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A Modeling and Shaping Approach to Increase Food-Related Responses for Children Diagnosed with Autism Spectrum Disorder

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A Modeling and Shaping Approach to Increase Food-Related Responses for Children Diagnosed with Autism Spectrum Disorder

by

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Abstract

Food selectivity and other mealtime problems are common in children diagnosed with autism spectrum disorder (ASD). Food selectivity can interrupt appropriate development and lead to disruptive behaviors and familial stress. Escape extinction, a common intervention, can lead to more undesirable behaviors, more health concerns, and fails to teach independent eating skills. This study aimed to treat food selectivity in 2 children diagnosed with ASD by modeling and shaping independent initiations (i.e., tolerating, interacting, tasting, and eating) to food items. A nonconcurrent multiple baseline across participants design evaluated the effects of the intervention while measuring the participant's affect throughout the mealtimes. The results indicated that this approach increased food-related responses and provided a positive mealtime experience for both participants.

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Chapter 1: Introduction and Literature Review

Food selectivity and mealtime challenges are common for children diagnosed with autism spectrum disorder (ASD; Ahearn, et al., 2001; Ausderau & Juarez, 2013; Bandini et al., 2010). Bandini and colleagues (2010) defined food selectivity as including food refusal, limited food repertoire, and high-frequency single food intake (HFSFI). Children diagnosed with ASD consume a more limited number of foods than typically developing children, and this selectivity does not decrease as a result of maturation (Bandini et al., 2010). Food selectivity can lead to disrupted family meals and children engaging in disruptive behaviors such as tantrums, throwing food, and spitting out food (Ausderau & Juarez, 2013). Furthermore, research has found that having a child who displays food selectivity increases reported stress from the parents and the siblings in the home (Ausderau & Juarez, 2013; Curtin et al., 2015). Sharp et al. (2013) conducted a comprehensive review and found that children with eating problems had a significantly lower intake of nutrients such as calcium and protein compared to their typical peers. Mealtime problems are one of the most important difficulties facing children as nutritional intake is what leads to appropriate development and sustaining life (Sharp et al., 2013).

Many studies have shown that interventions based upon the principles of applied behavior analysis (ABA) can effectively treat mealtime challenges for children with and without a diagnosis of ASD (Laud et al., 2009). According to Riordan et al. (1980), the intervention most commonly used to treat children who refuse food is escape extinction. This assertion has been confirmed with more recent literature reviews. For example, Bachmeyer (2009) found that the most commonly used intervention for children who display food selectivity is a multi-component treatment package including escape extinction. In another example, Massa et al. (2013)

conducted a meta-analysis and discovered that all but one of the 14 studies analyzed used escape extinction techniques. The prevalence of escape extinction to treat food selectivity may be a result of functional analyses demonstrating that mealtime problems are commonly maintained by escape (i.e., negative reinforcement), leading to a function-based treatment, escape extinction (Bachmeyer, 2009; Piazza et al., 2003).

While function-based treatments have been documented to be more effective than non-function-based treatments (e.g., Carr & Durand, 1985), there may be several potential concerns with the use of escape extinction to treat food selectivity. First, escape extinction, when used in isolation, fails to teach desirable behaviors (e.g., initiating to food). That is, escape extinction does not teach or reinforce independent mealtime behavior, as it commonly involves another person feeding the child (e.g., non-removal of the spoon or physical guidance; Bachmeyer, 2009). Second, escape extinction can lead to other health concerns such as weight loss, malnutrition, and lethargy (Bachmeyer, 2009; Riordan et al., 1980). Given the health concerns already existing with food selectivity, one may wish to avoid further complicating the matter with other potential health concerns. Third, the use of escape extinction can create challenges with respect to procedural fidelity (Tanner & Andreone, 2015). For example, fidelity can be compromised due to emotional responding (e.g., crying; Lerman et al., 1999) and/or the aversive effects on caregivers if undesirable escape behaviors occur (Bachmeyer, 2009). Fourth, and relatedly, it has been documented that undesirable behaviors, such as aggression and self-injury may arise from the use of escape extinction (Lerman & Iwata, 1996; Lerman et al., 1999). If these aberrant behaviors result in the person implementing the procedure to stop, then the undesirable behaviors could be inadvertently reinforced during mealtimes.

Given the potential challenges and undesirable side effects of escape extinction, some have developed and evaluated alternative approaches to escape extinction when treating food selectivity. For example, Bernal (1972) trained a child's mother to implement a shaping procedure to increase her child's consumption of non-strained foods. The mother was trained how and when to reinforce through a series of 10 steps culminating in the child eating a regular family meal. Bernal instructed the mother to never force her child to eat, but simply to withhold all reinforcement, including smiling, eye contact, and chatting pleasantly until the child met the current criterion for reinforcement. At the start of intervention, the child only ate strained foods such as oatmeal and cottage cheese. By the end of the final step, 32 weeks later, the child was independently consuming non-strained foods from all food groups. In the final 20 weeks of the intervention, the child added 50 novel foods to her diet. At the conclusion of the study, her mother expressed she had no further concerns about her daughter's eating.

Another example of the use of alternative methods included the use of observational learning and modeling to change the food preferences in children diagnosed with ASD. Cihon et al. (2020) first identified a high preference and low preference food for three participants diagnosed with ASD using a paired-stimulus preference assessment. Baseline confirmed the initial high preference food (IHP) and the initial low preference food (ILP). Sessions involved the participant completing a short task (i.e., sorting chips) before choosing between their IHP, ILP, or a blank card. The participant was then given up to 30 s to consume the chosen food or 30 s without interaction if the blank card was chosen. Two intervention conditions were implemented. During these conditions, the participant sat facing a second experimenter who completed the same task and was presented with the same choices as the participant. The second

experimenter chose the participant's ILP on every trial. The second experimenter would talk about the ILP favorably during the task and would interact with the ILP in a favorable way. The interactions were tailored for each individual participant (e.g., pretending the food was the participant's favorite character). The second intervention condition was identical, but included two additions. First, the second experimenter interacted with the participant once the ILP was chosen. Also, the experimenter made comments about the IHP food (e.g., they think the ILP is better than the IHP). Results showed an increase in selections of the ILP for all 3 participants although varied responding was observed across participants (i.e., participants varied their selection of the IHP and ILP foods). This flexibility in responding may be desired with respect to mealtime behavior.

Koegel et al. (2012) evaluated the effectiveness of an intervention that included differential reinforcement within a systematic hierarchical sequence. The participants included 3 children, ages 6-7 years, diagnosed with ASD. The hierarchy began with refusing the food, then continuing to touch the food and bringing it towards the mouth, putting the food to the lips, biting the food, putting the food in the mouth without swallowing, chewing the food without swallowing, swallowing the food reluctantly, and ended with accepting the food without any markers of displeasure. The participants were never forced to interact with or eat the food items, but, instead, accessed reinforcement contingent upon engaging in the behavior outlined in the targeted step in the hierarchy independently. The results of a clinical replication showed that the intervention successfully increased the number of foods the participants consumed and maintained at an 18 week follow-up (Koegel et al., 2012).

Tanner and Andreone (2015) evaluated a similar intervention to Koegel et al. (2012) that used a graduated exposure hierarchy to increase the food repertoire and decrease undesirable mealtime behaviors for a 3.5-year-old boy diagnosed with ASD. The procedure included the experimenter modeling the steps of the hierarchy and differentially reinforcing imitative behavior from the child. The first step of the hierarchy was tolerating the food in the therapy room. The 4th-7th steps included touching, smelling, kissing, and licking the food, respectively, before throwing the food away. The 12th and final step was eating an entire piece of the food item. Sessions included the use of natural language and a playful atmosphere (e.g., acting silly and using social reinforcement). The results of a changing criterion design showed that the intervention was successful in increasing the food repertoire, and decreasing food refusal and HFSFI. Furthermore, Tanner and Andreone (2015) demonstrated generalized responses to other people and settings.

These studies differ from escape extinction in that, the child is not being fed by a therapist, but, instead, desirable mealtime responses (e.g., independent eating, tasting) are developed through a gradual process of shaping in the absence of escape extinction. It is possible that there are some conditions under which escape extinction is less avoidable (e.g., failure to thrive; Wilkins et al., 2011); however, when the presenting problem is food selectivity and not food refusal/avoidance, an alternative strategy focusing on the development of independent mealtime behaviors may be preferred.

Cihon et al. (2018) conducted a study using a flexible shaping approach to improve synchronous engagement in children diagnosed with ASD. The experimenter in this study decided in-the-moment what behaviors to reinforce in order to work toward the target goal of

synchronous engagement with their peer. The study included two sets of dyads who were instructed to play with toys. The experimenter moved each child up or down on a level chart based on their level of synchronous engagement during the play. The level chart would determine if they received a reinforcer at the conclusion of the play time. The experimenter did not follow a set hierarchy of specific behaviors to reinforce, but instead moved the child up the level chart if their behaviors reflected a general improvement toward the target goal or moved the child down the level chart if their behaviors were generally below what would be expected in that moment. A reversal design showed that flexible shaping resulted in an increase in synchronous engagement for both dyads. The experimenter considered many variables in their decision to move the child up or down including how the child typically responded to movement on the chart and how frequently the desired behavior occurred throughout the interval. This technique differed from shaping in other studies in which predetermined behaviors were reinforced in a set order with a set criterion to achieve their target goal (Koegel et al., 2012; Tanner & Andreone, 2015).

The current study sought to add to the small, but emerging, literature on alternative approaches to escape extinction to treat food selectivity for individuals diagnosed with ASD. Specifically, previous studies have evaluated the effectiveness of shaping with previously determined steps (e.g., Koegel et al., 2012; Tanner & Andreone, 2015), have targeted novel foods independently (e.g., Tanner & Andreone, 2015), have used modeling with favorable affect (e.g., Cihon et al., 2020), and have reinforced approximations in the absence of a model (e.g., Bernal, 1972). The purpose of this study was to evaluate the use of a flexible shaping approach (Cihon et al., 2018) while modeling desired behaviors, presenting novel foods simultaneously

with preferred foods, and evaluating child preference for the intervention through affect measures to improve the mealtime behavior for two children diagnosed with ASD.

Chapter II: Method

Setting

All conditions of the study were implemented at a private agency in Southern California that provides ABA-based intervention for children diagnosed with ASD. Sessions occurred in a small room appropriate for mealtimes. The room contained a table and 2 chairs appropriate for the size of the participant and the therapist. A video camera was also present in the room so all sessions could be video recorded for data collection.

Participants

Two children diagnosed with ASD participated in the study. Both participants could feed themselves using their hands, utensils, or both. They both exhibited a generalized imitative repertoire and would participate in social interactions with peers and adults during treatment sessions at the agency. The participants had been identified as having selective eating habits or restricted food preferences through direct observation by staff and supervisors during mealtimes at the agency, and their parents had expressed concern about their diets. Both participants had no history of medical complications or current medical complications stemming from their food selectivity.

Zeke was a 5-year-old boy who communicated using full sentences. His parents were concerned that he was not eating enough protein or vegetables on a regular basis, and there were many foods he used to eat but did not anymore, such as hamburgers, meatloaf, and meatballs. Zeke's parents typically only offered foods at mealtimes that they knew he would eat. Sometimes his parents would direct him to try one bite of a new food and provide him a treat for "being a big boy." He ate slowly during mealtimes and took very small bites of his food. Zeke

independently ate chicken, fruit, peanut butter and jelly sandwiches, French fries, chips, and one type of pasta. Their hopes were for Zeke to be able to eat the same foods as they did at mealtimes.

Larry was a 2-year-old who also communicated using full sentences. His parents were concerned that he was not eating vegetables, new fruits, and often resisted eating soft foods or taking bites from large pieces of foods. Larry did not eat liquid foods such as soup. His parents encouraged him to try foods that he did not eat independently. They reported that he was more willing to taste new foods when they allowed him to spit the food out into a napkin. If he refused, his parents would let him know that he did not seem hungry and the meal would end. No other food would be offered until the next meal time. He ate chicken nuggets, hot dogs, bagels, bread, French fries, and spaghetti and meatballs. His parents wanted him to eat vegetables, fruits, and soup.

Materials

The study required two nearly identical plates and utensils, one for the participant and one the therapist. Each participant was exposed to two sets of foods. One set served as an intervention set and another as a generalization set. Both food sets included foods from multiple food groups (e.g., dairy, meat, fruits, vegetables). Portions of the food items were held constant throughout the study, such that the preferred food had a smaller portion than the less preferred foods. This allowed more opportunities for food-related responses with the less preferred foods and ensured the participant did not get full by only eating the preferred food. The intervention set consisted of a total of four foods, one of which was a food that had been identified that the participant readily ate without prompting or programmed reinforcement. A second food was

similar to a readily eaten food in texture *and* flavor. For instance, if goldfish crackers were a readily eaten food, Cheez-it crackers may serve as a second food in the set as they are similar in taste (i.e., cheese flavored) and texture (i.e., crunchy). A third food was similar to a readily eaten food in texture *or* flavor. For instance, if Goldfish crackers were a readily eaten food, sliced cheddar cheese may serve as a third food as it is similar in taste (i.e., cheese flavored) but not texture (i.e., soft). Finally, one food was dissimilar to a readily eaten food and/or a food that the participant's caregivers would like the participant to eat. For instance, if Goldfish were a readily eaten food, a banana may serve as the fourth food as it is not similar in taste or texture. Each set of foods was determined based upon caregiver interviews (see Appendix A) and confirmed during baseline sessions. The generalization set included 4 foods determined in the same manner as the intervention set. Each participant also had a highly preferred food only available during intervention (described below), which was also identified through the caregiver interview. The food sets for both participants are in Table 2 below.

Table 2

Food sets for both participants

	Readily Eaten Foods	Foods Similar in Taste *and* Texture to a Readily Eaten Food	Foods Similar in Taste *or* Texture to a Readily Eaten Food	Foods Dissimilar to Readily Eaten Foods
Zeke				
Intervention Set	Lunchable pizza	Bagel bites	Veggie chips	Meatloaf
Generalization Set	French fries	Strawberry Greek yogurt	Kale chips	Celery
Larry				
Intervention Set	Chicken nuggets	Watermelon	Mango	Carrot sticks
Generalization Set	Green beans	Asparagus	Bagel bites	Chicken noodle soup

Dependent Variables and Measurement

Sessions were videotaped to record data at a later time. Data were collected on four behaviors related to consumption. *Tolerating* was defined as maintaining or increasing proximity to the plates containing the foods. Examples included the participant sitting at the table with the plate in front of them or the participant moving the plate closer to their body while sitting at the table. Non-examples included the participant pushing their chair back farther away from the food or pushing the plate farther away from their body. Tolerating was measured using 10 s partial interval recording.

Interacting was defined as independently manipulating the food with any part of the hand or utensils. Examples included the participant pushing a food around the plate with their finger, stabbing a food with a fork, and picking up a food. Non-examples included the participant pointing to a food, making a comment about a food, and smelling a food without touching it. Interacting was measured using frequency counts.

Tasting was defined as food passing the plane of the lips or touching the tongue. Examples included the participant licking a food or taking a small bite of a food and spitting it out. Non-examples included the participant kissing a food such that their tongue does not touch the food and the food does not pass the plane of the participant's lips. Tasting was measured using frequency counts.

Eating was defined as consuming a piece or all of the food. An example of eating was the participant swallowing a piece of a food. A non-example of eating was the participant putting a food in their mouth, then spitting it out. Eating was measured using frequency counts. For interacting, tasting, and eating frequency counts, only the highest behavior in the hierarchy was

counted for each food-related response. The behavioral hierarchy from highest to lowest was eating, tasting, and then interacting. For example, if the participant picked up a food and licked it before placing it back on their plate, tasting was scored but interacting was not as tasting was the highest behavior in that response.

An objective of this study was to create a positive mealtime environment while still addressing the selective eating of the participants. As a result, data were collected on participant affect as an indication of their preference for or against the intervention. *Favorable affect* was defined as "the child emits a vocalization or assumes a facial expression indicating pleasure, favor, or amusement" (Anderson, 2010, p.10). *Neutral affect* was defined as "the child assumes a facial expression or emits vocalizations indicating indifference…[and] does not appear to be decidedly happy or particularly unhappy" (Anderson, 2010, p. 11). *Unfavorable affect* was "the child engages in vocalizations such as yells, whines with distress or screams which may or may not be accompanied by physically retreating or protesting or assumes a facial expression including a grimace, smirk, or eye roll" (Anderson, 2010, p. 11). All affect data were collected using 10 s partial interval recording. Favorable affect was recorded for each interval when a favorable affect was displayed at any point in the interval. Neutral affect was recorded if neither favorable nor unfavorable affect were displayed at any point in the interval. Finally, unfavorable affect was recorded if an unfavorable affect was displayed and no favorable affect was displayed at any point in the interval.

Research Design

This study was conducted using a nonconcurrent multiple baseline across participants design (Watson & Workman, 1981). There were three conditions: baseline, intervention, and

generalization. Once the baseline data were stable, the intervention began for the first participant. Intervention for the second participant began once the data from the first participant demonstrated improvements in the dependent measures while the baseline data remained stable for the second participant.

Procedure

Caregiver questionnaire. A typed questionnaire (see Appendix A) was given to the caregiver to fill out and return to the researcher. The questionnaire was used to determine the participant's preferred foods and foods the caregivers wanted the participants to eat for use during the study.

General Procedure. Each participant's intervention food set included 4 foods as described previously. Throughout all conditions, the table and plate set up remained the same with the exception that the therapist also had a plate with the same foods during the intervention condition. One session occurred per day, 2-3 times each week. Sessions occurred 30 minutes to 90 minutes prior to the participant's regular lunch time to increase the probability the participant was hungry. The participant's regular lunch was offered at their regularly scheduled lunch time.

Baseline. Baseline sessions began with the therapist walking with the participant to the room with the participant's plate and foods already on the table. The therapist did not have a plate and did not eat during baseline. Once the participant and therapist were sitting at the table at a right angle from each other, the therapist informed the participant it was time for snack (e.g., "It's snack time!"). The therapist made neutral comments with a neutral affect throughout the session (e.g., "What did you play at recess today?"). The therapist did not give any instructions about the food, such as telling the participant to touch or taste a food, and did not provide any

programmed consequences for initiations to any of the foods. Baseline sessions ended after 10 min or when the participant signaled they were done (e.g., “I’m done.”).

Generalization probe. One generalization probe occurred prior to intervention and following intervention. Generalization probes were identical to baseline with one exception. The participant’s plate consisted of foods from the generalization food set (i.e., foods that had not been included in any intervention session).

Intervention. Intervention consisted of modeling and a flexible approach to shaping (Cihon et al., 2018). Each session began with the therapist walking with the participant into the room with the participant’s plate already on the table. During intervention, the therapist also had a plate with all of the same foods as the participant’s plate. A small container with the participant’s highly preferred food item, not included on either of the plates used during intervention, was next to the therapist’s plate out of reach of the participant and was used contingently for movement both within dependent variables (e.g., from a small lick to placing the food fully in the mouth and removing it) and across the dependent variables (e.g., from interacting to tasting).

Similar to the baseline condition, once the therapist and participant were seated, the therapist informed the participant that it was time for snack (e.g., “It’s snack time!”). The therapist labeled each food on the participant’s plate by pointing to it and stating the name, but did not give any instructions about the food, such as telling the participant to touch a food item or taste a food item at any time. The therapist then modeled responses (e.g., interacting, tasting, eating) with all the foods on their plate while displaying favorable affect (e.g., smiling, making statements about how good the food tasted). The therapist also made neutral comments with the

participant (e.g., “What did you play at recess today?”). The therapist used a flexible approach to shaping to engender movement across the dependent measures. All responses that symbolized movement toward the terminal goal were candidates for reinforcement. The shaping approach included differential reinforcement. For example, the therapist initially provided praise and access to the preferred food when the participant interacted with a food on their plate; however, if the participant continued to interact with the same food in the same way, the therapist would have only provided praise. The therapist provided praise and a piece of a preferred food item if the participant tasted that same food. Praise was specific and descriptive for why the participant earned the praise (e.g. “Wow, you’re licking that carrot just like I am!”). The experimenter used clinical judgement and in-the-moment assessment of the participants’ behavior (Cihon et. al., 2018; Leaf et. al., 2018) to determine what and when to reinforce. Each session ended after 10 min or when the participant signaled they were done (i.e., “I’m done”).

Treatment Integrity

A trained observer took data on treatment integrity while watching the intervention on video recordings. The observer marked “correctly implemented” or “incorrectly implemented or did not implement” on a checklist (see Appendix B) of the steps the therapist should have implemented within each condition of the study. Treatment integrity was determined by dividing the number of “correctly implemented” marks by the total number of marks, “correctly implemented” plus “incorrectly implemented”, then converting it to a percentage. Treatment integrity data, taken on 33% of the total sessions, was 100%.

Interobserver Agreement

The same trained observer took data while watching the video recorded sessions for 33% of the sessions. For frequency data, IOA was calculated separately for interacting, tasting, and eating per session across foods. IOA was determined by dividing the smaller number by the bigger number, then converting it to a percentage. For the PIR data, IOA was calculated separately for favorable, neutral, and unfavorable affect. IOA was determined by dividing the smaller number of intervals by the bigger number of intervals, then converting it to a percentage. A window of error of 2 intervals was allowed due to the relatively small numbers.

The average IOA for interacting, tasting, and eating for Zeke was 88% (range, 86-90%), 100%, and 98% (range, 95-100%), respectively. The average IOA for interacting, tasting, and eating for Larry was 79% (range, 43-100%), 93% (range, 60-100%), and 100%, respectively. The IOA data for favorable, neutral, and unfavorable affect for Zeke were 56% (range, 44-67%), 86% (range, 81-90%), and 100%, respectively. The IOA data for favorable, neutral, and unfavorable affect for Larry were 53% (range, 34-76%), 63% (range, 30-83%), and 100%, respectively.

Social Validity

To determine if this study succeeded in creating a positive mealtime environment while still addressing the selective eating of the participants, a questionnaire (see Appendix C) was distributed at the conclusion of the study to each participant's caregiver along with a few short video clips of their child during the study. The caregiver was asked to answer questions using a 3 point Likert scale based on observations of their child following the study and what they observed in the video clips of the study. The 3 point Likert scale ranged from a 0, disagree, to a 1, neither disagree nor agree, to a 2, agree. The questionnaire included statements such as "I feel

the intervention was helpful," "My child appeared comfortable during the intervention," and "Mealtimes are less stressful following the intervention."

Chapter III: Results

Food-Related Responses

Figure 3.1 displays the results for interacting, tasting, and eating for both participants. The primary y-axis represents the frequency of interacting, tasting, and eating during each condition for both participants. The secondary y-axis represents the number of foods the participants ate during each session. Tolerating data were 100% of intervals across all sessions and are not presented graphically.

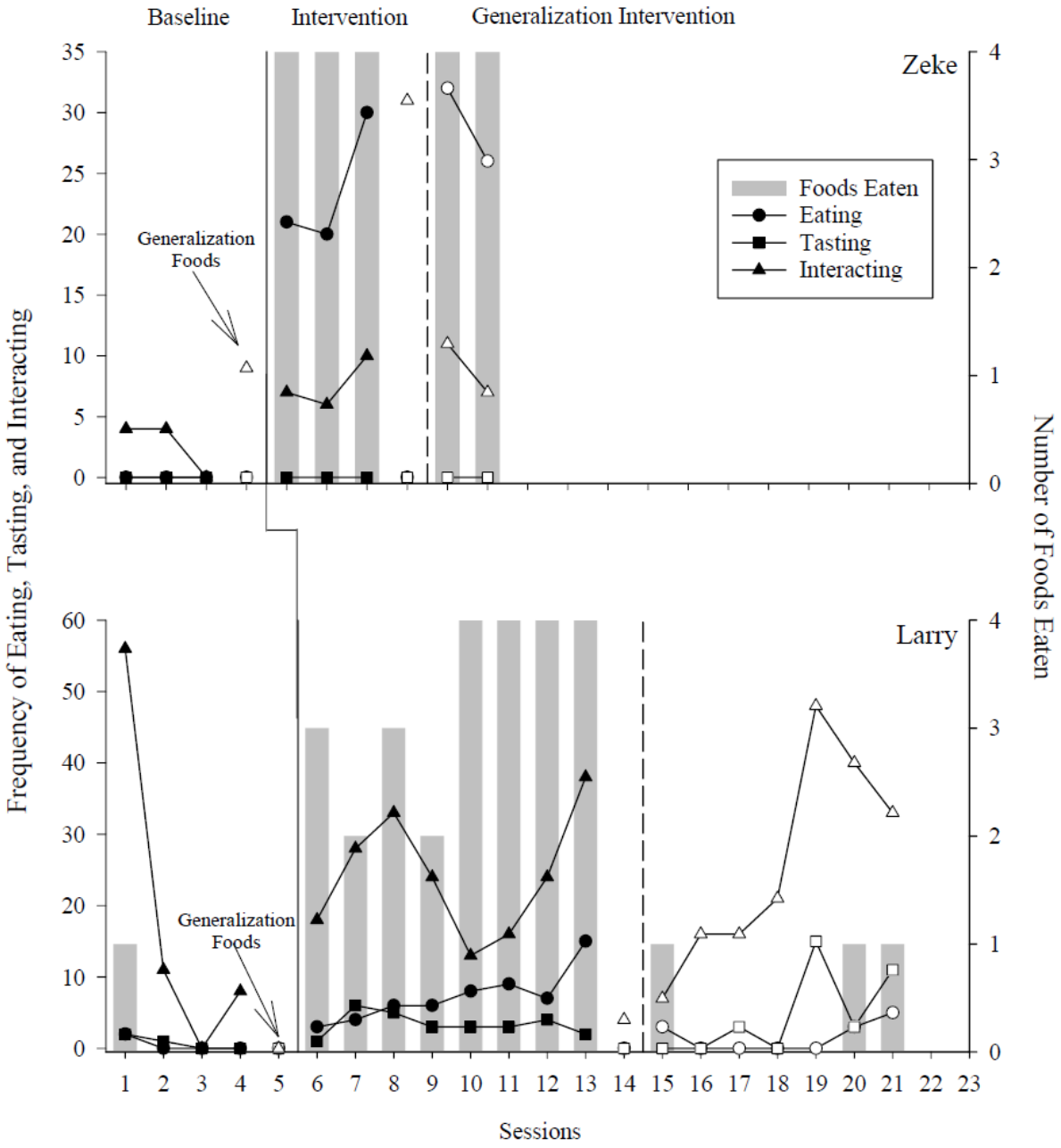
During baseline and the first generalization probe, the frequency of eating, tasting, and interacting for Zeke remained low or at zero. Following the introduction of the intervention, the frequency of eating and interacting increased and Zeke was eating all of the foods available on the plate. However, during the second assessment of generalization, Zeke only interacted with the foods but did not taste or eat them. As a result, intervention for the generalization food set was introduced. With the introduction of the intervention, the frequency of eating, tasting, and interacting all increased and Zeke was eating all of the foods available in the generalization food set.

Following the first baseline session with a high frequency of interacting, the frequency of eating, tasting, and interacting remained low or at zero for baseline and the first generalization probe for Larry. Following the introduction of the intervention, the frequency of eating, tasting, and interacting all increased. Larry began eating all 4 foods on his plate halfway through the intervention and continued to do so throughout the intervention condition. During the second generalization probe, Larry did not taste or eat any of the foods and had few interactions. Intervention for the generalization food set was introduced. Following the introduction of the

intervention, the frequency of interacting, tasting, and eating all increased; however, only 1 food was eaten during this condition.

Figure 3.1

Results for Food-Related Responses



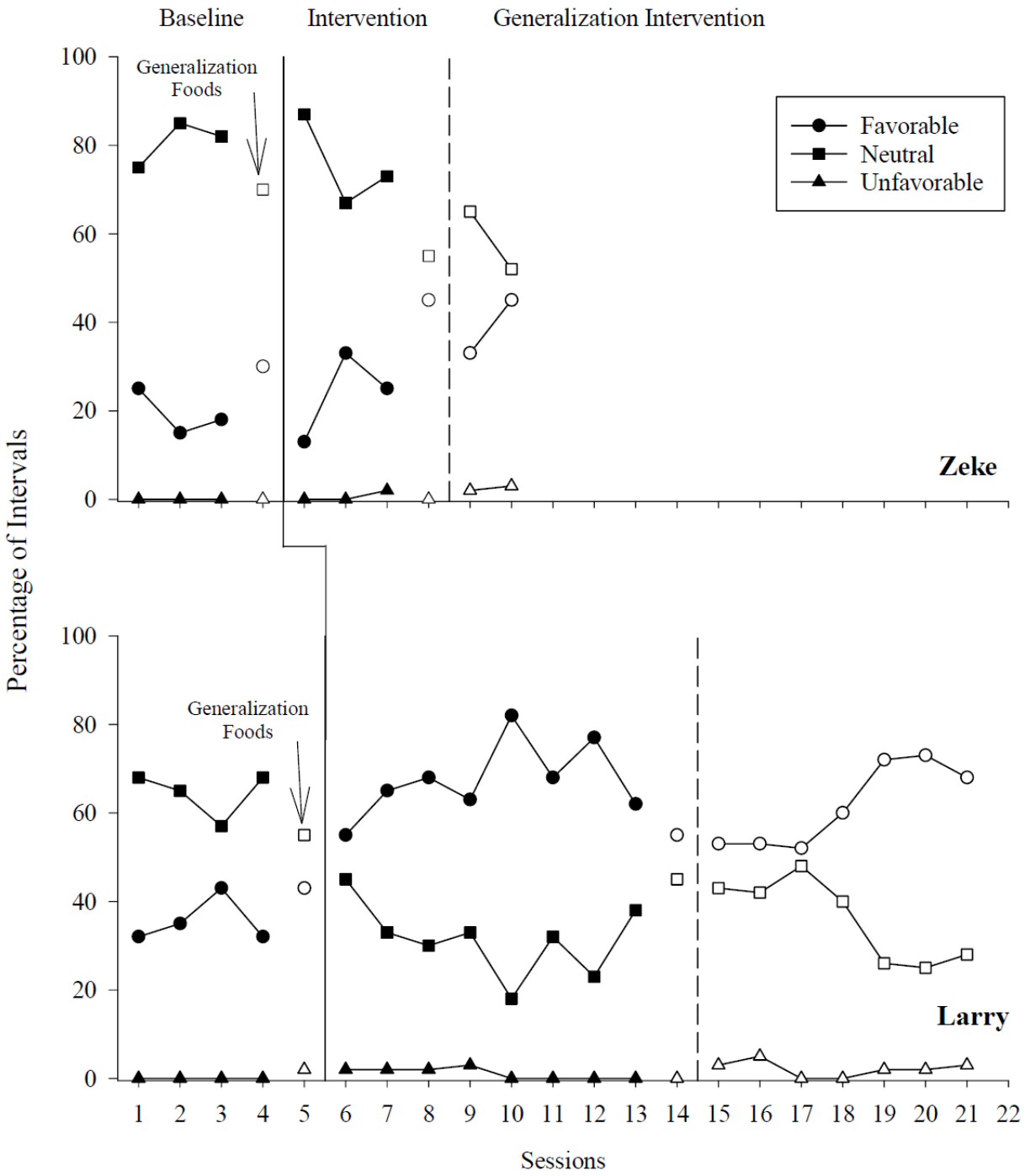
Affect

Figure 3.2 displays the participant's affect across all conditions. The average percentage of 10 s intervals that Zeke displayed favorable affect during baseline, generalization probes, intervention, and intervention for the generalization food set was 19% (range, 15-25%), 38% (range, 30-45%), 24% (range, 13-33%), and 39% (range, 33-45%), respectively. The average percentage of 10 s intervals that Zeke displayed neutral affect during baseline, generalization probes, intervention, and intervention for the generalization food set was 81% (range, 75-85%), 63% (range, 55-70%), 76% (range, 67-87%), and 56% (range, 52-65%), respectively. Zeke displayed unfavorable affect during 2% of 10 s intervals across all intervention sessions, and 2% and 3% of 10 s intervals during the two intervention sessions for the generalization food set, respectively.

The average percentage of 10 s intervals that Larry displayed favorable affect during baseline, generalization probes, intervention, and intervention for the generalization food set was 36% (range, 32-43%), 49% (range, 43-55%), 68% (range, 55-82%), and 62% (range, 52-72%), respectively. The average percentage of 10 s intervals that Larry displayed neutral affect during baseline, generalization probes, intervention, and intervention for the generalization food set was 65% (range, 55-68%), 50% (range, 45-55%), 32% (range, 18-45%), and 36% (range, 25-48%), respectively. The average percentage of 10 s intervals that Larry showed unfavorable affect during baseline, generalization probes, intervention, and intervention for the generalization food set was 0%, 1% (range, 0-2%), 1% (range, 0-3%), and 2% (range, 0-5%), respectively.

Figure 3.2

Results for Affect



Social Validity

Answers to the questionnaire showed that the caregivers felt the intervention was helpful and would recommend this procedure to others with children with food selectivity; however, neither caregiver felt that mealtimes at home were less stressful following the intervention. Zeke's caregiver felt more comfortable bringing him to eat in public settings, and Larry's caregiver reported that he was trying new foods at home or in other settings following the conclusion of this study. Results for "Food selectivity is an important problem in my child's life" averaged a 2. "I feel the intervention was helpful" received an average of 1.5. "My child appeared comfortable during the intervention" received an average of 2. "My child has been trying new foods at home or in other settings" received an average of 1.5. "Mealtimes are less stressful following the intervention" received an average of 1. "I feel more comfortable bringing my child to eat in public settings" received an average of 1.5. "I feel my child is able to eat a healthier, more balanced diet" received an average of .5. And finally, "I would recommend this procedure to others with children with food selectivity" received an average of 2.

Chapter IV: Discussion

The purpose of this study was to increase food-related responses to new or less preferred foods while maintaining an enjoyable mealtime environment for two children diagnosed with ASD. Previous studies have evaluated the effectiveness of shaping with previously determined steps (e.g., Koegel et al., 2012; Tanner & Andreone, 2015), targeted novel foods in isolation (Tanner & Andreone, 2015), used modeling with favorable affect (e.g., Cihon et al., 2020), and reinforced approximations in the absence of a model (e.g., Bernal, 1972). This study extended these previous studies by modeling desired food-related behaviors while simultaneously using a flexible shaping approach (Cihon et al., 2018), presenting novel and less preferred foods with preferred foods, and evaluating child affect. While the participants of this study both increased food-related responses, idiosyncratic patterns of responding were observed across the participants.

The intervention produced immediate increases in food-related responses for Zeke. The second generalization probe resulted in Zeke not tasting or eating any foods; however, his eating immediately increased once intervention on the generalization set started. Zeke not only ate all 4 foods on his plate during every intervention session in this study, he took multiple bites of every food. During one session, he finished his whole serving of one of the foods most dissimilar to his preferred food. It is interesting to note that Zeke's responses increased with the flexible shaping approach and the experimenter modeling typical food-related responses with a favorable affect. The experimenter did not need to be extremely playful with the food in order for Zeke to initiate his responses.

Larry's data also displayed an increase in food-related responses beginning with the first intervention session; however, data showed a slower progression toward the terminal goal of eating all 4 foods on his plate. The second generalization probe produced few food-related responses similar to Zeke. With the introduction of intervention on the generalization food set, his frequency of tasting was overall higher than his frequency of eating. Larry displayed unfavorable affect following tasting many of the foods in this set, which may have been correlated with his lower frequency of eating the foods. This condition ended when Larry displayed an increasing trend in eating and tasting even though he had not eaten every item on his plate as the goal of this study was to increase food-related responses, not to eat every item on his plate. In contrast to Zeke, the experimenter got more animated and playful with food-related responses before Larry initiated his own responses. For example, the experimenter built pretend cars using the food and pretended the food items changed her into different animals when they were tasted or eaten.

Affect was measured to ensure that the intervention and mealtimes remained enjoyable for the participants. Zeke's neutral affect remained high throughout all conditions of the study and his unfavorable affect remained at or close to 0%. His favorable affect increased during both intervention conditions. During baseline, Larry's neutral affect occurred during more 10 s intervals than his favorable affect; however, this switched during both intervention conditions such that his favorable affect occurred more than his neutral affect. Larry's unfavorable affect remained at or close to 0% during all conditions. It rose to 5% of 10 s intervals during the intervention on the generalization set. His unfavorable affect during that condition mostly occurred following tasting a food item and was best described as a grimace. These results show

that the intervention was likely a positive experience for both participants as their time showing unfavorable affects was extremely low and their time showing favorable affects during intervention phases was high or increasing.

It is important to note that the IOA data for favorable and neutral affects did not meet standards, while IOA data for unfavorable affect were 100%. PIR data for affect were more challenging to score than the frequency counts for food-related responses, possibly due to being less objective. For example, favorable affect was defined as involving pleasure, favor, or amusement, but people may view those differently or have varying thresholds for what constitutes pleasure, favor, or amusement. Also, a favorable or unfavorable affect was scored if they were displayed at any point in the interval. It is possible for the scorer to miss a quick smile when looking away to record the previous interval. It is also possible that unfavorable affect may be easier to differentiate from neutral affect than favorable affect is. More training for affect data could be done in the future to reach better agreement.

This study did not go without its limitations that warrant discussion. First, this study was implemented in a clinical setting and generalization data were not collected in any additional settings. Future studies could address this limitation by ensuring sessions occurred in more than one mealtime context (e.g., snack table, kitchen, dining room), and testing for generalization in multiple contexts after intervention effects are observed. Furthermore, the social validity questionnaire revealed that both participants' caregivers would recommend the intervention, but neither reported that mealtimes at home were less stressful. The continuation of stressful mealtimes at home could be due to the home being a different setting or the caregivers not being trained in the intervention. Although one caregiver reported their child was trying new foods in

different settings after the conclusion of the study, formal data on the generalized effects of the intervention were not collected. Similarly, maintenance data were not taken during this study, and future research could address this by implementing a third probe after a period of time had passed following the conclusion of the intervention.

Second, this study involved a limited number of foods and included only two participants. As such, it is unclear if the results may have differed with more than one intervention food set. For example, it is possible that better generalization effects would have been obtained with more than one food set. Future research should include multiple intervention food sets to continue to align closely with the mealtime context, and to increase the likelihood of the generalized effects of the intervention. Relatedly, the limited number of participants limits the external validity of the results. That is, this study only included two participants with varied results across both. Therefore, it is unclear if the results would extend to a wider demographic or similarly skilled individuals. Future research in this area should include more participants with a range of mealtime challenges to evaluate the potential external validity of the results.

This type of intervention had many benefits; however, a limitation is the potential training required to implement the procedure. The intervention requires a flexible shaping approach, modeling, and refraining from issuing instructions about the food. The experimenter was free to make adjustments in-the-moment to the shaping process based on individual learner responding and the context. For this reason, replication could also be difficult as varying in-the-moment adjustments can occur. Researchers have discussed a possible limitation of such flexible approaches as the time required to train professionals to implement such an approach (Cihon et al., 2018). The use of a protocol with unvarying rules may permit the onset of intervention to

occur faster. However, it remains unclear if one approach results in more favorable and socially valid results. Future researchers could address this by evaluating the time required to train professional in each approach, and the results of each approach in the short and long term for the participants.

Finally, this study used a package intervention of modeling and a flexible shaping approach. Future research could include a component analysis to determine if either part of the intervention would be successful on their own. Analysis should include determining whether either individual intervention or the package intervention is the most beneficial for the participants. Some factors to consider include the number of sessions required to increase food-related responses, the time requirement for training experimenters in each intervention, and the mealtime enjoyment displayed by the participants.

Children diagnosed with ASD often have food selectivity and other mealtime challenges (Ahearn et al., 2001; Ausderau & Juarez, 2013; Bandini et al., 2010), and the most common interventions include the use of escape extinction (Bachmeyer, 2009). Escape extinction may be undesired for a variety of reasons including the failure to teach independent mealtime behaviors (e.g., Bachmeyer, 2009) and the possibility for undesirable behaviors such as aggression and self-injury (Lerman & Iwata, 1996; Lerman et al., 1999). The current study provides preliminary data for an alternative intervention that resulted in interacting, tasting, and eating new and less preferred foods by implementing modeling and a flexible shaping approach. Furthermore, the affect data indicated that the participants enjoyed the intervention. This intervention can provide a positive mealtime approach to help children diagnosed with ASD not only interact, taste, and eat new foods, but also enjoy the experience.

References

Ahearn, W. H., Castine, T., Nault, K., & Green, G. (2001). An assessment of food acceptance in children with autism or pervasive developmental disorder-not otherwise specified. *Journal of Autism and Developmental Disorders*, *31*(5), 505–511.

Anderson, C. T. (2010). *Comparing Indices of Happiness during Teaching Interactions* [Unpublished master's thesis]. University of North Texas.

Ausderau, K. & Juarez, M. (2013). The Impact of Autism Spectrum Disorders and Eating Challenges on Family Mealtimes. *ICAN: Infant, Child, & Adolescent Nutrition*, *5*(5), 315–323.

Bachmeyer, M. H. (2009). Treatment of selective and inadequate food intake in children: A review and practical guide. *Behavior Analysis in Practice, 2(1),* 43-50.

Bandini, L. G., Anderson, S. E., Curtin, C., Cermak, S., Evans, E. W., Scampini, R., … Must, A. (2010). Food selectivity in children with autism spectrum disorders and typically developing children. *Journal of Pediatrics*, *157*(2), 259–264.

Bernal, M. E. (1972). Behavioral treatment of a child's eating problem. *Journal of Behavior Therapy and Experimental Psychiatry*, *3*(1), 43–50.

Carr, E. G. & Durand, M. (1985). Reducing behavior problems through functional communication training. *Journal of Applied Behavior Analysis, 18,* 111-126.

Cihon, J. H., Ferguson, J. L., Leaf, J. B., Leaf, R., McEachin, J., & Taubman, M. (2018). Use of a level system with flexible shaping to improve synchronous engagement. *Behavior*

Analysis in Practice. https://doi.org/10.1007/s40617-018-0254-8.

Cihon, J. H., Weiss, M. J., Ferguson, J. L., Leaf, J. B., Zane, T., & Ross, R. K. (2020). Observational effects on the food preferences of children with autism spectrum disorder. Hammil Institute on Disabilities. https://doi.org/10.1177/10883576209543.

Curtin, C., Hubbard, K., Anderson, S. E., Mick, E., Must, A., & Bandini, L. G. (2015). Food Selectivity, Mealtime Behavior Problems, Spousal Stress, and Family Food Choices in Children with and without Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders*, *45*(10), 3308-3315.

Koegel, R. L., Bharoocha, A. A., Ribnick, C. B., Ribnick, R. C., Bucio, M. O., Fredeen, R. M., & Koegel, L. K. (2012). Using individualized reinforcers and hierarchical exposure to increase food flexibility in children with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *42*(8), 1574–1581.

Laud, R. B., Girolami, P. A., Boscoe, J. H., & Gulotta, C. S. (2009). Treatment outcomes for severe feeding problems in children with autism spectrum disorder. *Behavior Modification*, *33*(5), 520–536.

Leaf, J. B., Cihon, J. H., Ferguson, J. L., McEachin, J., Leaf, R., & Taubman, M. (2018). Evaluating three methods of stimulus rotation when teaching receptive labels. *Behavior Analysis in Practice*, 63.

Lerman, D. C., & Iwata, B. A. (1996). Developing a technology for the use of operant extinction in clinical settings: an examination of basic and applied research. *Journal of Applied Behavior Analysis*, *29*(3), 345-385.

Lerman, D. C., Iwata, B. A., & Wallace, M. D., (1999). Side effects of extinction: Prevalence of bursting and aggression during the treatment of self-injurious behavior. *Journal of Applied Behavior Analysis, 32,* 1-8.

Massa, J., Cicca, A. H., & Vick, J. (2013). Effectiveness of treatment of food selectivity in children with autism. *eHearsay, 3(2),* 59-72.

Piazza, C. C., Fisher, W. W., Brown, K.A., Shore, B.A., Patel, M. R., Katz, R. M., . . . Blakely-Smith, A. (2003). Functional analysis of inappropriate mealtime behaviors. *Journal of Applied Behavior Analysis, 36,* 187-204.

Riordan, M. M., Iwanta, B. A., Wohl, M. K., & Finney, J. W. (1980). Behavioral Treatment of Food Refusal and Selectivity in Developmentally Disabled Children. *Applied Research in Mental Retardation, 1,* 95-112.

Sharp, W. G., Berry, R. C., McCracken, C., Nuhu, N. N., Marvel, E., Saulnier, C. A., ... Jaquess, D. L. (2013). Feeding problems and nutrient intake in children with autism spectrum disorders: a meta-analysis and comprehensive review of the literature. *Journal of Autism and Developmental Disorders*, *43*(9), 2159-2173.

Tanner, A., & Andreone, B. E. (2015). Using graduated exposure and differential reinforcement to increase food repertoire in a child with autism. *Behavior Analysis in Practice*, *8*(2), 233–240.

Watson, P. J., & Workman, E. A. (1981). The non-concurrent multiple baseline across-individuals design: an extension of the traditional multiple baseline design. *Journal of Behavior Therapy and Experimental Psychiatry*, *12*(3), 257–259.

Wilkins, J. W., Piazza, C. C., Groff, R. A., & Vaz, P. C. M. (2011). Chin prompt plus re-presentation as treatment for expulsion in children with feeding disorders. *Journal of Applied Behavior Analysis*, *44*(3), 513–522.

Appendix A

Caregiver Interview

Child: _____ **Date: _____**

Parent: _____

Overarching Goal(s)

1. What is your overall goal for your child's nutritional health? *(e.g., "With respect to mealtime behaviors such as grazing or sitting entire duration of meal, etc."; "Foods you would like your child to eat more or less of")*:

Nutritional Health History

1. Does your child currently have any Special diets and/or allergies? *(e.g., GFCF, tree nuts, etc.)*:

2. Is your child currently experiencing any health issues related to food refusal/selectivity? *(e.g., inadequate nutrition, weight difficulties, slow growth, etc.)*:

    a. If "Yes" then: Has your child ever seen or been referred to see a doctor for his/her food refusal/selectivity? If so what were the results/recommendations? *(e.g., special vitamins or dietary restrictions, swallow study, etc.)*:

Mealtime Behavior

1. What are the typical eating habits for your family and your child now (*e.g., Do you all sit down and eat together?, Where do you typically eat?, etc.*)? What would you like them to be?:

2. What is your child's attitude towards eating/mealtimes now? What would you like it to be?:

3. What are your typical response(s) when your child refuses food? *(e.g., "Do you allow him/her to leave the table, provide alternative item, etc.")*:

4. What are your typical response(s) when your child attempts to eat a novel/less preferred food item?:

Food Intake:

1. What types of food does your child currently eat? Are those your child's most preferred foods? If not, what are?

2. What foods would you like your child to eat?

3. What are your child's least preferred foods? How do you know?

4. What foods/food types did your child eaten in the past but does not eat now?

5. Are there any foods that are a staple of your meals as a family? *(e.g., Does your family regularly consume pasta? If so, how is it typically prepared?)* Are there any foods you would like to be a staple?:

6. How independent is your child's eating across type, size, and texture?

Food Selectivity

My child is selective:

	Never		Sometimes		Always	Problem for you	
• By food texture	1	2	3	4	5	Yes	No
• By food temperature	1	2	3	4	5	Yes	No
• By food color	1	2	3	4	5	Yes	No
• By food size	1	2	3	4	5	Yes	No
• By food smell	1	2	3	4	5	Yes	No
• By food taste	1	2	3	4	5	Yes	No
• By setting	1	2	3	4	5	Yes	No
• By who is present	1	2	3	4	5	Yes	No

Food Consistency

My child eats foods:

	Never		Sometimes		Always	Problem for you	
• Bite sized	1	2	3	4	5	Yes	No
• Chopped	1	2	3	4	5	Yes	No
• Ground	1	2	3	4	5	Yes	No
• Wet ground	1	2	3	4	5	Yes	No
• Pureed	1	2	3	4	5	Yes	No
• Liquid:	1	2	3	4	5	Yes	No
• Crunchy	1	2	3	4	5	Yes	No
• Soft	1	2	3	4	5	Yes	No

Feeding Rating Scale*

Rate each item below as: *0-rarely happens* *1-happens sometimes* *2-happens all the time*

- Independently eats meals: 0 1 2
- Exhibits problem behavior: 0 1 2
- Pushes food away: 0 1 2
- Steals food: 0 1 2
- Eats too quickly: 0 1 2
- Eats available food: 0 1 2
- Eats small amounts: 0 1 2
- Eats non-food: 0 1 2
- Chews properly: 0 1 2
- Insufficient chewing: 0 1 2
- Chokes on food: 0 1 2
- Spits out food: 0 1 2
- Vomits: 0 1 2
- Rumination: 0 1 2
- Ability to swallow food 0 1 2

*Revised from Matson & Kuhn (2001)

Feeding Scale*

Rate each item below as: *0-rarely happens 1-happens sometimes 2-happens all the time*

	CHILD		
• Enjoys eating	0	1	2
• Is interested in food	0	1	2
• Always asks for food	0	1	2
• Always asks for drinks	0	1	2
• Will try new foods	0	1	2
• Prefers the same foods at every meal	0	1	2
• Prefers to have foods served/prepared a certain way	0	1	2
• Refuses new foods at first	0	1	2
• Decides that s/he doesn't like the food before tasting it	0	1	2
• Takes more than 20 min. to finish meal	0	1	2
• Comes readily to mealtime	0	1	2
• Is flexible about mealtime routines	0	1	2
• Eats junky foods but will not eat at meals	0	1	2
• Gets up from table during meal	0	1	2
• Lets food sit in mouth and doesn't swallow	0	1	2
• Whines or cries at mealtimes	0	1	2
• Tantrums at mealtimes	0	1	2
• Is aggressive during mealtimes	0	1	2

*Revised from Behavior Pediatrics Feeding Assessment Scale (BPFAS) and Children's Eating Behavior Questionnaire

Rate each item below as: *0-rarely happens 1-happens sometimes 2-happens all the time*

• Closes mouth tightly when food is presented	0	1	2
• Delays eating by talking	0	1	2
• Would rather drink than eat	0	1	2
• Tries to negotiate what he/she will eat	0	1	2

PARENT/CAREGIVER

• I am frustrated/anxious when feeding my child	0	1	2
• I feel confident in my ability to manage my child's behavior at mealtime	0	1	2
• I coax my child to get him/her to take a bite	0	1	2
• I use threats to get my child to eat	0	1	2
• I feel confident my child gets enough to eat	0	1	2
• I get so angry at mealtimes that it takes me a while to calm down after the meal	0	1	2
• I disagree with other adults (spouse, child's grandparents) about how to feed my child	0	1	2
• If my child does not like what is being served, I make something else	0	1	2
• When my child refuses to eat, I put the food in his/ her mouth by force if necessary	0	1	2
• My child's eating affects my daily routine	0	1	2
• My child's eating affects our ability to eat together as a family	0	1	2
• My child's eating affects our ability to go out and eat	0	1	2

Rate each item below as: *0-rarely happens 1-happens sometimes 2-happens all the time*

• I feel confident in my ability to present a new food to my child	0	1	2
• I feel confident in my ability to get my child to taste new foods	0	1	2
• I feel confident in my ability to choose news foods my child will enjoy	0	1	2

Play and Preferences:

Pleas list your child's preferences for the following:

Toys, Games, Books:

_____

_____

Songs:

_____

_____

Television/Videos:

_____

_____

Praise (such as hugs, tickling, etc):

_____

_____

Activities (such as peek-a-boo, soccer, coloring, etc):

_____

_____

Appendix B

Treatment Integrity Checklist - Intervention

Experimenter: _____ **Date: _____**

Place a check in the appropriate box next to each statement.

	Correctly Implemented	**Incorrectly Implemented or Did Not Implement**
Materials were correctly set up prior to bringing the child into the room.		
The therapist informed the child that it is time to eat once they were both sitting.		
The therapist labeled all the foods on the plate.		
The therapist refrained from giving any instructions about the food.		
The therapist modeled initiation responses with a favorable affect.		
The therapist made neutral comments about neutral topics throughout the intervention.		
The therapist used differential reinforcement for movement across initiations.		
The therapist ended the session after 10 min or when the child indicated they were done.		

% of correctly implemented steps: _____

Treatment Integrity Checklist - Baseline

Experimenter: _____ **Date: _____**

Place a check in the appropriate box next to each statement.

	Correctly Implemented	**Incorrectly Implemented or Did Not Implement**
Materials were correctly set up prior to bringing the child into the room.		
The therapist informed the child that it is time to eat once they were both sitting.		
The therapist refrained from giving any instructions about the food.		
The therapist made neutral comments about neutral topics throughout the intervention.		
The therapist ended the session after 10 min or when the child indicated they were done.		

% of correctly implemented steps: _____

Appendix C

Social Validity Questionnaire

Child: _____ **Date: _____**

Parent: _____

Rate each item as: *0- disagree* *1- neither disagree nor agree* *2- agree*

1. Food selectivity is an important problem in my child's life.	0	1	2
2. I feel the intervention was helpful.	0	1	2
3. My child appeared comfortable during the intervention.	0	1	2
4. My child has been trying new foods at home or in other settings.	0	1	2
5. Mealtimes are less stressful following the intervention.	0	1	2
6. I feel more comfortable bringing my child to eat in public settings.	0	1	2
7. I feel my child is able to eat a healthier, more balanced diet.	0	1	2
8. I would recommend this procedure to others with children with food selectivity.	0	1	2