A Comparison of Two Interventions to Treat Food Selectivity

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Shannon C. Garvey

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Abstract

The purpose of the present study is to systematically replicate and extend the procedures of Kern and Marder (1996) using simultaneous and sequential presentations of preferred and nonpreferred foods. Systematic fading procedures were evaluated to decrease the amount of preferred foods and increase the amount of nonpreferred foods presented. The participants were two 16-year-old males diagnosed with autism that had a history of food selectivity. In the simultaneous presentation, preferred foods were presented at the same time as nonpreferred foods. In the sequential presentation, acceptance of the nonpreferred food resulted in the presentation of the preferred food. Results were evaluated using an alternating treatments design to compare the two interventions (simultaneous presentation vs. sequential presentation). Increases in consumption occurred immediately in the simultaneous and sequential presentations for Participant 1 and in the sequential presentation for Participant 2. Additional treatment interventions were evaluated for Participant 2 in the simultaneous presentation because consumption did not increase.
A Comparison of Two Interventions to Treat Food Selectivity

Children who are selective eaters consume some foods but not others (Ahearn, 2003). While some degree of food selectivity is acceptable, in its extreme form food selectivity can result in serious health problems, ranging from malnutrition to growth and developmental delays (Kern & Marder, 1996). Among children with disabilities, food selectivity is a commonly reported problem (Riordan, Iwata, Finney, Wohl & Stanley, 1984). Although the etiology of feeding problems varies and is sometimes unclear, it is thought to be either biological, environmental, or a combination of these two variables (Ahearn, Castine, Nault, & Green, 2001). Kern and Marder (1996) state that feeding problems may persist as a result of environmental factors. That is, permitting escape contingent on resistance and other problem behaviors may exacerbate and maintain food refusal and selective eating.

Research has shown that food refusal and food selectivity can be effectively treated using behaviorally based interventions strategies (Ahearn, 2002). Behavioral interventions that have previously been used and demonstrated effectiveness for increasing food acceptance and consumption include, escape-extinction, differential reinforcement of alternative behavior, differential reinforcement of incompatible behavior, choice, and contingent reinforcement in the form of attention, preferred foods, or preferred materials (Cooper et al., 1995; Piazza, Meeta, Gulotta, Sevin, & Layer, 2003; Riordan et al., 1984).

Food selectivity can be resistant to positive reinforcement based interventions and thus require interventions based on negative reinforcement (Piazza et al., 2003). Negative
reinforcement in the form of escape from or avoidance of eating is one variable that has been hypothesized to maintain feeding problems (Piazza et al., 2003). Ahearn, Kerwin, Eicher, Shantz, and Swearingin (1996) compared two treatment packages involving negative reinforcement contingencies for three children. In one contingency the child was physically guided to accept food contingent on noncompliance and in the other the spoon was not removed until the child accepted the presented food. The two treatments were compared using within subject alternating treatments design and a multiple baseline across subjects. The results indicated both treatments were effective in establishing food acceptance.

Piazza et al. (2003) compared the effects of positive reinforcement, escape extinction, and positive reinforcement with escape extinction. The participants were four children diagnosed with pediatric feeding disorders. Food consumption did not increase when positive reinforcement was the only intervention. However, consumption did increase when escape extinction was implemented, independent of whether positive reinforcement was present or absent. The addition of positive reinforcement combined with escape extinction appeared to change the maladaptive behavior of some participants.

Based on the effectiveness of studies employing negative reinforcement to treat feeding problems, many researchers have hypothesized that feeding problems are, at least in part, learned behaviors that develop as a result of the child’s interaction with the environment (Piazza et al., 2003). Although negative reinforcement has shown to effectively treat food selectivity, several studies have suggested that positive reinforcement based interventions alone may increase consumption. For example, Riordon, Iwata, Wohl, and Finney (1980) treated the food refusal and selectivity of two
developmentally disabled children by delivering preferred foods contingent on the consumption of nonpreferred foods (e.g., sequential presentation). Results were assessed with a multiple baseline design, which demonstrated an increase in consumption of all selected foods, as well as a decrease in food expulsion for both children. Similarly, Riordan et al. (1984) used positive reinforcement as a treatment for the food refusal and selectivity of four children with disabilities. During baseline data collection, the children accepted near zero rates of food, expelled food, and engaged in disruptive behaviors. The treatments consisted of social praise, access to preferred food, brief periods of toy play, and forced feeding. Preferred and nonpreferred foods were presented simultaneously in the first few sessions for two of the participants. Subsequently, preferred and nonpreferred foods were presented sequentially by introducing two to three second delays between the presentation of the preferred and nonpreferred food. Results of the study, which used a multiple baseline and reversal design, showed an increase in food acceptance for all participants independent of whether the preferred food was presented simultaneously or sequentially. Riordan et al. (1984) suggested that positive reinforcement alone was responsible for the increases in acceptance of food for three of the participants.

Methods that have been used to increase the consumption of a variety of food have included simultaneous presentation (Kern & Marder, 1996) and sequential presentation (Riordan et al., 1980) of preferred and nonpreferred foods. Ahearn (2003) evaluated the effects of the simultaneous presentation to increase vegetable consumption in a 14-year-old boy diagnosed with autism and profound mental retardation. During the simultaneous condition, condiments were placed on top of the food item. A multiple
baseline across food items was used to evaluate the acceptance of three separate condiments and three vegetables. A withdrawal to baseline was used between the different condiment conditions to enhance the strength of the design. The participant accepted 100% of the bites of each presented food item during the subsequent simultaneous presentation sessions.

Piazza et al. (2002) compared two methods of food presentations, simultaneous and sequential, to increase consumption of nonpreferred food for three children with food selectivity. During the simultaneous condition, the preferred food was presented at the same time as the nonpreferred food (e.g., broccoli embedded in an apple). In the sequential condition, acceptance of the nonpreferred food resulted in the presentation of the preferred food (e.g., apple slice was presented following consumption of each bite of broccoli). In the simultaneous condition, the food consumption increased for two of the three participants. Overall, the results showed that the simultaneous presentation was more effective than the sequential presentation.

Kern and Marder (1996) compared the effects of simultaneous versus sequential presentation of food items on the food consumption of a 7-year-old boy diagnosed with pervasive developmental disorder (PDD) who only ate five different food items. An escape-extinction procedure was used during both interventions in which the food was held in front of the participant until it was accepted. During the simultaneous presentation condition, a chip and fruit were presented at the same time. During the sequential presentation condition, the chip was provided contingent on the acceptance of the vegetable. Results indicated that both procedures were effective in increasing acceptance; however, the simultaneous reinforcement procedure produced more rapid behavior
change and a higher overall percentage of food acceptance. Kern and Marder (1996) stated that a possible explanation for the effectiveness of the simultaneous reinforcement procedure is that the presence of the preferred food masked the control of the nonpreferred food. Ultimately, the levels of acceptance reach similar rates towards the last 10 sessions of the experiment.

The purpose of the present study is to systematically replicate and extend the procedures of Kern and Marder (1996) using simultaneous and sequential presentations of preferred and nonpreferred foods. Systematic fading procedures were evaluated to decrease the amount of preferred foods and increase the amount of nonpreferred foods presented.

Method

Participants

Jesse was a 16-year-old boy diagnosed with autism and had a history of food selectivity. He typically exhibited selective consumption of starches, fruits and vegetables. When presented with novel or nonpreferred foods, Jesse frequently became aggressive or got out of his seat. Jesse was primarily nonverbal, but would make approximations for highly reinforcing items. Additionally, he was independent in self-help skills.

Mike was a 16-year-old boy diagnosed with autism and had a history of food selectivity. Mike was selective with most fruits, meats, starches and all vegetables. Upon the presentation of novel or nonpreferred foods, Mike frequently became aggressive, got out of seat, flopped, made inappropriate contact towards staff or engaged in property
destruction. Mike had an extensive vocabulary, but he used words mainly to express wants and needs. Mike needed frequent prompting to complete self-help skills.

*Setting and Materials*

Jesse and Mike attended a private day school for individuals with developmental disabilities and were in a classroom comprised of peers with similar diagnoses. All feeding sessions were conducted at a table in the classroom. The preferred and nonpreferred foods, eating utensils and a plate were present during all sessions. Sessions were conducted twice a day, approximately two hours before lunch (e.g., 10:00 a.m.) and two hours after lunch (e.g., 2:00 p.m.). Sessions typically lasted about 10 minutes. The participants were not allowed to have access to their identified preferred foods during the school day.

*Dependent Variable, Operational Definitions, and Response Measurement*

The dependent variables were the percentage of bites consumed, inappropriate mealtime behaviors, and disruptive behaviors. The percentage of bites consumed was derived by dividing the number of clean mouths by the total number of bites accepted and multiplying by 100%. Clean mouth was defined as no food larger than the size of a pea in the child’s mouth following acceptance. The experimenter would prompt the participant to open his mouth 30 seconds after the bite was accepted to determine if the bite had been swallowed. Acceptance was defined as opening the mouth and allowing food to be placed inside within 30 seconds of the presentation of the food item. Data on clean mouth and acceptance were collected using hand-held timers. Inappropriate mealtime behaviors consisted of expulsion, gagging, head turning, batting, throwing and packing. Expulsion
was defined by emitting food from inside mouth, larger than the size of a pea past the
plane of the lips. Gagging was defined as retching via movement of stomach, chest, and
mouth, with or without audible noises. Head turning was defined as moving the head
away from midline after presentation of the food item. Batting was defined as pushing the
utensil or experimenters hand away from the mouth. Throwing was defined as throwing
food or utensils out of or within working area, at people, on the table or the floor. Lastly,
packing was defined as holding food in mouth for longer than 30 seconds after the bite
had been accepted. Data were collected using a frequency count for each occurrence of
inappropriate mealtime behavior. Disruptive behaviors for Jesse included aggression and
out of seat. Disruptive behaviors for Mike included aggression, out of seat, flopping,
inappropriate contact and property destruction. Data were collected using a frequency
count for each occurrence of disruptive behavior.

*Interobserver Agreement and Procedural Integrity*

Two observers independently but simultaneously scored responses during
interobserver agreement (IOA). Agreement was calculated by dividing the number of
agreements by the number of agreements plus disagreement and multiplying by 100%.
IOA was assessed for 50% and 96% of sessions conducted for Jesse and Mike,
respectively. The mean total IOA for bites consumed was 100% for both Jesse and Mike.
The mean total IOA for inappropriate mealtime behavior was 99% (range, 90% to 100%)
and 99% (range, 73% to 100%) for Jesse and Mike, respectively. The mean total IOA for
disruptive behaviors was 100% and 99% (range, 76% to 100%) for Jesse and Mike,
respectively.
Procedural integrity was scored by an independent observer during 50% and 96% of the sessions conducted for Jesse and Mike, respectively. Procedural integrity was calculated by dividing the number of correct responses by the total number of responses and multiplying by 100%. The mean total was 100% for both Jesse and Mike.

**Experimental Design**

Following an initial baseline condition, an alternating treatments design was used to compare the two interventions (simultaneous presentation vs. sequential presentation). For both participants, mashed potatoes was the nonpreferred food used during the escape-extinction procedures implemented in the simultaneous presentation; whereas corn was the nonpreferred food used during the escape-extinction procedures implemented in the sequential presentation.

**Procedure**

*Pre-Intervention.* Prior to conducting the intervention, informed consent was obtained from participants’ parents for the participant to partake in the study. Parent and school staff interviews were conducted to identify preferred and nonpreferred food items as well as eating habits. A probe session was conducted to ensure that both participants would accept food items presented to them on a spoon and plate. Food items used in this probe were familiar preferred food items. A multiple stimulus without replacement preference assessment was also conducted to identify stimuli that were most likely to function as reinforcers. Procedures used were similar to those of DeLeon and Iwata (1996). Following the stimulus preference assessment, a reinforcer assessment was conducted to ensure that the participants would respond contingent on receiving their
preferences. The highest preferred, second highest preferred and lowest preferred foods identified by the stimulus preference assessment were used in the reinforcer assessment. The reinforcer assessment procedures were similar to those of Moher, Gould, Hegg, Hahoney (2008). Lastly, a probe was conducted using various fruits and vegetables that parent and school staff had suggested that the participants did not prefer. In this probe each food item from both fruit and vegetable food groups was presented twice. The food items with the lowest percentage of selection were chosen for the simultaneous and sequential presentation.

For Jesse the preferred food was identified as Craisins and for Mike the preferred food was identified as Doritos. The nonpreferred foods for Jesse and Mike were identified as corn and mashed potatoes.

Baseline. During baseline sessions, the experimenter presented the nonpreferred food on a spoon for both participants. For Jesse, the nonpreferred food item was placed on a spoon on a plate in front of him. Every 30 seconds Jesse was prompted to take a bite. If Jesse failed to place the bite in his mouth within 30 seconds, the bite was removed for 5 seconds and represented. If Jesse accepted a bite of the nonpreferred food, no consequence was delivered. For Mike, the experimenter held the spoon 1-inch in front of his mouth and said, “Take a bite”. If Mike opened his mouth, the experimenter deposited the food inside. If he did not open his mouth within 30 seconds of the spoon presentation, or interrupted the bite with inappropriate mealtime or disruptive behaviors, the experimenter withdrew the spoon. The baseline sessions lasted approximately 10 minutes. For both participants all inappropriate mealtime behaviors and disruptive behaviors were ignored.
Simultaneous vs. Sequential Presentations. During both presentations, escape-extinction was implemented in which the experimenter held the spoon containing the nonpreferred food 1-inch in front of the participant’s mouth for 30 seconds. In the simultaneous presentation, the target nonpreferred food (i.e., mashed potatoes) was presented at the same time as the preferred food (i.e., Craisin for Jesse, Dorito for Mike). That is, both foods were presented on one spoon. In the sequential presentation, the preferred food (i.e., Craisin for Jesse, Dorito for Mike) was presented contingent on the acceptance of the nonpreferred food (i.e., corn). For both participants the preferred and nonpreferred food items were presented on separate spoons (i.e., a bite of vegetable was held in front of the reinforcer). In both presentations, if the bite was accepted then expelled, it was represented. Contingent on a bite being consumed, verbal praise was provided. As in baseline, all inappropriate mealtime behaviors and disruptive behaviors were ignored.

The quantity of the preferred food and nonpreferred food was modified depending on the rate of consumption. Initially, the whole preferred food was presented in both presentations. Criterion to decrease the size of the preferred food was when the participant demonstrated 80% or more of bites consumed for two consecutive sessions. The preferred food was then decrease by half the original size. Criterion to increase the size of the preferred food was 79% of bites consumed or less for one consecutive session. The starting point (i.e., the whole reinforcer) was the biggest increase possible. Once the preferred food was completely faded, the amount of the nonpreferred food was increased (using the same criteria for the preferred food) to a half spoonful, spoonful, and to a serving size (i.e., 2/3 cup).
Simultaneous Presentation Plus Additional Reinforcer. Additional treatment interventions were implemented with Mike because his consumption of mashed potatoes did not increase in the simultaneous presentation, or when they were subsequently presented in sequential presentation. Furthermore, he displayed an increase in inappropriate mealtime behaviors and disruptive behaviors that lead to terminating sessions. First, the preferred food (i.e., Dorito) was presented to Mike using additional reinforcement (i.e., computer) on a fixed-ratio (FR) of four. Specifically, access to the computer was contingent on every fourth bite consumed. The first session of this condition did not include the nonpreferred food (i.e., mashed potatoes). In the subsequent sessions, the mashed potatoes were gradually introduced by providing increasing amounts under the preferred food (i.e., Dorito). The additional reinforcement (i.e., computer) was systematically faded out. The fading procedure to fade the preferred food was resumed. During this condition, acceptance of food was not maintained. Procedures to recapture responding were then implemented. The Dorito was first presented in isolation and the computer was provided on a FR2. The amount of mashed potatoes under the Dorito was increased. In the last phase, the Dorito was removed.

Generalization and Maintenance Probes. Generalization for Jesse and Mike were transitioning into the cafeteria setting, eating alongside their peers, and using different but familiar experimenters to present the food items. Maintenance probes were conducted weekly for three weeks in the cafeteria setting. All conditions were the same as in baseline, however, verbal praise was delivered contingent on acceptance of the non-preferred food.
Results

Results for both participants’ probe sessions for spoon and plate acceptance are displayed in Figures 1 and 2. Jesse averaged 100% acceptance of familiar preferred food items from a spoon and plate while he averaged 0% inappropriate mealtime and disruptive behaviors. Mike averaged 96.6% acceptance of familiar preferred food items from a spoon and 100% acceptance from a plate. Mike averaged 0% inappropriate mealtime and disruptive behaviors during the probe sessions.

Figures 3 and 4 display the results of both participants’ preference assessments. Jesse’s highest preferred food items were Craisins and chips, with 75% and 60% averaged percent chosen, respectively. His lowest preferred food item was cookies with 16% averaged percent chosen. Mike’s highest preferred food items were Doritos and Oreos, with 100% and 50% averaged percent chosen, respectively. His lowest preferred food item was Gummy Bears with 20% averaged percent chosen.

Figures 5 and 6 display the results of both participants’ reinforcer assessments. During baseline data collection, Jesse’s average response rate per minute was 1.3 and Mike’s average response rate per minute was one. Across five sessions of reinforcer assessments for Craisins, Jesse’s average response rate was 11.8 responses per minute. Across four sessions of reinforcer assessments for the chips and cookies, Jesse’s average response rate was 6.3 and 6.8 responses per minute, respectively. Mike’s average response rate per minute across five sessions of reinforcer assessments was 10.4 for Dorito, 7 for Oreos, and 8.8 for Gummy Bears.
Figure 7 displays the results for Jesse during the simultaneous and sequential presentations of preferred and nonpreferred food items. During baseline data collection, Jesse averaged 0% and 13.3% of bites consumed for mashed potatoes and corn, respectively. Rates of inappropriate mealtime behavior and disruptive behavior averaged 2.3% and 0%, respectively (data not shown). Consumption increased immediately to 90% and 100% as the simultaneous and sequential presentations were introduced, respectively. During both presentations, consumption remained at 100% for the following treatment sessions. Subsequently, fading procedures were introduced where consumption was maintained. Stable responding of near 100% consumption was achieved during generalization and maintenance probes. During treatment, near zero rates of responding for inappropriate mealtime and disruptive behaviors were achieved (data not shown).

Figure 8 displays the results for Mike during the sequential presentation. During baseline data collection, Mike averaged 0% of bites consumed for corn. The percent of bites consumed immediately increase to 100% as the sequential presentation was introduced. The percentage of bites consumed remained at a steady 100% throughout the entire fading procedures. High percentages of consumption were maintained during generalization and maintenance probes. Figure 9 depicts the same results for Mike in the sequential presentation, however the inappropriate mealtime and disruptive behaviors are shown. During baseline, the average frequency of inappropriate mealtime and disruptive behaviors were 11% and .5%, respectively. The frequency of the inappropriate mealtime and disruptive behaviors remained near zero rates during the duration of the study.

The percent of bites consumed in the simultaneous presentation for Mike are displayed in Figure 10. During baseline data collection, Mike averaged 0% of bites
consumed for mashed potatoes. There was an increase of consumption to 44% when the simultaneous presentation was introduced. Consumption decreased to 0% by the last session in the simultaneous presentation. During the sequential presentation of the mashed potatoes, consumption remained at 0%, furthermore, the last two sessions of the sequential presentation resulted in terminating sessions. There was an immediate increase of consumption to 100% for Mike during the simultaneous presentation plus additional reinforcer phase, which was maintained as the mashed potatoes were gradually faded in under the Dorito. During the fading of the Dorito, there was a decreasing trend to 0% consumption by the last session. The percent of bites consumed was recaptured at 100% as the simultaneous presentation plus additional reinforcer was reintroduced. By contrast, once the Dorito was removed in the last phase, the percent of bites decreased to 0%.

Figure 11 depicts the same results for Mike in the simultaneous presentation, however the inappropriate mealtime and disruptive behaviors are shown. During baseline data collection, the averaged frequency of inappropriate mealtime and disruptive behaviors were 3% and .6%, respectively. There was a steady increase in the inappropriate mealtime and disruptive behaviors during the simultaneous presentation, reaching rates of 45 and 21, respectively. Rates of inappropriate mealtime and disruptive behaviors remained relatively high during the sequential presentation. As the simultaneous presentation plus additional reinforcer condition was introduced, rates of inappropriate mealtime and disruptive behaviors immediately decreased to zero. There was slight variability observed during the fading procedure, then again an immediate decrease as the simultaneous presentation plus additional reinforcer phase was
reintroduced. During the last phase, rates increased to five for both inappropriate mealtime and disruptive behaviors.

**Discussion**

The purpose of the present study was to systematically replicate and extend the procedures of Kern and Marder (1996) using simultaneous and sequential presentations of preferred and nonpreferred foods. Systematic fading procedures were evaluated to decrease the amount of preferred foods and increase the amount of nonpreferred foods presented.

Results from the current investigation show that both simultaneous and sequential presentations for Jesse were effective in increasing the consumption of nonpreferred foods. Results were similar to those of Kern and Marder (1996) in that both presentations were effective, but differed by the rate of consumption. Jesse had immediate consumption once treatment was introduced, whereas Kern and Marder (1996) showed more variability across both presentations before reaching stable responding by the last 10 sessions of treatment. Results for Mike showed that the simultaneous presentation was identified as ineffective in increasing food consumption and the sequential presentation was more effective than the simultaneous presentation. Mike’s results for the simultaneous presentation were not only less effective, but showed a decreasing rate of consumption to zero rates, even when additional treatment interventions were added. Mike’s results are in contrast to previous research where the simultaneous presentation of preferred and nonpreferred foods have been superior to the sequential presentation (Kern & Marder, 1996; Piazza et al., 2002).
There are several reasons why the simultaneous and sequential presentations of preferred and nonpreferred foods may have been effective in increasing consumption for Jesse. Negative reinforcement in the form of escape from or avoidance of eating is one variable that has been hypothesized to maintain feeding problems (Piazza et al., 2003). In the case of food selectivity, the aversive stimulus is the nonpreferred food. If so, using a simultaneous presentation method, the preferred food may act as an establishing operation by reducing the aversiveness of the nonpreferred food. Therefore, the presence of the preferred food in combination with the nonpreferred food may alter the participant to escape as reinforcement (Piazza et al., 2002). During baseline, Jesse was able to escape from eating by engaging in inappropriate mealtime behaviors resulting in the removal of the spoon. During the simultaneous presentation, where the preferred and nonpreferred foods were presented together, escape extinction was implemented and engaging in inappropriate mealtime behaviors no longer resulted in the removal of the spoon, thus, Jesse began to eat.

In the sequential presentation, providing access to the preferred food contingent on acceptance of the nonpreferred food was effective in increasing consumption for Jesse and Mike. The presented preferred food may have not competed with the motivation to escape from the nonpreferred food. This is, the preferred food may have been a potent enough reinforcer to alter the effectiveness to escape.

The effectiveness of both presentations for Jesse and the effectiveness of the sequential presentation for Mike may have resulted from systematic procedures used to identify potent reinforcers. While researchers have documented the use of preference assessments to identify preferences for their participants with food selectivity (Ahearn et
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al., 1996), the use of reinforcer assessments to ensure that the participants would respond contingent on receiving their preferences is largely undocumented.

In addition to the effectiveness of both presentations for Jesse and the sequential presentation for Mike, the implementation of the fading procedures were essentially effective in establishing both participants to eat the nonpreferred foods independent of edible reinforcers. Fading of preferred and nonpreferred foods occurred at the same time for Jesse, indicating that there was equivalence in terms of treatment duration. Similarly, the fading of preferred and nonpreferred foods in the sequential presentation for Mike, occurred approximately within the same number of sessions as Jesse.

It is unclear why the escape extinction procedure was ineffective for Mike in the simultaneous presentation to increase the consumption of mashed potatoes. Several studies have demonstrated the effectiveness of escape extinction in the treatment of feeding problems (Ahearn, 1996; Kern & Marder, 1996; Piazza et al., 2003). Furthermore, Piazza et al. (2003) found that consumption of nonpreferred foods did increase when escape extinction was implemented, independent of whether positive reinforcement was present or absent. However, escape extinction was not effective for one of the participants, which lead to using more intrusive procedures such as physical guidance. It may be possible that escape from or avoidance of the spoon may have functioned as reinforcement for food refusal for Mike.

Subsequently, the mashed potatoes were presented to Mike in the sequential presentation phase in which consumption remained at 0%. An explanation for why consumption did not occur may be carryover effects from the simultaneous presentation,
where Mike initially consumed the mashed potatoes but steadily decreased to 0% consumption in the last session of the presentation. Also, Mike never contacted the contingency of the sequential presentation. Inappropriate mealtime and disruptive behaviors increased to high levels during both presentations, ultimately leading to terminating the last two sessions in the sequential presentation phase. The inappropriate mealtime and disruptive behaviors were causing disruptions and an unsafe environment in the classroom. Moreover, leading to difficulty implementing the procedures.

In the simultaneous presentation plus additional reinforcer phase, which was only implemented with Mike to increase consumption of the mashed potatoes, there was an immediate increase of consumption and a decrease to near zero rates of inappropriate mealtime and disruptive behaviors suggesting the computer may have been the maintaining variable for consumption. In addition, inappropriate mealtime and disruptive behaviors decreased to near zero rates during this phase and remained low during the fading of the computer. Once the computer was completely faded, fading of the preferred food was introduced where Mike’s consumption steadily decrease and inappropriate mealtime and disruptive behaviors increased. At this point, stimulus control was lost and this may have been due to a flawed fading technique. Subsequently, to recapture consumption of the mashed potatoes the simultaneous presentation plus additional reinforcer phase was reintroduce, and responding was recapture. To test for the computer being the hypothesized maintaining variable for consumption of the mashed potatoes, the Dorito was removed in the last phase where acceptance of the mashed potatoes resulted in access to the computer. However, Mike did not contact the contingency and an increase in inappropriate mealtime and disruptive behaviors were observed.
Mike’s refusal of mashed potatoes may have not been due to the presentation methods but possibly the aversive flavor, smell, texture, or temperature. It is also likely that the mashed potatoes were so aversive that regardless of how potent the reinforcer was, Mike was not going to accept. That is, the strength of the aversiveness of the mashed potatoes was stronger than the reinforcer. Another possibility of Mike’s refusal of mashed potatoes may be due to the result of flavor-flavor conditioning. Piazza et al. (2002) suggested that increases in acceptance in the simultaneous presentation condition may be a result of flavor-flavor conditioning. It is possible that the pairing of two flavors could result in non-acceptance due to flawed pairing of two flavors. Rather than increasing the preference for the nonpreferred food, the procedure may have decreased the preference for the preferred food.

While food consumption of nonpreferred foods increased for both participants, there were some limitations. Further research should examine the controlling variables that influenced food consumption. For Jesse and Mike, escape extinction and positive reinforcement were used as consequence manipulations. A direct test to control for which consequence manipulation was maintaining consumption was not conducted. That is, Piazza et al. (2003) found that consumption of nonpreferred foods did increase when escape extinction was implemented, independent of whether positive reinforcement was present or absent. It is possible this study may have yielded similar results without the use of positive reinforcement as a consequence manipulation.

Additional research should focus on varying the criteria for implementing fading techniques. During the simultaneous presentation plus additional reinforcer phase, it may have been more effective to fade Mikes preferred edible at a slower rate or to change the
criteria of consumption before introducing the fading procedures for the preferred food. In addition, careful reconsideration may be needed, given that Mike’s consumption of mashed potatoes was present at 100% consumption in the simultaneous presentation plus additional reinforcer phase until the fading procedure to decrease the preferred food was implemented. The simultaneous plus additional reinforcer phase was effective, however time consuming and difficult to implement.

The school setting may have also been a limitation, as it limited the opportunity to control only for meals presented during the school hours. If the experimenters were present during all meals across all settings (i.e., school, home), there may have been more stimulus control of consumption. Additionally during this study, identified reinforcers were only isolated during the school day. If experimenters were present across all settings, withholding identified reinforcers across all settings, it may have enhanced the strength of the reinforcer.

Data from this current investigation suggest a number of avenues for future research. First, testing other nonpreferred foods using the simultaneous and sequential presentations would replicate and verify the effectiveness of these procedures. In addition, the generality of this study is somewhat limited due to the use of two participants. Using a greater number of participants may enhance the external validity of the study. Second, controlling for and evaluating the mechanisms responsible for influencing the rate of consumption. If using multiple antecedent or consequence manipulations, a direct test would be sufficient. Lastly, evaluating fading as part of a treatment package. It may be difficult to maintain consumption if the preferred food was
immediately removed. Thus, comparing treatments with and without the use of fading preferred and nonpreferred foods.

In conclusion, the results of the current investigation show that both simultaneous and sequential presentations for Jesse were effective in increasing the consumption of preferred and nonpreferred foods. Results were similar to those of Kern and Marder (1996) in that both presentations were effective for Jesse. The sequential presentation for Mike was effective, however additional treatment interventions were evaluated to increase consumption in the simultaneous presentation. The data of this study extends the previous research by contributing the use of systematic procedures to identify reinforcers and the use of fading procedures, furthermore adding to a growing body of research dedicated to helping children with food selectivity and refusal.
References


Figure Captions

Figure 1: Percent acceptance of edibles observed for Jesse from a spoon and plate.

Figure 2: Percent acceptance of edibles observed for Mike from a spoon and plate.

Figure 3: Percent chosen of edibles observed for Jesse’s 6 item multiple stimulus without replacement preference assessment.

Figure 4: Percent chosen of edibles observed for Mike’s 6 item multiple stimulus without replacement preference assessment.

Figure 5: Frequency of responses per minute observed for Jesse across all conditions of baseline, highest preferred, second highest preferred and lowest preferred edibles.

Figure 6: Frequency of responses per minute observed for Mike across all conditions of baseline, highest preferred, second highest preferred and lowest preferred edibles.

Figure 7: Percent of bites consumed observed for Jesse in the simultaneous and sequential presentation of preferred and non-preferred food items.

Figure 8: Percent of bites consumed observed for Mike in the sequential presentation of preferred and non-preferred food items.

Figure 9: Percent of bites consumed observed for Mike in the sequential presentation of preferred and non-preferred food items and inappropriate mealtime and disruptive behaviors.

Figure 10: Percent of bites consumed observed for Mike in the simultaneous presentation of preferred and non-preferred food items.

Figure 11: Percent of bites consumed observed for Mike in the simultaneous presentation of preferred and non-preferred food items and inappropriate mealtime and disruptive behaviors.
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