THE EFFECTS OF VARYING PREFERENCE ASSESSMENT METHODOLOGY ON THE
OCCURRENCE OF CHALLENGING BEHAVIOR

By

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And approved by

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ABSTRACT OF THE THESIS

The effects of varying preference assessment methodology on the occurrence of challenging behavior

by Nicholas Migliaccio

Thesis Director:

Robert LaRue

Preliminary research has suggested that while preference assessments are important for identifying items for use in behavioral and skill acquisition programming, some procedures may evoke challenging behavior. The occurrence of challenging behavior may vary from person to person due to assessment type and as a function of their challenging behavior. The purpose of this study was to extend on previous research and evaluate the relationships between different functions of challenging behavior and preference assessments. Three different models of preference assessments (paired stimulus (PS), multiple stimulus without replacement (MSWO), and free operant (FO)) were implemented three times each to 4 different participants whose challenging behavior was maintained by access to tangible items, escape from demand, and automatic reinforcement (AR). Results showed that the function of challenging behavior may impact rates of challenging behavior depending on assessment type. Two participants with access to tangible functions demonstrated little to no challenging behavior during all 3 assessment types. Two other participants with escape from demand and AR functions demonstrated higher rates of challenging behavior during the PS and MSWO sessions compared
to the FO sessions. These findings suggest that practitioners may want to consider a client’s function of challenging behavior when deciding which preference assessment type is right for them.
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Introduction

Effective use of reinforcement is an integral part of effective behavioral programming. When trying to increase the occurrence of a specific behavior, it is important to identify items that are preferred and ultimately have reinforcing value. Reinforcement is a natural part of life that we all experience and is integral to developing desired behaviors (Pace et al., 1985). Reinforcement can be utilized as a tool to increase appropriate behaviors. Common examples of reinforcement can include getting a sticker for getting an answer right or earning allowance money by doing chores. Reinforcement occurs only if the desired behavior is following contingent application.

There are several useful strategies for assessing preference. Among the most common, especially with neurotypical populations, is simply asking individuals about items or activities they prefer. However, items that individuals ask for may not function as powerful reinforcers to increase behavior (Northup et al., 1996). For populations who struggle with communication difficulties (e.g., Autism Spectrum Disorder (ASD), Intellectual Disability), more systematic procedures may be needed to reliably identify items that are preferred. Identifying preferred items is both critical to implementing skill-acquisition and behavior management programing as items identified using preference assessments are more likely to have reinforcing properties and increase the occurrence of desired behaviors compared to randomly chosen items (Dryer, 1987; Pace et al., 1985). Therefore, it is important to have systems in place to identify preferred items as they are integral to effective behavior intervention and skill acquisition success.

Procedures for Assessing Preference
Researchers have been evaluating strategies for identifying potential reinforcers for over 40 years. Several strategies have been identified to systematically assess preference for items that could potentially have reinforcing value (Verriden and Roscoe, 2016.). Among the most commonly used tools are the single operant preference assessment (Pace et al., 1985), the paired stimulus assessment (Fisher et al., 1992), the multiple stimulus without replacement assessment (MSWO) (DeLeon & Iwata, 1996), and the free operant preference assessment (Roane et al., 1998).

**Single Operant Preference Assessment**

Pace and colleagues (1985) were the first to demonstrate the utility of the single operant preference assessment (SO). The single operant preference assessment is a procedure conducted by presenting a participant with a single item and assessing whether they approach the item or not. In their study, 16 items were chosen based on accessibility and how easy they were to present. During sessions, a single item was placed in front of the individual. Preference was measured by approach behavior defined as reaching for the items. When presented with the item, the subject was given 5s to reach for it. If selected, they were given an additional 5s of interaction time. If the item was not selected, the participant was prompted to use the stimuli and again given 5s to reach for it. If not selected again, the item was removed. A percentage of approach behavior was calculated and used for each item (Pace et al., 1985).

The SO assessment has been found to be a useful tool for identifying preferred items. It can be particularly useful for individuals who struggle to make choices (Fisher et al., 1992). A potential limitation of the SO assessment is that it may overidentify preferred items, especially if the participant is inclined to approach everything placed in front of them. The SO assessment also provides little information about relative preference.
Paired Stimulus Preference Assessment

Fisher and colleagues (1992) were the first to evaluate the effectiveness of the paired stimulus preference assessment (PS). In their study, two items were presented simultaneously, and the participant was only given access to the item they approached first. Each item was then paired once with every other item in a randomized order (120 trials total) until all pairs were presented. They then compared the results of the PS assessment to a SO assessment using the same items. All the items identified as highly preferred by the paired stimulus method were also identified in the single stimulus method. For items the assessments disagreed on, the SO assessment found them to be highly preferred and the forced choice found them to be low to moderately preferred. This shows that the SO assessment overidentified preferred items when compared to the PS assessment.

Paired stimulus preference assessments not only identify preferred items but also provide information about relative preference. Knowing one’s preference is key to finding potential items with reinforcing value and developing effective behavior programming. This assessment serves as a better predictor of what will function as a reinforcer when compared to the SO assessment. Potential imitations of the PS assessment are that it can be time consuming to conduct if using many items and it may be difficult for those who struggle with choice making (Fischer et al., 1992).

Multiple Stimulus without Replacement Preference Assessment

DeLeon and Iwata (1996) were the first to propose the multiple stimulus without replacement assessment (MSWO) as an assessment procedure. The MSWO assessment involves presenting multiple items at the same time and allowing the participant to select from a large
array. After selecting an item, the participant is provided access for a brief period of time. The item is then removed, and the participant is prompted to select from the remaining stimuli. The assessment is run until all stimuli are selected. DeLeon and Iwata (1996) compared three preference assessments: the multiple stimulus with replacement, the multiple stimulus without replacement, and the paired stimulus (PS) preference assessment developed by Fisher et al. (1992). All three assessments produced similar results in identifying the most preferred items among participants, but the paired stimulus and MSWO methods found more consistent rankings of items.

One advantage of the MSWO method is that it takes less time to conduct compared to the PS method. An assessment that takes less time allows therapists to conduct more frequent preference assessments and possibly personalize treatment by identifying preference shifts (DeLeon & Iwata, 1996). A disadvantage, however, is that the presentation of multiple items at once can be overwhelming for some participants, making choosing difficult.

**Free Operant Preference Assessment**

The free operant preference assessment (FO) was first described by Roane and colleagues (1998). The FO preference assessment is an assessment that involves providing participants access to all items at once without restriction or demands, and item engagement is tracked. In the Roane and colleagues (1998) study, 5-minute sessions were run, and the therapist measured engagement with items using 10-s partial interval data, calculating a percentage of session engaged with each item. Results showed that the FO assessment identified high and low preference items for all participants.

Researchers also compared the FO to the PS assessment. One advantage of the free operant compared to the paired stimulus is that it took less time to conduct and produced similar
results compared to the PS assessment. It was also observed that the free operant assessment was associated with less challenging behavior compared to the paired stimulus. As encouraging as these results were, free operant assessments remain understudied when compared to other preference assessments. Each of these preference assessment models have been shown to have utility in specific circumstances. The unique characteristics of the assessed individuals determine the appropriateness of each model.

**Challenging Behavior During Preference Assessments**

While all listed preference assessment methods have been proven to be effective in specific instances, the clinical characteristics of individuals may indicate that some assessment models may be more appropriate than others. Procedural aspects of preference assessments (e.g., brief access to items, removing items after access), can sometimes result in challenging behavior. Exacerbation of challenging behavior has been noted when implementing MSWO and paired stimulus assessments (Kang et al., 2010; Kang et al., 2011; Roane et al., 1998; Tung et al., 2017; Verriden et al., 2016). Interestingly, Roane and colleagues (1998) found that the free operant assessment was associated with less challenging behavior compared to the paired stimulus assessment. They hypothesized this could be due to the removal of items in both the paired stimulus and MSWO assessments, indicating a free operant assessment may be better for individuals with challenging behavior maintained by access to tangibles.

Kang et al. (2010) extended on the Roane et al. (1998) study by investigating the extent to which the model of preference assessment contributed to challenging behavior. The authors first conducted a functional analysis of challenging behavior for two children. Both participants were found to have challenging behavior maintained by access to tangibles. The authors then conducted several types of preference assessment (MSWO, PS, free operant) and measured the
rates of challenging behavior during each type of preference assessment. The authors found that challenging behavior occurred most frequently in the PS and MSWO assessments as compared to the free operant assessment. A within session analysis of the PS and MSWO assessments showed 98% of challenging behavior occurred when items were removed and never when the participants had access to the items. These findings support the Roane et al. (1998) hypothesis that free operant assessments may be better suited for individuals with challenging behavior maintained by access to tangibles. Rates of challenging behavior maintained by other functions across different types of preference assessments were not evaluated.

Kang et al. (2011) expanded on Kang et al. (2010) by comparing rates of challenging behavior for 7 children with challenging behavior maintained by various functions during MSWO, PS and free operant preference assessments. Three of the children had functions of access to tangibles, two had attention functions, and two had demand functions. For the three participants with challenging behavior maintained by access to tangibles, the frequency of challenging behavior in free operant assessments was near zero as compared to higher rates of challenging behavior in the PS and MSWO assessments. They also found that challenging behavior for both participants with challenging behavior maintained by access to attention was lower in PS and MSWO assessments compared to free operant, potentially due to lower levels of interactions the FO assessment. Both participants with challenging behavior maintained by escape from demand had almost no challenging behavior in any of the preference assessments. The researchers hypothesized this could be due to the level of demand being too low to evoke escape related challenging behavior (Kang et al., 2011). This study further suggests the function of challenging behavior should be considered when deciding on preference assessment type.
Tung and colleagues (2017) extended on previous challenging behavior preference assessment research by comparing rates of challenging behavior across FO, MSWO, and PS preference assessments for four children with challenging behavior maintained by access to tangibles. They found that FO preference assessments produced less challenging behavior compared to MSWO and PS assessments for three of the four participants. It was also found that for three of the four participants, challenging behavior was observed following the completion of all three assessments, with highest rates after the paired stimulus and MSWO assessments compared to the free operant (Tung et al., 2017). This study also indicates that an individual’s function of challenging behavior should be considered when choosing an appropriate preference assessment type.

Preliminary research suggests that free operant assessments may result in less challenging behavior when the behavior is maintained by access to tangibles and produce similar preference hierarchies compared to other common preference assessments (Roane et al., 1988; Kang et al., 2010; Kang et al., 2011; Tung et al., 2017). It was also found by Kang et al. (2011) that PS and MSWO assessments resulted in less challenging behavior for individuals with challenging behavior maintained by access to attention. These studies have shown that the function of challenging behavior should be considered when deciding on preference assessment type. While preliminary research suggests different preference assessments could be better suited for different functions of challenging behavior, the research is currently limited with only a handful of studies with few participants. It should also be noted that previous studies have had variability in session durations due to yoking the schedule for item access. This can lead to long session times making it less practical to implement in clinical settings. This study controlled for this and kept session lengths relatively comparable for all three conditions. The purpose of this study was
to extend on previous research and evaluate the relationships between different functions of challenging behavior and preference assessments.

**Methods**

**Participants and Setting**

Three adolescents and one adult diagnosed with autism spectrum disorder (ASD) were recruited from the Douglass Developmental Disabilities Center (DDDC). Participants were recruited from both the DDDC school and adult day program. To be considered for the current study, participants had to have had a functional analysis (FA) completed within the past year. Board-Certified Behavior Analysts at the DDDC were contacted to identify participants who had an FA completed within the last year and obtain functional analysis data. Consent was also given by parents or caretakers to participate in the study. There were two participants with primary tangible functions, one with an automatic reinforcement (AR) function, and one with a primary demand function. Sessions were conducted in the participants’ classrooms at the DDDC.

**Preference Assessment Analysis Procedure**

In the preference assessment analysis, three conditions (paired stimulus, MSWO, free operant assessments) were alternated. Four assessment items were included in each condition and remained constant across all sessions. These items were identified by interviewing staff members familiar with the participants. One of the four items used was identified as a “neutral” item to the participant. One complete preference assessment represented a session in the analysis. After each session, data were collected on challenging behavior for 30 seconds to account for challenging behavior after the removal of all items. All three conditions were run three times. Paired stimulus and MSWO sessions were conducted first to determine the duration of the FO
assessments. The average time of the two PS and MSWO sessions most recently conducted was used to calibrate the length of the FO session to keep session durations consistent across preference assessments.

Conditions

PS Preference Assessment

PS conditions were conducted using the procedures created by Fisher et al. (1992). Every possible pairing of the 4 items was made and a total of 12 trials were conducted. Items were placed 12-18 inches from the participants and 6 inches apart on their desks. The therapist verbally instructed participants to pick an item (e.g., “pick one”) and they were then given 30s of access time following the choice. If an item was not selected within 5s, the pair was presented again. If no item was selected again, the next pairing was presented, and no selection was noted. Attempts to grab both items were blocked, and the pair was re-presented.

MSWO Preference Assessment

MSWO conditions were conducted using procedure created by DeLeon and Iwata (1996). All items were presented in an array 6 inches apart and placed in a line on the participant’s desk. Participants were verbally instructed to make a choice (e.g., “pick one”) and they were then given access to the item for 30 seconds. Once an item was selected it was removed from the array and the remaining items were re-presented until all items were chosen. If no item was selected after 30 seconds, the session was terminated. Attempts to grab more than one item were blocked and items were re-presented.

FO Preference Assessment

FO conditions were run using procedures by Roane et al. (1998) and session lengths were determined by the average duration of the PS and MSWO sessions prior to the FO session.
All 4 items were placed 12-18 inches from the participant and items were approximately 6 inches apart on their desk. Participants were given free access to the items with no demands. Item engagement duration was measured using momentary time sampling data every 10 seconds. Participants were allowed to stand but were redirected to their desk if they left the area by more than 2 feet. The therapist was positioned in a way that they could clearly see which items the participant was engaging with. If no items were selected, no preferred items were identified. If more than one item was engaged with at once, engagement was be measured for both items.

**Dependent Measures and Interobserver Agreement**

**Dependent Measures**

Data were collected on the rate of challenging behavior (e.g., self-injurious behavior, aggression, and disruption), stimulus selection, stimulus non-selection, and stimulus engagement duration. In the MSWO and PS conditions, Tung et al. (2017) procedures were followed, and stimulus selection was defined as engaging with an item by touching it for 3s or placing an edible past the plane of one’s lips. In the FO conditions, stimulus engagement was measured for items being touched or placed past the plane of one’s lips using momentary time sampling data every 10 seconds.

**Interobserver Agreement**

A second observer simultaneously and independently collected data on challenging behavior, item selection, and item engagement duration for 44.4% of sessions. When compared to the primary observer using the total count method, IOA for challenging behavior between observers averaged 100% (range, 100%-100%), 93.8% (range, 75%-100%), 100% (range, 100%-100%), and 100% (range, 100%-100%) for Arnold, Larry, James, and Marvin, respectively. When compared to the primary observer using the total count (MSWO conditions)
and interval by interval methods (PS and FO conditions), IOA for item selection/engagement between observers averaged 98.3% (range, 89.8%-100%), 100% (range, 100%-100%), 93.5% (range, 82.9%-100%), and 98.8% (range, 95.1%-100%) for Arnold, Larry, James, and Marvin, respectively.

**Design**

A multielement design was used by alternating in a counterbalanced order between Paired Stimulus (PS), MSWO, and free operant conditions.

**Results**

*Preference Assessment Analysis by Participant*

*Arnold.* Arnold’s challenging behavior is depicted in Figure 1. The average rate of challenging behavior observed during the PS condition was 0.03 responses per minute (range 0.0-0.08). In the MSWO condition, the average rate of challenging behavior was 0.02 responses per minute (range 0.0-0.07). No challenging behavior was observed during the FO conditions. In Session 7, an implementation error occurred, resulting in an extended session length that could have impacted the rate of challenging behavior for that condition.

*Larry.* Larry’s challenging behavior is depicted in Figure 2. The average rate of challenging behavior observed during the PS conditions was 0.13 responses per minute (range 0.0-0.29). No challenging behavior was observed in either the MSWO or FO conditions.

*Marvin.* Marvin’s challenging behavior is depicted in Figure 3. The average rate of challenging behavior observed during the PS condition was 6.8 responses per minute (range
In the MSWO condition, the average rate of challenging behavior was 4.43 responses per minute (range 2.67-6). No challenging behavior was observed during the FO conditions.

James. James’ challenging behavior is depicted in Figure 4. The average rate of challenging behavior observed during the PS condition was 0.75 responses per minute (range 0.31-1.58). In the MSWO condition, the average rate of challenging behavior was 0.87 responses per minute (range 0-1.33). No challenging behavior was observed during the FO conditions.

Preference Assessment Analysis Results by Function

Average Rate of challenging Behavior for Participants with Tangible Functions. Figure 5 depicts the average rate of challenging behavior for participants presenting with tangible functions. Challenging behavior was observed during the PS (M= 0.05 responses per minute; range, 0.0 to 0.29) and MSWO (M=0.01 responses per minute; range, 0.0 to 0.06) conditions. No challenging behavior was observed during the FO conditions.

Average Rate of challenging Behavior for Participants with Escape Functions. Figure 6 depicts the average rate of challenging behavior for participants presenting with escape functions. Challenging behavior was observed during the PS (M= 6.8 responses per minute; range, 4.39 to 8.4) and MSWO (M= 4.43 responses per minute; range, 2.67 to 6) conditions. No challenging behavior was observed during the FO conditions.

Average Rate of challenging Behavior for Participants with Automatic Reinforcement Function. Figure 7 depicts the average rate of challenging behavior for participants presenting with challenging behavior maintained by AR. Challenging behavior was observed during the PS (M= 0.75 responses per minute; range, 0.31 to 1.58) and MSWO (M= 0.87 responses per minute; range, 0 to 1.33) conditions. No challenging behavior was observed during the FO conditions.
Preference Assessment Results

Table 1 shows the average preference assessment rankings for each participant across all conditions.

Arnold. For the FO conditions, Arnold ranked iPad first, wand second, doll third, and costumes fourth. For the PS conditions, he ranked iPad first, wand second, doll third, and costumes fourth. For the MSWO conditions, he ranked Ipad first, wand second, costumes third, and doll fourth.

Larry. For the FO conditions, Larry ranked Youtube first, ghost toy second, squishy toy third, and pop-it fourth. For the PS conditions, he ranked YouTube first, ghost toy second, squishy toy third, and pop-it fourth. For the MSWO conditions, he ranked YouTube first, ghost toy second, squishy toy third, and pop-it fourth.

James. For the FO conditions, James ranked stick first, Kit-Kat second, lollipops third, and pop-it fourth. For the PS conditions, he ranked Kit-Kat first, lollipop second, pop-it third, and stick fourth. For the MSWO conditions, he ranked lollipop first, Kit-Kat second, stick third, and pop-it fourth.

Marvin. For the FO conditions, Marvin ranked iPad first, puzzle second, baseball activity third, and pop-it fourth. For the PS conditions, he ranked puzzle first, baseball activity second, pop-it third, and iPad fourth. For the MSWO conditions, he ranked baseball activity first, puzzle second, pop-it third and iPad fourth.

Participants presenting with a tangible function demonstrated correspondence across all assessment types for the top two items. A participant with an escape from demand function demonstrated correspondence across items during the PS and MSWO conditions, however their most preferred item during the FO conditions ranked lowest in the PS and MSWO conditions.
Similar findings occurred for a participant with an AR function in which there was correspondence across items during the PS and MSWO conditions and their most preferred item during the FO conditions ranked last or second to last in the PS and MSWO conditions.

**Discussion**

Prior research has suggested that certain PA procedures can evoke challenging behavior. The purpose of this study was to extend on previous research and evaluate the relationships between different functions of challenging behavior and preference assessments. It was found that all participants engaged in some challenging behavior during preference assessments. Larry engaged in challenging behavior during the PS conditions and none in the MSWO or FO conditions. Arnold, Marvin, and James engaged in challenging behavior during the PS and MSWO conditions and none during the FO condition. Two participants with tangible functions, Larry and Arnold, generally had low rates of challenging behavior across all conditions. Marvin, with an escape from demand function, and James, with an AR function, had higher rates of challenging behavior during the PS and MSWO conditions, with no challenging behavior during the FO conditions.

These findings for tangible function participants are not entirely consistent with those of Tung et al. (2017). Arnold and Larry both had undifferentiated data across all conditions. One possible explanation for the disparate findings could be that items used did not have enough reinforcing value to evoke challenging behavior due to restricted access. Also, unlike Tung et. al (2017), item access duration was not yoked for the PS and MSWO sessions based on the amount of time engaged with in the free operant session. Access time for items during the PS and MSWO sessions remained 30s to stay consistent with the typical procedures of those
assessments. Another potential explanation for the somewhat disparate results is that both participants demonstrated the ability to request items (e.g., “iPad please”) during the PS and MSWO conditions. Individuals who have received effective behavior intervention could be less likely to engage in challenging behavior and instead use functional communication and tolerate delays.

Findings from the current study are also inconsistent from the findings of Kang and colleagues (2011). In their investigation, the authors found low rates of challenging behavior across all preference assessment conditions for two children with escape from demand functions. It was hypothesized that the demand of the assessments (e.g., choosing an item) may have not been enough to evoke challenging behavior. This study found otherwise with an adult participant that has an escape from demand function. Marvin had high rates of challenging behaviors during the PS and MSWO sessions, with no challenging behavior during the FO sessions. It could be that for some individuals, having to make a choice is enough of a demand to evoke challenging behavior. PS and MSWO sessions can resemble the structure of a DTI session and may be perceived as “work” by the participant. Future research is needed to evaluate more participants with escape from demand functions and to conduct in session analyses of when challenging behavior occurs (e.g., when a demand is given). Practitioners should take note of what kind of demands evoke challenging behavior when deciding on preference type for their clients.

Another unique feature of this study was that we included a participant (James) with a novel function (AR). James engaged in more challenging behavior during the PS and MSWO conditions relative to the FO conditions. This could be due to the procedures of the PS and MSWO assessments interfering with ritualistic behaviors rather than the FO assessment in which
the therapist was removed. Future research should evaluate more participants with AR functions and conduct in session analyses of when challenging behavior occurs.

Table 1 shows preference assessment rankings for each assessments for all participants. Similar to DeLeon & Iwata (1996), rankings from the MSWO and PS conditions were generally consistent. The FO conditions sometimes produced different ranking as compared to the MSWO and PS conditions. For Marvin, with escape from demand function, and James, with an AR function, their most preferred item during the FO sessions ranked lowest in their PS and MSWO sessions. It could be that they were not motivated enough to select the item during the PS and MSWO assessments, but would use it if available demand free. This could indicate that those items may not have reinforcing value as the participants were unwilling to select them when given a demand.

While this study could have benefited from more participants, we were limited by the number of individuals with recently conducted functional analyses and parents willing to consent to participation. While there are only four participants to this point, we plan to expand the number of participants and continue running sessions for this protocol. Results also may have been impacted by methodological differences compared to other studies. The goal of the current investigation was to assess standard preference assessment procedures such as not yoking item access duration during the PS and MSWO sessions. This was due to time constraints as yoking the schedule would have led to longer session lengths and is not representative of typical preference assessment procedures or practical in a clinical setting.

Overall, future research should focus on continuing to assess challenging behavior during various preference assessment types for more individuals (e.g., children, adults) across different functions of challenging behavior. Sessions should also be recorded, and descriptive data
collected of when challenging behavior occurs during assessments. This can help determine which aspects of preference assessment procedures (e.g., presentation of items, removal of items) are evoking challenging behavior and allow for integrity checks on therapists to ensure assessment procedures are being followed. Future investigators should also consider running reinforcer assessments to assess the reinforcing value of identified preferred items across assessment types.

Preference assessments are very common and used regularly for skill acquisition and behavior management programming. When selecting PA types, practitioners rarely consider the appropriateness of the assessments based on function of challenging behavior. This can lead to challenging behavior during assessments and hinder identifying preferred items for treatment. This study indicates that the appropriateness of preference assessment type may depend on an individual’s function of challenging behavior. These findings have the potential for widespread impact on how PA types are selected by practitioners and can lead to less challenging behavior during assessments for individuals.
Figure 1

Arnold: Preference Assessment Analysis (Challenging Behavior)

Note. Arnold’s rate of challenging behavior across all conditions.
Figure 2

Larry: Preference Assessment Analysis (Challenging Behavior)

Note. Larry’s rate of challenging behavior across all conditions.
Figure 3

Marvin: Preference Assessment Analysis (Challenging Behavior)

Note. Marvin’s rate of challenging behavior across all conditions.
Figure 4

*James: Preference Assessment Analysis (Challenging Behavior)*

Note. James’s rate of challenging behavior across all conditions.
Figure 5

*Average Rate of Challenging Behavior for Participants with Tangible Functions*

*Note.* Tangible function participant’s average rates of challenging behavior across all conditions.
Figure 6

*Average Rate of Challenging Behavior for Participants with Escape Functions*

*Note.* Escape from demand function participant’s average rates of challenging behavior across all conditions.
Figure 7

*Average Rate of Challenging Behavior for Participants with Automatic Reinforcement Function*

*Note.* Automatic reinforcement function’s participants average rates of challenging behavior across all conditions.
### Table 1

**Participant Preference Assessment Results**

<table>
<thead>
<tr>
<th>Participant</th>
<th>Item Rank</th>
<th>FO</th>
<th>PS</th>
<th>MSWO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arnold (Tangible)</td>
<td>1</td>
<td>iPad</td>
<td>iPad</td>
<td>iPad</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Wand</td>
<td>Wand</td>
<td>Wand</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Doll</td>
<td>Doll</td>
<td>Costumes</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Costumes</td>
<td>Costumes</td>
<td>Doll</td>
</tr>
<tr>
<td>Larry (Tangible)</td>
<td>1</td>
<td>YouTube</td>
<td>YouTube</td>
<td>YouTube</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Ghost toy</td>
<td>Ghost toy</td>
<td>Ghost toy</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Squishy toy</td>
<td>Squishy toy</td>
<td>Squishy toy</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Pop-it</td>
<td>Pop-it</td>
<td>Pop-it</td>
</tr>
<tr>
<td>James (Automatic reinforcement)</td>
<td>1</td>
<td>Stick</td>
<td>Kit-Kat</td>
<td>Lollipop</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Kit-Kat</td>
<td>Lollipop</td>
<td>Kit-Kat</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Lollipop</td>
<td>Pop-it</td>
<td>Stick</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Pop-it</td>
<td>Stick</td>
<td>Pop-it</td>
</tr>
<tr>
<td>Marvin (Escape from demand)</td>
<td>1</td>
<td>iPad</td>
<td>Puzzle</td>
<td>Baseball Activity</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Puzzle</td>
<td>Baseball Activity</td>
<td>Puzzle</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Baseball activity</td>
<td>Pop-it</td>
<td>Pop-it</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Pop-it</td>
<td>iPad</td>
<td>iPad</td>
</tr>
</tbody>
</table>

*Note.* Average preference assessment rankings for all participants across conditions.
References


