Guardians

1. Child Development Services (CDS) administrators will identify potential participants.
2. CDS administrators will introduce the researchers to the parents/guardians of the potential participants.
3. Researchers will read the script below to at least one parent/guardian and ask if they are interested in having their child participate.
4. If yes, we will proceed with informed consent (see Appendix B of IRB Protocol for details).

“Thank you for your interest in our research study, which is entitled ‘An Investigation of Variability in Play Behavior in Children with Autism Spectrum Disorder and Neurotypical Controls’. In this study, we will be assessing preference for variable or repetitive play behavior in children with autism spectrum disorder (ASD), compared with neurotypical children. If you choose to let your child participate, we will teach them to play variably in one context and repetitively in another context. Then, we will offer your child the choice between the two teaching contexts, to assess their preference for variable or repetitive play. We will conduct several 5-minute sessions per day for several weeks while your child is already at the CDS.

“We are looking for several children diagnosed with or showing symptoms of ASD, as well as several children without that diagnosis. Your child will likely be a good fit for the study, but we will have you complete a questionnaire before we begin to make sure.

“In this study, your child will be playing with a playset, so they will be at minimal risk. We will never force your child to participate.

“There are several potential benefits of participating as well. If your child doesn’t already play variably, we will teach them to do so, which could be a valuable skill for them. Playing in different ways can enhance social interaction with peers and encourage creativity and problem solving. The study will also help us understand how children learn to play in general and what kinds of play they prefer, which will allow us to help more children in the future.

“Do you have any questions? Are you interested in learning more?”

If no: “No problem. Thank you for your time. If you change your mind and would like to discuss further, please notify a CDS administrator who will contact us.”

If yes: “Great! Here is an informed consent form for the study. I will describe each section of the form to make sure everything is clear. Then I’ll give you a moment to read it on your own and think about whether you’d like your child to participate. Participation is voluntary. You are under no obligation to sign, and there will be no negative consequences for your child if you do not allow them to participate. Remember, you can also withdraw your child from the study at any time. If you are ready, you can sign now! If you’d like more time to decide, feel free to bring this form home with you. If you decide to sign it, you can return the signed form to a CDS administrator, who will give the form to us.”

Appendix D. Parental Informed Consent Form

IRB

INSTITUTIONAL REVIEW BOARD

Office of Research Compliance,
010A Sam Ingram Building,
2269 Middle Tennessee Blvd
Murfreesboro, TN 37129



IRBF010a

RESEARCH WITH MINORS – PARENTAL PERMISSION

(Parental Consent form for Minors **UNDER 12 years**)

General Information

1. Use this form for requesting parental consent for enrolling their child who is under 12 years old.
2. Use the child assent form provided in the IRB forms page (IRBF010b/c).
3. This template is suitable for studies that qualify for exemption and those which are reviewed by the expedited or full review mechanisms.
4. Alterations and waiver of this template are strongly discouraged.
5. Use the same text when requesting online consent from the parents. However, child assent must not be administered online.

Instructions

1. This form contains two sections:
 - A. Parental Permission section – signed by the researcher and given to the parent
 - B. The signature section has to be signed by the parent:
 - i. The parent can sign the copy at home for all educational research studies unless specified by the IRB. The researcher must be available to answer questions requested by the parent.
 - ii. This section will be retained by the researcher
2. Barring the actual signatures, the text boxes in two sections must be properly completed before submitting for IRB approval.

Related IRB Forms:

Form ID	Description	IRB Comment
Appendix B	This form has to be completed to specifically describe the interventions when researching with minors	Mandatory when enrolling minors
IRBF010a	Parental consent for enrolling minors within the age 0 to 12 – Use either IRBF010b or IRBF010c as child assent	Must be obtained before administering child assent
IRBF010b	Child assent – for children less than 7 years	No signature is necessary
IRBF010c	Child Assent – for minors 7-12 years	Signature may be waived
IRBF0101d	Combined parental consent child assent forms for minors 12+ years	Mandatory signatures
IRBF010e	Parental Consent – for minors 12+ years	In most cases signature is required before enrolling the child
IRBF010f	Child Assent – for minors 12+ years	Children must sign or give oral consent

**A. PARENTAL PERMISSION
(Parents' Copy)**

Primary Investigator(s)	Paula Collette	Student ☒
Contact information	ACB 371 / 615-898-2319 / ann.galizio@mtsu.edu (Faculty Advisor)	
Department/Institution	Psychology / Middle Tennessee State University	
Faculty Advisor	Ann Galizio	Department Psychology
Study Title	An Investigation of Variability in Play Behavior in Children with Autism Spectrum Disorder and Neurotypical Controls	
IRB ID	NOT APPROVED	Expiration NOT APPROVED

Child's Name (Age <12) (type or print)

The following information is provided to you because your child may qualify to participate in the above identified research study. Please read this disclosure document carefully and feel free to ask any questions before you agree to enroll your child. The researcher must adequately answer all of your questions before your child can be enrolled. The researcher **MUST NOT** enroll your child without an active consent from you. Also, a copy of this consent document, duly signed by the investigator, must be provided to you for future reference.

Your child's participation in this research study is absolutely voluntary. You or your child can withdraw from this study at any time. In the event new information becomes available that may affect the risks or benefits associated with this research or your willingness to participate in it, you will be notified so that you can make an informed decision whether or not to continue your participation in this study.

For additional information about giving consent or your rights as a participant in this study, please feel free to contact the MTSU Office of Compliance (Tel. 615-494-3918) or send your emails to irb_information@mtsu.edu. Please visit www.mtsu.edu/irb for general information and visit <http://www.mtsu.edu/irb/FAQ/WorkinWithMinors.php> for information on MTSU's policies on research with children.

Please read this section and sign Section C if you wish to enroll your child. The researcher will not enroll your child without your physical signature.

1. Purpose of the study:

Your child is being asked to participate in a research study because we are interested in assessing preference for variable or repetitive play behavior in children with autism spectrum disorder (ASD) compared with neurotypical children. If your child has a diagnosis, or shows significant symptoms, of ASD, they will be placed in the ASD group. If not, they may be placed in the neurotypical group.

2. General description of procedures to be followed and approximate duration of the study:

The MTSU's classification of this study is

- ☐ **Educational Tests** – Study involves either standard or novel education practices which consists educational testing and such studies expose the minors to lower than minimal risk
- ☒ **Psychological and/or Behavioral Evaluation** – Although the study may or may not involve educational tests, the specific aim is to probe the child's behavioral ability.
- ☐ **Physical Evaluation** – The children will be asked to perform or part-take in physical activities or procedures. Examples of such studies simple physical exercises, medical or clinical intervention, pharmaceutical testing and etc. Due to the nature of these studies, your child may be exposed to more than minimal risk.

To answer our research question, we will first teach children to play variably in one context and play repetitively in another context. The teaching sessions will be brief (5 minutes), and we will conduct several of these sessions (a few sessions per day, with breaks, for several weeks). Then, we will offer a choice between the two teaching contexts to assess their preference for variable or

repetitive play behavior. These choice sessions will be like the teaching sessions, except that the child will choose which context in which to play.

3. What are we planning to do to your child in this study?

In this study, we will be teaching children to play variably and repetitively in different contexts (different colored cards). To do this, we will allow your child to interact with a playset. The researcher will be sitting beside your child in front of the playset. The researcher will occasionally help the child to play more variably or more repetitively, depending on the context (color). They will help by using their hand to gently guide your child's hands in various play actions, but only if your child does not respond on their own. The researcher will also praise your child and give them a small piece of a preferred edible item (e.g., candy, chips, etc.) every time they play variably or repetitively, depending on the context. We will never force your child to play.

4. What will your child be asked to do in this study?

Your child will be asked to sit at a table in front of a playset and will be instructed to play. They simply need to interact with the playset under the guidance of the researcher. After your child has been taught to play variably and repetitively in different contexts (colors), we will ask your child to choose which they would prefer. We will ask them to choose several times across multiple days, so that we are confident in your child's preferences. They may stop a session at any time and will never be forced to do anything we ask.

5. What are we planning to do with the data collected using your child?

We will be recording your child's choices for variable or repetitive play. These data will be reported in the primary investigator's Honor's Thesis. Hopefully, we will also be able to present their data at academic conferences and publish the data in a scientific paper. Your child will be given a pseudonym, so that when we report the data, none of your child's personal information will be published.

6. What are your expected costs, effort and time commitment:

Prior to your child's participation, we will ask you to complete a brief questionnaire to evaluate whether your child is eligible to continue in the study. After that, all research sessions will be conducted at the Child Development Services center on a typical day. You will only be asked to continue to bring your child to the center regularly. Sessions will be very brief and will only take up a small portion of your child's day at the center. There are no other costs, effort, or commitments required on your part.

7. What are the potential discomforts, inconveniences, and/or possible risks that can be reasonably expected as a result of participation in this study:

For the Child: This study only involves your child playing with a playset, something they probably already do, so we do not anticipate any discomforts, inconveniences, or risks. When the researcher helps your child play, they may touch your child's arm with their hand, which could be uncomfortable for some children. In those cases, we will try to help in a different way (e.g., pointing) or discontinue your child's participation in the study if necessary to prioritize their wellbeing. If your child already engages in any challenging behavior (e.g., aggression, self-injury) sometimes, it is possible that they may do so during a session. If so, the session will be immediately terminated so that the behavior can be dealt with according to their behavior plan if applicable. Once your child calms down, we will try again later. If this happens repeatedly, we will discontinue your child's participation in the study.

For you the Parent: There are no expected discomforts or risks for you. There may be an initial inconvenience, because we will ask you to complete a questionnaire to determine your child's eligibility for the study. However, this questionnaire is very brief and must only be completed once. If bringing your child to the CDS ever becomes inconvenient, please let us know and we will discontinue your child's participation in the study.

8. How will you or your child be compensated for enrolling in this study?

There is no compensation for enrolling in the study.

9. What are the anticipated benefits from this study?

We expect your child to benefit directly from the study, especially if they currently struggle with play. They will learn various ways to play, which can enhance their social interactions with peers and help with problem solving. Hopefully, the study will also be enjoyable for your child, given that we will be spending our time playing. There will also be indirect benefits to science and society, as we learn more about play variability, discover the best ways of teaching variable play, and better understand when children would prefer to play variably or repetitively.

10. Are there any alternatives to this study such that you or/and your child could receive the same benefits?

Your child may also have the opportunity to play while at the CDS, so it is possible that they may learn some of the same play skills indirectly.

11. Will you or/and your child be compensated for study-related injuries?

Child Development Services (CDS) has agreed to maintain responsibility for your child's wellbeing while they are participating in the study. In the extremely unlikely event of injury related to the study, the CDS will assume this responsibility.

12. Circumstances under which the Principal Investigator may withdraw your child from study participation:

Before your child begins to participate, we will ask you to complete a questionnaire to determine your child's eligibility. If your responses indicate that this study is not a good fit for your child, your child will be withdrawn. We may also withdraw your child if they engage in challenging behavior repeatedly during sessions or if the child asks to be removed.

13. What happens if you choose to withdraw from study participation?

You may choose to withdraw your child at any time with no negative consequences. To withdraw your child from the study, please contact the researchers.

14. Can you or/and your child stop the participation any time after initially agreeing to give consent/assent?

You may withdraw your consent, and your child can stop participating, at any time. We will explain the study to your child and ask for their assent to participate. After that, your child may withdraw assent by saying "No" or indicating with their body language or behavior. If your child withdraws assent on one day, they will be offered the chance to participate again the next day. However, they will never be forced to participate.

15. Contact Information. If you should have any questions about this research study or possibly injury, please feel free to contact Paula Collette by telephone 615-519-4066 or by email prc2v@mtmail.mtsu.edu OR my faculty advisor, Ann Galizio, at 615-898-2319 or ann.galizio@mtsu.edu.**16. Confidentiality.** All efforts, within reason, will be made to keep the personal information in your child's research record private but total privacy cannot be promised. Your information may be shared with MTSU or the government, such as the Middle Tennessee State University Institutional Review Board, Federal Government Office for Human Research Protections, if you or someone else is in danger or if we are required to do so by law.

Consent obtained by:

Date

Researcher's Signature

Researcher's Name and Title

Approved 11.3.22

**B. Signature Section
(Researchers' Copy)**

Primary Investigator(s) Paula Collette **Student** ☒
Contact information ACB 371 / 615-898-2319 / ann.galizio@mtsu.edu (Faculty Advisor)
Department Institution Psychology / Middle Tennessee State University
Faculty Advisor Ann Galizio Department Psychology
Study Title An Investigation of Variability in Play Behavior in Children with Autism Spectrum Disorder and Neurotypical Controls
IRB ID NOT APPROVED Expiration NOT APPROVED
Child's Name (Age <12) (type or print)

PARENT SECTION

☐No ☐Yes I have read this informed consent document pertaining to the above identified research
☐No ☐Yes The research procedures to be conducted have been explained to me verbally
☐No ☐Yes I understand each part of the interventions and all my questions have been answered
☐No ☐Yes I am aware of the potential risks of the study

By signing below, I give permission for my child, whose name is identified above, to participate in this study. I understand I can withdraw my child from this study at any time without facing any consequences.

Date **Approved 11.3.22**
Signature of the Parent

Parental Consent obtained by:

Date PI's Signature PI's Name & Title

Faculty Verification if the PI is a student:

Date Faculty Signature Print Name & Title

DO NOT begin this Research before IRB approval

Appendix E. Modified Checklist for Autism in Toddlers, Revised (M-CHAT-R)

M-CHAT-R™

Please answer these questions about your child. Keep in mind how your child usually behaves. If you have seen your child do the behavior a few times, but he or she does not usually do it, then please answer **no**. Please circle **yes** or **no** for every question. Thank you very much.

1. If you point at something across the room, does your child look at it? (FOR EXAMPLE , if you point at a toy or an animal, does your child look at the toy or animal?)	Yes	No
2. Have you ever wondered if your child might be deaf?	Yes	No
3. Does your child play pretend or make-believe? (FOR EXAMPLE , pretend to drink from an empty cup, pretend to talk on a phone, or pretend to feed a doll or stuffed animal?)	Yes	No
4. Does your child like climbing on things? (FOR EXAMPLE , furniture, playground equipment, or stairs)	Yes	No
5. Does your child make <u>unusual</u> finger movements near his or her eyes? (FOR EXAMPLE , does your child wiggle his or her fingers close to his or her eyes?)	Yes	No
6. Does your child point with one finger to ask for something or to get help? (FOR EXAMPLE , pointing to a snack or toy that is out of reach)	Yes	No
7. Does your child point with one finger to show you something interesting? (FOR EXAMPLE , pointing to an airplane in the sky or a big truck in the road)	Yes	No
8. Is your child interested in other children? (FOR EXAMPLE , does your child watch other children, smile at them, or go to them?)	Yes	No
9. Does your child show you things by bringing them to you or holding them up for you to see – not to get help, but just to share? (FOR EXAMPLE , showing you a flower, a stuffed animal, or a toy truck)	Yes	No
10. Does your child respond when you call his or her name? (FOR EXAMPLE , does he or she look up, talk or babble, or stop what he or she is doing when you call his or her name?)	Yes	No
11. When you smile at your child, does he or she smile back at you?	Yes	No
12. Does your child get upset by everyday noises? (FOR EXAMPLE , does your child scream or cry to noise such as a vacuum cleaner or loud music?)	Yes	No
13. Does your child walk?	Yes	No
14. Does your child look you in the eye when you are talking to him or her, playing with him or her, or dressing him or her?	Yes	No
15. Does your child try to copy what you do? (FOR EXAMPLE , wave bye-bye, clap, or make a funny noise when you do)	Yes	No
16. If you turn your head to look at something, does your child look around to see what you are looking at?	Yes	No
17. Does your child try to get you to watch him or her? (FOR EXAMPLE , does your child look at you for praise, or say “look” or “watch me”?)	Yes	No
18. Does your child understand when you tell him or her to do something? (FOR EXAMPLE , if you don’t point, can your child understand “put the book on the chair” or “bring me the blanket”?)	Yes	No
19. If something new happens, does your child look at your face to see how you feel about it? (FOR EXAMPLE , if he or she hears a strange or funny noise, or sees a new toy, will he or she look at your face?)	Yes	No
20. Does your child like movement activities? (FOR EXAMPLE , being swung or bounced on your knee)	Yes	No

Appendix F. Child Assent Form

IRB

INSTITUTIONAL REVIEW BOARD

Office of Research Compliance,
010A Sam Ingram Building,
2269 Middle Tennessee Blvd
Murfreesboro, TN 37129



IRBF010b/c RESEARCH WITH MINORS – CHILD ASSENT (For Minors UNDER 12 years)

General Information

1. Use this form for child assent when enrolling minors who are less than 12 years old.
2. Use the parental consent form provided in the IRB forms page (IRBF010a).
3. This template is suitable for studies that qualify for exemption and those which are reviewed by the expedited or full review mechanisms.
4. Alterations and waiver of this template are strongly discouraged.
5. Child assent must not be administered online.

Instructions

1. This form contains two sections:
 - A. Child Assent section – signed by the researcher and given to the child
 - B. The signature section signed by the participating minor (if 7-12 years)
 - i. This section will be retained by the researcher
2. Barring the actual signatures, the text boxes in two sections must be properly completed before submitting for IRB approval.

Related IRB Forms.

Form ID	Description	IRB Comment
Appendix B	This form has to be completed to specifically describe the interventions when researching with minors	Mandatory when enrolling minors
IRBF010a	Parental consent for enrolling minors within the age 0 to 12 – Use either IRBF010b or IRBF010c as child assent	Must be obtained before administering child assent
IRBF010b	Child assent – for children less than 7 years	No signature is necessary
IRBF010c	Child Assent – for minors 7-12 years	Signature may be waived
IRBF0101d	Combined parental consent child assent forms for minors 12+ years	Mandatory signatures
IRBF010e	Parental Consent – for minors 12+ years	In most cases signature is required before enrolling the child
IRBF010f	Child Assent – for minors 12+ years	Children must sign or give oral consent

Approved 11.3.22

A. CHILD ASSENT
(To be retained by the participating child who is less than 12 years of age)

Primary Investigator(s)	Paula Collette	Student ☒
Contact information	ACB 371 / 615-898-2319 / ann.galizio@mtsu.edu (Faculty Advisor)	
Department Institution	Psychology / Middle Tennessee State University	
Faculty Advisor	Ann Galizio	Department Psychology
Study Title	An Investigation of Variability in Play Behavior in Children with Autism Spectrum Disorder and Neurotypical Controls	
IRB ID	NOT APPROVED	Expiration NOT APPROVED

Child's Name (Age <12) (type or print)

(The PI or his/her IRB-approved representative must read the following disclosures to the child)

This information is provided to you because your parents/guardians have enrolled you to participate in a research study. Please read this carefully and feel free to ask any questions before you agree to enroll. The person who is speaking to you now must all of your questions before you participate. He/she must also give you a signed copy of this sheet. Your participation in this research study is absolutely voluntary. You can decline anytime and no one will inform your parents. You can withdraw at any time.

Please visit <http://www.mtsu.edu/irb/FAQ/WorkinWithMinors.php> or email irb_information@mtsu.edu for more information.

(The PI or his/her IRB-approved representative must read the following disclosures to the child)

1. **Why are you doing this research?**
We want to understand how kids play. Sometimes, kids play the same way and sometimes they play in lots of different ways. We'll teach you how to do both and then give you a choice of which you would rather do.
2. **What will the researcher do and how long will it take?**
You'll be allowed to do the study a few times each day for 5 minutes at a time. You'll have a break in between. While you do the study, the researcher will sit beside you and help you play, sometimes giving you tasty snacks.
3. **Do I have to be in this research study and can I stop if I want to?**
You don't have to be in the study if you don't want to be. Anytime you want to stop, just tell us "no" or use a signal that you want to stop. We won't tell your parents or anyone else.
4. **Will anyone know that I am in this research study?**
We will not tell anyone unless we believe that you or someone may be in danger or we are required by law.
5. **How will this research help me or/and other people?**
We're going to be teaching you some different ways to play. We hope it will be fun, and we hope that you might use what you learn when you're playing on your own later. Your participation will also help us understand how other kids play, which we will use to help others.
6. **Can I do something else instead of this research?**
You can do something else if you don't want to do the study. You will just be allowed to do what you would normally do today.
7. **Who do I talk to if I have questions?**
If you have questions or don't understand something, just ask Paula, Annie, or any other researcher who comes to play with you.

Institutional Review Board

Office of Compliance

Middle Tennessee State University

Date

Researcher's Signature

Print Name and Title of the Researcher

DO NOT begin this Research before IRB approval

Approved 11.3.22

**B. Signature Section
(Researchers' Copy)**

Primary Investigator(s) Paula Collette **Student** ☒
Contact information ACB 371 / 615-898-2319 / ann.galizio@mtsu.edu (Faculty Advisor)
Department Institution Psychology / Middle Tennessee State University
Faculty Advisor Ann Galizio Department Psychology
Study Title An Investigation of Variability in Play Behavior in Children with Autism Spectrum Disorder and Neurotypical Controls
IRB ID NOT APPROVED Expiration NOT APPROVED
Child's Name (Age <12) (type or print)

CHILD SECTION (7-12 years)

- ☐ No ☐ Yes I have read the information sheet
☐ No ☐ Yes I received a signed copy from the researcher
☐ No ☐ Yes I understand what I read and what I was told
☐ No ☐ Yes The researcher answered all my questions
☐ No ☐ Yes I am aware I can withdraw at any time

Date**Approved 11.3.22**_____
Signature of the Child (waived if less than 7 years' age)

Child Assent Administered by:

Date_____
PI's Signature_____
Print Name & Title

Faculty Verification if the PI is a student:

Date_____
Faculty Signature_____
Print Name & Title**DO NOT begin this Research before IRB approval**

Appendix G. Paired-Stimulus Preference Assessment for Playsets

Primary / IOA

Paired-Stimulus Preference Assessment

Participant _____ Session date _____ Data collector _____

Stimulus items:	Overall rank (largest % is #1)
1	
2	
3	
4	
5	

Stimulus item (left)	Stimulus item (right)	Choice (circle)
1	2	1 2 3 4 5 NA
5	4	1 2 3 4 5 NA
3	1	1 2 3 4 5 NA
2	4	1 2 3 4 5 NA
4	5	1 2 3 4 5 NA
3	2	1 2 3 4 5 NA
1	5	1 2 3 4 5 NA
3	4	1 2 3 4 5 NA
5	1	1 2 3 4 5 NA
1	4	1 2 3 4 5 NA
2	3	1 2 3 4 5 NA
3	5	1 2 3 4 5 NA
4	2	1 2 3 4 5 NA
5	2	1 2 3 4 5 NA
4	3	1 2 3 4 5 NA
2	5	1 2 3 4 5 NA
1	3	1 2 3 4 5 NA
4	1	1 2 3 4 5 NA
5	3	1 2 3 4 5 NA
2	1	1 2 3 4 5 NA

Totals:

1 ____ 2 ____ 3 ____ 4 ____ 5 ____ NA ____

1: ____ / ____ x 100 = ____ %
 2: ____ / ____ x 100 = ____ %
 3: ____ / ____ x 100 = ____ %
 4: ____ / ____ x 100 = ____ %
 5: ____ / ____ x 100 = ____ %

Appendix H. Paired-Stimulus Preference Assessment for Colors

Primary / IOA

Paired-Stimulus Preference Assessment: Colors

Participant _____ Session date _____ Data collector _____

Conduct the color preference assessment during breaks from playset preference assessment.

Practice Color: WHITE

Practice wearing white during playset PSPA and while building rapport.

Colors: Red, Blue, Orange

Stimulus item (left)	Stimulus item (right)	Choice (circle)
Red	Blue	R B O NA
Orange	Red	R B O NA
Orange	Blue	R B O NA
Blue	Orange	R B O NA
Red	Orange	R B O NA
Blue	Red	R B O NA
Red	Blue	R B O NA
Blue	Orange	R B O NA
Orange	Red	R B O NA
Blue	Red	R B O NA
Red	Orange	R B O NA
Orange	Blue	R B O NA
Totals:		
Red ____ Blue ____ Orange ____ NA ____		
R: ____ / ____ x 100 = ____ %		
B: ____ / ____ x 100 = ____ %		
O: ____ / ____ x 100 = ____ %		

Appendix I. Session Log

Session Log

Participant _____

Baseline _____ (Color)

Cubby _____ (Color)

Vary _____
(Playset) (Color)

Repeat _____ (Playset) _____ (Color)

Preference Assessment Edibles: _____, _____, _____,
 _____, _____

[illegible]

Appendix J. Session Data Sheet

Primary / IOA

Participant _____ Session date _____ Condition _____

Data collector _____ Researcher _____ Session # _____

Start time _____ Stop time _____ Vary / Repeat / NA

Playset: _____

Code only appropriate play actions. Appropriate play actions occur when the child holds a figurine in their hand and moves their hand and the figurine together. The figurine must touch the playset or another figurine on the table during the action. If the action is two figurines moving on the table, each figurine must be in a different hand and both hands must be moving. Opening/closing or moving the playset does not count, but opening/closing doors is acceptable. Setting or placing the figurine does not count, but stationary actions (e.g., sitting, laying down) may count if there is some movement in the location. Throwing or dropping the figurine on the playset does not count, unless the action occurs on a slide or trap door. Play actions end when the child's hand stops moving for 1 second OR the child makes a different movement OR the child moves the figurine to another location OR the child's hand is no longer in contact with the figurine. Code the time when the action is completed. Also code the figurine, movement, and location or other figurine(s) used in the play action. Finally, code whether the play action was independent or prompted; if a reinforcer was delivered; if it meets the lag (differs from the previous action in at least two ways [figurine, movement, and/or location] AND no dimension [figurine, movement, and/or location] has occurred in 3 or more consecutive immediately previous actions); and if the action combination (figurine, movement, and location) is novel so far in the session (only for independent responses; do not include prompted responses).

Time	Figurine	Movement	Location	I/P	SR+	Lag	Novel

_____ (independent) / _____ (total) = _____ % independent independent novel _____

_____ (independent lag) / _____ (independent - 1) = _____ % met lag

_____ (total) / 5 min = _____ responses/min _____ (SR+) / 5 min = _____ SR+/min

Updated 12/7/22

Appendix K. Treatment Integrity Data Sheet

Treatment Integrity

Participant _____ Session date _____ Condition _____

Data collector _____ Researcher _____ Session # _____

For each treatment component listed below, mark a + if it was completed correctly and a – if it was completed incorrectly. If completed incorrectly, describe the error in the comments section.

Treatment component	+/-
Session set up correctly (e.g., correct playset and figurines, correct color(s) on door, bracelets on wall etc.)	
MSWO conducted correctly (i.e., 5 items presented and first item selected was used as reinforcement, the container of the selected item was brought into the room)	
Discrimination/choice procedures conducted correctly (i.e., choosing a card, matching with bracelet, putting on bracelet)	
Experimenter said “go play” when the session began and “all done” after 5 min	
Each reinforcer consisted of an edible and brief praise (or not provided if Baseline)	
Reinforcement was provided for prompted responses and independent actions meeting the lag (Vary), repeating the first action (Repeat), or not at all (Baseline)	
Prompts were provided after 10 s passed without a response or after an incorrect response (or not provided if Baseline)	
Prompts were not provided when not needed (or never provided if Baseline)	
Prompts were correct responses (i.e., met the lag or repeated the first action) (or not provided if Baseline)	
Problem behaviors were ignored/blocked as appropriate, defined individually	

Comments:

_____ (total +) / 10 = _____ %