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An Analysis of Shifting Preferences for Tasks Involved In Contingency Schedules

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An Analysis of Shifting Preferences for Tasks Involved In Contingency Schedules

by

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A thesis submitted in partial fulfillment
of the requirements for the degree of
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Abstract

This experiment evaluated the effects of noncontingent and contingent access on relative preference for items identified through a series of preference assessments. Four typically developing children participated in multiple stimulus without replacement preference assessments to establish a relative hierarchy of preferred activities. Following the MSWO, the participants were exposed to contingent access or noncontingent access conditions that were separated by preference assessments to assess stability of the preference hierarchy. Results were discussed in terms of preference, preference shifts, and the response deprivation hypothesis.

Introduction

It has long been known that the consequence of a behavior affects the future occurrence of that behavior in similar contexts (Skinner, 1938, 1953; Thorndike, 1898). While behavioral principles may not be readily evident in situations where the acquisition of behavior is of main concern, Timberlake and Allison (1974) indicate that, “learning theorists of the most disparate persuasions agree that the consequence of an instrumental response is an important determinant of the subsequent probability of that response” (p. 146). This fact is especially relevant to applied psychology, where behavior change is the primary concern, such as educational settings (Gresham, 1998; Martin and Pear, 1999; Mayer, 1995; Sprague, Sugai, & Walker, 1998).

The earliest investigations of the principles of learning center on the law of effect (Thorndike, 1898) and its' subsequent elaboration as the empirical law of effect (Skinner, 1938). The empirical law of effect states that stimulus events are reinforcers if when presented after a response, the result is an increase in the performance of that response. This law requires empirical demonstration of the effect of a stimulus on a behavior before labeling it as a reinforcer and has, therefore, been characterized as a post hoc description of a series of events.

According to the empirical law of effect, the procedure necessary to produce the reinforcement effect is unambiguous (Konarski, Johnson, Crowell, & Whitman, 1981). First, the behavior to be increased is selected and its baseline level is assessed. Next, a stimulus event is chosen as a reinforcer and is presented contingent upon the occurrence

of the instrumental response. From an applied perspective, this procedure raises one critical question: How does one identify stimulus events that will function as effective reinforcers?

Reinforcer Identification

Empirical demonstration, use of known reinforcers, the use of a reinforcer menu, and the presentation of many stimulus events are all techniques that appear to be based on the empirical law of effect (Konarski et al., 1981). The major disadvantage to using any of these techniques is an inability to predict reinforcers, which stem from the post hoc analysis of reinforcement.

Fortunately, a considerable amount of research has been conducted over the last 25 years and procedures are now available to more accurately identify potentially reinforcing stimuli. These techniques are especially important for individuals with developmental disabilities who may not be able to verbally identify potential reinforcers.

The basic assumption that a stimulus identified as preferred can function as a reinforcer originates from the literature involving conditioned reinforcement and generalized conditioned reinforcement. Research has yielded methodologies for assessing preference when stimuli are presented to individuals in a variety of different formats: singly (Pace, Ivancic, Edwards, Iwata, & Page, 1985), in pairs (Fisher et al., 1992), or in grouped arrays (DeLeon & Iwata, 1996).

The first systematic assessment involving profoundly handicapped individuals incorporated a single-stimulus presentation technique to evaluate absolute preference for stimuli (Pace et al., 1985). This procedure requires that a single stimulus be presented in a randomized order for 5 s. The item is scored for approach or non-approach behavior and the subject is permitted 5 s of free access to the item. If not approached, the

individual is permitted to sample the item for 5-sec. Next, the item is once again placed in front of the subject. If approached, the subject is allowed access to it for 5 s. If no approach behavior occurs, the stimulus item is removed and the next trial begins. An approach percentage is calculated for each of the stimuli, and those with a higher percentage of approach are considered preferred stimuli. While validation of the preferred stimuli in the form of a 'reinforcer assessment' (Fisher, Piazza, Bowman, & Amari, 1996) is usually not conducted, this initial step in the systematic identification of preferred stimuli is more reliable than caregiver opinion or simply guessing.

Fisher et al. (1992) conducted a second comparison involving the single-stimulus presentation developed by Pace et al. (1985) to a concurrent operants preparation. In a forced-choice procedure, individuals were simultaneously presented with two stimuli and were provided 5 s access to only one of the stimulus items when approached. Access to both stimuli was blocked. Each of the 16 stimulus items were paired once with all other stimuli.

A variation on the paired-forced choice assessment was described as a group presentation (Windsor, Piche, & Locke, 1994) or multiple-stimulus (MS) preference assessment (Higbee, Carr, & Harrison, 2000; Deleon & Iwata, 1996). This type of preference assessment has been termed a multiple-stimulus format ... with replacement, or (MSW), as all stimuli were arranged in a single array in front of the subject on all trials. At the end of each trial, the stimuli were rotated such that each stimulus appeared at least once in each position and no more than twice. It was found that this variation of the PS preference assessment was effective in identifying reinforcing stimuli for all

participants. Additionally, fewer presentations were necessary, reducing the amount of time and effort required to identify reinforcing stimuli.

Another variation on the format described by Windsor et al. (1994) is a multiple-stimulus without replacement (MSWO) preference assessment (Deleon & Iwata, 1996). As with the Windsor et al. study, the results of the Deleon and Iwata study showed that the multiple-stimulus methods of identifying potential reinforcers are comparable to the paired-stimulus (PS) method described by Fisher et al (1992). In addition, the rank-orders of the MSWO procedure were consistent with the PS method and were found to include stimuli not selected in the MSW procedure. Another advantage of the MSWO is an assessment time approximately one-third to one-half of the PS method.

Other methods for determining preference include a “free operant” procedure in which participants are allowed to engage in a variety of activities with unlimited access and a response restriction assessment, which combines free-operant and trial based procedures (Hanley, Iwata, Roscoe, Thompson, & Lindberg, 2003). Although response restriction assessments are useful in that they overcome problems associated with exclusive preference, there are also many limitations. The criteria for conducting a response restriction assessment for determining preference are quite cumbersome and are not necessarily recommended for teachers, therapists or other practitioners. The assessment can be lengthy and also requires the experimenter to make several rules to determine when to remove an item or activity. Because time spent with each item is used as the index for rank ordering preferences, these assessments are most useful when duration engaged with an activity is of primary concern, as is the case with the Premack Principle.

Activities As Reinforcers

Probability Differential Hypothesis

A substantial departure from the traditional approach to defining reinforcing events is provided by Premack (1959). Premack indicated that all reinforcement situations consist of a stimulus, consequence and a consumatory response, such as eating candy or physically interacting with toys. The foundation for the probability differential hypothesis, otherwise known as the Premack principle, lies in identifying the duration of occurrence of a set of consumatory responses that an organism has free access to for a certain duration of time. The response that occurs most often during this time has a higher probability of occurrence than the other response(s), and, according to Premack, will serve as a reinforcer for a response having a lower probability of occurrence. The Premack principle has been employed to change behavior in a variety of settings including psychiatric wards (Mitchell & Stoffelmayr, 1973) and organizations (Welsh, Berstein, & Luthans, 1992).

The Premack principle has been shown empirically to predict reinforcement effects when providing a high probability behavior contingent on the performance of a low probability behavior, or when the schedule requires equal amounts of both behaviors. However, it has also been shown that a certain condition, known as “response deprivation”, is a necessary condition in these preparations for increases in instrumental responding.

Response Deprivation Hypothesis

In some situations, Premack noted that, “schedules which produced instrumental performance, also reduced the contingent response below its paired baseline level” (Timberlake & Allison, 1974). Timberlake and Allison termed this situation a response deprivation condition, and went on to suggest that low probability behaviors could, in fact, reinforce high probability behaviors when presented in a contingent relationship (Eisenberger, Karpman, & Trattner, 1967; Premack, 1965; Timberlake & Allison, 1974).

Konarski, Johnson, Crowell, and Whitman (1980) showed that when first grade children engaged in seatwork behaviors under reinforcement schedules established according to the Premack Principle and the Response Deprivation Hypothesis, an increase of on-task instrumental responding was only seen in those schedules where the condition of response deprivation was present. These results support predictions of the Response Deprivation Hypothesis while being contrary to the notion of probability differential as a critical condition for reinforcement. Based on the findings of Konarski et al. (1980) and others, it appears that the Premack Principle is actually only successful when it results in schedule requirements that produce the condition of response deprivation. The probability of occurrence is not a necessary or sufficient condition to observe a reinforcement effect. This effect is only possible when establishing a contingency schedule based on the ratio of occurrence derived for both behaviors from a free operant baseline and subsequently imposing a restriction on the contingent response such that the response could not occur at its free operant, or pre-contingency baseline level.

This refinement indicates a greater versatility and applicability of response deprivation over the Premack principle in that any behavior can serve to reinforce another behavior regardless of the probability of occurrence of either response (Timberlake & Allison, 1974; Timberlake & Farmer-Dougan, 1991). As Mazur (1998) indicates, the circularity of the law of effect is avoided due to the identification of a reinforcer prior to its' presentation. The advantage of knowing beforehand what will serve as a reinforcer is of obvious practical value to researchers as well as practitioners. As such, response deprivation, as with the Premack principle, has been applied to a variety of behaviors in many different settings.

While response deprivation conditions have been implemented in many settings and with many types of behavior, educational professionals continue to ignore the implications for incorporating this procedure into academic situations for their students. The reasons for this may be the effort needed to initiate reinforcement strategies in the classroom as well as time and staffing limitations (Hall, 1991). Potential applications of these types of contingent relationships in learning situations within the classroom are numerous, and include increasing on-task behavior, decreasing rates of inappropriate behavior, increasing the accuracy of academic outcomes, and increasing rates of correct and active responding. The only steps for practitioners to follow are, first, to identify the instrumental and contingent responses, and second, to establish an appropriate ratio requirement for the contingent relationship.

Contingent Relationships and Preference Shift

Hanley et al (2003) identified the preferences of 7 individuals with mental retardation using response restriction assessments. Following the assessments, the investigators increased participant engagement in nonpreferred activities using a Premack-type contingency. The study did not conduct a preference assessment following the contingent access conditions. Instead, the authors associated highly preferred activities with the highest percentage of interaction, an approach which is too lengthy and cumbersome for teachers or therapists to utilize.

Important to the research proposal herein is that very few research articles have described the effects of contingent relationships on relative preference and shifts in preference hierarchy based on pre- and post-measures.

Birch, Birch, Marlin, and Kramer (1982) and Birch, Marlin, and Rotter (1984) investigated the effects instrumental eating on preference for food items with individuals with chronic food refusal. Both studies incorporated pre- and post-preference assessments and a response deprivation preparation. Preference assessments were conducted to establish a preference hierarchy of food items. Following this, a response deprivation schedule was arranged that allowed access to highly preferred food items contingent on first consuming lower preferred food items. Results of both studies indicated that negative shifts in preference for the instrumental response occurred while preference for the contingent response remained high.

The results of these studies should be approached with caution for two reasons. First, the pre- and post-preference assessments occurred at least one week prior to, and one week following, the test condition. Reports from the preference literature indicate that preference shifts occur over time (Mazur, 1998) and, as such, the delays in testing may have affected preference reports. Second, the experimental preparations did not resemble typical response deprivation schedules. For example, not all items in the preference hierarchy were preferred, and, several food items were disliked, which would lead to low levels of baseline consumatory responses. Further, no attempt was made to control for the appropriate ratio of access to the instrumental and contingent responses. These methodological concerns, together with a greater adherence to the response deprivation schedule as well as greater contact with the preference literature would yield more conclusive evidence of the effects of contingency requirements on shifts in stimulus preference.

The purpose of this study, then, was to examine the effects of contingent relationships on shifting preference in established preference hierarchies for instrumental and contingent responses. This was accomplished through multiple stimulus preference assessments and response deprivation schedules of reinforcement as well as noncontingent access control conditions.

Method

Participants and Setting

Four typically developing children between the ages of 3-7 years old were selected for this study. Parent report indicated that all children functioned on grade level with no significant behavior problems. Participants were recruited from the community and consent to participate was obtained prior to the start of the study. Patrick, a 5 year-old male, lived at home with his mother and his mother's boyfriend. Sean was a 6 year-old boy who lived with his mother, father, and younger brother. Nathan was a 5 year-old male who lived with his mother, father and an older brother. Caleb was a 4 year-old male who lived at home with his mother and father. All sessions took place at the participants' home. For Patrick and Caleb, the sessions took place in the participant's dining room with a table and chairs and few other everyday stimuli. Sean and Nathan's sessions both took place in a playroom with various toys around the room, a table, and two chairs.

Materials

The following materials were used in the present study: RCA digital video camera recorder, tripod, session checklist, pencil, partial-interval recording data sheet, timer, preference assessment data sheet, and seven toys for each participant. The seven stimuli were included based on parent report of child's preference and interest level and can be seen in tables in the results section.

Design

The study utilized a multi-element ABACAB design. The noncontingent and contingent conditions alternated throughout all sessions with each child, beginning first with the noncontingent access condition. Preference assessments were conducted prior to both experimental conditions (Phases B and C) throughout each session. The second and third preference assessment in each session served two functions: to assess shifting preference hierarchies for the experimental condition that immediately preceded it and set the hierarchy for the subsequent experimental condition.

Data Collection

The primary data collector was seated across the table from the participant for the duration of each session. All sessions were videotaped. A session was comprised of three preference assessments, two noncontingent access conditions, and one contingent access condition. A single session was conducted each day, for each child, over five consecutive days. Data was collected on a child's preference for various items during the preference assessments by the primary data collector using a pencil and the preference assessment data sheet. In addition, the primary data collector recorded participant interaction with an item/activity during 5-s intervals on a partial interval basis to measure the percentage of intervals that the participant was engaged with each item/activity during the noncontingent access and contingent access conditions. If the child stopped engaging with the item, he was provided with one prompt to engage with the item. If after 5-s of the prompt being delivered, the participant still did not interact with the item, then the investigator delivered a final prompt stating, "Please play with the toy until time is up, okay!" Additional prompts were not needed during the study.

Dependent Variables and Measures

The dependent variable in this study was relative preference. Preference was measured through a MSWO preference assessment to establish a relative hierarchy. Of primary interest was the ranking of items in a preference hierarchy, and subsequently, the relative shift in preference for items/activities as a result of either noncontingent or contingent access. Additionally, the duration of engagement for each item in both conditions was evaluated, to ensure participants interacted with items for the full interval. The participants were required to engage with both items during the contingent access condition, the noncontingent access conditions did not have that requirement.

Preference of each item/activity. The primary dependent measure was the preference of each item/activity. Data was collected on each of the preference hierarchies by noting the preference of the item/activity by a number of 1 through 7, with 1 being the most-preferred item and 7 being the least preferred.

Percentage of intervals of interaction. The participant's interaction with an item was measured during both conditions. Interaction was scored during 5-s intervals on a partial interval basis and was recorded when a participant's hand contacted any part of the item/activity. Percentage of intervals of interaction was the secondary dependent measure.

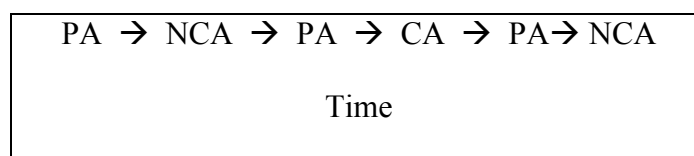
Interobserver Agreement. The secondary data collector scored 40% of videotaped sessions and independently recorded selections. For the preference assessments, agreement was defined as both the primary data collector and the secondary data collector having recorded the same selection or no selection for each trial. Agreement was calculated by dividing the number of agreements by the number of

agreements plus disagreements and multiplying by 100%. For all preference assessments, agreement was 100%.

For the percentage of intervals of interaction, both data collectors' records were compared on an interval-by-interval basis. An agreement was scored in any interval in which two data collectors both scored either the occurrence or nonoccurrence of behavior. Agreement percentages were calculated for each activity by dividing the number of agreement intervals by the total number of intervals and multiplying by 100%. Interobserver agreement for the secondary dependent measure averaged 94%, 96%, 93%, and 96% for Nathan, Sean, Patrick, and Caleb, respectively.

Procedure

The procedures herein are adapted from Weil and Ghezzi (2003). A session was comprised of three preference assessments (PA), two noncontingent access conditions (NCA), and one contingent access condition (CA). A single session was conducted each day, for each child, over five consecutive days, as follows:



Initial Item Preference Assessment

As a means of establishing a pool of preferred items for each child, parents were requested, for one time only, to complete a form on which they listed seven of the child's favorite "small toys or play things" (e.g. a picture book, yo-yo, action figure, etc.) that have no apparent start or finish, as would be the case with a story, videotape, puzzle, etc. Given this list, the primary investigator requested that access to these items be restricted for the duration of the study (approximately five days). To ensure a condition of response deprivation with respect to the toys/items, the researcher gained access to the items prior to a weekend, which allowed 2-3 days of no access prior to the first session. These items remained constant throughout the study.

Orienting Child to the Setting

Each session began with the investigator arriving at the child's home with materials, greeting the child, and asking him if they would like to participate. All children

agreed to participate during every session without issue. Following this, the participant was asked to take a seat and the researcher explained to him what he would be doing for the next several minutes. Throughout the sessions, age typical language was used such as “Hey Jennifer would you like to play today?” For the duration of each session, the investigator did not initiate conversation with the participant except to prompt interaction with the item (contingent access condition) or to instruct the child on what to do during the session more generally. Additionally, if the child asked any questions during the session, the investigator answered them.

Item Activity Preference Hierarchy

A preference hierarchy was established prior to each noncontingent and contingent access condition utilizing a three-array MSWO preference assessment. The post-assessment for the noncontingent access condition also served as the pre-assessment for the contingent access condition.

While seated at a table across from the data collectors, the child was presented with the seven items in a row in front of him/her, and was asked to indicate their most preferred item. All preference assessments were conducted without replacement of the chosen items. That is, after an item had been identified as most preferred (relative to the other stimuli present), it was removed from the table. The remaining items were removed and replaced in a random order in front of the child with the instruction to choose the most preferred item. This same procedure occurred until all seven toys had been chosen and was conducted three times for each preference assessment. Any attempt to select more than one stimulus at a time was blocked and the initial verbal instruction was repeated. At no point in the study did the child refrain from selecting a toy during the

preference assessments. Conducting a preference assessment in this manner established a hierarchy of those items from most-to-least preferred. From this hierarchy, the first most-preferred and fifth most preferred items were utilized in the subsequent non-contingent access condition.

Noncontingent Access to High and Low Preference Items

The noncontingent condition served as the control condition and occurred first during each session. Sessions also ended with a noncontingent access condition. The first and fifth items in the preference hierarchy were given to the child noncontingently for 6-minutes. The rationale for using the fifth most preferred is to account for potential decreases in preference. That is, by including the fifth most preferred item, it is possible to record decreases in preference up to two ranks in the seven-item hierarchy. There was no requirement (time allocation, order or otherwise) regarding which item the child engages during this 6-minute session. During this time, the remaining items, (i.e. items 2-4) were removed from the area. At the conclusion of this condition, a second preference hierarchy was established.

Item Activity Preference Assessment

A second preference hierarchy served as a post-trial assessment for the noncontingent access condition, assessing for any change in relative preference due to noncontingent access to the item. This preference assessment also served as the pre-assessment moving into the contingent access condition.

Contingent Access to Low and High Preference Items

Following the pre-trial preference assessment, all remaining items were removed from the table and the child was then required to engage with the instrumental response

(item ranked fifth). The contingency session began following a verbal statement from the primary data collector, as follows: “I want you to play with (toy/item) until time is up, okay!” At the end of 6-minutes, the item was removed and the child was required to engage with the contingent response (item ranked first). This was accompanied by the statement, “Now I want you to play with (toy/item) until time is up, okay!” The duration of this portion of the session was also 6-minutes, resulting in a total trial time of 12-minutes. Data was collected on the child’s interaction with each item during the contingent access condition to ensure that 6-minutes of interaction occurred for each toy/item. Following the contingent access condition, a final preference item assessment was conducted to assess preference for the toys/items.

Item Activity Preference Assessment

A third and final preference hierarchy served as a post-trial assessment for the contingent access condition, assessing for any change in relative preference due to contingent access to the item. This preference assessment also served as the pre-assessment moving into the noncontingent access condition.

Noncontingent Access to Low and High Preference Items

Following the third preference assessment, a final noncontingent access condition was implemented that was the same as described above. The participant was presented noncontingently with the item ranked fifth most preferred and the item ranked first most preferred for a total of 6 minutes. This final noncontingent access condition served to validate the results of the third preference assessment.

Results

Preference hierarchies and shifts in hierarchies can be seen for each participant in both tables and figures. In order to illustrate the stimuli involved, as well as movement from assessment to assessment, a table is included for each participant. Figures are included to provide a visual analysis for each participant.

Participant 1

Results for Nathan are shown in Table 1. During session 1, Nathan ranked the car as the most preferred item and the playdough activity as fifth most preferred during the initial preference assessment (see Figure 1). Following the noncontingent access condition, the car shifted down two levels in the hierarchy, ranking as the third most preferred item. The playdough activity moved up one level in the hierarchy following the noncontingent access condition. Following the noncontingent access condition and preceding the contingent access condition, the gun ranked as number one and the tools ranked as number five in the hierarchy. At the conclusion of the contingent access condition, the gun shifted downward two levels in the hierarchy, ranking as the third most preferred item. The tools remained as the fifth most preferred item.

During the initial preference assessment for session 2, the participant showed preference for the car, ranking it as the most preferred item. The fifth most preferred item was the playdough. Following the noncontingent access condition and preceding the contingent access condition, the car remained in the most preferred position and the playdough remained the fifth most preferred item. Following the contingent access

condition, the car shifted downward one level and the playdough shifted upward two levels in the hierarchy.

In session 3, the car again was ranked as the most preferred item in the initial preference assessment. The blender was ranked as the fifth most preferred item. Following noncontingent access, the car shifted to the fifth most preferred item and the blender moved to the fourth most preferred position. The gun was ranked as most preferred going into the contingent access condition and shifted one level downward in the hierarchy following the contingent access condition. The car was ranked as fifth most preferred preceding the contingent access condition, and shifted upward to the first most preferred following contingent access.

For session 4, the car was most preferred in the initial preference assessment and shifted downwards two levels following the noncontingent access condition. The item ranked as the fifth most preferred in the initial preference assessment, shifted downward two levels in the hierarchy following the noncontingent access condition. The item rank as most preferred going into the contingent access condition shifted downwards one level in the hierarchy following contingent access. The item ranked as the fifth most preferred prior to the contingent access condition remained in the same place in the hierarchy following noncontingent access.

The pots and pans ranked as most preferred before the noncontingent access condition in session 5, and remained most preferred following the first condition. The doodle ranked as fifth most preferred in the initial preference assessment, shifted downward two levels in the hierarchy following the noncontingent access condition.

Table 1: Shift in Preference for Nathan Across All Sessions

Session 1

Rank	PA 1	PA 2	PA 3
1	Car	Gun	Blender
2	Gun	Blender	Playdough
3	Blender	Car	Gun
4	Tools	Playdough	Car
5	Playdough	Tools	Tools
6	Pans	Pans	Doodle
7	Doodle	Doodle	Pans

Session 2

Rank	PA 1	PA 2	PA 3
1	Car	Car	Gun
2	Gun	Gun	Car
3	Blender	Blender	Playdough
4	Tools	Tools	Blender
5	Playdough	Playdough	Tools
6	Pans	Doodle	Pans
7	Doodle	Pans	Doodle

Session 3

Rank	PA 1	PA 2	PA 3
1	Car	Gun	Car
2	Playdough	Playdough	Gun
3	Tools	Pans	Pans
4	Gun	Blender	Playdough
5	Blender	Car	Doodle
6	Pans	Tools	Blender
7	Doodle	Doodle	Tools

Session 4

Rank	PA 1	PA 2	PA 3
1	Car	Gun	Car
2	Gun	Tools	Gun
3	Tools	Car	Pans
4	Playdough	Pans	Tools
5	Blender	Playdough	Playdough
6	Pans	Doodle	Blender
7	Doodle	Blender	Doodle

Session 5

Rank	PA 1	PA 2	PA 3
1	Pans	Pans	Pans
2	Playdough	Gun	Blender
3	Gun	Car	Gun
4	Car	Tools	Playdough
5	Doodle	Playdough	Car
6	Tools	Blender	Tools
7	Blender	Doodle	Doodle

Note. PA= preference assessment.

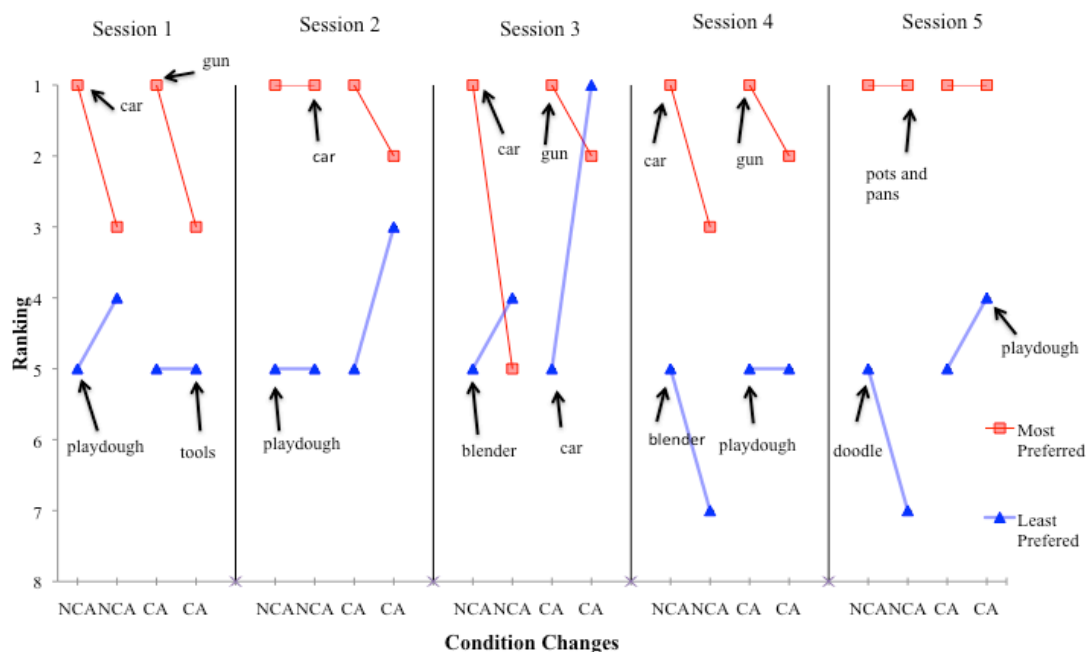


Figure 1: The shift in preference for Nathan's first and fifth most preferred items over five sessions.

The pots and pans remained in the most preferred position for all preference assessments during session 5. The fifth most preferred item going into the contingent access condition (playdough) moved upward one level following contingent access.

To illustrate how much shifting occurred for all items in the hierarchy following the noncontingent contingent access condition a table is provided (see Table 2) that displays the average number of levels shifted across all five sessions. The item ranked as first most preferred in the initial preferred assessment shifted an average of -1.6 levels following the noncontingent access condition. The item ranked fifth most preferred in the initial preference assessment shifted an average of -0.4 levels following noncontingent access. To show the average shift in preference following contingent access see Table 3. The item ranked first in the second preference assessment shifted an average of -1.0 level following contingent access to the first and fifth most preferred items. The item ranked

fifth most preferred in the second preference assessment shifted an average of 1.4 levels following the contingent access condition.

The results show that during the noncontingent access conditions, Nathan played with the toy ranked most preferred for the majority of the 6-minute condition during 80% of the noncontingent access conditions over the five days. In the final preference assessment of session 4, Nathan selected the car as the most preferred item and playdough as the fifth most preferred item. However, when given access to both of these toys, Nathan interacted with the playdough for the entire 6-minutes. Similarly, in the third preference assessment during session 5, Nathan selected pans as his most preferred item and the car as the fifth most preferred toy. During the noncontingent access condition that followed the preference assessment, Nathan played exclusively with the car.

Table 2: Shift in Preference Following Noncontingent Access For Nathan

Rank	Session 1	Session 2	Session 3	Session 4	Session 5	Average
1	-2.0	0	-4.0	-2.0	0	-1.6
2	1.0	0	0	1.0	-3.0	-0.2
3	1.0	0	-3.0	1.0	1.0	0
4	-1.0	1.0	3.0	-1.0	1.0	0.6
5	1.0	0	1.0	-2.0	-2.0	-0.4
6	0	-1.0	3.0	2.0	2.0	1.2
7	0	1.0	0	1.0	1.0	0.6

Table 3: Shift in Preference Following Contingent Access For Nathan

Rank	Session 1	Session 2	Session 3	Session 4	Session 5	Average
1	-2.0	-1.0	-1.0	-1.0	0	-1.0
2	1.0	1.0	-2.0	-2.0	-1.0	-0.6
3	-1.0	-1.0	0	-2.0	-1.0	-1.0
4	2.0	-1.0	-2.0	1.0	-2.0	-0.4
5	0	2.0	4.0	0	1.0	1.4
6	-1.0	-1.0	-1.0	-1.0	4.0	0
7	1.0	1.0	2.0	1.0	0	1.0

Participant 2

Results for Sean are shown in Table 4. Across all of the five sessions, Sean selected the car, the truck or the gun for his most preferred item. In session 1, Sean selected the truck as his most preferred item and legos as his fifth preferred item in the initial preference assessment (see Figure 2). Following the noncontingent access condition, the truck and the legos both shifted downward one level, ranking as the second and sixth most preferred items. In the second preference assessment, Sean selected the gun as his most preferred item and the car as his fifth most preferred item. Following the contingent access condition, the gun shifted downward one level while the car shifted upward four levels.

For session 2, Sean initially ranked the car as his first most preferred item and the ball as his fifth most preferred item. Following noncontingent access to both items, the car was then ranked as the second most preferred item and the ball as the fourth most preferred item. For the second preference assessment, Sean selected the truck as the first most preferred item, where it remained following the contingent access condition. The 3-D coloring activity was ranked as fifth most preferred following the first noncontingent access condition. After the contingent access condition, the 3-D coloring activity shifted upward one level in the hierarchy, ranking as the fourth most preferred item.

During session 3, the truck was chosen as Sean's first most preferred item and the legos were chosen as the fifth most preferred item. Following noncontingent access to both items, the truck and the legos each shifted downward one level in the hierarchy. For the second preference assessment, the gun ranked first and the doodle ranked fifth. After

the contingent access condition, the gun ranked fourth most preferred and the doodle ranked sixth most preferred.

For session 4, Sean selected the truck as his most preferred item and the 3-D coloring activity as his fifth most preferred item. Both the truck and the 3-D coloring activity remained at the same level in the hierarchy following noncontingent access to the items. Following the contingent access condition, the truck and the 3-D coloring both shifted downward one level, ranking as the second most preferred item and the sixth most preferred item, respectively.

In the final session, the car was ranked as the first most preferred item in the hierarchy, where it remained throughout the three preference assessments. The doodle was selected as the fifth most preferred item in the initial preference assessment, where it remained following the noncontingent access condition. Following the contingent access condition, the doodle shifted upward one level, ranking as the fourth most preferred item in the final preference assessment.

The average shift for the items in the hierarchy following noncontingent access is displayed in Table 5. The item ranked first most preferred in the initial preference assessment, shifted an average of -0.6 levels following noncontingent access across all five sessions for Sean. The item ranked fifth most preferred initially shifted an average of -0.2 levels following noncontingent access. The average shift for the items following contingent access is displayed in Table 6. The item ranked first most preferred in the second preference assessment shifted an average of -1.0 levels, following the contingent access condition. The item ranked fifth most preferred in the second preference assessment shifted an average of 0.8 levels.

Table 4: Shift in Preference for Sean Across All Sessions

Session 1

Rank	PA 1	PA 2	PA 3
1	Truck	Gun	Car
2	Gun	Truck	Gun
3	Car	3-D Coloring	Truck
4	3-D Coloring	Ball	3-D Coloring
5	Legos	Car	Doodle
6	Ball	Legos	Legos
7	Doodle	Doodle	Ball

Session 2

Rank	PA 1	PA 2	PA 3
1	Car	Truck	Truck
2	3-D Coloring	Car	Car
3	Gun	Gun	Gun
4	Truck	Ball	3-D Coloring
5	Ball	3-D Coloring	Doodle
6	Legos	Doodle	Legos
7	Doodle	Legos	Ball

Session 3

Rank	PA 1	PA 2	PA 3
1	Truck	Gun	Truck
2	Gun	Truck	Car
3	Car	Car	3-D Coloring
4	3-D Coloring	3-D Coloring	Gun
5	Legos	Doodle	Ball
6	Doodle	Legos	Doodle
7	Ball	Ball	Legos

Session 4

Rank	PA 1	PA 2	PA 3
1	Truck	Truck	Car
2	Car	Car	Truck
3	Gun	Gun	Ball
4	Ball	Ball	Gun
5	3-D Coloring	3-D Coloring	Legos
6	Legos	Doodle	3-D Coloring
7	Doodle	Legos	Doodle

Session 5

Rank	PA 1	PA 2	PA 3
1	Car	Car	Car
2	Truck	Truck	Truck
3	Gun	Ball	3-D Coloring
4	Ball	Gun	Doodle
5	Doodle	Doodle	Gun
6	3-D Coloring	3-D Coloring	Legos
7	Legos	Legos	Ball

Note. PA= preference assessment.

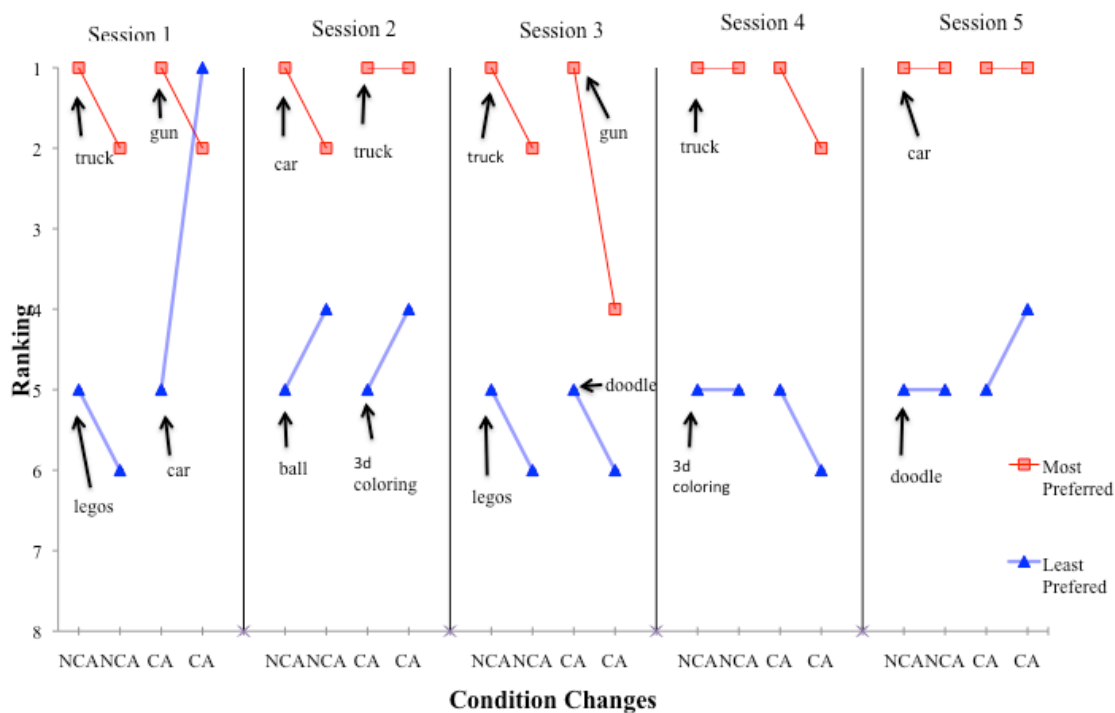


Figure 2: The shift in preference for Sean's first and fifth most preferred items over five sessions.

Throughout the five consecutive days of sessions, there were ten noncontingent access conditions. In 100% of the noncontingent access conditions, Sean played with the item ranked as the first most preferred item the majority of the time. In all but one noncontingent access conditions, he interacted with the item ranked most preferred for 100% of intervals. In session 5, Sean interacted with the car for 64% of intervals and the gun for 36% of intervals during the second noncontingent access condition.

Table 5: Shift in Preference Following Noncontingent Access for Sean

Rank	Session 1	Session 2	Session 3	Session 4	Session 5	Average
1	-1.0	-1.0	-1.0	0	0	-0.6
2	1.0	-3.0	1.0	0	0	-0.2
3	-2.0	0	0	0	-1.0	-0.6
4	1.0	3.0	0	0	1.0	1.0
5	-1.0	1.0	-1.0	0	0	-0.2
6	2.0	-1.0	-1.0	-1.0	0	-0.2
7	0	1.0	0	1.0	0	0.4

Table 6: Shift in Preference Following Contingent Access for Sean

Rank	Session 1	Session 2	Session 3	Session 4	Session 5	Average
1	-1.0	0	-3.0	-1.0	0	-1.0
2	-1.0	0	1.0	1.0	0	0.2
3	-1.0	0	1.0	-1.0	-4.0	-1.0
4	-3.0	-3.0	1.0	1.0	-1.0	-1.0
5	4.0	1.0	-1.0	-1.0	1.0	0.8
6	0	1.0	-1.0	-1.0	3.0	0.4
7	2.0	1.0	2.0	2.0	1.0	1.4

Participant 3

Results for Patrick are shown in Table 7. For Patrick's first session, playdough ranked as number one and markers ranked as number five in the hierarchy (see Figure 3). Following noncontingent access to both items, playdough shifted downward in the hierarchy six levels, ranking as the seventh most preferred item. Markers shifted upward three levels, ranking as the second most preferred item. Legos were ranked as the first most preferred item in the second preference assessment and the race track was ranked as fifth most preferred. Following the contingent access condition, the legos shifted downward three levels to number four in the hierarchy and the race track moved upward two levels, ranking as the third most preferred item.

For session 2, Patrick selected playdough as his most preferred item and the car as fifth most preferred in the initial preference assessment. Following noncontingent access

to both items, the playdough moved to the third most preferred position and the car moved to the sixth most preferred position. The legos were then ranked as first most preferred and the sword was ranked as fifth most preferred. Following the contingent access condition, in the final preference assessment, the legos shifted downward two levels in the hierarchy to the number three position and the sword moved up to the fourth most preferred item.

During session 3, playdough was again ranked as the most preferred item in the initial preference assessment, with the race track ranking in the number five position in the hierarchy. The playdough moved to the second most preferred item following the noncontingent access condition, while the race track moved upward into the fourth most preferred position. The legos were ranked first most preferred and the sword was fifth most preferred in the second preference assessment. Following the contingent access condition, the legos moved downward five level into the sixth most preferred position, while the sword moved into the third most preferred position.

For session 4, Patrick selected the legos as the most preferred item and the race track as fifth most preferred. After the noncontingent access condition, the legos shifted downward three levels, ranking as the fourth most preferred item. The race track shifted downwards, ranking as the seventh most preferred item. Playdough was then ranked as first most preferred and markers ranked as the fifth most preferred item. In the final preference assessment, the playdough moved from being first in the hierarchy to ranking as the fourth most preferred item. The markers also shifted downward, ranking as the sixth most preferred item.

Table 7: Shift in Preference for Patrick Across All Sessions

Session 1

Rank	PA 1	PA 2	PA 3
1	Playdough	Legos	Car
2	Legos	Sword	Sword
3	Car	Car	Markers
4	Race Track	Race Track	Legos
5	Sword	Markers	Race Track
6	Markers	Drawing Board	Drawing Board
7	Drawing Board	Playdough	Playdough

Session 2

Rank	PA 1	PA 2	PA 3
1	Playdough	Legos	Drawing Board
2	Sword	Drawing Board	Playdough
3	Legos	Playdough	Legos
4	Markers	Race Track	Sword
5	Car	Sword	Markers
6	Drawing Board	Car	Car
7	Race Track	Markers	Race Track

Session 3

Rank	PA 1	PA 2	PA 3
1	Playdough	Legos	Playdough
2	Car	Playdough	Drawing Board
3	Sword	Drawing Board	Car
4	Legos	Race Track	Markers
5	Race Track	Car	Sword
6	Markers	Sword	Legos
7	Drawing Board	Markers	Race Track

Session 4

Rank	PA 1	PA 2	PA 3
1	Legos	Playdough	Drawing Board
2	Drawing Board	Drawing Board	Race Track
3	Playdough	Car	Car
4	Car	Legos	Playdough
5	Race Track	Markers	Sword
6	Markers	Sword	Markers
7	Sword	Race Track	Legos

Session 5

Rank	PA 1	PA 2	PA 3
1	Markers	Legos	Sword
2	Car	Markers	Markers
3	Playdough	Drawing Board	Legos
4	Legos	Car	Car
5	Drawing Board	Sword	Drawing Board
6	Sword	Playdough	Playdough
7	Race Track	Race Track	Race Track

Note. PA= preference assessment.

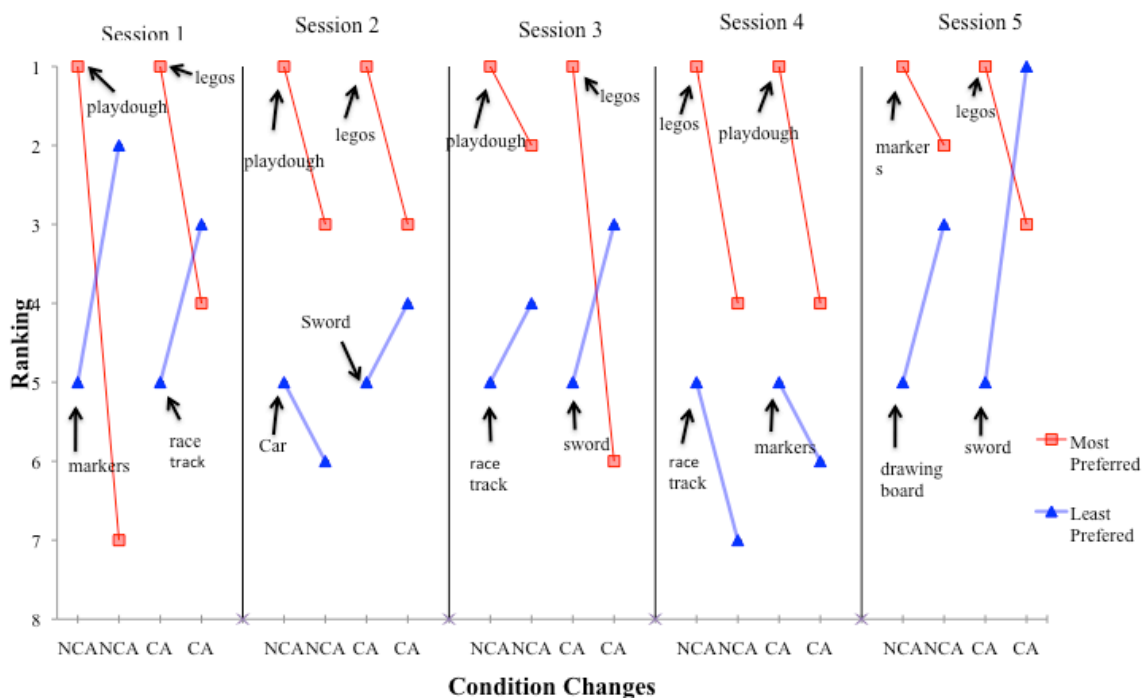


Figure 3: The shift in preference for Patrick's first and fifth most preferred items over five sessions.

Markers were selected as the most preferred item in the initial preference assessment of session 5. The drawing board was ranked as the fifth most preferred item. After given noncontingent access to both toys, Patrick ranked the markers as second most preferred and the drawing board as third most preferred. Legos were ranked as the most preferred item and the sword was ranked as fifth most preferred in the second preference assessment. Following the contingent access condition, the legos shifted downward to the third most preferred item and the sword shifted upward four levels to the first most preferred item.

The average shift for the items in the hierarchy following noncontingent access is displayed in Table 8. The item ranked first most preferred in the initial preference

Table 8: Shift in Preference Following Noncontingent Access for Patrick

Rank	Session 1	Session 2	Session 3	Session 4	Session 5	Average
1	-6.0	-2.0	-1.0	-3.0	-1.0	-2.6
2	1.0	-3.0	-3.0	0	-2.0	-1.4
3	0	2.0	-3.0	2.0	-3.0	-0.4
4	0	-3.0	3.0	1.0	3.0	0.8
5	3.0	-1.0	1.0	-2.0	2.0	0.6
6	1.0	4.0	-1.0	1.0	1.0	1.2
7	1.0	3.0	4.0	1.0	1.0	2.0

Table 9: Shift in Preference Following Contingent Access for Patrick

Rank	Session 1	Session 2	Session 3	Session 4	Session 5	Average
1	-3.0	-2.0	-5.0	-3.0	-2.0	-3.0
2	0	1.0	1.0	-3.0	-2.0	-0.6
3	2.0	1.0	1.0	0	-2.0	0.4
4	-1.0	-3.0	-3.0	-3.0	0	-2.0
5	2.0	1.0	2.0	-1.0	4.0	-1.6
6	0	0	1.0	1.0	0	0.4
7	0	2.0	3.0	5.0	0	2.0

assessment, shifted an average of -2.6 levels following noncontingent access across all five sessions. The item ranked fifth most preferred initially shifted an average of 0.6 levels following noncontingent access. The average shift for the items following contingent access is displayed in Table 9. The item ranked first most preferred in the second preference assessment shifted an average of -3.0 levels, following the contingent access condition. The item ranked fifth most preferred in the second preference assessment shifted an average of -1.6 levels.

Across all five sessions, Patrick interacted with the item that was ranked first most preferred for 100% of intervals, except in session 3. In session 3, during the second noncontingent access condition, Patrick interacted with the most preferred item for 94% of intervals and the fifth most preferred item for 6% of intervals.

Participant 4

Results for Caleb are shown in Table 10. For session 1, the motorcycle was ranked as the first most preferred item and the car was ranked as the fifth most preferred item in the initial preference assessment (see Figure 4). Following noncontingent access, the car remained in the fifth most preferred position, while the motorcycle shifted downward six levels into the seventh most preferred position in the hierarchy. The baseball glove was then ranked as the most preferred item in the hierarchy. After the contingent access condition, the baseball glove shifted downward five levels, ranking as the sixth most preferred item. The car shifted upward one level, ranking as the fourth most preferred item.

For session 2, Caleb again selected the motorcycle as the first most preferred item in the initial preference assessment. Coloring was ranked as the fifth most preferred item, where it remained for all preference assessments during this session. After given noncontingent access to coloring and the motorcycle, the motorcycle shifted downward five levels, ranking as the sixth most preferred item. The baseball glove was ranked as the first most preferred item. Following the contingent access condition, the baseball glove moved to the third most preferred position and coloring remained as fifth most preferred.

For the initial preference assessment in session 3, Caleb selected the motorcycle as the first most preferred item and playdough as the fifth most preferred item. For the second preference assessment, the motorcycle moved downward four levels into the fifth most preferred position, while the playdough shifted upwards into the fourth most preferred position. The glove was then ranked as the first most preferred item and the

Table 10: Shift in Preference for Caleb Across All Sessions

Session 1

Rank	PA 1	PA 2	PA 3
1	Motorcycle	Baseball Glove	Motorcycle
2	Coloring	Blocks	Coloring
3	Zoo	Zoo	Blocks
4	Baseball Glove	Playdough	Car
5	Car	Car	Zoo
6	Blocks	Coloring	Baseball Glove
7	Playdough	Motorcycle	Playdough

Session 2

Rank	PA 1	PA 2	PA 3
1	Motorcycle	Baseball Glove	Car
2	Car	Car	Playdough
3	Baseball Glove	Playdough	Baseball Glove
4	Blocks	Zoo	Blocks
5	Coloring	Coloring	Coloring
6	Zoo	Motorcycle	Motorcycle
7	Playdough	Blocks	Zoo

Session 3

Rank	PA 1	PA 2	PA 3
1	Motorcycle	Baseball Glove	Motorcycle
2	Coloring	Coloring	Baseball Glove
3	Zoo	Car	Car
4	Baseball Glove	Playdough	Coloring
5	Playdough	Motorcycle	Blocks
6	Car	Zoo	Playdough
7	Blocks	Blocks	Zoo

Session 4

Rank	PA 1	PA 2	PA 3
1	Baseball Glove	Zoo	Motorcycle
2	Motorcycle	Coloring	Baseball Glove
3	Playdough	Baseball Glove	Zoo
4	Zoo	Car	Coloring
5	Coloring	Playdough	Playdough
6	Car	Motorcycle	Car
7	Blocks	Blocks	Blocks

Session 5

Rank	PA 1	PA 2	PA 3
1	Playdough	Car	Motorcycle
2	Car	Motorcycle	Baseball Glove
3	Motorcycle	Zoo	Playdough
4	Zoo	Coloring	Coloring
5	Baseball Glove	Baseball Glove	Blocks
6	Blocks	Playdough	Car
7	Coloring	Blocks	Zoo

Note. PA= preference assessment.

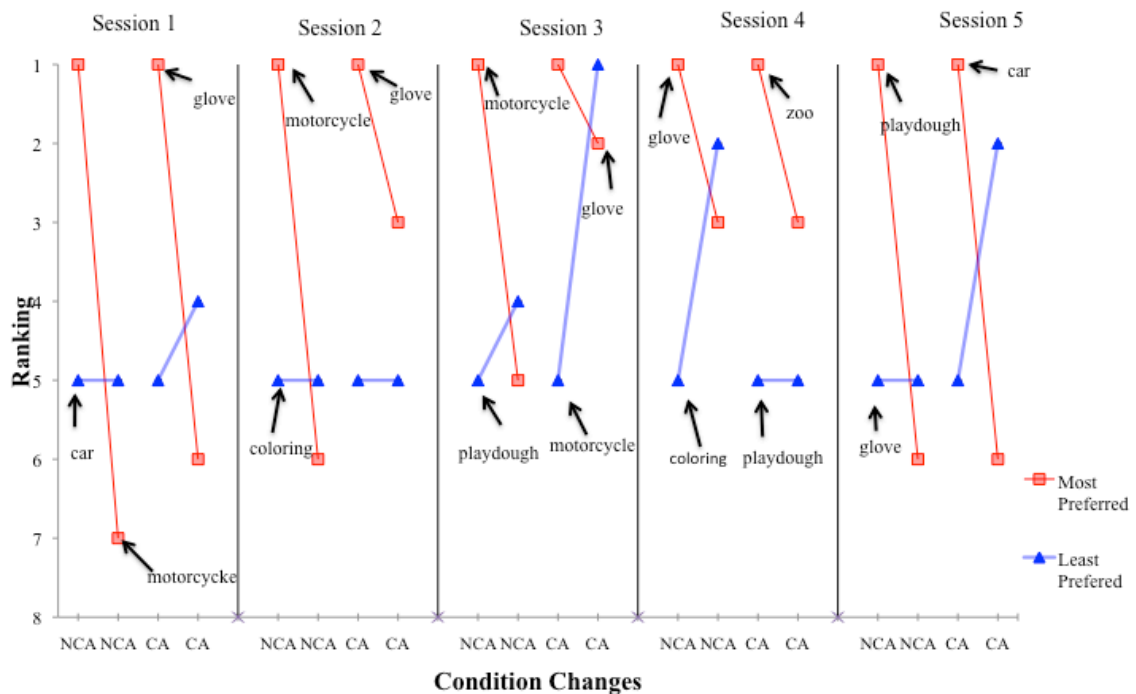


Figure 4. The shift in preference for Caleb's first and fifth most preferred items over five sessions.

motorcycle was in the number five position. After contingent access, the glove was ranked as the second most preferred item and the motorcycle was ranked as the first most preferred item.

For session 4, Caleb initially selected the glove as the first most preferred item and coloring as the fifth most preferred item. The glove shifted downward two levels and coloring shifted upward three levels following noncontingent access to both items. The zoo was then ranked as the most preferred item and playdough ranked as the fifth most preferred item. Following the contingent access condition, the zoo shifted downward two levels, ranking as the third most preferred item. Playdough remained the fifth most preferred item following the contingent access condition.

For Caleb's final session, he selected playdough as his most preferred item and the baseball glove as his fifth most preferred item. Following noncontingent access to playdough and the baseball glove, playdough shifted downward five levels, ranking as the sixth most preferred item. The baseball glove remained as the fifth most preferred item. The car was then the first most preferred item. After the contingent access condition, the car shifted downwards five levels, ranking as the sixth most preferred item. The baseball glove moved upward three levels, ranking as the second most preferred item.

The average shift across all five sessions following the nocontingent access condition is shown in Table 11. The item ranked first most preferred in the initial preference assessment, shifted an average of -4.4 levels following the noncontingent access condition. The item ranked fifth most preferred in the initial preference assessment shifted an average of 0.8 levels following noncontingent access. The average shift across all five sessions following the contingent access condition is shown in Table 12. The item ranked first in the second preference assessment shifted an average of -3.0 levels following the contingent access condition. The item ranked second most preferred following the contingent access condition shifted an average of -0.6 levels and the item ranked seventh most preferred shifted an average of 2.6 levels. The item ranked fifth most preferred in the second preference assessment shifted an average of 1.6 levels in the hierarchy following the contingent access condition.

Throughout the five consecutive days of sessions, there were ten noncontingent access conditions. In the second noncontingent access condition for session 4, Caleb interacted with the item ranked fifth most preferred (playdough) for 92% of the intervals

Table 11: Shift in Preference Following Noncontingent Access for Caleb

Rank	Session 1	Session 2	Session 3	Session 4	Session 5	Average
1	-6.0	-5.0	-4.0	-2.0	-5.0	-4.4
2	-4.0	0	0	-4.0	1.0	-1.4
3	0	2.0	-3.0	-2.0	1.0	-0.4
4	3.0	-3.0	3.0	3.0	1.0	1.4
5	0	0	1.0	3.0	0	0.8
6	4.0	2.0	1.0	2.0	-1.0	1.6
7	3.0	4.0	0	0	3.0	2.0

Table 12: Shift in Preference Following Contingent Access for Caleb

Rank	Session 1	Session 2	Session 3	Session 4	Session 5	Average
1	-5.0	-2.0	-1.0	-2.0	-5.0	-3.0
2	-1.0	1.0	-2.0	-2.0	1.0	-0.6
3	-2.0	1.0	0	1.0	-4.0	-0.8
4	-3.0	-3.0	-2.0	-2.0	0	-2.0
5	1.0	0	4.0	0	3.0	1.6
6	4.0	0	-1.0	5.0	3.0	2.2
7	6.0	3.0	2.0	0	2.0	2.6

and he interacted with the item ranked first most preferred for 8% of the intervals. For all other noncontingent access conditions throughout the five consecutive days of sessions, Caleb interacted with the item ranked most preferred for 100% of the intervals and did not interact with the item ranked fifth most preferred.

Discussion

The purpose of this study was to evaluate the effects of contingent relationships and noncontingent relationships on shifting preference in established preference hierarchies for instrumental and contingent responses. The results suggest that after given noncontingent access to a preferred item, the item's position in the preference hierarchy will shift downward. The results also suggest that following the contingent access condition, in which participants were required to first interact with the item ranked fifth most preferred for 6-minutes, preference for the instrumental response (item ranked fifth) shifted upward. Additionally, the results also suggest that it may be possible to shorten MSWO assessments even more by using a one-stimulus array presentation rather than a three-stimulus array.

For Patrick and Caleb, preference for the items generally shifted more than for Sean and Nathan. One potential explanation could be that for Sean and Nathan certain items were always ranked lower in the hierarchy because they were items that the participants typically played with another person. For example, during the study Nathan asked if he could get his dad to play on the doodle with him. The doodle was consistently ranked low in the preference hierarchy even though his mother listed it as one of his most preferred items when asked prior to our first session. Future research should make sure the participants prefer the items even if they must play with them alone.

When a preference assessment was conducted after the first noncontingent access condition, the item ranked as first most preferred in the initial preference assessment shifted downward for 100% of sessions for Participants 3 and 4. For Participant 1 and Participant 2, the item ranked first most preferred shifted downward following the noncontingent access condition for 60% of sessions. Following contingent access to the fifth and first most preferred items, similar results are shown. For Participants 3 and 4, the item ranked as first most preferred shifted downward for 100% of sessions following contingent access. For Participants 1 and 2, the item ranked first most preferred shifted downward in 60% of sessions following contingent access.

Furthermore, the results suggest that following contingent access to the items, preference for the toy ranked as least preferred, shifted upward or remained in the fifth most preferred position. Previous research (Birch et al., 1982 and Birch et al., 1984) indicated that negative shifts in preference for the instrumental response occurred while preference for the contingent response remained high. Only for Patrick in session 4 and Sean for sessions 3 and 4, did a negative shift occur following contingent access.

Hanley and colleagues (2003) conducted response restriction assessments to evaluate preference shifting. The study demonstrated that when a high probability activity was removed and the participant only had access to a low-probability activity, responding was reallocated to the low-probability activities for two participants. The other two participants in Hanley's study interacted with the low-probability items only when the high-probability activity was provided contingent upon engaging in the low probability item. During the current study, all participants interacted with the least preferred item in the contingent access condition for 100% of intervals across all contingent access

conditions, requiring two verbal prompts or less from the experimenter. In the study conducted by Hanley and colleagues, after high-probability items were restricted and the participants interacted with the low-probability items, a baseline condition was implemented in which participants again had access to all items. In this condition, all participants interacted exclusively with the high-probability item. The results of my study differ from the results of Hanley's study because after participants interacted with the item ranked fifth preferred, their preference for that item increased or remained constant.

Previous research has demonstrated that three-stimulus array preference assessments are as effective as five-stimulus array preference assessments (Carr, Nicolson, & Higbee, 2000). Carr and colleagues also conducted a correlational analysis that moderately supported the use of a one-stimulus array preference assessment. My study also supports the use of one-stimulus array MSWO assessment. Over the five days of my study, 15 three-array MSWO assessments were conducted for each participant (three preference assessments during each session). Of the 60 preference assessments that were conducted, the item the participant selected as first when presented with the initial array of items, was eventually ranked as the first most-preferred item for 65% of preference assessments. That is, for 38 out of 60 preference assessments, the item the participant chose first was the item ranked first after a three-stimulus array preference assessment was completed. The results suggest that it may be possible to determine preference after presenting a single-array to participants. This brief assessment would be extremely useful for teachers, therapists and parents that do not have time to administer lengthier assessments. Future studies should look more in depth at the possible

effectiveness of one-stimulus array preference assessments, as compared to three-stimulus or five-stimulus array preference assessments.

There were several limitations to this study that should be addressed in future research. First, because only preference assessments were conducted, the effectiveness of the items as reinforcers was not assessed. Next, because all items included in the study must have no specific end or beginning, this limited which items could be included in preference assessments. For Sean, one of his most preferred items was a Nintendo DS. However, because all items incorporated in the study had to have no specific beginning or end, the Nintendo DS was not included as one of Sean's seven items. Future studies should use participants whose most preferred items can all be included in the study. Another limitation was that some of the toys used in the preference assessment were typically played with another person. Throughout the current study, the participants were required to play with the item without another person. Furthermore, for Nathan and Sean, the sessions took place in a playroom with a table and chairs. Because of the location, there were distractions throughout the study. Sean and Nathan both asked if they could play with the toy they were instructed to play with in addition to a toy from a box or shelf in the playroom. Additionally, it was difficult to control for time spent outside of the sessions. Even though the seven items used for each participant were restricted prior to the first session and throughout the study, no data was taken on participants' interaction with similar items. Future studies could incorporate a recording system for parents to keep track of the amount of time the participants were exposed to similar toys as those used in the study.

It is hoped that the results of this study will help to better understand the effects of contingent relationships on preference for items and activities. One area most suited to benefit from this type of research and application is education. The use of various forms of potentially reinforcing stimuli has been shown to be effective in the acquisition of academic and social behaviors. Potentially understanding the ways in which preference for items or activities shift will better equip those responsible for learning and teaching in these environments.

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