

January 01, 2011

## Social ephemeral vs. non-social ephemeral conditioned reinforcers

Michael E. Insalata  
*Northeastern University*

---

### Recommended Citation

Insalata, Michael E., "Social ephemeral vs. non-social ephemeral conditioned reinforcers" (2011). *Applied Behavioral Analysis Master's Theses*. Paper 73. <http://hdl.handle.net/2047/d20001177>

This work is available open access, hosted by Northeastern University.

**Social Ephemeral vs. Non-social Ephemeral Conditioned Reinforcers**

**A Thesis Presented**

**by**

**Michael E. Insalata**

The Department of Counseling and Applied Educational Psychology

In partial fulfillment of the requirements

for the degree of

**Master of Science**

**in the field of**

**Applied Behavior Analysis**

Northeastern University

Boston, MA

July 2011

NORTHEASTERN UNIVERSITY

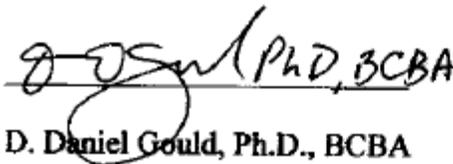
Bouvé College of Health Sciences Graduate School

Thesis Title: Social vs. Non-social Ephemeral Conditioned Reinforcers

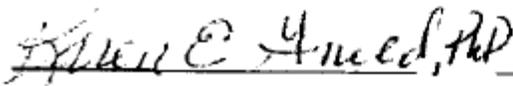
Author: Michael E. Insalata

Department: Counseling and Applied Educational Psychology

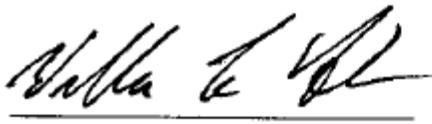
Approved for Thesis Requirements of Master of Science Degree

 PH.D., BCBA 15 August 2011

D. Daniel Gould, Ph.D., BCBA      Date

 PH.D., BCBA 08/12/11

Karen E. Gould, Ph.D., BCBA      Date

 15 August, 2011

William Holcomb, Ph.D., BCBA      Date

**Social vs. Non-social Ephemeral Conditioned Reinforcers**

by

Michael E. Insalata

Master of Science in Applied Behavior Analysis

B.S., Northeastern University

Submitted in partial fulfillment of the requirements for the degree of  
Master of Science in Applied Behavior Analysis  
in the Bouvé College of Health Sciences Graduate School  
of Northeastern University, August 2011

## Acknowledgements

Many people were instrumental throughout the development of this project, but I would like to express my utmost appreciation to my thesis advisor, Dr. Daniel Gould. He provided invaluable support from start to finish. I would also like to express my gratitude to the other members of my thesis committee, Dr. Karen Gould and Dr. William Holcomb. In addition, I would like to thank my colleagues, Whitney Hammel and Megan Maloney, for all their hard work conducting sessions.

# Social vs. Non-social Ephemeral Conditioned Reinforcers

## Table of Contents

ABSTRACT .....	2
INTRODUCTION .....	3
METHOD .....	12
Participant .....	12
Setting and Materials .....	12
Variables and Definitions .....	13
Measurement and IOA .....	13
Procedure and Experimental Design.....	14
RESULTS AND DISCUSSION .....	17
REFERENCES .....	24
FIGURE CAPTIONS .....	26
FIGURES .....	27

### Abstract

A preference assessment was conducted to identify highly preferred edible stimuli, followed by a reinforcer assessment to verify that the highly preferred edible stimuli functioned as reinforcers. The reinforcer assessment also evaluated the reinforcing properties of social ephemeral stimuli (verbal praise) and a non-social ephemeral stimulus (TAG). A pairing procedure was then evaluated to determine if social ephemeral and/or non-social ephemeral stimuli could be successfully conditioned as positive reinforcers. Three children diagnosed with autism participated in the study. The initial reinforcer assessment verified that neither praise nor TAG functioned as reinforcers. Results of a post-pairing reinforcer probe indicated that the pairing procedure was unsuccessful in establishing or strengthening social ephemeral and non-social ephemeral stimuli as conditioned reinforcers for two of the three participants.

### Social vs. Non-social Ephemeral Conditioned Reinforcers

“Positive reinforcement occurs when a behavior is followed immediately by the presentation of a stimulus and, as a result, occurs more often in the future” (Cooper, Heron & Heward, 2007, p. 36). Identifying stimuli that function as effective positive reinforcers is critical when attempting to establish or sustain socially acceptable behavior in people with developmental disabilities. A failure to use effective reinforcers will result in a lack of behavior change (Pace, Ivancic, Edwards, Iwata, & Page, 1985).

In one method for identifying positive reinforcers participants were presented 16 stimuli one at a time (Pace et al., 1985). To determine which stimuli were preferred and which were not preferred, experimenters recorded the participants’ approaches to the stimuli. In a later phase, experimenters presented the stimuli contingent on a target response; results indicated that the preferred stimuli produced higher rates of responding than the nonpreferred stimuli.

Fisher et al. (1992) compared a forced-choice procedure to the Pace procedure and experienced difficulty differentiating relative preference among stimuli when the Pace procedure was used. This occurred because the participants often approached all or most of the stimuli, as a result producing false positives. That is, some of the stimuli identified as reinforcers were actually only lowly to moderately preferred. In the forced-choice procedure, participants were presented two stimuli simultaneously, but were only given access to the one they approached initially. Results indicated that every stimulus identified as highly preferred in the forced-choice assessment was also shown to be highly preferred in the Pace procedure. On the other hand, for stimuli in which the assessments disagreed, the forced-choice assessment identified them as low to moderately preferred and the Pace procedure indicated they were

highly preferred. Thus, results of this comparison suggest that the Pace procedure has a greater tendency to produce false positive results, while the forced-choice assessment results are more accurate. Experimenters then used a concurrent operants paradigm to compare the reinforcing effects of stimuli in which both procedures showed either agreement or disagreement. Results indicated that when there was agreement on preference, contingent presentation of the stimuli led to a greater increase in responding, showing that the forced-choice method is a more accurate way to predict reinforcers (Fisher et al., 1992).

DeLeon and Iwata (1996) compared the forced-choice method (Fisher et al., 1992), the multiple-stimulus with replacement (MS) procedure (Windsor, Piche & Locke, 1994), and multiple-stimulus without replacement (MSWO) procedure to determine the most effective and efficient method for identifying potent reinforcers. DeLeon and Iwata attempted to combine the best qualities of the MS and the forced-choice procedures. The MSWO procedure was similar to the MS procedure except the items selected were not replaced and were unavailable in the next presentation. This required the participant to choose from potentially less preferred items, which is a feature used in the forced-choice procedure. The results indicated that the MSWO and the forced-choice procedure identified a similar number of reinforcers, but the forced choice method took almost twice as long to administer. DeLeon and Iwata also found that the MS procedure produced false negatives, failing to identify reinforcers that were selected in the MSWO and forced-choice procedures. False negatives produced by the MS procedures are likely due to the fact that the most preferred stimuli are continuously present throughout each session, and as a result the participant is not likely to choose a wide variety of preferred items (Deleon & Iwata).

The reinforcing efficacy of stimuli is often specific to the individual. To administer effective treatment, one must assess such stimuli often and in a precise manner (Kelleher & Gollub, 1962). There is extensive research concerning positive reinforcement in the applied settings, but it is also understood that there are issues that can occur when it is administered, including: satiation of the primary reinforcer and delay between the time the target response is emitted and the delivery of a primary reinforcer (Kadzin & Bootzin, 1972).

The studies referenced above used primary reinforcers. While primary reinforcers can be employed to teach countless skills, it is often preferable to use conditioned reinforcers. A conditioned reinforcer is "... a stimulus change that functions as a reinforcer because of prior pairing with one or more other reinforcers" (Cooper et al., 2007, p. 40). Conditioned reinforcers can be social, ephemeral, or tangible. A social conditioned reinforcer is a stimulus typically delivered to the subject by another person. Common examples are physical touch, such as back pats, or verbal praise, such as "nice job". Ephemeral conditioned reinforcers are stimuli that are brief and once they are presented they are not available until they are presented again. Many social stimuli are also ephemeral, but there are also non-social ephemeral stimuli, such as a tone or a click. A tangible conditioned reinforcer is a stimulus that can be observed and is physically present. Tokens are often used as tangible conditioned reinforcers (Ayllon and Azrin, 1968a).

Conditioned reinforcers have many advantages over primary reinforcers including: (a) they are unlikely to lose reinforcing value because they are independent from deprivation states; (b) under some circumstances they can gain more reinforcing value than a single primary; (c) they can maintain responding when the primary reinforcer is unavailable; (d) they can deliver the same reinforcement for individuals with different preferences; (e) providing reinforcement

between the time the target response is emitted and the time the primary reinforcer is delivered; (f) participants are less likely to satiate on conditioned reinforcers; (g) successive responses can be reinforced without delay; (h) and they can be delivered in almost any setting (Kazdin & Bootzin, 1972).

Token economies are a frequently used extension of conditioned reinforcement in which “... a system whereby participants earn generalized conditioned reinforcers as an immediate consequence for specific behaviors; participants accumulate tokens and exchange them for items and activities from a menu of backup reinforcers” (Cooper et al., 2007, p. 706). Generalized conditioned reinforcers, such as tokens, gain their reinforcing properties from pairings with many other reinforcers. Tokens have been used in behavior-management since the 1800’s, but they became increasingly important as applied behavior analysis developed in the 1960’s and 70’s (Hackenberg, 2009).

Ayllon and Azrin (1968a) discussed the advantages of tangible conditioned reinforcers, such as tokens, when compared to ephemeral conditioned reinforcers; that is, reinforcers that exist only briefly. These advantages include:

- (1) The number of tokens can bear a simple quantitative relation to the amount of reinforcement;
- (2) the tokens are portable and can be in the subject’s possession even when he is in a situation far removed from that in which the tokens were earned;
- (3) no maximum exists in the number of tokens a subject may possess...;
- (4) tokens can be used directly to operate devices for the automatic delivery of reinforcers;
- (5) tokens are durable and can be continuously present during the delay...;
- (6) the physical characteristics of the tokens can be easily standardized
- (7) the tokens can be made fairly

indestructible so they will not deteriorate during the delay; (8) the tokens can be made unique and nonduplicable so that the experimenter can be assured that they are received only in the authorized manner.” (p. 77).

One advantage of tokens not discussed by Ayllon and Azrin (1968a) is the fact that tokens can be physically exchanged for the primary reinforcer, which may also be a contributing factor to their effectiveness as conditioned reinforcers.

In one of the earliest studies of token reinforcement (Wolfe, 1936), chimpanzees were trained to drop poker chips into a vending-machine to gain access to primary reinforcers such as grapes and water. At the beginning of the study, the experimenters modeled the depositing of the poker chips and exchange opportunities were reinforced on an FR1 schedule. During this part of the study, the tokens were continuously paired with food, but in later conditions the chimps were trained to respond differentially to white and brass tokens. White tokens were exchangeable for grapes while brass tokens could not be exchanged for anything. This resulted in a preference for white tokens and the chimps stopped depositing the brass tokens.

After the target response was trained, poker chips became contingent on operating a weight-lifting machine. Wolfe wanted to explore whether the poker chips could establish and maintain this behavior as efficiently as food alone. Results indicated that for three of the four chimps responding was the same under token and food conditions, indicating that the poker chips were effective conditioned reinforcers.

In a classroom application of token economy, McLaughlin and Malaby (1972) conducted a study using a token economy to increase assignment completion in a classroom for typically developing fifth and sixth graders. The students earned points which were exchangeable for

activities that were naturally available in the classroom. Desirable behavior such as assignment completion resulted in earning points, but undesirable behavior resulted in the removal of points. Results indicated that the token economy raised assignment completion to nearly 100%.

Despite extensive research regarding the effectiveness of conditioned reinforcers, to date, there is insufficient research regarding the establishment and maintenance of conditioned reinforcers in applied settings. It is understood, however, that the schedules used when pairing the primary reinforcer and the neutral stimulus and the percentage of times the reinforcer follows the neutral stimulus are variables that can affect the establishment and lasting effects of conditioned reinforcers (Williams, 1994). Kelleher and Gollub (1962) found that the number of pairings between the neutral stimulus and the primary reinforcer directly affect the conditioning process. The authors stated, however, that it is uncertain how many times the neutral stimulus should be paired with the primary reinforcer before it obtains reinforcing properties. In addition, it is unknown which is the most effective method for pairing the neutral stimulus and primary reinforcer.

Lovaas et al. (1966), attempted to identify a method for establishing and maintaining social conditioned reinforcers. Lovaas et al. used three procedures to establish social stimuli as reinforcers including: (a) reduction of self-stimulatory behavior, (b) discriminative stimulus ( $S^D$ ) training, and (c) intermittent reinforcement during that training. Lovaas and colleagues used shock therapy to reduce self-stimulatory behavior, which interfered with the acquisition of target responses. During  $S^D$  training, the subjects were presented with food only if they approached the experimenter following social consequences. Finally, in the intermittent reinforcement training portion of the study, the subjects were trained to approach the experimenter following social

consequences even though food was not delivered each time they emitted the target response. Experimenters were unable to establish social stimuli as conditioned reinforcers by simply pairing the social stimuli with the primary reinforcer. They speculated that this was because the participants did not attend to the social stimuli. The authors concluded that the establishment of social stimuli as an  $S^D$  was the most important of the three procedures because the social stimuli did not obtain reinforcing properties when the  $S^D$  procedure was not implemented. The authors also suggested that  $S^D$  training was successful because it forced the participants to attend to the social stimuli. The results indicated that verbal praise did become a conditioned reinforcer and as long as it was maintained as a discriminative stimulus for food, it sustained its reinforcing properties.

Moher, Gould, Hegg, and Mahoney (2008) conducted a study in which they paired an edible reinforcer with a novel token in order to determine if this procedure was an effective way to establish conditioned reinforcers as well as verifying the strength of the previously neutral stimulus. Following pairing sessions, experimenters confirmed the previously neutral tokens had acquired reinforcing properties via preference and reinforcer assessments. Results also indicated that the tokens' reinforcing value was equivalent to the edible reinforcers they had been paired with. In a later phase, the effectiveness of the tokens as reinforcers was evaluated when the motivating operation was manipulated. Results indicated that during satiation conditions, the tokens' reinforcing effectiveness decreased. It was also discovered that the reinforcing effectiveness of the tokens could be maintained in satiation conditions if they were paired with multiple primary reinforcers.

Gibson (2009) conducted a study in which neutral social stimuli, in the form of back pats and verbal praise, were evaluated in two separate  $S^D$  procedures and pairing procedures. First a reinforcement assessment was conducted and confirmed that the social stimuli did not function as reinforcers. Following the reinforcer assessment, the social stimuli were paired with an edible reinforcer. That is, immediately following a praise statement or back pats, an edible reinforcer was delivered. Each session consisted of ten pairings and four pairing sessions were conducted for both praise and back pats. In a subsequent probe phase, the social stimuli were delivered contingent on a target response to determine if they had acquired any reinforcing properties. The pairing and probe phases were alternated until there was stable responding or until response rates matched rates obtained in the initial reinforcer assessment.

Gibson (2009) also conducted an  $S^D$  procedure in an attempt to establish the social stimuli as conditioned reinforcers. Following each delivery of verbal praise or back pats, the participant was allowed to take an edible reinforcer. There were four sessions, ten trials each, for both praise and back pats. Following the  $S^D$  procedure, probe sessions were conducted to determine if the social stimuli had acquired reinforcing properties. The  $S^D$  procedure and the probes were alternated until stable responding was observed or response rates matched those obtained in the initial reinforcer assessment.

Finally, Gibson (2009) conducted a reinforcer assessment using established token reinforcers from the participant's daily program to determine if they functioned as conditioned reinforcers. Tokens were delivered contingent on a target response and when 10 tokens were obtained the participant was able to trade them in for an edible reinforcer.

The initial reinforcer assessment for praise and back pats resulted in zero or near zero responding which confirmed that they did not function as conditioned reinforcers. After praise and back pats were paired 240 each, the probe sessions indicated a slight increase in responding over baseline levels through the first 47 sessions, but rates subsequently decreased to zero or near zero responding. These results indicated that neither social stimulus was effectively established as a conditioned reinforcer.

A total of 320 conditioning trials were conducted using the  $S^D$  procedure. In the probe sessions, responding was initially low for praise and back pats, but eventually began to increase indicating that the previously neutral social stimuli had obtained at least some reinforcing value. Response rates never reached rates equivalent to the primary reinforcer, however, indicating that they were only weak conditioned reinforcers when contrasted with the results of the reinforcer assessment results from the tokens used in daily programming, which indicated that they did function as effective conditioned reinforcers.

Gibson (2009) concluded that the tokens may have been more effectively established as conditioned reinforcers because they were tangible stimuli that were used in a physical exchange for a primary reinforcer. That is, once delivered they were in the participant's possession until they were traded in for the primary reinforcer. On the other hand, praise and back pats were ephemeral stimuli and once delivered, they were unavailable until presented again.

Given that individuals do not respond well to social stimuli, however, it is also possible that the social nature of the stimuli interfered with their establishment as conditioned reinforcers.

Therefore, the purpose of the current study was to determine if it is the social or ephemeral nature of social stimuli that make them difficult to establish as conditioned reinforcers.

## Method

### *Participants*

Three children diagnosed with autism participated in this study. Sam was a 4-year-old boy with deficits in receptive and expressive language as well as deficits in fine motor skills. He communicated with one or two word vocal approximations, modified signs and the Picture Exchange Communication System (PECS). He could answer yes and no questions, but could not reliably follow two-step directions. Sam engaged in high rates of vocal stereotypy, motor stereotypy, tantrums and low rates of self injurious behavior and aggression.

Paul was a 5-year-old boy who had deficits in receptive and expressive language, however, he could request preferred items and respond correctly to verbal prompting. He engaged in self-injurious behavior in the form of hand mouthing as well as vocal and motor stereotypy.

Shelly was a 6-year-old girl who also communicated verbally, but had deficits in receptive and expressive language as well as gross motor skills. She engaged in low rates of noncompliance and flopping.

The participants were chosen for the current study because reinforcers other than edibles would be more appropriate to deliver in all environments. For Paul and Shelly, health concerns also contributed to their inclusion in this study as a reduction in edible reinforcement was desirable. All three participants attended a school for autism full time.

### *Settings and Materials*

Sam's sessions were conducted in his work area at school, Paul's sessions were conducted in the kitchen at the school and Shelly's sessions were run in an assessment room at

the school. Each area contained a desk, two chairs, a timer, a video camera, and a clicker that produced a distinctive, audible tone. Other materials present during the study included edible reinforcers specific to each participant.

#### *Dependent Variables and Response Definition*

For all participants, the dependent variable during preference assessments was selection, which was defined as making physical contact with one of the presented items. The dependent variable during Sam's reinforcer assessment and probes was target touching, defined as touching a green square with any part of his hands or fingers. He had to remove his hand from the square completely before another response was scored. The dependent variable during Paul's reinforcer assessment and probes was hand-raising, defined as raising the palm of his right hand above the top of his right ear without previously touching his head. The palm of his hand had to drop below his ear before another response was scored. The dependent variable during Shelly's reinforcer assessment and probes was also target touching, but the topography was different than Sam's. Target touching for Shelly was defined as touching a blue star on the wall with any part of her right hand, followed by touching a green star on the desk with any part of her right hand.

The social consequences used in the present study were similar to those used by Gibson (2009). Experimenters randomly rotated between three verbal praise phrases: "That's great", "Good work", and "Nice job." An enthusiastic tone was used when delivering verbal praise.

#### *Measurement and IOA*

During preference assessments experimenters recorded each selection on a data sheet customized for the specific procedure. Percent selected was then calculated by dividing the

number of times an edible item was chosen by the total number of opportunities then multiplied by 100.

During the reinforcer assessment and reinforcer probes the experimenter recorded data by taking a tally of each response to determine the frequency of responses. Response rate was calculated by dividing the number of responses in the session by the duration of the session.

Interobserver agreement (IOA) data were collected for a minimum of 33% of reinforcer assessment and reinforcer probe sessions. IOA was scored in vivo for Sam and via videotape for Shelly and Paul. Agreement was calculated for each session by dividing the smaller count by the larger count and multiplying by 100. IOA averaged 97% (range, 96% to 98%) across all participants and conditions.

#### *Procedure and Experimental Design*

*Phase 1.* An 8-item paired stimulus preference assessment consisting of edible items only was conducted for Sam and Shelly, while 16 items were included in Paul's preference assessment. The purpose of the preference assessments was to establish a highly-preferred edible item for each participant. Procedures resembled those described by Fisher et al. (1992). The 8 or 16 stimuli were presented within arm's reach of the participant in pairs and each stimulus was paired with every other stimulus an equal number of times and delivered in a quasi-random order. Each stimulus was available for 10 s and selection was recorded after the participant touched one of the items with his or her hand. Experimenters blocked attempts to select both items and if no selection was made within 10 s, both items were removed and "no response" was scored. Following a selection the participants were allowed to immediately consume the edible item and the remaining stimulus was removed.

Following Sam's 8-item paired stimulus preference assessment he was given a brief MSWO assessment. Edible stimuli included three highly preferred items from the previous preference assessment and another edible item that was frequently requested in the natural environment.

Due to health concerns, Shelly participated in two separate 8-item paired stimulus preference assessments. The first consisted of edible items containing sugar; the second consisted of sugar-free edible items. Following the paired stimulus preference assessments, Shelly also participated in a brief MSWO assessment using the two most preferred items from the sugar and sugar-free paired stimulus preference assessments.

*Phase 2:* To determine whether the highly preferred items chosen from the preference assessment functioned as reinforcers, experimenters conducted a reinforcer assessment in a multi-element design. During the reinforcer assessment experimenters also ruled out the possibility that Teaching with Acoustic Guidance (TAG), otherwise known as a clicker, and social praise functioned as reinforcers prior to conditioning. Target touching was the free-operant response used for Sam and Shelly, while Paul's free-operant response was hand-raising (each response as defined above). Conditions were rotated in a quasi-random order with a ratio of three sessions of praise, three sessions of TAG, one session of FR1 edible, and one session of extinction. During praise sessions, one of three verbal praise statements ("That's great", "Nice job", or "Good work") was delivered contingent on the target response. During TAG sessions, the experimenter pressed a clicker one time contingent on the target response. During FR1 edible sessions, a small piece of a highly preferred edible selected from the preference assessment was delivered contingent upon each response. For Paul, the edible was delivered directly to his

mouth. For Sam and Shelley the edible was placed on the table in front of them. There were no programmed consequences during the extinction condition.

Prior to each session in which reinforcement was scheduled for delivery, the experimenter performed two demonstration trials and delivered verbal praise, TAG, or an edible if the participant imitated the model. After the two demonstration trials the experimenter read instructions to the participant. Instructions for the praise condition were as follows, “You can touch the target (or ‘raise your hand’) as many times as you want to earn ‘That’s great’ (‘Nice job’ or ‘Good work’)”. Prior to the TAG condition the experimenter read the following instructions to the participant, “You can touch the target (or ‘raise your hand’) as many times as you want to earn (experimenter pressed the clicker one time).” Prior to the FR1 edible sessions the experimenter read the following instructions to the participant “You can touch the target (or ‘raise your hand’) as many times as you want to earn (preferred edible).” During the extinction condition, the experimenter read the instructions, “You can touch the target (or ‘raise your hand’) as many times as you want, but you will not earn anything.”

Sam and Paul’s sessions were 4 min and Shelly’s sessions were 2 min. Sessions were run until there was stable responding across conditions or differential responding between the FR1 edible and other conditions.

*Phase 3:* In an attempt to establish the potentially neutral stimuli (NS) as conditioned reinforcers, a pairing procedure was conducted. The procedures were similar to those used in the new response procedure (Dozier et al., 2007). During the praise sessions experimenters stated a short phrase in an enthusiastic tone followed immediately by an edible reinforcer. There was no response requirement and experimenters randomly rotated between 3 phrases; “Nice job”, “Good

work”, and “That’s great.” There were 20 pairings per session, for six sessions, (120 pairings total) before moving on to Phase 4. TAG pairing sessions were identical to the procedures used in the praise pairing sessions, except that TAG was delivered and followed by the edible reinforcer.

*Phase 4:* Reinforcer probe sessions were conducted following the pairing sessions to determine if the NS had obtained reinforcing properties. Sessions were identical to the procedures used in Phase 2. Phase 3 and Phase 4 were alternated until response rates in Phase 4 sessions matched the rates obtained in Phase 2 FR1 edible condition or until stable responding was observed in Phase 4 sessions.

## Results and Discussion

Figure 1 shows the results of Sam’s MSWO in which Bugles<sup>®</sup> ranked as the most preferred. Prior to the MSWO, Sam participated in an 8-item paired stimulus preference assessment in which Galaxy Chocolate<sup>®</sup> ranked most preferred. Through the first 80 sessions, experimenters delivered Galaxy Chocolate<sup>®</sup> in the edible condition, but responding in those sessions remained low. Experimenters hypothesized that Sam’s preference had changed, so they conducted the brief MSWO. Although Bugles<sup>®</sup> were not included in the original preference assessment, experimenters noted that they were frequently chosen in the natural environment; hence, they were included in the subsequent MSWO. Bugles<sup>®</sup> were the most preferred edible in the final MSWO.

Sam’s Phase 2, 3, and 4 results can be viewed in Figure 2. The first 49 sessions of the reinforcer assessment were 2 min in length. In those sessions, Sam’s mean response rates for the praise, TAG, extinction, and edible conditions were 0.9 (range, 0.0 to 5.0), 1.4 (range, 0.0 to

10.5), 3.3 (range, 0.0 to 11.0), and 1.0 (range, 0.0 to 3.0), respectively. Session length was extended to 4 min starting at session 50 in order to give Sam a greater opportunity to contact the contingencies in each session. Response rates over the next 30 sessions remained low in all four conditions. The mean response rates for the praise, TAG, extinction, and edible conditions from sessions 50 to 80 were 0.6 (range, 0.0 to 3.5), 0.3 (range, 0 to 1.8), 0.1 (range, 0.0 to 0.3), and 1.1 (range, 0.0 to 2.0), respectively.

Beginning with session 81, five consecutive sessions of FR1 edible were scheduled and experimenters implemented a pre-session choice between four highly preferred edible items. The mean response rate in those five sessions increased to 3.5 responses per minute (range, 0.5 to 8.3). The next 10 sessions alternated between the edible and extinction conditions in an attempt to demonstrate experimental control. In the extinction condition, the mean response rate from session 86 to session 95 was 1.2 responses per minute (range, 0.5 to 2.3) and in the edible condition it was 10.2 responses per minute (range, 6.25 to 16.5), thus demonstrating that the edible was an effective reinforcer.

Experimenters resumed the reinforcer assessment at session 96 while continuing to offer a pre-session choice before each edible session. Mean responding over the next 28 sessions for praise, TAG, extinction, and edible conditions was 0.9 (range, 0.0 to 2.5), 0.6 (range, 0.0 to 1.5), 2.6 (range, 0.3 to 4.5), 5.6 (range, 4.8 to 6.3), respectively. Responding was low and slightly variable for praise, TAG, and extinction, but responding in the edible condition was high and stable. Differential results indicated that neither praise nor TAG was functioning as a reinforcer, unlike the edible item, and therefore Sam moved on to Phases 3 and 4.

Phases 3 and 4 were alternated three times over the following 24 sessions. A total of 120 pairings of praise and TAG preceded each probe, but responding in the praise and TAG conditions were at or near zero for every session. Sam's mean responding in the extinction condition was 1.5 (range 0.3 to 3.0), while mean responding in the edible condition was 2.7 (range, 0.0 to 5.75). After 360 pairings of both neutral stimuli, neither was established as a conditioned reinforcer.

Paul's results for Phase 1 are illustrated in Figure 3. Kit Kat<sup>®</sup> chocolate bars were identified as the most preferred item, but were not available to use in the reinforcer assessment because they were isolated for a separate reinforcement program. Instead, experimenters used Galaxy Chocolate<sup>®</sup>, which ranked second in the preference assessment.

Figure 4 shows Paul's results for Phases 2, 3, and 4. Through the first 40 sessions of Phase 2, Paul's responding in all four conditions was at or near zero. Following session 40 experimenters shaped Paul's target response of hand raising then resumed the reinforcer assessment. Response rates increased in all conditions, but were highly variable. Mean responding from session 41 to session 96 in the praise, TAG, extinction, and edible conditions were 22.5 (range, 0.0 to 41.5), 11.9 (range, 0.0 to 37), 5.7 (range, 1 to 30), 14.9 (2.5 to 23.5), respectively.

Experimenters hypothesized that if sessions were extended from 2 min to 4 min, Paul's responding would decrease in praise, TAG, and extinction, while remaining high in the edible condition. Starting at session 97 all sessions were 4 min in length. Experimenters also noted that Paul's responding in the edible condition was hindered by the amount of time it took him to get the food from his hand to his mouth. Prior to session 97 the experimenter placed a piece of

chocolate in his hand every time he emitted the target response. When Paul received the chocolate, 2 to 3 s would elapse before the chocolate was in his mouth and he did not respond during this time. Starting at session 97 experimenters delivered the chocolate directly into Paul's mouth rather than his hand. As anticipated, response rates in the edible condition increased and rates in all other conditions decreased; however, responding in the praise and TAG conditions remained high enough to indicate that those stimuli were functioning as reinforcers for hand raising. From session 97 to 112, mean response rates in the praise, TAG, extinction, and edible conditions were 13.7 (range, 4.3 to 27.5), 9.8 (range, 3 to 23.3), 4.6 (range, 0.8 to 8.5), and 25.0 (range, 23.8 to 26.3), respectively. Although Paul's response rates in the praise, TAG, and extinction conditions remained relatively high and variable, researchers did not anticipate stabilization, thus Paul moved onto Phases 3 and 4.

After 120 pairings of both praise and TAG, a reinforcer probe was conducted in which response rates were similar to those seen in previous sessions. Experimenters conducted an additional 120 pairings, but before the probe could be implemented Paul went on vacation. Following his return, experimenters conducted another 120 pairings of praise and TAG before introducing the second reinforcer probe. Results showed an increase in responding in the praise and TAG conditions, indicating that both ephemeral stimuli were strengthened as conditioned reinforcers. Mean responding in the two reinforcer probes was 31.4 (range, 15.0 to 44.3), 20.3 (range, 10.5 to 35.5), 7.0 (range, 0.5 to 13.5), and 23.1 (range, 22.0 to 24.3), for praise, TAG, extinction, and edible conditions, respectively.

Figure 5 illustrates Shelly's Phase 1 MSWO results. Prior to the MSWO, Shelly participated in an 8-item paired stimulus preference assessment with edible items containing

sugar followed by a sugar-free paired stimulus preference assessment. Experimenters used the two highest ranked items from each of the previous preference assessments in a brief MSWO. The results of the brief MSWO indicated that sugar-free chocolate was the most preferred item.

Shelly's results for Phases 2, 3, and 4 are presented in Figure 6. Through the first 24 sessions of Phase 2, mean response rates for the praise, TAG, extinction, and edible conditions were 17.5 (range, 3.5 to 29.0), 8.6 (range, 0.0 to 20), 2.3 (range, 0.0 to 4.5), and 6.5 (range, 4.0 to 7.0), respectively. Experimenters noted that when the edible was delivered Shelly stopped responding and took several seconds to consume the item before she began responding again. To control for consumption time, starting at session 25, the experimenter stopped the timer when the edible item was delivered and did not restart the timer until the item was completely consumed.

From session 25 to 72, response rates remained highly variable in the praise and TAG conditions. The mean response rate for praise was 17.6 (range, 2 to 30.5) and the mean response rate for TAG was 6.7 (range, 0 to 31.5). The response rates in the extinction and edible conditions became relatively stable. The mean response rate for praise was 2.0 (range, 0.5 to 3.5) and as expected, response rates increased in the edible condition to 16.1 (range, 12 to 18.5).

Experimenters hypothesized that praise and TAG were functioning as reinforcers for hand raising, but that a response requiring more effort would result in decreased responding in those conditions. Starting at session 73 Shelly's new target response was changed to target touching and response rates immediately decreased in all conditions. Mean response rates in the praise, TAG, extinction and edible conditions from session 73 to 97 were 7.5 (range, 5.0 to 11.5), 0.8 (range, 0.0 to 4.0), 1.0 (range, 0.0 to 3.0), and 7.0 (range, 0.0 to 11), respectively. Even with increased response effort praise continued to function as a reinforcer, but TAG did not.

Responding stabilized in all four conditions by session 97, thus Shelly moved onto Phases 3 and 4.

After 120 pairings of both praise and TAG, response rates in the praise condition dropped to zero during the first probe phase, while responding in the other three conditions remained similar to rates observed previously. Following another 120 pairings responding in all four conditions was comparable to the rates seen in the Phase 2 reinforcer assessment. One more round of pairings was conducted, followed by a third probe, which revealed stable responding in each of the four conditions. After a total of 360 pairings, neither praise nor TAG was strengthened as a conditioned reinforcer.

Experimenters determined that neither of the ephemeral stimuli used in the current study were effectively established or strengthened as conditioned reinforcers for Sam or Shelly. It does appear, however, as though they may have been strengthened as conditioned reinforcers for Paul. It is worth noting that Paul was the only participant who received 240 pairings before a single reinforcer probe and it was the subsequent probe that showed a large increase in responding for both praise and TAG. It is possible that the greater number of pairings was effective to establish both social ephemeral and non-social ephemeral stimuli as conditioned reinforcers, however, further research is needed in this area.

One limitation of the current study is the schedule change between pairings and reinforcer probes. During pairings, the primary reinforcer immediately followed the delivery of the verbal praise or TAG. During the reinforcer probes, however, the primary reinforcer never followed either the verbal praise or the TAG. It is possible that both praise and TAG came to

signal the absence of reinforcement for the participants under these conditions. Further research should explore the effects of schedule thinning on response rates in the reinforcer probes.

Another limitation related to that mentioned above was a procedural problem with the pairings and probes. During pairings there was no response requirement, so the neutral stimulus and the primary reinforcer were delivered in the absence of any effort by the participant. Reinforcer probes, however, required the participant to emit the target response before praise or TAG was delivered. The response requirement may have acted as a cue to the participant that the primary reinforcer was not available. Future studies should investigate a procedure in which the pairing procedure includes a response requirement.

A final limitation of the present study was another procedural issue between the pairings and probes. Experimenters displayed the edible reinforcer during all pairings, but did not display them during the reinforcer probes. It is possible that the differential presence of the primary reinforcer signaled differential availability of primary reinforcement, which could have affected response rates. In combination with a pairing procedure that includes a response requirement, future research should include controls for the presence of the edible reinforcer.

## References

- Ayllon, T. & Azrin, N. H. *The token economy: a motivational system for therapy and rehabilitation*. New York: Appleton-Century-Crofts, 1968. (a)
- Cooper, John, Timothy Heron, and William Heward. *Applied Behavior Analysis: Second Edition*. New Jersey: Pearson Education Inc. 2007. Print.
- DeLeon, I.G., & Iwata, B.A. (1996). Evaluation of a multiple-stimulus presentation format for assessing reinforcer preferences. *Journal of Applied Behavior Analysis*, 29, 519-533.
- Fisher, W., Piazza, C. C., Bowman, L. G. Hagopian, L. P., Owens, J. C. & Slevin, I. (1992). A comparison of two approaches for identifying reinforcers for persons with severe and profound disabilities. *Journal of Applied Behavior Analysis*, 25, 491-498.
- Gibson, H.A. (2009). Determining the reinforcing value of social consequences and establishing social consequences as reinforcers. *Counseling Psychology Master's Theses*. Paper 4.
- Gollub, L.R. (1977). Conditioned reinforcement: Schedule effects. In W.K. Honig & J.E.R. Staddon (Eds.), *Handbook of operant behavior* (pp. 288-312). Englewood Cliffs: NJ: Prentice-Hall.
- Hackenberg, D. T. (2009). Token reinforcement: a review and analysis. *Journal of the Experimental Analysis of Behavior*. 91, 257-286.
- Kazdin, A. E. (1982). The token economy: A decade later. *Journal of Applied Behavior Analysis*, 15, 431-445.
- Kazdin, A. E., & Bootzin, R. R. (1972). The token economy: An evaluative review. *Journal of Applied Behavior Analysis*, 5, 343-372.
- Kelleher, R. T. & Gollub, L. R. (1962). A review of positive conditioned reinforcement. *Journal*

of the *Experimental Analysis of Behavior*, 543-597. Lovaas, O. I., Greitag, G., Kinder, M. I., Rubenstein, B.D., Schaeffer, b., & Simmons, J. Q. (1966).

McLaughlin, T.F., & Malaby, J. (1972). Intrinsic reinforcers in a classroom token economy. *Journal of Applied Behavior Analysis*, 5, 263-270.

Moher, Gould, Hegg & Mahoney (2008). Non-Generalized and Generalized Conditioned Reinforcers: Establishment and Validation. *Behavioral Interventions*, 23, 13-38.

Pace, G. M., Ivancic, M. T., Edwards, G. L., Iwata, B. A., & Page, T. J. (1985). Assessment of stimulus preference and reinforcer value with profoundly retarded individuals. *Journal of Applied Behavior Analysis*, 18, 249-255.

Skinner, B. F. (1953). *Science and Human Behavior*. New York: Free Press.

Smaby, K., MacDonald, R. P., Ahearn, W. H., & Dube, W. V. (2007). Assessment protocol for identifying preferred social consequences. *Behavioral Interventions*, 22, 311-318.

Williams, B.A. (1994). Conditioned reinforcement: Experimental and Theoretical Issues. *The Behavior Analyst*,

Windsor, J., Piche, L. M. & Locke, P. A. (1994). Preference Testing: A comparison of two presentation methods. *Research in Developmental Disabilities*, 15 439-455

### Figure Captions

*Figure 1.* Percent chosen of edible stimuli during an MSWO for Sam.

*Figure 2.* Responding (target touching) during reinforcer assessment (Phase 2) and reinforcer probes (Phase 4) for Sam.

*Figure 3.* Percent chosen of edible stimuli in a 16-item paired stimulus preference assessment for Paul.

*Figure 4.* Responding (target touching) during reinforcer assessment (Phase 2) and reinforcer probes (Phase 4) for Paul.

*Figure 5.* Percent chosen of edible stimuli during an MSWO for Shelly.

*Figure 6.* Responding (target touching) during reinforcer assessment (Phase 2) and reinforcer probes (Phase 4) for Shelly.

**Sam: MSWO**

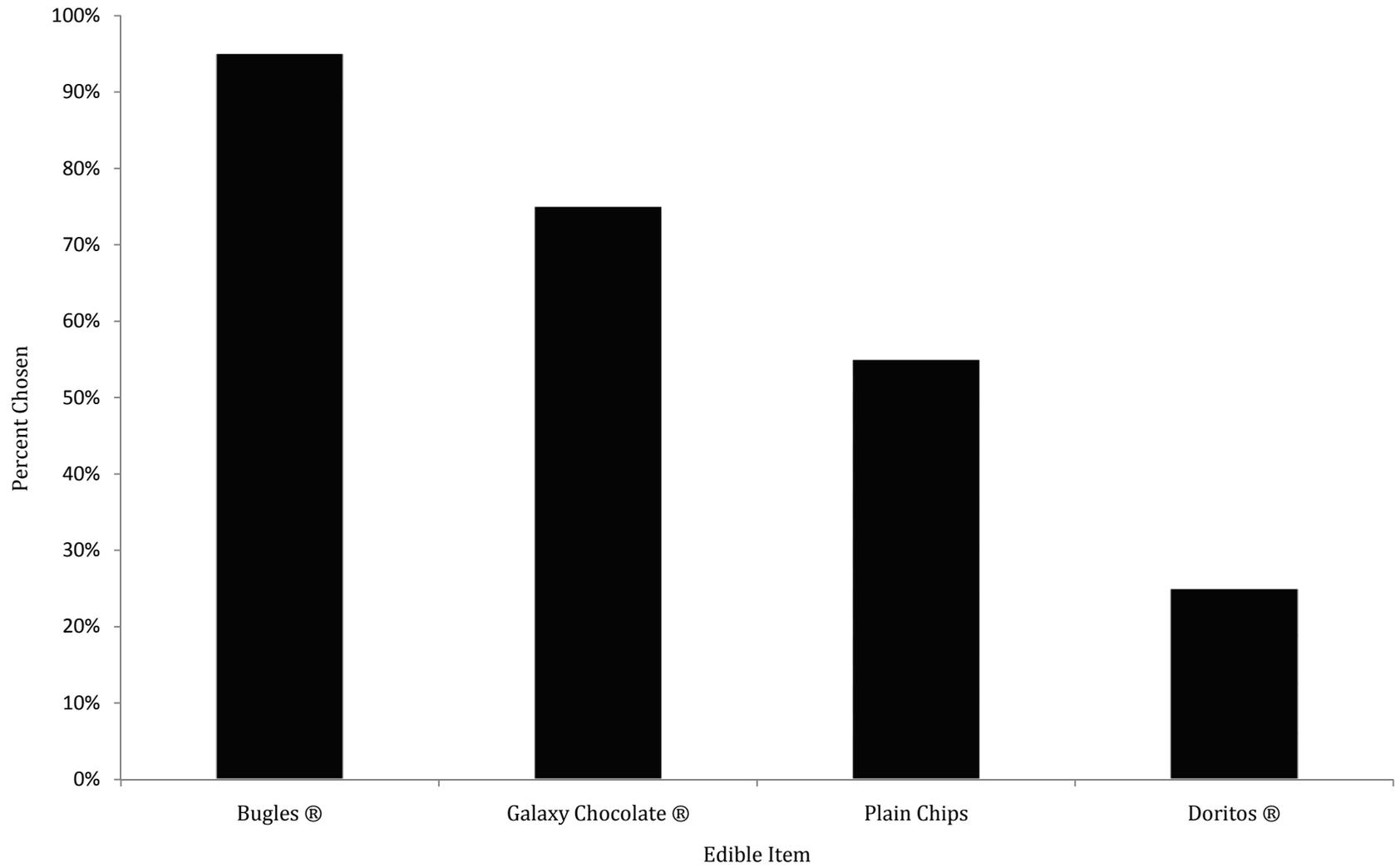


Figure 1

# Sam

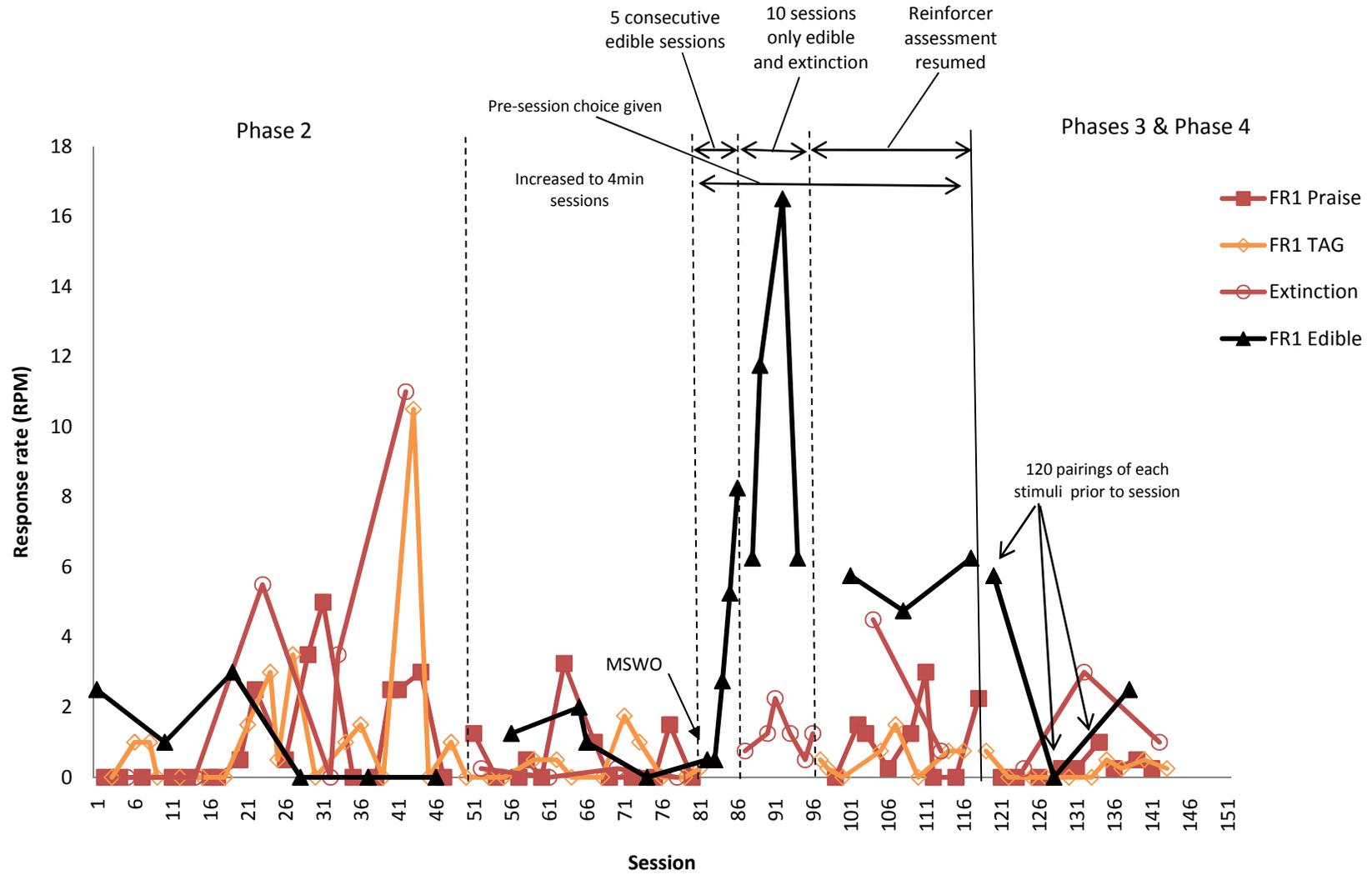


Figure 2

### Paul: Paired Stimulus Preference Assessment

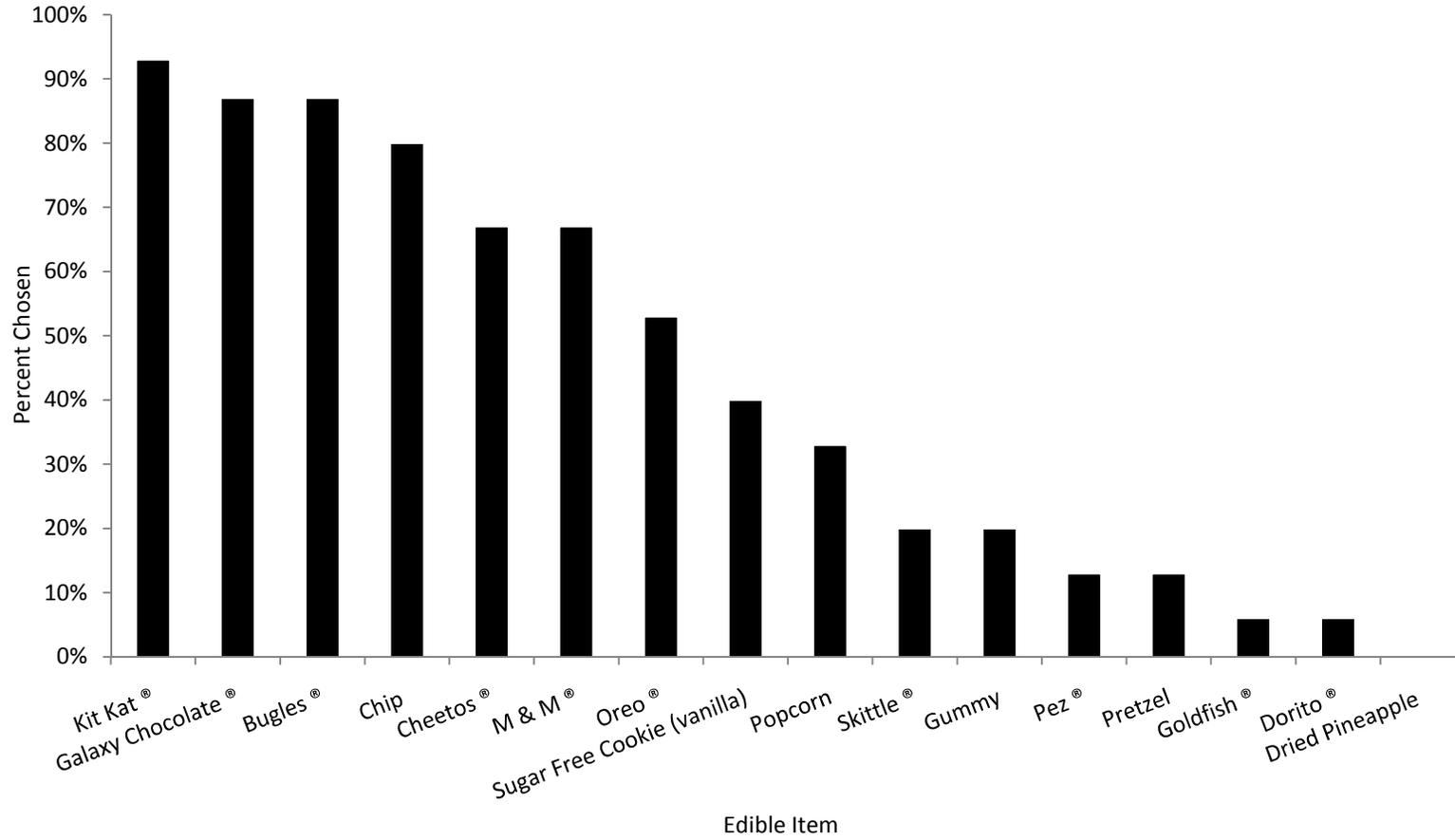


Figure 3

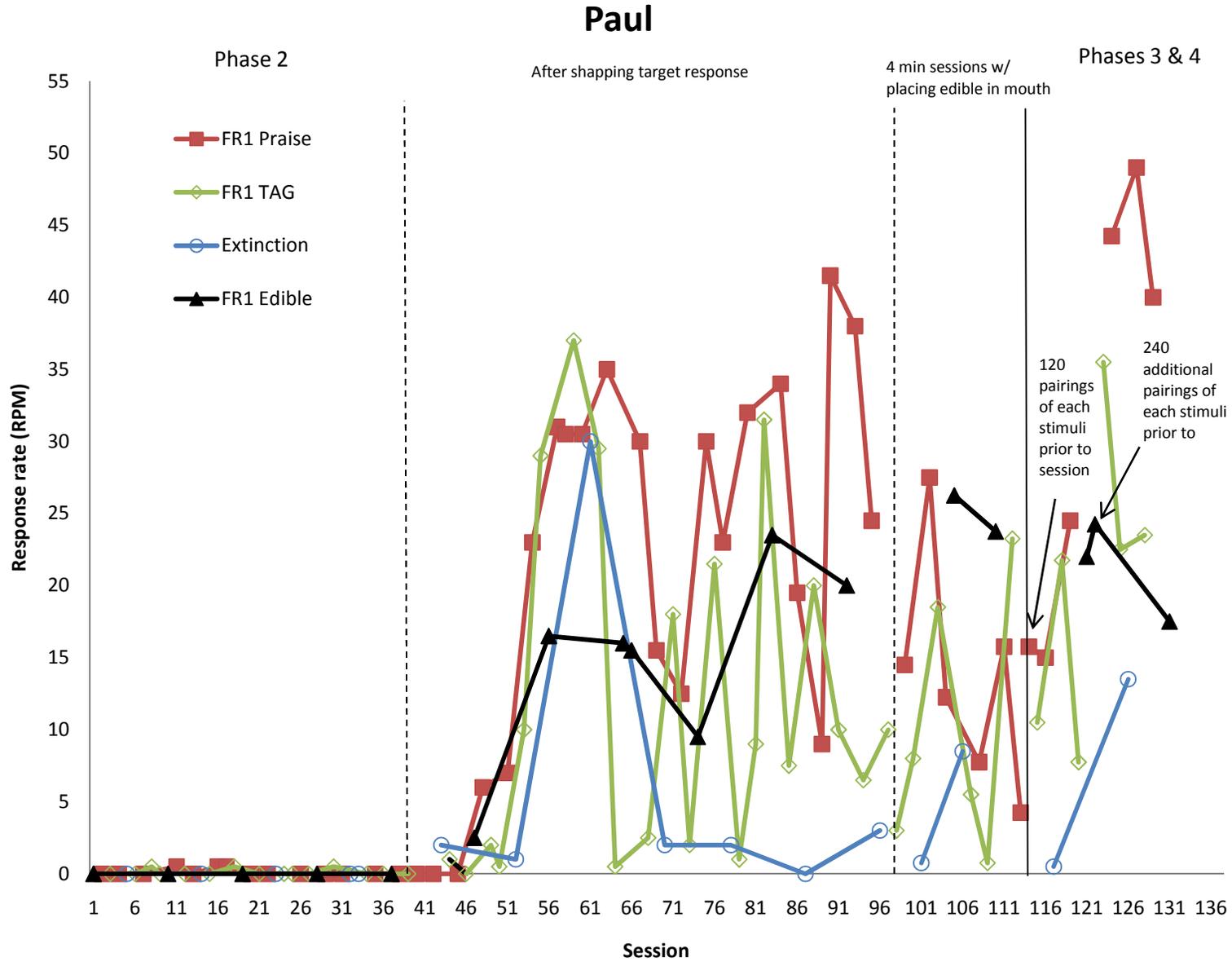


Figure 4

### Shelly: MSWO Sugar vs Sugar Free Items

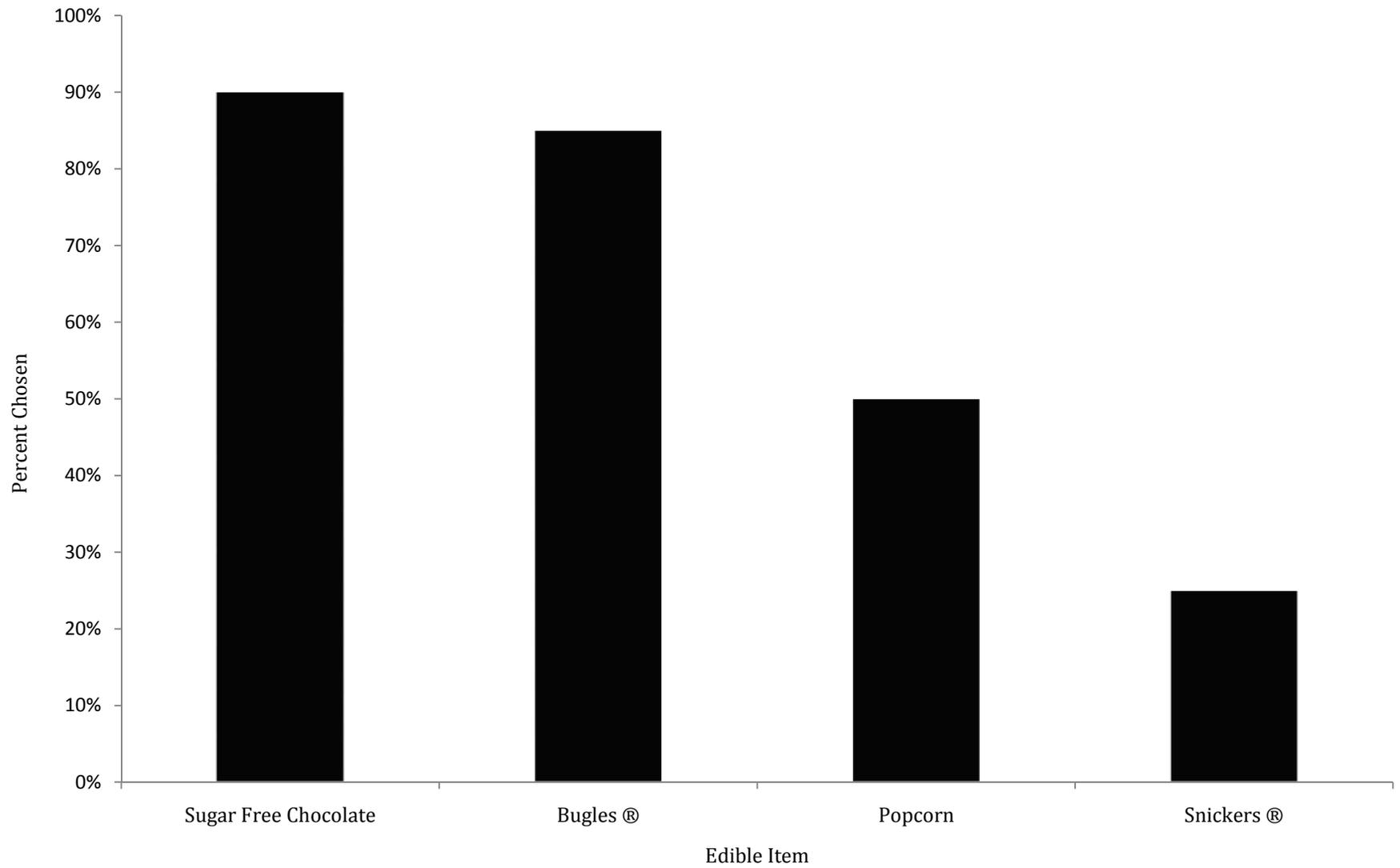


Figure 5

# Shelly

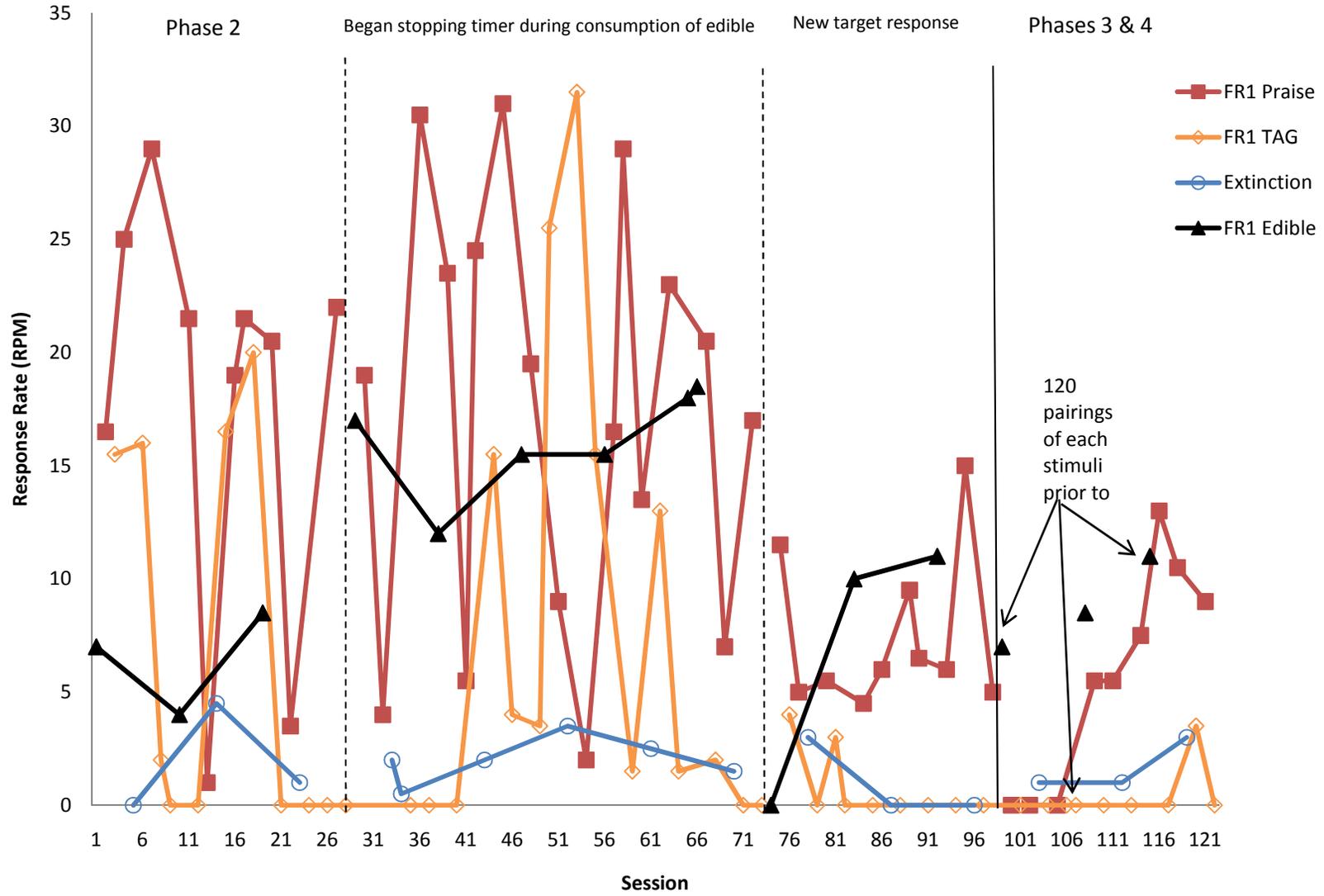


Figure 6

