A Comparison of Pictorial and Edible Paired Stimuli Preference Assessments

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Anna Richardson Matloff

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Author: Anna Richardson Matloff

Department: Counseling and Applied Educational Psychology

Approved for Thesis Requirements of Master of Science Degree

_________________________________________________
Gary M. Pace, PhD, BCBA

_________________________________________________
Karen A. Gould, PhD BCBA

_________________________________________________
Shawn Kenyon, MS BCBA
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by

Anna Richardson Matloff

B.A. College of the Holy Cross 2003
M.Ed. CUNY College of Staten Island 2006

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# Table of Contents

A Comparison of Pictorial and Edible Paired Stimuli Preference Assessments

1. Title
   A. Abstract
   B. Introduction
      - Basics of preference assessments
      - Stimulus approach preference assessments
      - Paired stimuli preference assessments
      - Verbal-tangible preference assessments
   C. Method
      a. Participants and Setting
      b. Selection Criteria
      c. Response Measurement and IOA
      d. Procedural Integrity
      e. Paired Stimulus Preference Assessment- Edible and Pictorial
      f. Reinforcer Assessment
   D. Results
   E. Discussion
   F. References
   G. Acknowledgements
   H. Tables
   I. Figure Captions
   J. Figures
Abstract
Preference assessments are an important tool in any treatment package. In this study, pictorial preference assessments were compared with edible preference assessments for 4 individuals diagnosed primarily with autism. A paired stimulus procedure was used with both. In the pictorial condition, participants were presented with two picture symbols of edibles and told, “Pick one.” In the edible condition, the participants were presented with two foods and told “Pick one.” The resulting hierarchies were compared. The edibles identified as most preferred and least preferred during both conditions were tested for reinforcer efficacy. The reinforcer assessment verified that the stimuli that were identified as high preference in both the pictorial and edible conditions produced higher rates of responding than those identified as low preference stimuli. The similar results with both pictures and edibles indicate that both the pictorial and edible preference assessments were effective in determining reinforcers.
A Comparison of Pictorial and Edible Paired Stimuli Preference Assessments

Reinforcers play a crucial role in skill acquisition and control of maladaptive behaviors of children with developmental delays. Motivation via reinforcers can come in many forms, whether it be edible (food), tangibles such as toys, or access to special activities, or a break from work activities. Preference assessments serve to provide a rank order of different materials so that professionals can use those that are most preferred as consequences for the behavior of individuals they serve. Another important goal of preference assessments is to identify stimuli that may function as effective positive reinforcers (Lee 2010). Several studies have addressed how preference based on the result of an assessment predicted reinforcer efficacy.

Preference assessments come in several forms. At their most basic, assessments may be categorized as direct assessments or indirect. Direct assessments are completed through interacting with the clients; while indirect assessments rely on the caregivers and direct care staff observation of their client’s behavior. Direct assessment procedures may be either approach-based or engagement-based. Hagopian (2004) defines approach-based procedures as “involving recording the individuals’ approach responses to stimuli presented singly or concurrently with other stimuli, whereas engagement-based procedures involve recording duration of engagement with stimuli”. In comparison, indirect preference assessments rely on the opinions of care providers or others who know the participants (Hagopian 2004). Indirect assessments can include checklists or unstructured interviews. Based on opinions drawn from interviews, stimuli are ranked from least to most reinforcing. Many studies have tried to determine which type of
assessment is the most effective, takes the least amount of time, or produces the best hierarchy of reinforcers. The functioning level of the participant, however, may be a crucial variable in determining the outcome of these studies. For instance, certain assessments have proved more effective for non-verbal versus verbal populations.

In direct preference assessments, the participants are systematically exposed to stimuli for a brief period and their approach or level of engagement with each stimulus are recorded across multiple trials (Hagopian 2004). Many studies have manipulated different aspects of the direct assessment, often combining the preference assessment with a reinforcer assessment to determine the highly preferred stimuli’s efficacy.

Pace, Ivancic, Edwards, Iwata, and Page (1985) conducted one of the first studies that approached the direct assessment systematically. In this study, 16 stimuli were used. Participants were given access to one stimulus at a time and given the opportunity to approach the item, either by interacting with it or eating it. Highly preferred stimuli were determined by a high rate of approach. If the participant approached the item within 5 seconds, the stimulus was made available for an additional 5 seconds. Following the preference assessment, a second assessment was run to validate the reinforcing effects of the highly preferred stimuli. During each trial of the reinforcer assessment, the researcher presented a demand. If the participant successfully completed the demand, they were given the reinforcer. The results showed that the contingent use of the preferred stimuli increased the number of target behaviors relative to baseline and nonpreferred conditions (Pace 1985).

In another landmark preference assessment study, Fisher, Piazza, Bowman, Hagopian, Owens, and Slevin (1992) compared a paired stimuli procedure and the
aforementioned Pace procedure. During the paired stimuli procedure, each stimulus was paired once with every other stimulus, in a randomized order, for a total of 120 stimulus-pair combinations (Fisher 1992). Participant approaches to one of the stimuli resulted in access to that stimuli for 5 seconds and removal of the other stimuli. Fisher et al. found that all the items identified as highly preferred by the paired stimuli assessment were also identified as highly preferred on the approach preference assessment. The study demonstrated that a forced choice assessment resulted in greater differentiation and more readily identified reinforcers than an approach procedure.

Piazza, Fisher, Hagopian, Bowman, and Toole (1996), further evaluated choice assessments. This study attempted to determine whether the effectiveness of reinforcement varieties positively with the degree of preference. A choice assessment was used to predict relative effectiveness of stimuli categorized as high, middle, and low preference. A concurrent operant design was run to test the reinforcer effectiveness. Three responses were concurrently available to the participants in each session. For example, they could choose to sit in Chair A and gain access to a high preference stimulus, Chair B and gain a low preference stimulus, or Chair C and gain nothing (control). They rotated through low versus high, low versus middle, and high versus middle. The choice assessment did identify effective reinforcers. Those rated high preference or middle preference reinforced better than those rated low.

A study by Northrup, George, Jones, Broussard, and Vollmer (1996) compared three types of preference assessments with high functioning, verbal participants. The first was a survey in which children ranked items from different categories as being liked not at all, a little, and a lot. The second was a verbal stimulus-choice procedure (“Which
would you do a lot of hard work to get, x or y?). The final one was a pictorial stimulus-choice procedure in which the child was given coupons representing two categories and was told to “Just pick one.” The results of these three preference assessments was that the verbal or pictorial stimulus-choice assessments were more likely than the survey to identify items that served as reinforcers.

Higbee, Carr, and Harrison (1999) conducted a multiple stimulus without replacement (MSWO) preference assessment using both pictorial and tangible stimuli. The two participants had moderate to severe mental retardation. Both were able to verbally identify each object or point to the card when its name was spoken. In the tangible condition, seven stimuli were presented, including solid edibles, beverages, and toys. In the pictorial condition, photographs of the same seven actual stimuli were used. After the hierarchies were determined, a reinforcer test was run with the four stimuli with the largest selection difference produced by the two assessments. The result of the study was that the tangible stimulus assessment produced greater variation in selection percentages than the pictorial condition. Also, stimuli identified as high preference by the tangible assessment were more potent reinforcers. The results may have been that way because although the subjects could reliably identify the stimuli (tact), they did not have the ability to respond (mand) to the pictures in the same way.

Cohen-Almedia, Graff, and Ahearn (2000) found that children who perform in the normal range on IQ tests and have age appropriate language have a high degree of correspondence between verbal and nonverbal expressions of stimulus preference. The purpose of the study was to compare hierarchies of preferred stimuli generated by tangible preference assessments with hierarchies generated by verbal assessments with
verbal students. The result was that for most participants, the two assessments provided a high degree of correspondence for the most and least preferred items.

In past studies, authors have compared many types of preference assessments. The findings show that verbal or pictorial stimulus-choice assessments are more likely than a survey to identify items that functioned as reinforcers (Cohen-Almeida 2000). Verbal assessment requires the least amount of time. Plus, there is no cost associated with a verbal-pictorial assessment, whereas with an edible assessment the food must be purchased. Additionally, studies have shown that for children who perform in the normal range on IQ tests and have age appropriate language, there is a high degree of correspondence between verbal and nonverbal expressions; however, for individuals whose language skills fall below their chronological age, it is not clear that verbal preference assessments produce valid and reliable results (Cohen-Almeida 2000). What then of those that fall in the middle range? What of children who use a combination of verbal and pictorial communication? The purpose of the present study was to determine if a pictorial forced choice preference assessment would yield the same hierarchy as a tangible forced choice preference assessment, and whether the results of the pictorial assessment would have high reinforcer efficacy. Some questions the research aimed to answer are: Which edible reinforces better? Will there be a difference in the edibles chosen in the pictorial condition and the tangible condition? Will the highly preferred edibles as determined by the pictorial condition be effective reinforcers?
Method

Participants and Setting

All sessions took place at a day school for children and youth with autism and other developmental disabilities. Four students participated, three males and one female. Steve was 20 years old and diagnosed with Down syndrome and hyperactivity disorder. Bob was 18 years old and diagnosed with autism and pervasive developmental disorder (PDD). Bill and Sally were 17 years old and 19 years old, respectively, and diagnosed with autism. All sessions were conducted in a conference room that was furnished only with tables and chairs. One or two researchers and the participant were the only ones present in the room during sessions.

Selection Criteria

Prior to the beginning of the research, students demonstrated spoken word/picture match to sample skills for the assessed stimuli, that is they could identify the pictorial stimuli both receptively and expressively with 100% accuracy and independence. Expressive identification can be done with verbal language, sign language, or an augmentative and alternative communication (AAC) device, however the students in the study were all primarily verbal communicators. From an initial group of seven, the four participants were those who scored 90% or higher with the expressive and receptive identification tests were chosen to participate in the study.

Response Measurement and Interobserver Agreement

In the paired stimulus preference assessment, the participant’s selection of an edible or picture was measured. The response, a point, had to be initiated within 10 seconds of the stimulus presentation. If the participant did not select an item, the
researcher cleared the items from the table, and represented those items after all other trials were completed. In the reinforcer assessment, the response measured was whether the participant raised a hand. The hand had to be raised at least 6 inches off the table.

Interobserver agreement was taken by a second observer for 50% of paired choice stimulus assessment trials. The IOA was 99.4% agreement (range 97%–100%). IOA was taken by a second observer for 67% of the reinforcer assessment trials. The IOA was 98.4% agreement (range 84%–100%).

Procedural Integrity

A checklist was used to assess procedural integrity. During the paired stimulus preference assessment, the checklist was next to the data sheet on the table in front of the researcher. Experimenter behaviors listed on the checklist included: clear labeling of the pictures/edibles, correct left/right positioning of the pictures/edibles as indicated on the worksheet, presentation of the correct picture as indicated on the worksheet, correct recording of the stimulus selected, equidistant presentation of two pictures/edibles, and clear, understandable statement of the instruction “Pick One”?

During the reinforcer assessment, the checklist was added to the bottom of the data sheet on the table in front of the researcher. Items on the checklist included: Participant imitated desired response following “Do this”, researcher waited until participant did same, repeated direction if needed, researcher said instruction, researcher started timer for 1 minute, and researcher gave 1 minute break between sessions.

Procedural integrity was collected for 50% of all paired stimulus assessment and 49% of reinforcer assessments.
Procedure

**Paired Stimulus Preference Assessment- Edible and Pictorial**

A paired stimulus preference assessment (Fisher et al. 1992) was run with six randomly selected edibles. The edibles, which were the same for each participant, were Oreos, Doritos, goldfish, raisins, Skittles, and potato chips. In the pictorial assessment, six pictures of the same edible objects were used. The pictures were in color, measured 1.5 inches by 1.5 inches, and had the name of the object depicted above them. The edible (A) and pictorial (B) assessments were presented in two different sequences. For Sally and Steve, the order was ABABBABA order, while for Bill and Bob it was ABBAABAB.

**Reinforcer Assessment**

A reinforcer assessment similar to the one described by Moher et al. (2008) was used to assess the reinforcing effectiveness of stimuli identified in the preference assessment. The desired response was a hand raise, at least 6 inches off the table. For this condition, the participant was seated across the table from the experimenter. For the baseline condition, participants were told “You can raise your hand as many times as you want, but you will not earn anything for it”. For the high and low preference edible conditions, the participants were told “You can raise your hand as many times as you want, and every time you raise your hand you will earn an (edible)” . The participants had one minute to raise their hands. Every time they exhibited the desired response, an edible was deposited in a cup in front of them. At the end of one minute, the experimenter and
participant counted out the number of edibles, and then the participant was allowed to consume them. If multiple trials were run in one session, participants were given a one-minute break in between trials. The experimental design was ABCA: three baseline sessions, three sessions with the highest preferred edibles, three sessions with the lowest preferred edibles, and a return to baseline conditions for three sessions.

Results

Paired Stimulus Preference Assessment

Table 1 depicts the results of both paired stimulus preference assessments for Sally. The data are represented as the average number of approaches per session over the four assessment sessions. Sally preferred the Skittles picture the most, approaching it 27 out of 40 opportunities, or 67.5%, making them her highest preferred stimulus. In comparison, Sally never approached the picture of the raisins, making it her least preferred stimulus. In the edible condition, Sally’s highest preferred edibles were Skittles and Doritos, approaching each of them 29 out of 40 opportunities, or 72.5%. Raisins were her least preferred edible, which she never approached.

Over the course of Steve’s four pictorial assessments, his highest preferred picture was of Skittles, approaching it on 32 out of 40 opportunities, or 80%. He preferred the picture of the raisins the least, approaching it on 3 out of 40 occasions, or 7.5%. In the edible condition, his highest preferred edible was Skittles, approaching it on 32 out of 40 opportunities, or 80%. His lowest preferred edible was raisins, approaching them on 7 out of 40 occasions, or 17.5%.
Over the course of Bill’s four pictorial assessments, his most preferred picture was of Doritos, approaching it in 34 out of 40 opportunities, or 85%. His least preferred picture was of raisins, approaching it 6 out of 40 opportunities, or with 15% approach. In the edible condition, his most preferred edible was Doritos, approaching it during 35 out of 40 opportunities, or with 87.5% approach. His least preferred edible was goldfish, approaching it in one out of 40 opportunities, or a 2.5% approach.

For Bob, his most preferred picture was of Oreos, approaching it in 26 out of 40 opportunities, or a 65% average approach. His least preferred picture was of raisins, approaching them during 3 out of 40 opportunities, or a 7.5% average approach. His most preferred edible was Oreos, approaching them during 30 out of 40 opportunities, or a 75% average approach. His least preferred picture was raisins, approaching them once during 40 opportunities, or with a 2.5% average approach.

Across the four participants, the number of concurrent pairs varied widely. Bill had the lowest with 1, Sally had 2, and Steve and Bob both had 4.

Reinforcer Assessment

Figure 1 shows the results of Sally’s reinforcer efficacy test. Over the course of three sessions of baseline, she made 0, 0, and 5 responses. Because Sally’s data showed an increasing trend, an additional session was run. During baseline session 4, she responded 0 times. Since Sally had the same highly preferred picture and edible, Skittles, these stimuli were used during the high responding condition. When tested with the high-preferred edible consequence, she had an average of 37.6 responses per minute (range 33-
When tested with the low preferred edible consequence, raisins, Sally averaged 28 responses per minute (range 16-41). When baseline conditions were reinstated, she initially responded 19 times, followed by 2 and 3 times. The initially higher rate of responses is possibly a carryover effect from the previous condition in which hand raising was reinforced.

Figure 2 shows the results of Steve’s reinforcer efficacy test. During baseline, he made no responses. Since Steve’s most highly preferred picture and edible was Skittles, they were used for the high responding condition. When tested with the high-preferred edible, he produced an average of 38 responses per minute (range 33-42). Raisins were used for the low preferred condition. When tested with the low preferred edible, he had an average of 29.3 responses per minute (range 26-33). When Steve returned to the baseline condition, he initially had 33 responses per minute, followed by two sessions of zero responses, similar to Sally.

Figure 3 shows the results of Bill’s reinforcer efficacy test. Like Steve, he made no responses during baseline. Bill had the same highly preferred picture and edible, Doritos, and they were used for the high responding condition. However, his least preferred picture and edible differed, so both goldfish and raisins were tested. When tested with the high-preferred edible, he had an average of 9 responses per minute (range 7-11). When tested with the low preferred edible, he had 0 responses per minute across both edibles. After a return to baseline, he had 0 responses per minute.

Bob unexpectedly withdrew from school and therefore was unable to participate in the reinforcer effectiveness test.
Discussion

The results of the rank order of the edible and pictorial preference assessments varied widely. Two participants had 4 concurrent pairs, one participant had two concurrent pairs, and one participant had one concurrent pair. However, with one exception, each participant selected the same stimuli most or least frequently in both conditions. For example, the participant selected the picture of X most frequently and selected the edible X most frequently. Conversely, the participant selected the picture of Y least frequently and the edible Y least frequently. The reinforcer assessment verified that the stimuli that were identified as high preference in both the pictorial and edible conditions produced higher rates of responding than those identified as low preference stimuli, which replicates what was shown in previous studies (Pace et al., 1985 and Fisher et al., 1992). The similar results with corresponding picture and edible stimuli indicate that both the pictorial and edible preference assessments may be effective in determining reinforcers.

This study highlights the role that pictures can play in preference assessments. The results from the pictorial assessment yielded similar results to those in the edible assessments, thus indicating that pictorial assessments are a viable alternative to traditional edible assessments for determining potential edible reinforcers. One advantage of using pictures is that it is cheaper. The ability to generate a large catalog of pictures that could be used prior to purchasing reinforcers could be an important money saving tool for schools and organizations (Groskreutz 2009). Another advantage is that pictures could be used for items that cannot be easily used in a trial format (Groskreutz
Although the current study focused on edibles, in the future research could be extended to activities. Things such as bowling, crafts, cooking, visits to certain people, and games could be presented in a picture format and followed by a reinforcer assessment. These activities are highly reinforcing for some students, and if researchers were able to formally rank order them in terms of preference, it could open up a greater number of opportunities (Graff 2003). Another benefit of a pictorial preference assessment is that it can be completed faster than an edible preference assessment. Although the duration of the assessments was not formally measured, it was observed that the picture assessments took about half the time of edible assessments. This is very likely because during the pictorial assessment, the researcher did not have to pause between trials to allow the participant to chew and swallow each edible.

There are several limitations to the present study. One is that there were a small number of participants, thus limiting its external validity. Another limitation was that one participant, Bob, withdrew from the study before his reinforcer test could be run. Also, during the reinforcer test with Sally and Steve, high rates of responding were observed in their first session after returning to baseline. It is believed that this was a carryover effect. In addition, the task chosen for the reinforcer efficacy test (hand raising) was a low demand task for two of the participants (Sally and Steve). Instead of using a single operant design with a low demand task, in the future researchers may find better results running a concurrent operant design, similar to what was used by Piazza et al (1996).
The present study attempted to further the research of Cohen-Almeida et al (2000) by showing that a paired stimulus preference assessment done with pictures gave similar results to a traditional paired stimulus preference assessment done with edibles. Researchers were able to validate these findings by running a reinforcer assessment. Future research could focus on picture preference assessments using activities instead of edibles, paired with a reinforcer test.
References


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<table>
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<th>Name</th>
<th>Stimuli</th>
<th>Picture Rank</th>
<th>Total responses and mean approach responses</th>
<th>Edible Rank</th>
<th>Total responses and mean approach responses</th>
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</thead>
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<tr>
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<td>Skittle</td>
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<td>27/40 or 67.5% 1</td>
<td>29/40 or 72.5%</td>
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</tr>
<tr>
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<td>Oreo</td>
<td>2.33</td>
<td>25/40 or 62.5% 5</td>
<td>18/40 or 45%</td>
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</tr>
<tr>
<td></td>
<td>Goldfish</td>
<td>2.33</td>
<td>25/40 or 62.5% 4</td>
<td>21/40 or 52.5%</td>
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<tr>
<td></td>
<td>Potato Chip</td>
<td>2.33</td>
<td>25/40 or 62.5% 3</td>
<td>23/40 or 57.5%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dorito</td>
<td>5</td>
<td>19/40 or 45% 1</td>
<td>29/40 or 72.5%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Raisin</td>
<td>6</td>
<td>0/40 or 0% 6</td>
<td>0/40 or 0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total Concurrent Pairs= 2</strong></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

| Steve  | Skittle  | 1            | 32/40 or 80% 1 | 32/40 or 80%  |
|        | Potato Chip | 2          | 28/40 or 70% 2 | 27/40 or 67.5%|
|        | Goldfish | 3           | 26/40 or 65% 5 | 15/40 or 37.5%|
|        | Oreo     | 4           | 19/40 or 47.5% 4 | 19/40 or 47.5%|
|        | Dorito   | 5           | 12/40 or 30% 3 | 20/40 or 50%  |
|        | Raisin   | 6           | 3/40 or 7.5% 6 | 7/40 or 17.5% |
|        | **Total Concurrent Pairs= 4** | | | |

| Bob    | Oreo     | 1            | 26/40 or 65% 1 | 30/40 or 75%  |
|        | Potato Chip | 2          | 24/40 or 60% 5 | 18/40 or 45%  |
|        | Skittle  | 3           | 23/40 or 57.5% 3 | 23/40 or 57.5%|
|        | Goldfish | 4           | 22/40 or 55% 4 | 20/40 or 50%  |
|        | Dorito   | 5           | 21/40 or 52.5% 2 | 28/40 or 70%  |
|        | Raisin   | 6           | 3/40 or 7.5% 6 | 1/40 or 2.5%  |
|        | **Total Concurrent Pairs= 4** | | | |

| Bill   | Dorito   | 1            | 34/40 or 85% 1 | 35/40 or 87.5%|
|        | Oreo     | 2            | 30/40 or 75% 4 | 14/40 or 35%  |
|        | Skittle  | 3            | 20/40 or 50% 2 | 34/40 or 85%  |
|        | Potato Chip | 4          | 18/40 or 45% 3 | 19/40 or 47.5%|
|        | Goldfish | 5           | 12/40 or 30% 6 | 1/40 or 2.5%  |
|        | Raisin   | 6           | 6/40 or 15% 5 | 10/40 or 25%  |
|        | **Total Concurrent Pairs= 1** | | | |

Table 1
Figure Captions

Figure 1. Results of Sally’s Reinforcer Efficacy Test

Figure 2. Results of Steve’s Reinforcer Efficacy Test

Figure 3. Results of Bill’s Reinforcer Efficacy Test
Figure 1
Figure 2
Figure 3