MODELING REINFORCEMENT CONTINGENCIES TO INCREASE DIET VARIABILITY OF CHILDREN WITH FOOD SELECTIVITY

A Thesis

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Abstract

of

MODELING REINFORCEMENT CONTINGENCIES TO INCREASE DIET VARIABILITY OF CHILDREN WITH FOOD SELECTIVITY

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The current study evaluated the effectiveness of modeling positive and negative reinforcement contingencies for three children with food selectivity and autism spectrum disorder. A differential reinforcement contingency was first modeled in which participants observed the model access preferred items and edibles upon the model's consumption of six bites of nonpreferred foods. If participants' acceptance of nonpreferred food did not increase, a nonremoval of the spoon procedure was modeled. Modeling differential reinforcement resulted in increased food acceptance for one participant and, for two participants, food acceptance increased after the nonremoval of the spoon procedure was modeled.

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_____
Date

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Chapter 1

BACKGROUND ON PEDIATRIC FEEDING PROBLEMS

Pediatric feeding problems can be a major concern for parents and caretakers. It has been estimated that 10-35% of typically developing children (Seiverling, Harclerode, & Williams, 2014) and 46-89% of children with developmental disabilities are affected by food selectivity (Bandini, et al., 2017). Food selectivity has been defined as the intake of a small variety of foods (Seiverling, Williams, Sturmey, & Hart, 2012), as well as having a high preference for select foods while rejecting novel foods (Taylor, Wernimont, Northstone, & Emmet, 2015). Persistent food selectivity can lead to serious medical problems such as malnutrition, in some cases necessitating placement of a gastrostomy tube (Bachmeyer, 2009). Although some children may maintain a sufficient weight by eating only select foods, their accepted foods may not meet nutritional requirements necessary for proper mental and physical development (Bachmeyer; Silbaugh et al., 2016).

A treatment plan that ensures the child receives proper nutrition is needed to prevent or remediate some of the potential side effects of food selectivity. Nonremoval of the spoon (NRS) is one empirically supported treatment for food selectivity that has been demonstrated to be effective in expanding a child's diet (LaRue et al., 2011; Piazza, Patel, Gulotta, Sevin & Layer, 2003; Rivas, Piazza, Patel, & Bachmeyer, 2010; Seiverling, Harclerode, & Williams, 2014). During NRS, the spoon (or other feeding apparatus) is held directly in front of the child's mouth and the bolus is deposited when

the child opens their mouth. Expelled bites are often represented; however, NRS may be implemented with or without representation (Piazza, 2008).

Although effective, NRS might be accompanied by emotional responding (e.g., crying) and inappropriate mealtime behavior (IMB) such as turning the head away from the spoon, and possibly even aggression towards the feeder or self-injurious behavior (Borrero, Woods, Borrero, Masler, & Lesser, 2010; LaRue et al., 2011). The NRS procedure is also likely to evoke food refusal behaviors such as expulsion of accepted bites, heaving, and in some cases, regurgitating (Williams, Field, & Seiverling, 2010). Additionally, the procedure may seem invasive to those who are not familiar with it (Tarbox, Schiff, & Najdowski, 2010). Moreover, if the child exhibits problem behavior during the procedure and the feeder fails to implement NRS correctly by removing the food, this may establish or strengthen a history of reinforcement in which the child escapes consuming the food (Bachmeyer et al., 2009; Borrero et al., 2010; LaRue et al. 2011). Thus, given some of the potential side effects of NRS and challenges with implementation of the procedure, further evaluation of alternative treatments is needed.

Alternative interventions that have been evaluated, both alone and in conjunction with NRS, include antecedent and reinforcement-based interventions, such as noncontingent reinforcement (e.g., Reed et al., 2004), simultaneous presentation of preferred and nonpreferred foods (e.g., Kern & Marder, 1996; Piazza et al., 2002), offering choices among nonpreferred or novel foods (e.g., Fernand, Penrod, Fu, Whelan, & Medved, 2016), high probability instructional sequences (e.g., Dawson et al., 2003; Patel et al., 2007), stimulus or demand fading (e.g., Rivas et al., 2010; Penrod, Gardella,

& Fernand, 2012), differential reinforcement of alternative behavior (e.g., Patel, Piazza, Martinez, Volkert & Santana, 2002; Sira & Fryling, 2012), and sequential presentation of nonpreferred and preferred foods (e.g., Piazza et al., 2002). There is evidence to suggest that these procedures are not always effective when used in isolation, however, when used in conjunction with the NRS procedure, these procedures may help mitigate some of the negative side effects that may be associated with the NRS procedure (LaRue et al., 2011; Reed et al., 2004; Patel, Piazza, Martinez, Volkert, & Santana, 2002; Piazza, Patel, Gulotta, Sevin, & Layer, 2003).

Another promising intervention to treat food selectivity is the use of modeling, which is the focus of the current study. Within the field of behavior analysis, modeling has been used with a number of different populations to teach a wide variety of skills including play skills (Blum-Dymaya, 2010; MacDonald et al., 2005; Sancho et al., 2010), social skills (Nikopoulos & Keenan, 2004; Tetreault & Lerman, 2010), verbal skills (Plavnick, & Ferreri, 2011), and abduction prevention skills (Johnson et al., 2006), but only a few studies have evaluated modeling as a treatment for food selectivity (Fu et al., 2015; Greer, Dorow, Williams, McCorkle, & Asnes, 1991; Sira & Fryling, 2012).

Greer and colleagues (1991) evaluated a peer modeling procedure with an 18-month old child who was reported to imitate his 5-year old sister (although imitation was not formally assessed). Thus, the participant's 5-year old sister was selected to serve as the peer model. During the treatment phase of the study, a token cup was presented in front of the model and the participant who were seated at their dinner table facing one another. A single bite of food was placed on the model's plate, and upon consumption of

the food, praise was delivered and a token was dropped into the cup. A single bite of food was then placed on the participant's plate and after 5 s elapsed without the child reaching for the bite, it was removed, and the procedure continued until the model consumed all of the food. At the end of the meal the model exchanged the tokens in the cup for reinforcers. After the participant observed the contingencies modeled (i.e., observed his sister contacting reinforcement), consumption of solid foods increased.

Similarly, Sira and Fryling (2012) evaluated the effectiveness of peer modeling with a 9-year-old child diagnosed with autism spectrum disorder (ASD) who exhibited IMB. A sibling model was also used in this study. The participant was reported to have a strong verbal repertoire though no formal assessment was noted. During treatment, both the model and the participant were presented with 10 bites of food in a rotating fashion. Upon consumption of the food, the model's behavior was praised, and the model was granted access to a preferred item or activity. Results demonstrated that modeling differential reinforcement was effective in increasing food consumption. Although this study along with the Greer et al. (1991) study effectively increased food consumption, some limitations should be noted. Both studies consisted of a treatment package including modeling consumption of nonpreferred foods and differential reinforcement. Additionally, neither study specified what constituted a strong imitative repertoire nor was a formal assessment completed to confirm that participants did in fact have a strong imitative repertoire, as reported.

In a more recent study, Fu and colleagues (2015) evaluated a modeling procedure with two boys with food selectivity and a diagnosis of ASD. The model used in this study was an adult who modeled IMBs that resembled the behaviors the participant engaged in during presentation of novel or nonpreferred foods. During baseline, the adult modeled consuming the foods and there were no programmed consequences for consumption. During the second phase of the study, a differential reinforcement contingency was modeled and a rule specifying the contingency was also provided. Specifically, the model was given a preferred food and access to a preferred activity upon consumption of all bites of food presented. If participant consumption did not increase during the modeling differential reinforcement phase, then a third phase was implemented, during which the researcher modeled the NRS procedure in addition to providing a rule specifying this contingency.

Results of the Fu et al. (2015) study demonstrated that modeling differential reinforcement was partially effective for one participant, whereas modeling the NRS procedure was effective in increasing food consumption for all target foods for both participants. Fu and colleagues attempted to control for limitations of the Greer et al. (1991) and Sira and Fryling (2012) studies; however, this study is not without its own limitations. The authors noted that rules were stated at the start of the session. Thus, it is unclear if the rule or the modeling procedure led to the change in the dependent variable. Additionally, session durations were not held constant across phases, so it is unknown if longer exposure to the foods in the treatment phases facilitated consumption. Lastly,

praise was not delivered in baseline. Therefore, it is difficult to determine if praise influenced consumption during the treatment phases.

Purpose of Study

In summary, results of the Fu et al. (2015) study are consistent with previous studies that directly evaluated positive and negative reinforcement contingencies and found that food consumption is more likely to increase through the process of negative reinforcement (Najdowski, Wallace, Doney & Ghezzi, 2003; Rivas, et al., 2010; Patel et al., 2002; Piazza et al., 2003; Valdimarsdottir, Halldorsdottir, & Sigurdardottir, 2010). In contrast, in both the Greer et al. (1991) and Sira and Fryling (2012) studies, food consumption increased through the process of positive reinforcement. Given few studies have evaluated modeling in the context of feeding and results of those studies have been mixed, further evaluation of the effects of modeling positive and negative reinforcement contingencies is needed. Thus, the purpose of this study was to replicate and extend the Fu et al. study. This study aimed to control for limitations of previous research by conducting a formal assessment of relevant skills needed to benefit from a modeling procedure. Additionally, modeling was evaluated in the absence of a rule, session durations were held constant, and praise was held constant across all phases of the study.

Chapter 2

METHOD

Participant Characteristics

Three participants were included in this study. All participants were between the ages of 6 and 10 and had a diagnosis of ASD. All primary caregiver(s) of the participants signed a consent form for their child to participate in the research and participant assent was also obtained (see Appendices A and B, respectively).

At the onset of participation, caregivers were asked to complete a feeding questionnaire to determine participant characteristics, such as diagnosis and previous feeding history (See Appendix C for the Silbaugh Feeding Questionnaire [SFQB] Brief Form V1.0). Additionally, parents were asked to identify 7-10 foods that they wanted their child to consume, and 7-10 preferred items and edibles that they were willing to restrict for use in this study. Further, participants were assessed using the Communication Domain of the Vineland Adaptive Behavior Skills- 3rd Edition (interview form for Luke and teacher form for Blake and Jason). In order to participate in this study, participants had to receive a score of 2 on following instructions in the if/then form (item #17, subdomain: Receptive of the Communication Domain) and score a 90% on the imitation assessment (described below). Information regarding each participant's age equivalence and adaptive levels for each subdomain are presented in Table 1.

Table 1:

Vineland Scores for Participants

Participant: Luke			
Age at time of assessment: 6 years, 8 months			
Domain	Standard Score	Age Equivalent	Adaptive Level
Communication	98		Adequate
Receptive		3:8	Moderately Low
Expressive		6:10	Adequate
Written		7:6	Moderately High
Participant: Blake			
Age at time of assessment: 10 years, 9 months			
Domain	Standard Score	Age Equivalent	Adaptive Level
Communication	79		Moderately Low
Receptive		5:10	Moderately Low
Expressive		4:6	Moderately Low
Written		5:4	Moderately Low
Participant: Jason			
Age at time of assessment: 10 years, 9 months			
Domain	Standard Score	Age Equivalent	Adaptive Level
Communication	77		Moderately Low
Receptive		5:10	Moderately Low
Expressive		4:6	Moderately Low
Written		3:0	Moderately Low

Note. This table depicts the standard score, age equivalent in years and months, and adaptive level for each of the particpants for the Communication Domain of the Vineland Adaptive Scales – 3rd Edition and the respective subdomains of Receptive, Expressive, and Written.

Luke was a 6-year-old male with a diagnosis of ASD and a secondary diagnosis of generalized anxiety disorder. At the time of the study, Luke had the diagnosis of ASD for less than one year. Luke was in the first grade with a 504 Behavior Support Plan. Luke's father reported that he regularly consumed bananas, strawberries, grapes and lemons. Luke consumed pureed baby food vegetables in oatmeal but did not consume whole vegetables. Luke also consumed the following proteins with ketchup: hamburger, chicken, and bacon. Luke had not received previous services for feeding problems although he had seen a Gastroenterologist and a Pediatrician for feeding concerns. Specifically, Luke had a food allergy to dairy products and developed a minor skin reaction to some foods such as walnuts, soy, eggs and blueberries.

Luke's father reported the following maladaptive behaviors surrounding feeding: gagging, expulsion, spitting, and eating food too slowly. He reported no signs of vomiting, packing, rumination, and no problems with sucking or swallowing foods. IMB involved turning his head away, holding his lips closed, negative vocalizations and pretending to fall to the floor when presented with novel or nonpreferred foods. Luke's family regularly prepared alternative meals for him and gave multiple prompts to stay seated at the table. He was able to feed himself with a spoon or fork and most often drank from a water bottle but could also use a straw.

Blake and Jason were twin 10-year-old brothers with a diagnosis of ASD. At the time of this study, Blake and Jason had the diagnosis of ASD for five years. They were in a 5^{th} grade general education classroom with support of Individualized Education Plans (IEP) and full day aides. According to their mother, Blake and Jason did not consume any

fruits or vegetables other than banana (Jason) and an occasional small piece of apple if peeled and sliced (Blake). More than three years prior to this study, Blake and Jason participated in a novel foods program implemented by an in-home ABA therapy provider. At the time of this study, neither Blake or Jason were receiving any services for ongoing feeding concerns.

Blake's mother reported that he consumed most meats such as bacon, sausage, pepperoni, hamburger and salami and foods that are high in carbohydrates such as pancakes or breaded items such as popcorn chicken. Blake also consumed scrambled eggs. Blake's mother reported the following maladaptive behaviors surrounding feeding: gagging, vomiting, expulsion and spitting foods. She reported no drooling, no issues with swallowing or sucking and reported it was unknown if there were any issues with chewing or packing; however, Blake was able to eat preferred foods without any issue. Blake's mother reported the following IMBs when she presented novel or nonpreferred foods: turning the head away from foods, pushing the plate of nonpreferred or novel foods away, and negative vocalizations such as "No, I have already had that," elopement, throwing the novel or nonpreferred foods and frequent requests for other foods. Blake's mother regularly prepared alternative meals for him. He was able to feed himself with a spoon or fork and could drink from a cup or use a straw.

Jason was reported to consume most meats such as bacon, sausage, pepperoni, and foods that are high in carbohydrates such as pancakes, French fries, bread or breaded items such as fish sticks, and chicken nuggets. He would also regularly consume grilled cheese sandwiches, quesadillas and scrambled eggs. Jason's mother reported the

following maladaptive behaviors surrounding feeding: gagging, vomiting, expulsion and spitting foods. She reported no drooling, no issues with swallowing or sucking and reported it was unknown if there were any issues with chewing or packing; however, Jason was able to eat preferred foods without any issue. Jason's mother reported the following IMBs: turning the head away from foods, pushing the plate of nonpreferred or novel foods away, and negative vocalizations such as "No, I don't want that," elopement, throwing novel or nonpreferred foods and frequent requests for other foods. Jason's mother regularly prepared alternative meals for him. He was able to feed himself with a spoon and fork and could drink from both a cup and straw.

Setting and Materials

For Luke, the study took place in his home at the dining table where the family regularly ate dinner. For Blake and Jason, the study took place in the Pediatric Behavior Research Lab located on the campus of Sacramento State University. Session materials included a table, chair, microwave, refrigerator and a sink in addition to plates, utensils, napkins, water in a clear water cup, a timer, and Motivaiders®. Foods targeted in the study were cut into bite-sized pieces approximately 2 cm by 2 cm. All sessions were video recorded in order to collect interobserver agreement and procedural integrity data.

Model and Feeder Characteristics

The model for this study was a graduate student from the Applied Behavior Analysis program at California State University, Sacramento (Blake and Jason) and an undergraduate student from the University of Texas at San Antonio (Luke). The models were trained via behavioral skills training that encompassed instructions, modeling,

rehearsal, and feedback (Miltenberger, 2014). Models were required to perform the procedure with 100% accuracy on one occasion before interacting with a participant. For Luke, the experimenter who served as the feeder was an assistant professor and Board Certified Behavior Analyst at the Doctorate level (BCBA-D) from the University of Texas at San Antonio. The experimenter who served as the feeder for Blake and Jason was a graduate student in the Applied Behavior Analysis program at California State University, Sacramento.

Imitation Assessment

Participants' imitative repertoire was assessed by modeling 20 simple motor responses following the instruction "Do this." Participants were seated directly across from the experimenter. The instructions were given one after another and no breaks were provided during the assessment. Each instruction was presented one time and no consequences were provided. If the participant engaged in the target response within 5 s then the experimenter marked a (+) on a prepared data sheet (see Appendix D) next to the corresponding instruction and immediately delivered the next instruction. If the participant did not engage in the target response within 5 s, the experimenter marked a (-) and issued the next instruction. Any challenging behavior emitted by the participant was ignored. The assessment ended after all 20 instructions were issued or 20 min elapsed, whichever occurred first. All participants scored a 100% (20 out of 20) on the imitation assessment.

Compliance Assessment

Following the imitation assessment, a compliance assessment was conducted with each of the nonpreferred foods identified by the parents. The compliance assessment was adapted from Penrod, Gardella and Fernand (2012). The compliance assessment included a series of 10 instructions that were issued by stating, “Do this” while modeling the motor response. The procedures for the imitation assessment regarding the inter-instruction interval, managing challenging behavior and duration of the assessment were the same procedures used for the compliance assessment. Each instruction was presented one time, marked as a (+) or (-) and no consequences were provided following instructions, irrespective of how participants responded (see Appendix E for corresponding data sheets). The compliance assessment was conducted to determine six foods that were relatively equal in terms of the extent to which participants would interact with the food. Foods with a similar percentage of compliance (i.e., within a 20% range of each other) were selected for inclusion in the study. If all foods were relatively similar, then six foods were chosen randomly. Three of the six foods were placed in group A and three foods were placed in group B. Group A foods were associated with a continuous baseline condition, while foods in group B were associated with treatment conditions.

Luke’s caregivers suggested the following foods to target: white potato, asparagus, broccoli, tofu, spinach, sweet potato, carrot, ground beef and peas. Percentage of compliance for white potato, asparagus, broccoli, tofu, spinach, sweet potato, and carrot were equal; that is, Luke complied with 7 of the 10 instructions with each of these foods. Therefore, six foods were randomly selected and assigned to either the continuous

baseline group or the treatment group. The continuous baseline group foods included carrot, asparagus, tofu and the treatment group included broccoli, white potato and sweet potato (see Figure 1).

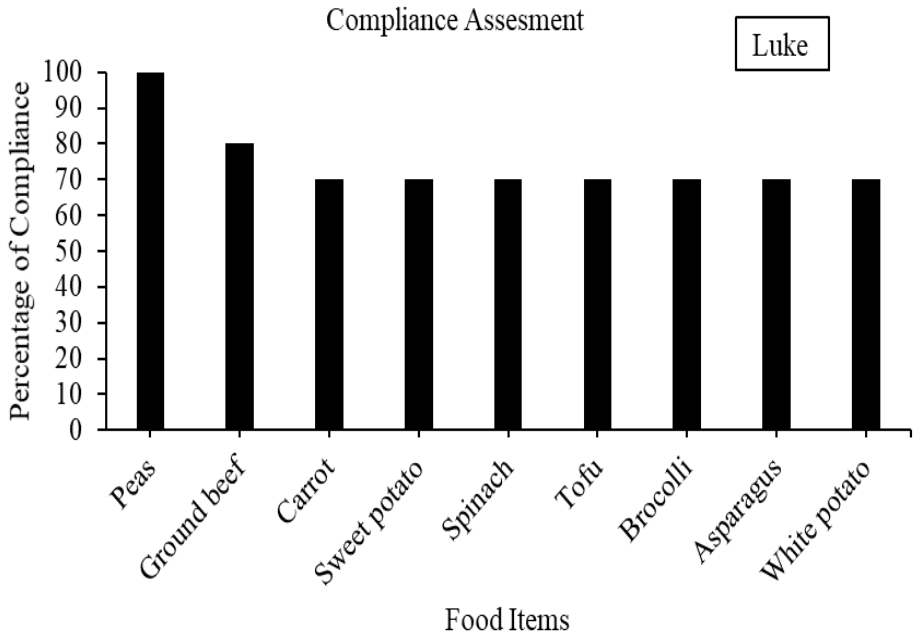

Figure 1: Compliance Assessment for Luke.

Blake's mother suggested the following foods to target: turkey, celery, apple, grape, strawberry, banana, white rice, cutie, peas, and corn. Percentage of compliance was 100% for turkey, celery and apple; 90% for grape, strawberry, banana and corn; and 70% for rice, cutie and peas. To ensure similarity across food groups, banana, grape, and celery were assigned to the continuous baseline group and apple, strawberry, and corn were assigned to the treatment group (see Figure 2).

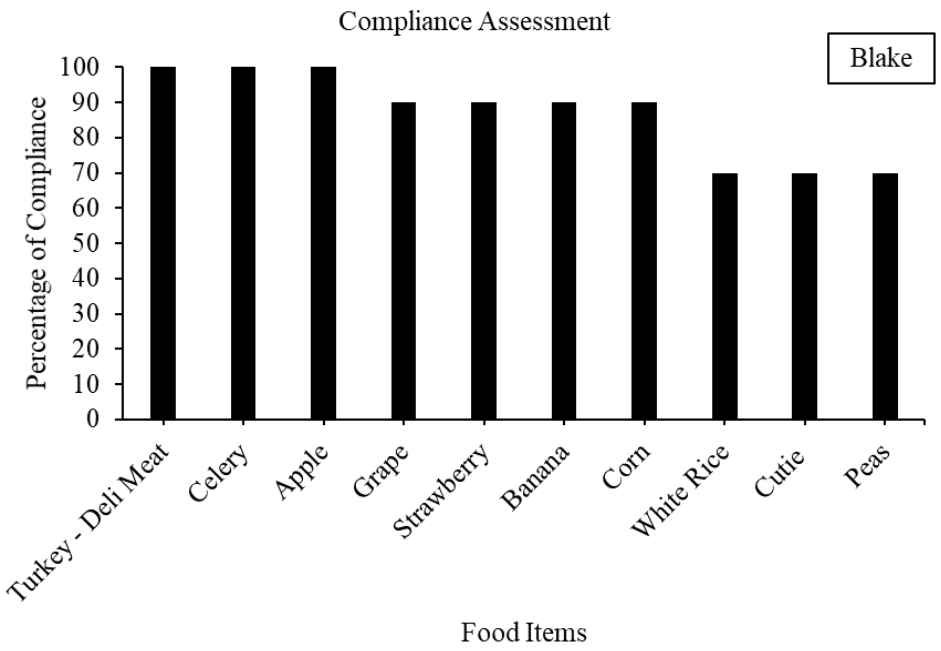

Figure 2: Compliance Assessment for Blake.

Jason's mother suggested the following foods to target: turkey, celery, apple, grape, strawberry, white rice, cutie, peas, and corn. Percentage of compliance for apple was 100%, turkey and celery were equal at 90%, corn and peas were equal at 80%, cutie and grape were equal at 70%, strawberry 60% and white rice 40%. To ensure foods were similar in type across food groups, two fruits and one vegetable were assigned to each group. Strawberry, corn, and apple were assigned to the continuous baseline group while cutie, grape and celery were assigned to the treatment group (see Figure 3).

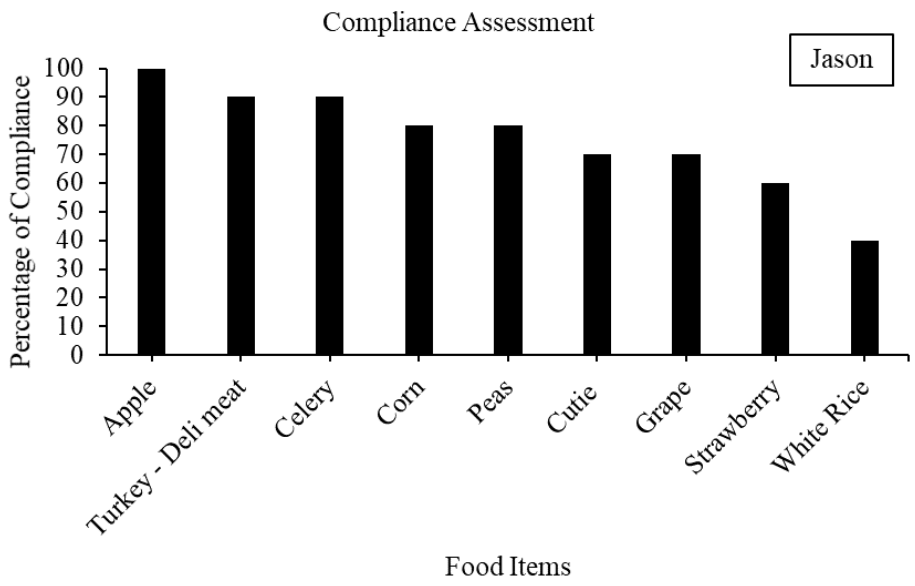

Figure 3: Compliance assessment for Jason.

Preference Assessment

For Luke, Blake and Jason two multiple-stimulus without replacement (MSWO) preference assessments were conducted to determine a relative hierarchy of preferences for preferred items or activities and preferred edibles (DeLeon & Iwata, 1996). Stimuli were selected based on items and edibles parents reported to be preferred during the parent interview. During the preference assessment for preferred foods, a single bite of each preferred food was placed on a cafeteria tray (Luke) or paper towels (Jason and Blake) in a semi-circular array and the experimenter stated, “Pick one.” If the child selected and consumed a bite, it was scored on the data sheet and that food was not replaced. Remaining foods were rotated in a clockwise rotation. This continued until all foods had been chosen. If the child did not select a food within 5 seconds following the clockwise rotation, the experimenter continued the rotation until all trials were

completed; for example, if there were eight remaining foods, the experimenter completed 8 additional trials but did not score any of the remaining foods as selected. For the preferred items, the same procedure was used, and the participant was granted access to the item for a maximum of 1 minute (See Appendix F).

Response Measurement and Interobserver Agreement

The primary dependent variable was the percentage of bites accepted without expulsion per session. A (+) was scored if the participant placed a bite in their mouth past the plane of the lips and removed their fingers or the utensil from the bite. A (-) was scored if the participant expelled any portion of the bite larger than a pea. A (-) was also scored for each bite that remained on the child's plate after 5 min elapsed. Dependent upon parent report, operational definitions of problem behavior were developed, specific to each participant (see Appendix G for data sheet). For Luke, frequency data were collected on the participant eloping from the designated feeding area defined as the participant removing himself from the chair and walking or falling to the floor without being told that it was "Break time." For Blake, frequency data were collected on expulsions during the session defined as the removal of a previously accepted bite(s) with the fingers or spitting the accepted bite(s). An instance was counted once even if there were multiple bites expelled at the same time. For Jason, frequency data were collected on self-injurious behavior defined as the participant using an open hand to hit himself in the face or using the wall or table to hit his head and 10 s partial interval data were collected on food play defined as using a utensil or finger to break the bite into smaller pieces or squish the bite into the plate. This did not include piercing the food with a fork

for purposes of placing the bite in the mouth or natural instances where the bite fell apart without being broken with a utensil or finger.

Interobserver agreement (IOA) data were collected by a secondary data collector via video for 47% of sessions across all participants and across all phases. For Luke, IOA was calculated for 50% of sessions, for Blake 44% of sessions and for Jason 46% of sessions. IOA data were calculated using the point-to-point agreement method (Kazdin, 2011). When the primary and secondary observer collected data on each trial (scored as a [+] or [-]), then each trial was scored as an agreement or disagreement. The total number of agreements were divided by the total number of agreements plus disagreements and multiplied by 100 to obtain a percentage. IOA data were 100% across participants for all sessions. Additionally, IOA data were calculated on challenging behavior following the same point to point agreement method. For Luke, there was 100% agreement on eloping. For Blake there was 100% agreement on frequency data for expulsions, and for Jason there was 100% agreement on partial interval data for food play and 100% for frequency data on self-injurious behavior.

Treatment Integrity

Two independent observers collected treatment integrity data on 46% of all sessions across participants and phases (see below for each participant). Correct versus incorrect implementation of the following steps were recorded: (a) the experimenter simultaneously presented six bites of three foods (two bites each) to both the model and the participant; (b) the experimenter made the statement, “Here’s your food”; (c) the model consumed the food 5 s after initial presentation of food or 5 s after consumption of

a previous bite; (d) the experimenter delivered praise upon acceptance of each bite; (e) the model did not respond to any of the vocalizations emitted by the participant; (f) the experimenter did not respond to any of the vocalizations emitted by the participant; and (g) the session ended after the participant consumed all six bites or after 5 min elapsed.

During the modeling differential reinforcement treatment phase, correct versus incorrect implementation of the following steps were recorded: (a) the experimenter simultaneously presented six bites of three foods (two bites of each) to both the model and the participant; (b) the experimenter made the statement, “Here’s your food”; (c) the model consumed the food 5 s after initial presentation of food or consumption of a previous bite; (d) praise was delivered upon acceptance of each bite; (d) a preferred item (identified during a pre-task choice described below) was presented to the model after consumption of the six bites of food; (e) a preferred edible of the participant’s (identified during the pre-task choice) was presented to the model after consumption of all six bites; (f) a praise statement was provided to the participant following acceptance of each bite; (g) the experimenter performed a mouth clean check 30 s following acceptance of the last bite; (h) a preferred item was presented to the participant upon consumption of all six bites of food; (i) a preferred food item was presented to the participant upon consumption of all six bites of food; (j) the model did not respond to any vocalizations emitted by the participant; (k) the experimenter did not respond to any vocalizations emitted by the participant; and (l) the session ended after the participant consumed all six bites or after 5 min elapsed.

During the modeling nonremoval of the spoon treatment phase, correct versus incorrect implementation of the following steps were recorded: (a) the experimenter simultaneously presented six bites of three foods (two bites each) to both the model and the participant; (b) the experimenter made the statement, “Here’s your food”; (c) the model did not consume the food 5 s after initial presentation of the food; (d) the experimenter initiated the NRS procedure with the model, (e) the model engaged in problem behavior for 30 s before accepting each bite of food; (f) the model was presented with a preferred item following consumption of all 6 bites; (g) the model was presented with a preferred edible following consumption of all 6 bites; (h) if the participant accepted any bites of food a praise statement was provided; (i) a mouth clean check was performed 30 s after acceptance of the 6th bite; (j) the model did not respond to any vocalizations emitted by the participant; (k) the experimenter did not respond to any vocalizations emitted by the participant; and (l) the session ended after all six bites were consumed or after 5 min elapsed.

Treatment integrity data were calculated by dividing the total number of correct steps by the total number of correct and incorrect steps, multiplied by 100 to obtain a percentage of correct implementation (See Appendix H for the data sheet). For Luke, treatment integrity data were collected on 46% of sessions, with a mean of 96.9% correct implementation (range, 83.3% to 100%). For Blake, treatment integrity data were collected on 44% of sessions, with a mean of 98.8% correct implementation (range, 83.3% to 100%). For Jason, treatment integrity data were collected on 46% of sessions, with a mean of 100% correct implementation. Additionally, IOA was collected on the

treatment integrity measures. For Luke, IOA data were collected for 68% of sessions during which treatment integrity was measured. Mean IOA was100%. For Blake, IOA was collected for 86% of sessions during which treatment integrity was collected. Mean IOA was 98.8% (range, 90% to100%). For Jason, IOA was collected on 100% of sessions during which treatment integrity data were collected. Mean IOA was 100%.

Social Validity

Following the completion of maintenance probes, participants' caregivers were asked to complete a questionnaire adapted from Hoch, Babbitt, Coe, Krell and Hackbert (1994). The questionnaire has 14 questions in a 5-point Likert scale format with a rating of 1 meaning not effective/not satisfied, and a rating of 5 meaning extremely satisfied/effective. The questionnaire assesses the overall satisfaction, effectiveness of the study, questions regarding the feeders, and if goals were achieved (see Appendix F for social validity questionnaire). Luke's father was shown a video recording of the last session of baseline before the modeling differential reinforcement procedure was implemented irrespective of the food group (treatment or continuous baseline), the first session of the modeling differential reinforcement procedure, and first and last session when the modeling differential reinforcement procedure was applied to the continuous baseline food group. Blake and Jason's mother was shown the last session during the baseline phase, the first and last session during the modeling differential reinforcement phase and the first and last session of the modeling nonremoval of the spoon treatment phase. Parents were also asked if they wanted to view any other sessions and had the opportunity to watch in vivo during the study. In general, Luke's father and Blake and

Jason's mother rated a 5 (extremely satisfied) for being satisfied with the services they received and rated a 5 for questions pertaining to positive interactions with the researchers working with their child. Also, Luke's father and Blake and Jason's mother reported they felt neutral (a rating of 3) for improvement to other skills or an increase in their child's health (see Table 2 for parent responses to the social validity questionnaire).

Table 2:

Social Validity Scores

Question	Rating				
	1	2	3	4	5
	Number of Parents (n=3)				
1. In an overall, general sense, how satisfied were you with the service you received?	0	0	0	0	3
2. In general, how effective treatment recommendations for this child were?	0	0	0	0	3
3. The training sessions were presented in a concise and easy to understand manner.	0	0	0	0	3
4. The amount of work required by the program was at a reasonable level to be most effective.	0	0	0	0	3
5. If a friend were in need of similar help, would you recommend our program to him/her?	0	0	0	0	3
6. At home, will you continue to use the treatment program?	0	0	0	0	3
7. I feel that when I do use these recommendations, they will be effective when applied consistently.	0	0	0	1	2
8. I feel that the methods involved with the treatment recommendations were ethically sound.	0	0	0	0	3
9. The feeding team:					
a. was flexible and open to work with.	0	0	0	0	3

b. was knowledgeable and thoroughly trained.	0	0	0	0	3
c. was cooperative and easy to work with.	0	0	0	0	3
d. was helpful in solving problems as they arose.	0	0	0	0	3
e. showed positive regard for the child.	0	0	0	0	3
f. showed positive regard for the family.	0	0	0	0	3
g. was empathic and sensitive to the child.	0	0	0	0	3
10. Has the implementation of the treatment program helped reduce any other behavior problems or increase other skills?	0	0	3	0	0
11. At the time of discharge, were your child's problems worse (1), the same (3), or absent (5)?	0	0	0	3	0
12. If for some reason you needed to seek help again, would you come back to our program?	0	0	0	0	3
13. Have you noticed an improvement in your child's health?	0	0	3	0	0
14. To what extent has our program achieved the goals set at admission?	0	0	0	0	3

Hoch, Babbitt, Coe, Krell, Hackbert (1994)

Table 2: This table depicts responses to the social validity questionnaire. Numbers below each rating indicate the number of parents (from 0 to 3) who selected that rating. Note that Blake and Jason's mother filled out the questionnaire twice, once for each participant.

Experimental Design

A concurrent multiple baseline design across participants with an embedded alternating treatment design was utilized for Jason and Blake. An alternating treatment design was utilized for Luke. Treatment was applied to group B foods while the foods in group A were assigned to a continuous baseline condition. Experimental control was

demonstrated by showing differentiation between baseline and treatment conditions and an increase in acceptance for each participant only after treatment was applied. To control for the possibility of multiple treatment interference and generalization to foods in the continuous baseline food group before treatment had been applied, each condition was associated with a different colored tablecloth (Blake and Jason) or placemat (Luke) to facilitate discrimination between conditions.

Procedures

Baseline

The experimenter presented two separate plates each containing six bites of three foods (two bites of each). The bites that were presented to both the model and participant were approximately 2 cm by 2 cm. The foods were randomly placed on the plate to avoid one food consistently being placed in the same position. The experimenter wrote each food two times on small pieces of paper, folded them in half and drew one piece of paper as the first food placed on the plate, this was continued until all 6 pieces of paper were drawn and each food had been placed on the plate in the respective order. The foods were placed in the same order on both the participant and the model's plate. From the participants perspective, the foods were arranged on the plates in the same order and placed in front of the participant and the model in the same position. Therefore, the plates were mirror images of each other. This same procedure took place at the onset of each session to ensure randomization of the foods. However, this did not affect the data collection process. If the model consumed a bite of food and the participant consumed a different bite on the plate, this was still considered a correct response. One plate was put

in front of the model, the other plate in front of the participant and the experimenter stated, “Here’s your food.” The model waited 5 s and if the participant did not independently accept the first bite of food or did not approach the food, then the model consumed the first bite of food on their plate. The experimenter provided a praise statement following acceptance of the bite, for both the model and participant. This same procedure was followed until all six bites of food had been consumed. If the participant accepted multiple bites and the model still had bites on their plate, then the model placed two bites in their mouth at a time such that their plate matched the participant’s plate. Session ended when (a) 5 min elapsed or, (b) the participant accepted all six bites, whichever occurred first. Following acceptance of the sixth bite, the experimenter conducted mouth clean checks 30 s after the last bite was placed in the mouth, and every 10 s thereafter until mouth clean was observed or 2 minutes had elapsed. After 2 minutes had elapsed, participants were instructed to swallow or remove the remaining food from their mouth. If expulsion occurred during the session the experimenter continued the session until one of the aforementioned guidelines to end session occurred. Sessions were ended by telling the participant that it is time for a break.

During sessions (baseline or treatment sessions), the model and the experimenter did not provide attention or respond to any vocalizations emitted by the participant. However, if the participant stood up from their chair then the experimenter physically guided the child to sit back down.

Modeling differential reinforcement

At the onset of each visit during the treatment phases of the study, the experimenter presented the participant's preferred leisure items (identified during the initial preference assessment). The participant was asked, "If you were going to play with one today, which one would you like to play with?" The participant was given access to the selected item for 1 minute. The participant was also presented with their preferred edibles identified during the initial preference assessment (one third bite of each edible) and was asked, "If you were going to eat one today, which one would you like to eat?" The participant was allowed to consume the selected edible. During the modeling differential reinforcement phase, the intervention was applied to group B foods while the foods in group A remained in baseline. The two plates of food were presented with six bites each to the model and the participant. The experimenter stated, "Here's your food." The child was given 5 s to initiate acceptance of the food; if the food was not accepted within 5 s, the model consumed the first bite of food. The procedures were the same as in baseline, except following acceptance of all six bites of food the model was given access to a preferred food and leisure item (selected by the participant). During the session, preferred leisure and edible items were placed out of the participant's sight but were easily accessible and remained in close proximity of the experimenter such that they could be immediately delivered to the model following acceptance of all six bites. The model consumed the edible and had access to the preferred item or activity for 3 minutes. If the participant accepted all six bites and had a clean mouth within the 5-min duration of the session, they too were given access to their preferred edible and preferred item or

activity for 3 minutes. If the participant accepted all six bites within the 3 min time period during which the model had access to the participant's preferred item or activity then the model handed the item or activity to the experimenter, who then gave it immediately to the participant following a successful mouth clean check (no remaining bites left in the participant's mouth larger than a pea). A slight modification occurred for Luke, who was given access to his preferred item and edible contingent upon acceptance of all six bites, and the experimenter conducted a mouth clean check prior to allowing the participant to leave the table after the 3 minutes of access to the preferred item was granted. The procedure was considered successful if the participant consumed 100% of bites for at least three consecutive sessions. The procedure was considered unsuccessful if there was a decreasing, or no trend (no new highs with a 20% increase) for three consecutive sessions.

Modeling nonremoval of the spoon

If the modeling differential reinforcement phase was unsuccessful the NRS procedure was modeled. The procedures were similar to those in baseline and modeling of the differential reinforcement procedure in regard to praise being delivered after acceptance of each bite and access to preferred edibles and items or activities following the consumption of all six bites. The modeling of the NRS condition differed in that the experimenter implemented the NRS procedure with the model, while the model engaged in behaviors that resembled the child's own inappropriate mealtime behavior (as determined during the parent interview or behaviors that were observed during previous sessions) for 30 s, whether the participant was engaged in those behaviors or not. During

the NRS procedure the feeder held the food directly in front of the model's mouth as they engaged in the inappropriate mealtime behavior. The feeder did not deposit the bite until the model opened their mouth and leaned toward the bite. The model and experimenter then waited 5 seconds after acceptance of the first bite of food and if the participant did not emit any behaviors of approaching a bite on their own plate, then the procedure continued with the model until all six of the model's bites were consumed. The session was terminated after the participant consumed all six bites or after 5 min elapsed, whichever occurred first. The aforementioned criterion for the procedure to be considered successful or unsuccessful was also applied to this treatment phase.

Maintenance and generalization

To assess generalization, the most effective treatment was applied to the continuous baseline food group in alternation with the treatment food group (for Luke). Once stability had been reached (three consecutive sessions at 100%) with the continuous baseline foods, the study was completed. Follow-up probes for all three participants were conducted two weeks after the completion of the study with both the continuous baseline food group and the treatment food group to assess maintenance of food acceptance. Two probe sessions for both the continuous baseline and treatment food group were conducted.

Chapter 3

RESULTS

During baseline, Luke inconsistently accepted bites of food presented across both food groups. Initially, Luke accepted 100% of bites in the treatment food group but then acceptance decreased to 33% for the last two sessions of the baseline phase. Luke consistently accepted 33% of bites in the continuous baseline food group except for two sessions during which 0% of bites were accepted. When modeling differential reinforcement was applied to the treatment food group during session 12, Luke accepted 100% of bites. In the continuous baseline condition, Luke initially accepted 17% of bites but thereafter consumed 0% of bites. Once Luke met the mastery criterion (three or more consecutive sessions at 100%) then the procedure was implemented with the continuous baseline foods. Both groups of food were accepted and consumed at 100% for three consecutive sessions. Two weeks after the completion of the study, maintenance probes were conducted two times each for each group for a total of four sessions and Luke accepted and consumed 100% of bites across all four sessions. Luke engaged in little to no challenging behavior across all phases of the study. During the baseline phase (session three) and during the treatment phase with the continuous baseline food group (session 15) Luke walked away from the table or fell to the floor but after being physically guided to sit down he remained seated for the remainder of the session.

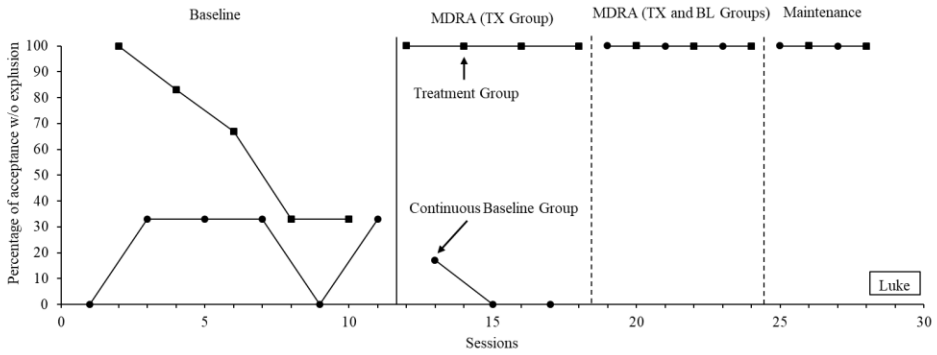

*Figure 4***:** Alternating Treatment Design for Luke.

This graph represents the percentage of bites Luke accepted in the absence of expulsion across baseline and treatment phases of the study (modeling differential reinforcement with foods assigned to the treatment food group; modeling differential reinforcement with both the treatment and continuous baseline food groups and maintenance). Closed squares depict the treatment food group and closed circles depict the continuous baseline food group.

For Jason, during the first session of baseline he accepted 67% of bites in the continuous baseline food group; however, during subsequent sessions, percentage of bites accepted decreased. Mean percentage of acceptance in the absence of expulsion was 42% (range, 33% - 67%). For the treatment food group, Jason accepted 33% of bites on the first session and 0% during subsequent sessions. Mean percentage of acceptance in the absence of expulsion was 8% (range, 0% - 33%). When modeling differential reinforcement was applied to the treatment food group, percentage of bites accepted remained at 0% whereas mean percentage of acceptance for the continuous baseline food

group was 33% (range, 0% - 33%). Modeling of the nonremoval of the spoon procedure was implemented with the treatment food group during session 47. Initially, acceptance remained at 0% but then increased to 100% in both the treatment food group and continuous baseline food group starting with session 52. Two weeks after the completion of the study, maintenance probes were conducted two times each for each group for a total of four sessions and Jason accepted and consumed 100% of bites across all four sessions.

Jason engaged in one instance of self-injurious behavior in the form of slapping himself on the face with no visible marks during baseline. He engaged in one attempt of self-injurious behavior in the form of slapping when modeling of the differential reinforcement contingency was implemented, and the model gained access to his preferred item and edible. However, when the experimenter said, “Hands down,” Jason immediately placed his hands in his lap. Furthermore, Jason engaged in disruptive mealtime behavior in the form of food play which consisted of repetitively breaking bites into smaller and smaller segments, using a utensil or his fingers. Partial interval data were collected on food play. This behavior occurred during the modeling of the differential reinforcement phase and the nonremoval of the spoon phase with both continuous baseline and treatment food groups.

During the baseline condition for Blake, mean percentage of acceptance in the absence of expulsion was 45% (range, 0% - 67%) in the continuous baseline food group and 34% (range, 17% - 67%) in the treatment food group. When modeling differential reinforcement was applied to the treatment food group, mean percentage of bites

accepted in the absence of expulsion was 23% (range, 0% - 33%). Mean percentage of acceptance in the absence of expulsion in the continuous baseline food group was 53% (range, 33% - 67%). Modeling of the nonremoval of the spoon procedure was implemented with the treatment group foods during session 33 and percentage of bites accepted in the absence of expulsion increased in both the treatment food group and continuous baseline food group. For the treatment group the mean was 75% (range 0% - 100%) and for the continuous baseline group the mean was 83.25% (range 33% -100%). Two weeks after the completion of the study, maintenance probes were conducted two times each for each food group for a total of four sessions and Blake accepted and consumed 100% of bites across all four sessions.

Blake engaged in consistent expulsions of bites across baseline and modeling of the differential reinforcement phases. Data were collected on expulsions when Blake removed bites or spit bites back onto the plate, floor or trashcan. However, it should be noted that only one expulsion was counted even if there were several bites being expelled.

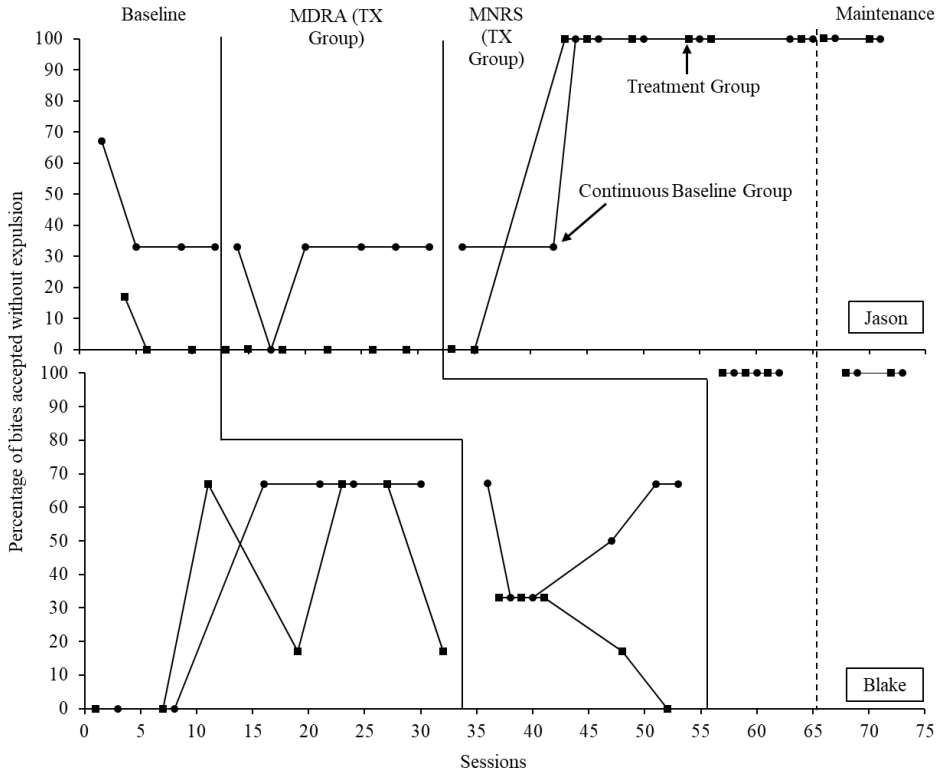

*Figure 5***:** Multiple Baseline Design for Jason and Blake.

This graph represents the percentage of bites accepted in the absence of expulsion across baseline and treatment phases of the study (modeling differential reinforcement with the treatment food group; modeling NRS with the treatment food group and maintenance) for Jason in the top panel and Blake in the bottom panel. Closed squares depict the treatment food group and closed circles depict the continuous baseline food group.

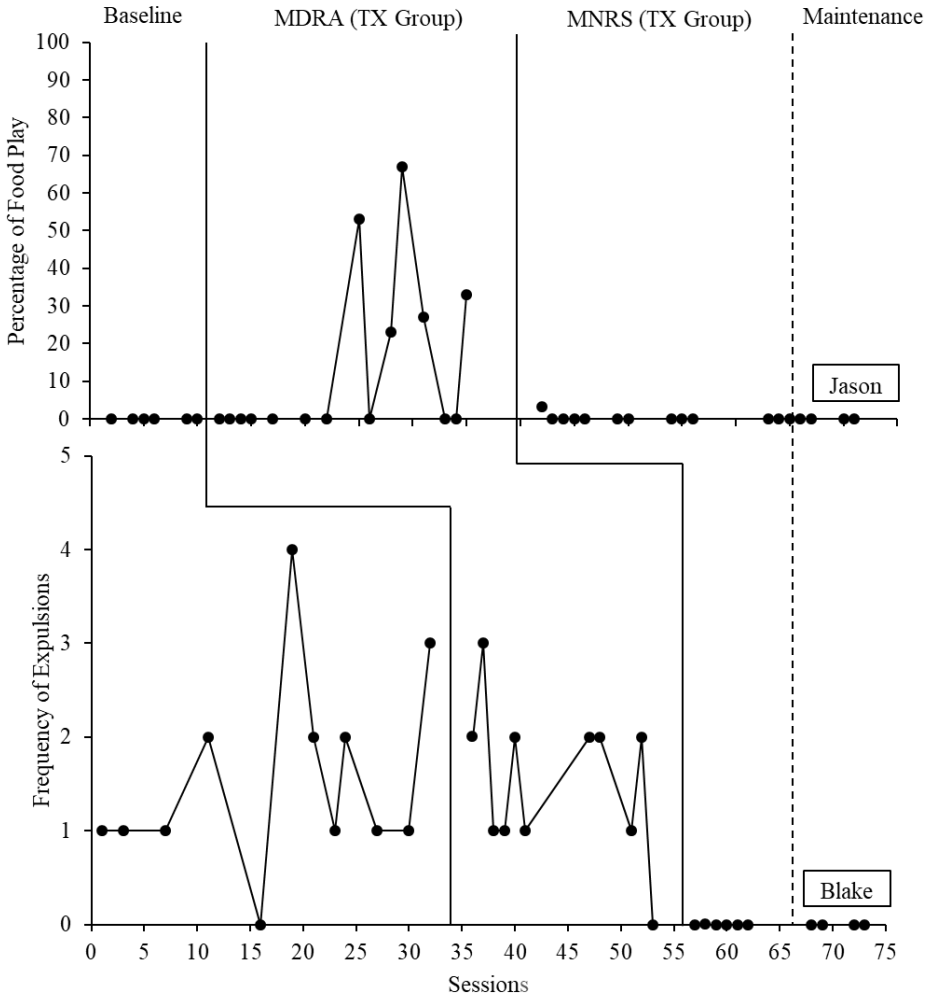

*Figure 6***:** Problem Behavior for Jason and Blake.

This graph represents the inappropriate mealtime behavior for Jason in the top panel and Blake in the bottom panel. For Jason, partial interval data were collected on food play. For Blake, frequency of expulsions was collected during the sessions.

Chapter 4

DISCUSSION

For all three participants in this study, modeling contingencies were successful in increasing food acceptance. For Luke, modeling a positive reinforcement contingency was successful in increasing food acceptance; that is, when Luke observed a model gain access to his preferred play items and edibles, food acceptance increased to 100%. Results for Luke are consistent with Greer and colleagues (1990) and Sira and Fryling (2012). For Jason and Blake, modeling a positive reinforcement contingency was not effective in increasing acceptance of bites; however, consistent with Fu et al. (2016), acceptance increased after a nonremoval of the spoon procedure was modeled.

There have been mixed results in the feeding literature with respect to the effectiveness of differential reinforcement of alternative behaviors (DRA). Results of several studies have suggested that when DRA is used in isolation it is not effective in increasing acceptance (e.g., Ahearn, 2002; Patel et al., 2002; Najdowski, Wallace, Doney & Ghezzi, 2003), yet other studies have found that modeling differential reinforcement contingencies is effective in increasing acceptance (Greer et al.,1990; Sira & Fryling, 2012) which was also the case for one participant in the current study (Luke). It is possible that modeling differential reinforcement contingencies is effective for some participants because it functions as an establishing operation for acceptance of nonpreferred foods. An establishing operation is defined as “an environmental event, operation, or stimulus condition that affects an organism by momentarily altering (a) the reinforcing effectiveness of other events and (b) the frequency of occurrence of the type

of behavior that had been consequented by those other events" (Michael, 2004, p.136). For Luke, observing the model contact the reinforcer (his preferred items and edibles) may have momentarily increased the value of the reinforcer which may account for the increased acceptance that was observed. However, it is also possible that differential reinforcement alone may have been effective in increasing acceptance; given DRA was not evaluated in the absence of the modeling procedure, this cannot be ruled out. Future research should evaluate whether modeling DRA will function as an establishing operation that evokes acceptance when DRA alone does not produce an increase in acceptance.

In contrast to Luke, modeling a differential reinforcement contingency was not effective in increasing acceptance for Blake and Jason; rather, food acceptance remained consistent with baseline or decreased (Blake). Modeling nonremoval of the spoon was implemented for Jason first, then Blake. The procedure was effective in increasing food acceptance for both participants. One factor that may account for inconsistent results across participants may include the age of the participants. Luke was 6 years old at the time of the study, whereas Blake and Jason were 10 years old. Thus, it is likely that Blake and Jason had a longer history of reinforcement for rejecting foods. Another contributing factor may be the extent to which the participants' diets were limited. Luke did not have as limited of a diet compared to Blake and Jason. That is, Blake and Jason consumed less foods than Luke, since their diets consisted mostly of foods high in fat or carbohydrates, and Luke's diet consisted of those foods, as well as some fruits and vegetables.

For Blake and Jason, it is possible that modeling nonremoval of the spoon functioned as a reflexive conditioned motivating operation (CMO-R), defined as "a stimulus that precedes some form of worsening event, and the stimulus is terminated prior to the occurrence of the worsening, then the worsening does not occur" (Michael, 2004, p. 143), in which case acceptance of nonpreferred foods likely increased through the process of negative reinforcement. That is, Blake and Jason may have engaged in modeled behaviors (bite acceptance) to avoid the NRS procedure being implemented directly with them, following a self-generated rule.

In terms of inappropriate mealtime behavior, it is interesting to note that Blake engaged in food expulsions across both baseline and the modeling differential reinforcement phases of the study; however, when modeling NRS was implemented, the frequency of expulsions decreased to zero. For Jason, inappropriate mealtime behavior (food play) was only observed after modeling differential reinforcement was implemented. Similar to Blake, when modeling NRS was implemented, percentage of intervals with food play behavior decreased to zero. Although inappropriate mealtime behavior has been observed to occur at higher rates during implementation of NRS (Borrero et al., 2010), modeling NRS does not appear to be associated with similar side effects. Future research should continue to examine the extent to which inappropriate mealtime behavior is correlated with modeling contingencies compared to direct contact with contingencies.

This study attempted to address limitations of previous research, however it did not come without its own limitations. First, at the onset of the study, Luke, Blake and Jason all interacted with the foods to some degree, including consuming some of the bites. During baseline, all three participants accepted and consumed some of the bites across both treatment and continuous baseline food groups. This suggests that modeling acceptance and praise for acceptance may be effective in increasing acceptance for at least some foods. Some of the foods selected for inclusion in the study had a high percentage of compliance during the compliance assessment (e.g., Jason complied with 100% of instructions with apple). Future research should examine foods that are relatively more preferred using a different baseline without a modeling component. Modeling bite acceptance and praise for bite acceptance could then be introduced in a sequential component analysis.

It should also be noted that for both Jason and Blake acceptance increased across both food groups even though the modeling procedure was only applied to the treatment food group. Undifferentiated results across the treatment and continuous baseline food groups may have been due to multiple treatment interference. That is, once Blake and Jason contacted the contingency of escaping the treatment room following acceptance of all six bites, this may have functioned as a reinforcer to maintain the behavior which potentially could have influenced responding during the continuous baseline condition.

Future research could examine release from the table or treatment room as a reinforcer for acceptance. This could be done in a modeling procedure in which the participant observes the model being allowed to escape the room or table contingent upon consumption.

It is also possible that undifferentiated results were due to lack of discrimination between conditions. In the current study, different colored placemats or table cloths were used to facilitate discrimination between conditions. Future researchers may consider associating continuous baseline and treatment conditions with a different experimenter, different model or both to further enhance discrimination across conditions as was done in Fu et al. (2016). In any case, although there was no differentiation between treatment and continuous baseline food groups, the effects of modeling nonremoval of the spoon were replicated across participants, in that acceptance increased for each participant only after the procedure was implemented.

Another limitation of this study was that generalization across settings was not demonstrated. Future research should consider assessing generalization across environments, such as the home, community or school. It may be particularly interesting to examine the effects of the study in the school environment where competing modeling contingencies may occur in abundance. Specifically, other children in the school environment may model eating the participants' nonpreferred foods and expelling those bites. Future research should examine evaluating the effectiveness of modeling access to preferred items and edibles contingent upon bite acceptance after observing a competing contingency such as another child accepting and expelling the nonpreferred foods.

Lastly, a limitation within this study was that the modeling procedure was not faded. At the end of the study caregivers of the participants were trained on the effective procedure used in the study (modeling access to preferred items and edibles for Luke and modeling nonremoval of the spoon for Blake and Jason). Therefore, future research should examine fading the modeling procedure and fading the access to the preferred items and edibles to a more naturalistic procedure of presenting the foods as a caregiver would do during a normal mealtime presentation.

In conclusion, modeling positive reinforcement contingencies was effective for one participant in this study, whereas modeling nonremoval of the spoon was effective for increasing acceptance for two participants. This study serves as further support for modeling contingencies as an effective treatment for children who exhibit selective eating habits and have a limited range of foods within their diets. In terms of clinical implications, modeling a positive reinforcement contingency may enhance the effectiveness of differential reinforcement such that more intrusive procedures (i.e., escape extinction) are not necessary. Further, modeling nonremoval of the spoon is far less intrusive than direct implementation of the nonremoval of the spoon procedure, and therefore may be more feasible for caregivers to implement with fewer fidelity errors thus increasing the likelihood of positive treatment outcomes.

APPENDIX A

Informed Consent Agreement
Parent/Legal Guardian
The Examination of Modeling Positive and Negative Reinforcement Effects on Food Selectivity

Please read this consent agreement before you sign.

Purpose of this research: My name is JeNell Flanagan and I am a graduate student in the Applied Behavior Analysis program at California State University, Sacramento, Psychology. The purpose of this study is to increase food consumption for foods that your child does not typically eat or engages in problem behavior surrounding the presentation of these foods.

Participation: You will be interviewed to develop specific definitions of the problem behavior that your child engages in, as well as picking the foods that you would like to see your child consume more. Your child will be seated in a room with two adults that includes a one-way mirror and will be video recorded. The first treatment will consist of modeling in which the model and your child will have access to high preferred foods and items after they consume the nonpreferred foods. If this treatment is unsuccessful, the next treatment will be added in subsequent sessions. In this treatment, the researcher will perform a procedure known as nonremoval of the spoon first with the model. If during the session food consumption does not increase, the procedure will be done directly with your child. Each session will last 20 minutes unless consumption occurs before then. Participation in this study is completely voluntary and withdrawal from the study can be done at any time and you may collect any data I have collected if you wish.

Time required: This study will require about an hour of your time 2-3 times per week. Completion of this study will be dependent upon the time required for your child to consume the foods that are presented to them, or if they have reached 50 sessions without making progress. If your child does not progress in terms of eating foods presented to them, then the primary experimenter will give clinical recommendations that may aid in increasing food intake for your child.

Benefits and Risks: The benefits of this study are that your child could consume novel foods and could be at lower risks of health problems related to foods that they eat. The risks of this study include psychological distress because your child will be exposed to nonpreferred or novel foods and procedures that may cause anxiety. Sessions will be 20 minutes in duration and your child may ask for a break at any time. Additionally, a breach in confidentiality, although unlikely, may occur. Preventative measures will be conducted at the onset of the study such as assigning a numerical code and pseudo-names to your child. All data will be in locked cabinets in locked rooms or on a password

protected computer that only those directly involved in the research will have access to. All data with any identifiable information will be destroyed 3 years after the conclusion of the study.

Contact: Any questions that you may have in relation to the research can be answered by myself, JeNell Flanagan at [phone number] or [email address] or by Dr. Becky Penrod at [phone number] or [email address]. Any questions that you may have in relation to your child's rights as a participant in the research can be answered through the University through the Office of Research Affairs, California State University, Sacramento at (916)-278-5674 or irb@csus.edu.

I, _____ (Primary Caregiver 1), and _____ (Primary Caregiver 2, if applicable), hereby give my consent for my child, _____ to participate in the study, "The Examination of Modeling Positive and Negative Reinforcement Effects on Food Selectivity."

Furthermore, I, _____ and _____, hereby give my consent for all sessions to be video recorded so that measures can observed to ensure the integrity of the research.

Please sign below if you agree to allow your child to participate in this study and if you agree to have all sessions video recorded.

_____ _____

Primary Caregiver Signature Date

_____ _____

Primary Caregiver Signature Date

APPENDIX B

Verbal Informed Assent Agreement
Child
The Examination of Modeling Positive and Negative Reinforcement Effects on Food Selectivity

I am looking at helping you eat some more foods so that you stay healthy. I would like for you to watch someone else eat the foods that you may not like. You will be hanging out with us for about an hour 2-3 times a week.

If you feel like you need a break or want to stop just let us know. We have already spoke with your mom/dad and they said they are ok with you being in here with us. But if you want to know more about what you will be doing or want to talk to them, that's ok too. Just let us know if you have any questions and we will answer them!

For younger children or children with developmental disabilities the following will be indicative of assent:

1. An affirm vocal response, either ("yes") or another vocalization recognized by the caregiver.
2. A physical indication such as nodding or smiling.
3. Absence of either problem behavior or vocal dissent.

An observer will confirm assent and offer their own by their presence during this process.

Did the child give verbal consent for participation in the study?

_____Yes
_____No

_____ _____
Witness Signature Date

APPENDIX C

Silbaugh Feeding Questionnaire (SFQB) Brief Form V1.0

Date	
Research personnel name	
Caregiver Information	
Caregiver's relation to child	[ ] biological mother [ ] biological father [ ] Other: _____
Primary person responsible for the child's feeding and nutrition?	[ ] yes [ ] no, another adult is primarily responsible [ ] responsibility for feeding and nutrition are shared with at least one other adult
Child Information	
Child code	
DOB	
Sex	[ ] Male [ ] Female
Home Address	
Child's primary diagnosis	Diagnosis:_____ Professional who made the diagnosis:_____ Date of diagnosis:_____ [ ] Check if no diagnosis
Child's other diagnoses	Diagnosis:_____ Professional who made the diagnosis:_____ Date of diagnosis:_____ Diagnosis:_____ Professional who made the diagnosis:_____ Date of diagnosis:_____ [ ] Check if no other diagnoses

Child's race or ethnicity	[ ] Hispanic or Latino [ ] American Indian or Alaska Native [ ] Asian [ ] Black or African American [ ] White [ ] Native Hawaiian or Other Pacific Islander [ ] Other: _____ [ ] Combination: _____
School grade	[ ] Pre-K [ ] Kindergarten [ ] Grade:_____ [ ] Not in school
Individualized Education Plan (IEP) or Behavior Support Plan	He/she has an IEP: [ ] yes [ ] no He/she has a behavior support plan in place at school [ ] yes [ ] no
Medical and Health Information	
Professionals seen	Please check all of the following professionals your child has seen in the last 12 months to address feeding concerns: [ ] Behavior Analyst [ ] Dentist [ ] Dietitian [ ] Family Practitioner [ ] Gastroenterologist (GI doctor) [ ] Neurologist [ ] Occupational Therapist [ ] Pediatrician [ ] Psychiatrist [ ] Psychologist [ ] Social Worker [ ] Speech and Language Pathologist [ ] Other professionals:_____
Prior hospitalizations related to feeding and/or nutrition	He/she was admitted to a hospital or received medical treatment in a hospital setting for problems related to feeding and/or nutrition. [ ] Yes [ ] No *If yes, please describe in detail below:
Medical conditions and/or physician	He/she has a medical condition: [ ] yes [ ]no *If yes, please describe in detail below:

recommendations pertaining to feeding	His/her physician has made recommendations related to diet and nutrition to address a feeding problem: [ ] yes [ ] no *If yes, please describe in detail below:
Medications	Does your child take medication? [ ] Yes [ ] No *If yes, please describe in detail below.
Feeding or Food-Related Services, Diets, and Allergies	
Past services	Has he/she received services in the past to address feeding problems? [ ] Yes [ ] No *If yes, please describe in detail below:
Current services	Is he/she currently receiving services to address feeding problems? [ ] Yes [ ] No *If yes, please describe in detail below:
Diets	He/she is currently receiving a specific diet [ ] yes [ ] no He/she has received a specific diet in the past [ ] yes [ ] no

	*If yes to either question, please describe in detail below:
Allergies	My child has known allergies [ ] Yes [ ] No *If yes, please describe in detail below:
Observable Physical Characteristics of the Feeding Problem	
Problems with feeding	Check each box corresponding to behavior your child demonstrates during mealtimes when nonpreferred (i.e., food they don't want or like) is offered to them: <u>Gagging</u> (defined as making retching or choking sounds, or in the absence of sound, hyper extending the neck or tensing the neck muscles): [ ] yes [ ] no [ ] unknown <u>Vomiting</u> (defined as emitting contents of the esophagus or stomach, consisting of previously digested food or liquid, past the plane of the lips): [ ] yes [ ] no [ ] unknown <u>Food expulsion</u> (defined as pushing food or liquid larger than the size of a pea out of the mouth and past the lips):[ ] yes [ ] no [ ] unknown <u>Spitting food or saliva</u>: [ ] yes [ ] no [ ] unknown <u>Packing</u> (defined as any visible food in the mouth equal to or larger than a grain of rice, during a mouth check between bites or meals): [ ] yes [ ] no [ ] unknown <u>Chewing problems</u>: [ ] yes [ ] no [ ] unknown <u>Rumination</u> (defined as repeated regurgitation of food from a single meal or snack): [ ] yes [ ] no [ ] unknown

	Drooling: [ ] yes [ ] no [ ] unknown Sucking difficulties (e.g., trouble with straws): [ ] yes [ ] no [ ] unknown Swallowing difficulties: [ ] yes [ ] no [ ] unknown Eats too slowly (defined as meals lasting longer than 30 minutes on average): [ ] yes [ ] no [ ] unknown If other, please specify below:
Problems with challenging or disruptive behavior at mealtimes	Check each box corresponding to behavior your child demonstrates during mealtimes when nonpreferred (i.e., food they don't want or like) is offered to them: Turning one's head from the food or spoon: [ ] yes [ ] no Hitting the spoon or feeder's hand when fed by an adult: [ ] yes [ ] no Pushing the plate, bowl, or cup away: [ ] yes [ ] no Hold lips closed which prevents food from being placed in the mouth: [ ] yes [ ] no Negative vocalizations (e.g., crying, whining, saying "no"): [ ] yes [ ] no *If yes, please list sounds, words, or phrases they tend to say which are easily recognizable: Actual or Potential Self-Injurious Behavior (e.g., hitting own head or other body part with hand or objects, hitting own head on objects or people, scratching self): [ ] yes [ ] no Aggression Towards Others (e.g., hitting, kicking, scratching, or biting others): [ ] yes [ ] no

	Walking or running away, or hiding, from the feeder or table: [ ] yes [ ] no Throwing food or other items: [ ] yes [ ] no Aggression Towards Objects (e.g., destroying the food, hitting table, throwing chairs): [ ] yes [ ] no Frequent requests for other foods: [ ] yes [ ] no
Feeding History	
Estimated onset of feeding problems	Please indicate the approximate age at which you first felt he or she had difficulties with feeding and/or began to be a "picky eater": _ _____
Pattern of feeding problems	[ ] I believe feeding problems have worsened in the past 6 months [ ] I believe feeding problems have improved in the past 6 months [ ] It is difficult for me to confidently say whether I believe feeding problems have improved or worsened in the past 6 months
Potential triggering events	Please describe in as much detail as possible any EVENTS which you believe corresponded with or INITIALLY triggered his/her difficulties with feeding (e.g., allergies, choking, onset of symptoms of a developmental disability diagnosed later, major changes in family life or living situations, etc). Otherwise, just check this box: [ ]
Mealtime Structure, Schedule, and Skills:	
Meals Prepared	We sometimes prepare food for him/her at meals that differs from what the rest of the family is eating [ ] no [ ] one day per week [ ]three days per week [ ] daily
Mealtime Schedule	Typically, how many meals a day does he/she receive? Please provide anything important we should know about the number of meals: Typically, how many snacks a day does he/she receive? _____ Do you give snacks or meals on a schedule? [ ] yes [ ] no *If yes, please provide details below:

	He/she asks for food frequently throughout the day at unscheduled times [ ] yes [ ] no
Mealtime Arrangement and Feeding Skills	He/she sits and eats at a table without much prompting or encouragement: [ ] yes [ ] no He/she eats in a high chair: [ ] yes [ ] no He/she eats somewhere other than a table typically: [ ] yes [ ] no He/she is able to independently feed self with spoon and/or fork: [ ] yes [ ] no [ ] unknown He/she needs some physical assistance to avoid spilling when feeding self with utensils: [ ] yes [ ] no [ ] unknown Eats most often with his/her hands: [ ] yes [ ] no He/she typically drinks from a [ ] bottle [ ] sippy cup [ ] water bottle [ ] open faced cup He/she is able to use a straw: [ ] yes [ ] No [ ] Unknown

Thank you! Please give this completed questionnaire to the researcher.

APPENDIX D

Imitation Assessment

Participant #: _____Researcher Initials: _____Date: _____

Sit directly across from the participant. Mark a (+) or a (-) for each response. The experimenter will model the behavior and give the instruction "Do this." or "Copy me."

Instructions	Data
1. Clap hands	
2. Put index finger up (can be opposite hand of the one you are using)	
3. Place hand on table/desk (can be opposite hand of the one you are using)	
4. Touch nose	
5. Place hand over mouth	
6. Make a fist	
7. Pick up a pen or pencil with all fingers	
8. Raise arm straight in the air	
9. Touch top of head	
10. Touch chin	
11. Make a cup with your hands	
12. Place hands in a prayer position	
13. Touch elbow	
14. Touch belly	
15. Make thumbs up	
16. Hold hand up with all fingers up in high-five position	
17. Touch cheek	
18. Touch palm of hand one hand with index finger of the other hand	
19. Point to eye	
20. Grab your ear with all five fingers	

APPENDIX E

Compliance Assessment

Sit directly across from the participant. Each of you should have a plate of food with five bites of a single food. Mark a (+) or a (-) for each response. The experimenter will model the behavior and give the instruction "Do this."

Participant #: _____ Researcher Initials: _____ Date: _____

Instruction	Data
Use your index finger and touch the bite of food. (The participant must make contact with the food regardless of what finger they use).	
Pick up the bite of food with your hand or a utensil and hold it approximately an inch away from the tip of your nose and smell it.	
Pick up the bite of food and kiss it with your lips touching the bite (The participant's lips must also make contact with their bite).	
Pick up the bite of food and lick the bite with your tongue making contact with the bite (The participant's tongue must also make contact with their bite).	
Pick up the bite and brush your front teeth with the bite.	
Pick up the bite and brush your back teeth with the bite.	
Place a bite on your tongue for 3 seconds. (Swallow the bite of food, however, the participant does not need to eat the bite, if the participant holds the bite on their tongue for any portion of time, this is correct).	
Break a bite in half with your teeth. (Swallow the bite of food, however, the participant may expel the bite).	
Chew the bite 5 times. (Swallow the bite of food, however, the participant may expel the bite).	
Chew the bite and swallow. The participant must swallow the bite for it to be considered a correct.	

APPENDIX F

Initial MSWO

Participant #: _____ Researcher Initials: _____ Date: _____

MSWO (Check one): ____ Preferred items ____ Preferred foods

Item										
Round 1										
Round 2										
Round 3										

Item	Number of times picked	Number of times available	Fraction	Percentage

APPENDIX G

Data Sheet

Participant #: _____ Researcher Initials: _____

Condition: _____ Date: _____ Session #: _____

Preferred edible: _____ Preferred Item: _____

Take partial-interval data on inappropriate behavior as defined in the operational definitions. Mark (Y) if the behavior occurred and (N) if the behavior did not occur.

Fraction: (Y/[Y+N])						**Percentage: (**Y/[Y+N] x 100)					

Mark (+) if the child accepts any bites of food and a (-) for any bites that remain on the plate at the 5 min duration.

Food (Write the name of the food)	Data
Bite 1:	
Bite 2:	
Bite 3:	
Bite 4:	
Bite 5:	
Bite 6:	
Fraction:	
Percentage:	

Mouth clean observed:

30 s:			10 s:	10 s:	10 s:
10 s:	10 s:	10 s:	10 s:	10 s:	10 s:

Mark (+) if the participant does not have any food larger than a pea left in their mouth, mark (-) if the participant has a bite larger than a pea left in their mouth. Mark (E) if the bites were expelled.

APPENDIX H

Baseline Treatment Integrity

Participant #: _____ Researcher Initials: ___ Researcher Initials for TI: ____

Condition: Baseline Date: _____ Session #: _____

Mark (+) or (-) or (N/A) for each of the following questions.

1. The **experimenter** presented a plate with 6 bites of food to both the model and participant simultaneously.	
2. The **experimenter** stated, "Here's your food" at the start of the session.	
3. The **model** waited 5 seconds after the statement "Here's your food" before consuming the first bite.	
4. The **experimenter** provided a praise statement contingent upon the model's acceptance of the first bite.	
5. The **model** waited 5 seconds after the praise statement before consuming the second bite unless the participant made an approaching response towards a bite.	
6. The **experimenter** provided a praise statement contingent upon the model's acceptance of the second bite.	
7. The **model** waited 5 seconds after the praise statement before consuming the third bite unless the participant made an approaching response towards a bite.	
8. The **experimenter** provided a praise statement contingent upon the model's acceptance of the third bite.	
9. The **model** waited 5 seconds after the praise statement before consuming the fourth bite unless the participant made an approaching response towards a bite.	
10. The **experimenter** provided a praise statement contingent upon the model's acceptance of the fourth bite.	

11. The **model** waited 5 seconds after the praise statement before consuming the fifth bite unless the participant made an approaching response towards a bite.	
12. The **experimenter** provided a praise statement contingent upon the model's acceptance of the fifth bite.	
13. The **model** waited 5 seconds after the praise statement before consuming the sixth bite unless the participant made an approaching response towards a bite.	
14. The **experimenter** provided a praise statement contingent upon the model's acceptance of the fifth bite.	
15. The **experimenter** delivered praise if the participant accepted any bites of food.	
16. The **experimenter** did not provide any praise statements if the participant did not accept any of the bites of food.	
17. The **model** did not respond to any of the vocalizations emitted by the participant.	
18. The **experimenter** did not respond to any of the vocalizations emitted by the participant unless the participant stood up from chair or engaged in self-injurious behavior.	
19. The **experimenter** ended the session at 5 minutes after the statement, "Here's your food." OR after the participant accepted all 6 bites of food.	
20. The **experimenter** conducted a mouth clean check 30 seconds after the acceptance of the 6^{th} bite.	
21. The **experimenter** conducted mouth clean checks every 10 seconds after the initial mouth clean check for a total of 2 minutes (including the initial mouth clean check at 30 seconds), or	

expulsion occurred or consumption occurred.	
Fraction:	
Percentage:	
Calculations: (Correct steps / (Correct + Incorrect)) x 100	

APPENDIX I

Differential Reinforcement Treatment Integrity

Participant #: _____ Researcher Initials: ____ Researcher Initials for TI: _____

Condition: DR Date: _____ Session #: _____

Mark (+) or (-) or (N/A) for each of the following statements.

1. The **experimenter** presented a plate with 6 bites of food to both the model and participant simultaneously.	
2. The **experimenter** stated, "Here's your food" at the start of the session.	
3. The **model** waited 5 seconds after the statement "Here's your food" before consuming the first bite.	
4. The **experimenter** provided a praise statement contingent upon the model's acceptance of the first bite.	
5. The **model** waited 5 seconds after the praise statement before consuming the second bite unless the participant made an approaching response towards a bite.	
6. The **experimenter** provided a praise statement contingent upon the model's acceptance of the second bite.	
7. The **model** waited 5 seconds after the praise statement before consuming the third bite unless the participant made an approaching response towards a bite.	
8. The **experimenter** provided a praise statement contingent upon the model's acceptance of the third bite.	
9. The **model** waited 5 seconds after the praise statement before consuming the fourth bite unless the participant made an approaching response towards a bite.	
10. The **experimenter** provided a praise statement contingent upon the model's acceptance of the fourth bite.	

11. The **model** waited 5 seconds after the praise statement before consuming the fifth bite unless the participant made an approaching response towards a bite.	
12. The **experimenter** provided a praise statement contingent upon the model's acceptance of the fourth bite.	
13. The **model** waited 5 seconds after the praise statement before consuming the sixth bite unless the participant made an approaching response towards a bite.	
14. The **experimenter** provided a praise statement contingent upon the model's acceptance of the fourth bite.	
15. The **experimenter** provided access to the participant's preferred edible (a single bite) and 3 minutes of access to the participant's preferred item to the **model** after consumption of all 6 bites.	
16. If the **participant** consumed all 6 bites before the model's 3 minute of access ended, the **model** handed the item to the **experimenter** who then handed it to the item to the **participant.**	
17. The **experimenter** delivered praise if the participant accepted any bites of food.	
18. The **experimenter** did NOT provide any praise statements if the **participant** did not accept any of the bites of food.	
19. The **experimenter** conducted a mouth clean check 30 s after the participant accepted 6th bite.	
20. The **experimenter** conducted mouth clean checks every 10 seconds after the initial mouth clean check for a total of 2 minutes (including the initial mouth clean check at 30 seconds), or	

expulsion occurred or consumption occurred.	
21. The **model** did not respond to any of the vocalizations emitted by the participant.	
22. The **experimenter** did not respond to any of the vocalizations emitted by the model or the participant unless the participant stood up from the chair or engaged in self-injurious behavior.	
23. The **experimenter** delivered a single bite of a preferred food and access to the preferred item for 3 minutes if the **participant** consumed all 6 bites of food contingent upon a mouth clean check.	
24. The **experimenter** did NOT deliver preferred foods or items if the **participant** did not consume all 6 bites of food.	
25. The **experimenter** ended the session at 5 minutes after the statement, "Here's your food." OR after the participant consumed all 6 bites of food whichever occurred first.	
Fraction:	
Percentage:	
Calculations: (Correct steps / (Correct + Incorrect)) x 100	

APPENDIX J

Nonremoval of the Spoon Treatment Integrity

Participant #: _____ Researcher Initials: ____Researcher Initials for TI: ___

Condition: NRS Date: _____ Session #: _____

Mark (+) or (-) or (N/A) for each of the following questions.

1. The **experimenter** presented a plate with 6 bites of food to both the model and participant simultaneously.	
2. The **experimenter** stated, "Here's your food" at the start of the session.	
3. The **experimenter** waited 5 seconds after the statement "Here's your food" before conducting the NRS procedure with the **model**.	
4. The **model** engaged in 30 s of inappropriate mealtime behavior before opening their mouth and accepting the first bite.	
5. The **experimenter** waited 5 seconds after the **model** consumed the first bite of food before conducting the NRS procedure with the **model** with the second bite of food.	
6. The **experimenter** provided a praise statement contingent upon the model's acceptance of the first bite.	
7. The **model** engaged in 30 s of inappropriate mealtime behavior before opening their mouth and accepting the second bite.	
8. The **experimenter** waited 5 seconds after the **model** consumed the second bite of food before conducting the NRS procedure with the **model** with the third bite of food.	
9. The **experimenter** provided a praise statement contingent upon the model's acceptance of the second bite.	
10. The **model** engaged in 30 s of inappropriate mealtime behavior	

before opening their mouth and accepting the third bite.	
11. The **experimenter** waited 5 seconds after the **model** consumed the third bite of food before conducting the NRS procedure with the **model** with the fourth bite of food.	
12. The **experimenter** provided a praise statement contingent upon the model's acceptance of the fourth bite.	
13. The **model** engaged in 30 s of inappropriate mealtime behavior before opening their mouth and accepting the third bite.	
14. The **experimenter** waited 5 seconds after the **model** consumed the fourth bite of food before conducting the NRS procedure with the **model** with the fifth bite of food.	
15. The **model** engaged in 30 s of inappropriate mealtime behavior before opening their mouth and accepting the fifth bite.	
16. The **experimenter** provided a praise statement contingent upon the model's acceptance of the fifth bite.	
17. The **experimenter** waited 5 seconds after the **model** consumed the fourth bite of food before conducting the NRS procedure with the **model** with the sixth bite of food.	
18. The **model** engaged in 30 s of inappropriate mealtime behavior before opening their mouth and accepting the sixth bite.	
19. The **experimenter** provided a praise statement contingent upon the model's acceptance of the sixth bite.	
20. The **experimenter** provided access to the participant's preferred edible (a single bite) and 3 minutes of access to the participant's preferred item to the	

model after consumption of all 6 bites.	
21. If the **participant** consumed all 6 bites before the model's 3 minute of access ended, the **model** handed the item to the **experimenter** who then handed it to the item to the **participant.**	
22. The **experimenter** delivered praise if the participant accepted any bites of food.	
23. The **experimenter** did NOT provide any praise statements if the **participant** did not accept any of the bites of food.	
24. The **experimenter** conducted a mouth clean check 30 s to the participant if they accepted 6th bite.	
25. The **experimenter** conducted mouth clean checks every 10 seconds after the initial mouth clean check for a total of 2 minutes (including the initial mouth clean check at 30 seconds), or expulsion occurred, or consumption occurred.	
26. The **experimenter** did not respond to any of the vocalizations emitted by the model or the participant.	
27. The **experimenter** delivered preferred foods and items if the **participant** consumed all 6 bites of food.	
28. The **experimenter** ended the session at 5 minutes after the statement, "Here's your food." OR after the participant consumed all 6 bites of food whichever occurred first.	
Fraction:	
Percentage:	
Calculations: (Correct steps / (Correct + Incorrect)) x 100	

APPENDIX K

Social Validity Questionnaire

You will be asked to complete a series of questions regarding the acceptability and outcomes of the research that your child participated in. Please answer the following questions to the best of your ability.

Question:	Please Circle One:				
1. In an overall, general sense, how satisfied were you with the service you received?	1	2	3	4	5
2. In general, how effective were treatment recommendations for this child?	1	2	3	4	5
3. The training sessions were presented in a concise and easy to understand manner.	1	2	3	4	5
4. The amount of work required by the program was at a reasonable level to be most effective.	1	2	3	4	5
5. If a friend were in need of similar help, would you recommend our program to him/her?	1	2	3	4	5
6. At home, will you continue to use the treatment program?	1	2	3	4	5
7. I feel that when I do use these recommendations, they will be effective when applied consistently.	1	2	3	4	5
8. I feel that the methods involved with the treatment recommendations were ethically sound.	1	2	3	4	5
9. The feeding team:					
a. was flexible and open to work with.	1	2	3	4	5
b. was knowledgeable and thoroughly trained.	1	2	3	4	5
c. was cooperative and easy to work with.	1	2	3	4	5
d. was helpful in solving problems as they arose.	1	2	3	4	5
e. showed positive regard for the child.	1	2	3	4	5
f. showed positive regard for the family.	1	2	3	4	5
g. was empathic and sensitive to the child.	1	2	3	4	5
10. Has the implementation of the treatment program helped reduce any other behavior problems or increase other skills?	1	2	3	4	5
11. At the time of discharge, were your child's problems worse (1), the same (3), or absent (5)?	1	2	3	4	5
12. If for some reason you needed to seek help again, would you come back to our program?	1	2	3	4	5
13. Have you noticed an improvement in your child's health?	1	2	3	4	5
14. To what extent has our program achieved the goals set at admission?	1	2	3	4	5

Hoch, Babbitt, Coe, Krell, Hackbert (1994)

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