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# An Evaluation of the Efficacy of Antecedent Choice for Decreasing Food Selectivity in Children with Autism Spectrum Disorders

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**An Evaluation of the Efficacy of Antecedent Choice for Decreasing Food Selectivity  
In Children with Autism Spectrum Disorders**

by  
Star L. Lipe

A Thesis

Submitted to the Graduate Faculty of  
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in Partial Fulfillment of the Requirements  
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### **Abstract**

Children with autism are frequently labeled as selective or “picky” eaters (Volkert & Vaz, 2010). The purpose of the current study was to evaluate antecedent choice as an intervention for decreasing selective eating in children diagnosed with autism. The results show that choice as an antecedent intervention was not effective at increasing consumption of non-preferred foods for three children diagnosed with autism. Acceptance of non-preferred food was 0% in baseline for all participants and remained at 0% during choice between two non-preferred foods. A differential reinforcement of alternative behavior (DRA) component was added to the choice phase, but acceptance of the non-preferred bite remained at 0%. Discussion on possibilities for treatment failure and alternative interventions is provided.

**Keywords:** *choice, antecedent intervention, food selectivity, autism*

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## Chapter I

### INTRODUCTION AND REVIEW OF LITERATURE

Adequate nutrition is essential for survival. Most people eat a variety of foods throughout the day and week, such as having fajitas for supper one night and hamburgers the next. Some individuals will eat a very narrow variety of foods; for example, an individual may refuse to eat anything other than hog dogs or macaroni and cheese. This rigidity in food selection is commonly referred to as food selectivity (Volkert & Vaz, 2010). This is an especially prevalent problem in children with Autism Spectrum Disorders (ASD). Of children diagnosed with autism, 70% are labeled selective eaters (Volkert & Vaz, 2010), which complicates the intake of food necessary to thrive as adequate calories or nutrients may be lacking. The majority of research on food selectivity has included children with disabilities as participants. For example, Riordan, Iwata, Wohl, and Finney (1980) used differential reinforcement of alternative behavior (DRA), extinction, and fading to treat food selectivity and refusal in two children with intellectual disability. Patel, Piazza, Martinez, Volkert, and Santana (2002) also used DRA combined with escape extinction (EE) for three children diagnosed with a feeding disorder. Reed et al. (2004) used noncontingent reinforcement (NCR) plus EE with four boys diagnosed with poor oral intake and failure to thrive, while Wilder, Normand, and Atwell (2005) implemented NCR without EE for a girl diagnosed with ASD. Simultaneous presentation was used as a treatment for a 14-year-old boy diagnosed with autism by Ahearn (2003) (See *Treatments* section for definitions of treatments).

There is a vast array of feeding problems. Some children display a complete refusal to eat and are dependent upon gastrostomy-tube or nasogastronomy-tube feedings to maintain their

weight (Bachmeyer, 2009). In this case, a tube is implanted into the child's stomach with external access to allow formula to be dispensed directly into his or her stomach. Extra care such as time, formula, medical supplies, and nursing visits, are needed to monitor the tube's functioning and sanitation, and to prepare and administer feedings. Other children are designated as poor or selective eaters in which only a small amount, a narrow range, or certain kinds of foods are consumed (Seiverling, Williams, Sturme, & Hart, 2012). This review will focus on selective eating.

Non-compliance has been used to describe selective eating (Penrod, Gardella, & Fernand, 2012). Children may only eat from certain food groups while refusing to eat from others, only eat certain foods within food groups, or only eat foods with a particular flavor (Bachmeyer, 2009). For example, a child may eat foods from the protein food group and refuse foods from the vegetable and fruit groups; the child's diet would be exclusively meats and would suffer from the lost vitamins and minerals necessary from fruits and vegetables. An individual may also be selective within a food group. For example, within the grain group, the child may eat only white bread, but no other forms of grains resulting in a loss of fiber. Eating foods only with a particular flavor could manifest as the child requiring that all of his or her foods are salty. Salt could be added to bland foods, along with risk factors associated with elevated sodium levels. There may be additional criteria with some children, for example, only eating chicken nuggets that are in a particular shape.

Children who exhibit feeding problems are at risk for incomplete daily nutritional needs, weight loss, lethargy, and delayed mental and physical development (Bachmeyer, 2009; Penrod et al., 2012). The families of these children are also adversely affected with a higher risk for



stress and mental health problems (Bachmeyer, 2009). Even cooking a simple meal can be very stressful for these families because they may need to make an additional meal for the selective eater, there may be an argument to try to get that child to eat with the family, or the family has to conform to the restricted diet of the selective eater. By reducing selective eating in children, the risk factors that affect the child and the stress on their family can be decreased.

Inappropriate behavioral contingencies are speculated to be a contributing factor in the development of feeding problems (Bachmeyer, 2009; Penrod et al., 2012). For example, when a child refuses to eat a food that is presented during a meal, and perhaps engages in problem behavior, food refusal and problem behavior is negatively reinforced if parents or caregivers allow the child to be excused from the meal or remove the food from his or her plate.

Inappropriate meal-time behavior may also be positively reinforced if the parent or caregiver provides the child with a preferred food following food refusal and problem behavior.

Therefore, positive and negative reinforcement can strengthen and maintain inappropriate meal-time behaviors, such as food refusal and tantrums (Bachmeyer, 2009; Penrod et al., 2012).

Penrod et al. pointed out that parents' behavior may be negatively reinforced for continuing to present only preferred foods to their child as they escape or avoid the inappropriate meal-time behaviors.

### **Treatments**

A variety of treatments have been evaluated for food selectivity such as EE, DRA, NCR, simultaneous presentation, stimulus fading, and high-probability (high-p) instructions (Ahearn, 2003; Cooper et al., 1999; Meier, Fryling, & Wallace, 2012; Reed et al., 2004; Riordan et al., 1980; Tiger & Hanley, 2006; Valdimarsdóttir, Halldórsdóttir, & Sigurádóttir, 2010; Wilder et al.,

2005). The effectiveness of each treatment will be influenced by the presence or absence of problem behavior and the individual participants involved. For example, EE is difficult to implement with integrity if the child is strong and has aggressive behaviors as he or she may overpower you and escape from the bite. There are varying degrees of complexity, parental acceptance, and potential side effects with each intervention.

### **Consequent Manipulations**

One category of treatments for food selectivity involves consequent manipulations, including EE and DRA.

**Escape extinction.** EE is a procedure that is commonly used in conjunction with another intervention, especially when results are not obtained with the alternative intervention alone (Patel et al., 2002; Reed et al., 2004; Volkert & Vaz, 2010). When food selectivity or refusal is maintained by negative reinforcement in the form of escape from the demand of eating or of a particular food, escape extinction removes the possibility of escape. Non-removal of the spoon is a common EE procedure in which a bite of food is presented to the child and the spoon is not removed until the child consumes the bite (Patel et al., 2002; Reed et al., 2004). Physical guidance may be included. This involves exerting gentle pressure on the child's chin or mandibular joint to open the mouth and place food inside his or her mouth (Bachmeyer, 2009).

EE can produce an extinction burst, emotional responding, or aggression (Cooper, Heron, & Heward, 2007). As a child gets older and stronger, EE may not be able to be carried out with high treatment fidelity if the parent is unable to maintain physical control. In addition, parents and caregivers may not follow the procedure if one of the side effects occurs and an immediate solution is not seen (Bachmeyer, 2009).

**Differential reinforcement of alternative behavior.** DRA is a procedure in which a preferred item or edible is provided contingent upon behaviors alternative to food refusal, such as food acceptance (Patel et al., 2002). According to a review conducted by Bachmeyer (2009), the reinforcers used during the DRA component of studies reviewed used highly preferred foods as the reinforcers.

Riordan et al. (1980) used DRA, EE, and fading to increase food consumption and decrease problem behaviors in two children with intellectual disability considered to be selective eaters. Amy and Lisa, ages 6 and 9, did not lack the oral motor skills necessary for food intake or have digestive issues which hindered food consumption. Throughout the study, the participants were given high-caloric drinks multiple times per day as well as preferred foods at dinner and on the weekends as recommended by a nutritionist to maintain weight.

Treatment occurred five days a week. Amy's sessions consisted of two, 20 min meals and Lisa's consisted of four, 10 min meals (Riordan et al., 1980). Each meal was comprised of five items for Amy and three items for Lisa. Each item from the meal was from a different food group. Dependent variables included: bites/sips, food expulsion, empty mouth, tongue protrusion, hands in mouth, and disruptive behavior. The number of grams consumed during each meal was calculated by weighing the meal before and after each session and subtracting post-session weight from the pre-session weight.

Riordan et al. (1980) evaluated the treatment using a multiple baseline design across foods for each participant. During baseline, each participant was given a meal and told to eat. No consequences were delivered for food acceptance or problem behavior, except that the participant was returned to the meal if she tried to leave. During the reinforcement for bites/sips

phase, a bite of preferred food and praise was provided contingent upon a bite of the target food. Over the course of the meals, the number of target food bites required increased prior to delivery of the preferred food bite. Treatment started with one food from a food group and gradually included other food groups. The reinforcement for bites/sips plus swallows phase was implemented when there was observation of participants packing bites/sips into their mouth and expelling the food or liquid after the bite of preferred food was given (Riordan et al., 1980). In this phase, the bite of preferred food was only provided after the participant showed an empty mouth.

The results of Riordan et al. (1980) showed that the consumption of target foods increased substantially, while there was a decrease in food expulsion. Food expulsion occurred at low rates throughout the study and disruptive behaviors were rarely scored. The number of grams consumed during each session increased and both participants experienced weight-gain. Lisa was able to discontinue her high-caloric drink supplement and Amy's was delivered to her less often.

While Riordan et al. (1980) was able to use DRA effectively, problem behaviors and refusal of food did not produce differential consequences. In addition, neither participant reached their goal weight. This suggests that the issues with food selectivity and low intake were not completely solved. It was noted that weight loss occurred after brief visits home.

The type and amount of reinforcer used to treat food selectivity is a variable that must be taken into account. Cooper et al. (1999) found that the quality and quantity of the reinforcer had an effect on treatment for four selective eaters. The participants were able to safely chew and swallow food but were lacking growth and development due to feeding problems. The

dependent variables included choice of food and number of consumed bites. The independent variables included quantity of reinforcement, quality of reinforcement, response effort, choice, availability of reinforcement, and EE. A concurrent schedule and reversal design was used to assess treatment effects.

For Experiment 1 during baseline, Cooper et al. (1999) instructed the mother to feed her child in her usual manner while antecedent-behavior-consequence (ABC) data were collected on food acceptance and refusal behaviors. Different conditions of intervention were presented to determine the effects of each independent variable. Colored placemats were used to distinguish between options. The quantity of the reinforcer was evaluated by comparing one bite of target food with one bite/sip of preferred food and one bite of target food with two bites/sips of preferred foods. Bites of target foods were presented without preferred foods to determine the effects of the quality of the reinforcer; preferred foods were hypothesized to be a higher quality reinforcer when compared to praise.

Cooper et al. (1999) developed a treatment package based on the above results. If one target bite was consumed, then one bite/sip of preferred food was provided. If two consecutive bites of target food were consumed, then four bites/sips of preferred food were delivered.

Food acceptance increased when the quality or quantity of the reinforcer was increased (Cooper et al., 1999). Thus, to increase the acceptance of non-preferred foods using a DRA procedure, highly-preferred foods and drinks should be identified and used as reinforcers rather than praise alone. In addition, the quantity of reinforcement may need to start out large, such as double the amount of the non-preferred food, which can then be faded over the course of treatment as acceptance of non-preferred foods increases.

There are some limitations regarding implementing DRA in isolation for treatment of food selectivity. For example, DRA may not be effective without EE, which can lead to unpleasant side effects. Patel et al. (2002) implemented reinforcement for acceptance of foods and clean mouth (i.e., no food larger than the size of a pea remaining in mouth), which was not effective in isolation. Reinforcement combined with escape extinction was able to increase the acceptance of foods and clean mouth. Another study used a treatment package of DRA, EE, and stimulus fading to effectively increase the acceptance of food in a young child with autism, who was a selective eater (Valdimarsdóttir et al., 2010).

Implementation of EE appears to be labor intensive because of the length of time that could be involved and managing problem behaviors. Patel et al. (2002) engaged in non-removal of the spoon if the participant engaged in an inappropriate behavior with verbal prompts to take a bite on a FT 30 s schedule. Also, sessions were not terminated until the participant had consumed the last presented bite after 5 min had elapsed. If a participant did not take a bite for 20 min, then the researcher held a spoon in front of the child's face for 20 min. This may not be realistic for a parent to implement, especially if there are siblings to feed or work schedules to keep. EE may become more aversive to parents when considering the possible negative side effects of an extinction burst, emotional responding, or aggression.

### **Antecedent Manipulations**

Another category of treatment includes interventions which are based upon antecedent manipulations, including NCR, simultaneous presentation, stimulus fading, HP instructions, and providing choices.

**Noncontingent reinforcement.** NCR consists of providing known reinforcers, such as preferred edibles, videos, toys, escape, or attention, throughout the meal. Reinforcers are presented independent of behavior on a fixed- or variable-time schedule. If effective, NCR is an abolishing operation because providing the functional reinforcer non-contingently decreases the motivation to engage in the behavior to gain access to it (Cooper et al., 2007). NCR may be used with or without extinction. Using physical guidance or non-removal of the spoon with NCR will place food refusal on extinction.

Reed et al. (2004) found NCR to be ineffective in treating the poor oral intake of four young boys in the absence of escape extinction. The dependent variables were acceptance, inappropriate behavior, and negative vocalizations. A multielement design was used to determine the effectiveness of NCR with escape and NCR with escape extinction compared to escape and escape extinction, respectively.

Baseline consisted of escape. Bites or drinks were presented every 30 s. Following acceptance, brief verbal praise was delivered. If the child vomited or expelled the food, no differential consequences were provided and presentation of bites continued. Inappropriate behaviors resulted in removal of the bite or drink for 15 s. During NCR plus escape, toys were placed on the child's tray and therapists provided attention. The remainder of procedures were the same as baseline. EE was similar to escape baseline, except inappropriate behaviors produced non-removal of the spoon rather than removal of the bite or drink for 15 s. Expelled bites were scooped back up and re-presented until consumed. NCR plus EE followed the escape extinction procedures outlined above and the NCR procedures were the same as outlined in NCR plus escape.

The results of Reed et al. (2004) were that acceptance increased only during EE and NCR plus EE. Acceptance increased regardless of whether NCR was absent or present. Inappropriate behavior did not decrease when NCR was implemented without EE. It is likely that acceptance of food did not increase using NCR alone as there was no reinforcement contingency for acceptance. If the inappropriate behavior was maintained through escape, then the attention and toys provided likely did not function as reinforcers, and an abolishing operation was not in effect, which means that the procedure did not function as NCR.

Wilder et al. (2005) showed that NCR without escape extinction was effective in treating the food refusal of a girl diagnosed with autism, in contrast to Reed et al. (2004). A functional analysis concluded that self-injurious behavior (SIB) was maintained by escape from bite presentation. Therefore, SIB resulted in a 15-s break from bite presentations (i.e., EE was not implemented), yet non-removal of the spoon was used in the absence of SIB. The participant was shown a highly-preferred movie during the meal, which functioned as NCR. The combination of these procedures resulted in an increased acceptance of food and decreased SIB.

**Simultaneous presentation.** Presenting a non-preferred food at the same time as a preferred food is called simultaneous presentation (Ahearn, 2003). The two foods can be mixed together, presented within the same bite, or the preferred food can cover the non-preferred food (Bachmeyer, 2009). According to Piazza et al. (2002), simultaneous presentation may be effective as a result of flavor-flavor conditioning. That is, the flavor of the preferred food may produce a conditioned preference for the flavor of the non-preferred food. When an unconditioned stimulus (i.e., a preferred food) is paired with a neutral stimulus (i.e., a novel food) repeatedly, then a conditioned response (i.e., preferred taste) develops.



Ahearn (2003) used simultaneous presentation of preferred and non-preferred foods with a 14-year-old boy diagnosed with autism who exhibited food selectivity. The participant did not eat anything from the vegetable food group. DRA had failed as a prior treatment method for consumption of vegetables. A single bite of each vegetable was presented five consecutive times during each session every 30 s. The dependent variable was percentage of bites accepted.

During baseline, a single bite of target food was presented to the participant (Ahearn, 2003). There were no consequences for consumption of the bite. If the participant did not move toward acceptance of the bite within 5 s, then the bite was removed and a new bite was presented. The simultaneous presentation phase was identical to baseline with the following exception: 5 cc of a preferred condiment was placed on top of the target bite, with part of the target bite still visible so as to not completely change the visual appearance of the vegetables.

To determine preferred condiments, a paired-stimulus preference assessment was conducted. The top three condiments were used throughout the simultaneous presentation phase. Each condiment was evaluated in its own condition, within a multiple baseline across food items design to determine the effectiveness of simultaneous presentation.

The results of Ahearn (2003) were that simultaneous presentation increased vegetable consumption. During baseline, the participant consumed 0-3 out of 55 bites of three types of vegetables. With the simultaneous presentation of the condiments, acceptance of all three types of vegetables increased to 100%. A one-year follow-up showed that the participant continued to eat his vegetables *with* condiments.

Simultaneous presentation may be effective when preferred foods can be determined, however, there is a limitation to using this procedure. If the child will only eat a few foods,

simultaneous presentation may not be the safest treatment method as pairing the preferred food with a non-preferred food may result in the preferred food becoming non-preferred (Bachmeyer, 2009). If a child only accepts a few types of food, a decrease in the types accepted could result in failure to thrive.

**Stimulus fading.** A third antecedent manipulation is stimulus fading. During stimulus fading, the ratio of preferred to non-preferred foods and liquids is gradually changed until the food or liquid is composed mainly of the non-preferred food or liquid, which can be used after simultaneous presentation.

Tiger and Hanley (2006) were able to increase milk consumption in a 4-year-old, typically developing boy by using stimulus fading. The participant had a separate milk pitcher from which his milk was poured, which allowed teachers to measure the number of ounces of milk before and after the meal to determine how much the participant had consumed.

The teacher at school told the participant to pour his milk from the pitcher to his cup (as was the routine) during baseline, but did not tell him to drink it. No consequences were provided for drinking or not drinking. During baseline, the participant did not drink any of his milk. In the stimulus fading condition, the only difference was that the teacher mixed 5 ml of chocolate syrup (a preferred flavor) into the pitcher of milk prior to serving it to the participant. On the first day that chocolate syrup was added, the participant was told that it was chocolate milk and he could drink it. After chocolate syrup was added, the participant drank all of his milk. After two weeks of pairing the chocolate syrup with the milk, the fading procedure began; every two meals, the chocolate syrup was faded out by 0.2 ml. Across 48 meals, the chocolate syrup was faded until only plain milk was presented.

At the completion of the fading procedure, milk consumption was variable, but some milk was drank at each meal. The participant's parents were taught to conduct the stimulus fading procedure and milk consumption increased at home as well. A limitation of the study was that the fading may have been unnecessarily slow, which can be addressed with the use of probing the terminal ratio after each successful fading step.

Simultaneous presentation and stimulus fading are often used in combination (Tiger & Hanley, 2006), but simultaneous presentation may be used independently (Ahearn, 2003). Simultaneous presentation is used to increase the acceptance of the target food or drink and stimulus fading is a procedure which fades to preferred food or liquid so only the initially nonpreferred food remains. As mentioned previously, simultaneous presentation should be used with caution if the participant has a narrow selection of preferred foods as it may condition the preferred foods as nonpreferred foods. In addition, it is sometimes difficult to find a highly-preferred food that is able to be presented with the nonpreferred food. Stimulus fading can also be labor intensive to implement for parents and caregivers due to the slow and gradual steps. Further, precise and frequent measurements are made throughout each fading step, which increases the amount of time and effort that parents or caregivers would have to expend during the intervention.

**High-p instructions.** A fourth antecedent intervention for food selectivity is the high-p instructional sequence. A series of instructions are presented in which compliance is highly probable. These instructions are followed by an instruction in which compliance with is unlikely (Bachmeyer, 2009).

Meier et al. (2012) used the HP instructional sequence to increase the acceptance of non-preferred foods in a 3-year-old girl diagnosed with autism. The participant would shake her head, say “no,” and turn her head away when particular fruits and vegetables were presented. During the participant’s regular snack times, 1-2, 10-trial blocks were completed, with sessions being conducted three to five times per week. The dependent variables were percentage of acceptance of low-p and high-p foods. The effectiveness of the high-p sequence was evaluated using nonconcurrent multiple baseline and reversal designs. The high-p foods were identified by parents and tested by presenting each food 20 times; the 20 bites of each food were accepted during 100% of the presentations.

Baseline consisted of presenting 10 bites of low-p foods every 15 s. If the participant accepted the food, praise was provided. If the bite was not consumed within 6 s, the plate was pushed away, or she said “no,” the therapist removed the plate and bite. During the high-p sequence, 10 trials were conducted per session, and there were 4 bites in each trial. The first 3 bites consisted of the high-p food and the fourth bite was the low-p food. Bite presentations were presented every 3-5 s within each trial. The high-p sequence was faded by removing one high-p instruction when the low-p food acceptance was 80% or higher for three consecutive sessions.

The high-p instructional sequence increased acceptance of nonpreferred foods. During baseline, acceptance varied from 10-30% of trials. After the high-p sequence, acceptance increased to 67-100%. Limitations included acceptance increased with only three foods, and bite presentations were rapid which may not make this feasible for children with inadequate chewing skills.

**Providing choices.** Providing choices has been used to increase healthy food choices in large-scale studies in elementary schools (e.g., Hendy, Williams, & Camise, 2005, 2011). Hendy et al. (2005) designed the “Kids Choice” school lunch program, which is a treatment package containing token reinforcement, food choice, and peer participation used to increase the consumption of fruits and vegetables among children. The participants were 346 students from the first, second, and fourth grades of an elementary school. Regardless of which treatment condition the children were in, all children received the same fruits and vegetables on their trays. For the choice component, the children were given fruit and vegetable choices by adding one fresh fruit (i.e., apple, orange, or banana) and one fresh vegetable (i.e., celery, baby carrots, or grape tomatoes) to each lunch for a total of two fruit and two vegetable options. The students were allowed to choose which fruit and vegetable to eat from two choices of each. Throughout the study, the classrooms of each grade were divided into two groups; one group would receive token reinforcement for fruit consumption and the other group would receive token reinforcement for vegetable consumption. During baseline, trained observers recorded the fruit and vegetable consumption of the students. Each observer recorded consumption behavior of up to 12 students. Consumption of a fruit or vegetable was scored if the child consumed at least one-eighth cup of any fruit and any vegetable during the lunch period. In the token reinforcement condition, fruit and vegetable consumption was collected in the same manner as baseline. Two peers explained to the rest of the grade how much fruits and vegetables needed to be eaten in order to receive a token. Once per week the tokens could be turned in for a small prize on the “reward day.” The results were that the “Kids Choice” program was effective for increasing children’s fruit and vegetable consumption. The increase in fruit and vegetable consumption was

present in the first, second, and fourth grades, and the increased consumption was maintained throughout the program.

Hendy et al. (2011) evaluated whether the “Kids Choice” program was an effective intervention for increasing children’s weight-management behaviors and decreasing body mass index percentile (BMI) for overweight and average-weight children. The “Kids Choice” program consisted of children wearing nametags during lunch and recess, wearing pedometers at school and home, and parent record cards so parents could report behaviors that occurred during dinner. If the child was observed engaging in a weight-management behavior, then they received a punch in their nametag (i.e., a token system redeemable for tangible items). Weight-management behaviors included eating one-eighth of a cup of fruits or vegetables first during lunch, choosing a healthy drink that was low in fat and sugar, and obtaining 5,000 steps per week. For each behavior in the “Kids Choice” program, there were at least two choices available. For example, a child could choose between an apple or banana for his or her fruit choice, low-fat white milk or 100% fruit juice for their healthy drink, and walking or running for their exercise activity. Ten punches could be turned in weekly on “reward day” for a prize. Participants included 382 students from first through fourth grade who did not participate in previous studies. The students were divided into two groups. One group received punches on their name tag for weight-management behaviors (experimental group) and the other group received punches on their name tag for “Good Citizenship Behaviors” (control group). The “Kids Choice” program was effective in increasing children’s weight-management behaviors and decreasing their BMI% for the experimental group as well as the control group. The authors stated that the control group was affected by the experimental group through peer-modeling

effects. Perhaps the effectiveness for both the experimental and control groups is indicative of lack of experimental control. Increases in eating fruits and vegetables first, choosing low-fat, low-sugar drinks, and exercise were prevalent over the course of the three-month program. BMI% decreased a mean of 2.6% for overweight children and a mean of 2.4% for average-weight children. Evaluating a procedure based on weight may not be the most effective measure as children naturally gain weight as they grow. Furthermore, it was not noted whether these children had issues with food selectivity.

In addition to increasing healthy food choices, providing choices has been able to decrease inappropriate behavior and increase appropriate behavior without the use of EE (Dunlap et al., 1994; Dyer, Dunlap, & Winterling, 1990; Tasky, Rudrud, Schulze, & Rapp, 2008). Romaniuk et al. (2002) evaluated the effects of choice in seven participants diagnosed with developmental disabilities whose problem behavior was maintained by either escape from demands or by attention. The dependent variable was either the percentage of session time that problem behavior occurred or the frequency of problem behavior. Researchers presented the participants with either a choice or no-choice condition during which educational tasks were completed after conducting a functional analysis to determine the function of their behavior and holding all other variables constant. During the no-choice condition, teachers chose the educational task for the student; in the choice condition the student was allowed to choose which task to work on. If problem behaviors were maintained by attention, then in the choice and no-choice condition, problem behaviors resulted in 5 s of attention. When problem behaviors occurred that were maintained by escape from demands, a 10 s escape was provided. These conditions were kept constant to determine the effects of choice versus no-choice. The authors

concluded that providing choices decreased problem behaviors for the participants whose behavior was maintained by escape from demands because the opportunity to choose the task reduced the motivating operation of escape. Because the participants were able to choose their demands the situation became less aversive than when demands were placed by the teacher.

There has also been a considerable amount of research showing that choice contexts are preferred over no-choice contexts (Ackerlund Brandt, Dozier, Juanico, Laudont, & Mick; in press; Schmidt, Hanley, & Layer, 2009; Tiger, Hanley, & Hernandez, 2006). Schmidt et al. (2009) demonstrated that choice contexts were preferred over no-choice contexts, regardless of the preference level (high vs. low) of the reinforcers presented. The authors presented three educational worksheets which were associated with choice, no-choice, or control conditions. If the participant picked the choice condition, then he or she was able to pick one highly-preferred item from a set of identical items; the no-choice condition resulted in the experimenter choosing; and the control condition resulted in no highly-preferred item. Participants chose the worksheet associated with the choice context more often than the worksheet associated with the no-choice context. This was repeated with identical sets of low preferred items, and similar results were found; children were more likely to select the worksheet associated with the choice context. The results are important as they show that providing choices is preferred by the majority of children even if the reinforcers delivered are low-preferred items. Selecting the worksheet associated with the choice context even when low-preferred items were provided indicates that providing choices of non-preferred foods may be effective at increasing acceptance because the overall context may be less aversive.



### **Intervention Limitations**

Consequence-based interventions have been evaluated to treat food selectivity, and are highly effective; however, in the majority of cases, EE must be used in addition to DRA (Patel et al., 2002; Riordan et al., 1980; Valdimarsdóttir et al., 2010). Oftentimes these procedures are used in a structured, clinical setting by trained professionals (Patel et al., 2002; Riordan et al., 1980; Valdimarsdóttir et al., 2010). These professionals would be well-prepared for the side effects that are associated with EE (e.g., extinction bursts, emotional responding); however, these side effects are often aversive for parents and caregivers, which can result in low treatment fidelity and persistence or strengthening of food selectivity and refusal in less-structured settings. If low treatment fidelity occurs, and the food selectivity persists or gets worse, it may be assumed by parents that these procedures are actually ineffective.

Antecedent-based interventions have also been evaluated for treatment of food selectivity and are effective, even in the absence of EE (Ahern, 2003; Hendy et al., 2005, 2011; Meier et al., 2012; Tiger & Hanley, 2006; Wilder et al., 2005). Because these interventions may be conducted without the addition of EE, it may be that the side effects associated with EE will not be as prevalent; therefore, making these options a more-preferred option for parents and caregivers. However, it is possible that these procedures will not be as effective as consequence-based interventions. It may be that these interventions will take too long or be too labor-intensive for parents and caregivers to implement.

The social acceptance of antecedent-based interventions may override the efficiency of consequence-based interventions in many less-structured settings. An intervention such as providing choices is a relatively low effort manipulation that many parents or caregivers can

include in their day-to-day schedules. Also, the likelihood that the children will prefer to have choices is high; therefore, increasing the consumer satisfaction of the intervention.

### **Purpose**

The purpose of the current study was to evaluate the efficacy of providing antecedent choices to increase acceptance of non-preferred foods, therefore decreasing food selectivity and problem behavior. When choice was not effective, a combined antecedent and consequent intervention was implemented: choice + DRA.

## **Chapter II**

### **METHOD**

#### **Participants and Setting**

Participants were recruited from a school for students with special needs using recruitment flyers (see Appendix A). Participants chosen met the following conditions: (a) parental consent to be a participant was obtained, (b) qualified as having ASD, (c) between the ages of 4 and 10 years of age, (d) had developed chewing and swallowing skills previously, (e) did not possess medical problems that interfered with or prevented appropriate eating, such as underdeveloped chewing and swallowing skills (f), displayed food selectivity as reported by parents, and (g) were able to choose one item when presented with an array of two items. Contingent upon textural issues, non-preferred foods would have been matched for texture to foods the participant was currently consuming to decrease the risk of choking; all participants were able to eat all textures, so this was not necessary.

Kishan was a 4-year-old boy diagnosed with an autism spectrum disorder. At the time of the study, he attended a clinic for children with special needs two days per week. His mother reported that she pureed his meals twice a day with a fiber supplement, but that he was capable of chewing foods of various textures and did so once per day. After conducting a preferred and non-preferred food assessment for individuals with severe disabilities (modified RAISD, see Appendix C for sample) with Kishan's mother, we found that he ate a variety of grains and dairy products, and his meat acceptance was moderate, but not concerning. Kishan consumed a few vegetables if they were prepared with Indian spices and cooking methods, however he did not consume "American" style vegetables, such as carrots or corn. The only fruits Kishan tolerated

were bananas and pureed mango, which was a large deficit area in his diet. After a pre-assessment with Kishan, raw carrots and grapes were the foods chosen to include in the study. The pre-assessment also revealed that Kishan manipulated eating utensils in a non-functional way (i.e., he played with them) and ate with his hands, therefore utensils were not provided during sessions.

Chase was a 10-year-old boy diagnosed with an autism spectrum disorder. At the time of the study he attended school five days per week at a school for children with special needs. After conducting the modified RAISD with both parents, we concluded that Chase had a diet lacking variety, vitamins, and nutrients. He ate several grain products provided that they were toasted or crunchy. Chase refused all fruits and vegetables, with the exception of consuming oranges if instructed to do so. His meat consumption was limited to chicken, nuts, and fried pork rinds, and his dairy consumption was ice cream and frappuccino. A pre-assessment showed that Chase ate with his hands; therefore eating utensils were not provided during the study. Apples and raw tomatoes were the foods chosen for food acceptance.

Ethan was a 10-year-old boy (he turned 11 near the completion of the study) diagnosed with an autism spectrum disorder. He attended school five days per week at a school for children with special needs. The modified RAISD was conducted with his mother, which highlighted a few deficit food groups. Ethan only ate salad and cottage cheese from the vegetable and dairy groups, respectively. His meat and grain consumption included a variety of foods, such as chicken, pork chops, steak, sausage, bread, pancakes, crackers, and rice. Although he only ate apples, watermelon, and grapes from the fruit group, his mother reported that she would like to focus on the vegetable or dairy groups as those contained larger deficits. The pre-assessment

showed that Ethan ate with his hands; therefore no eating utensils were provided during the study. Also, Ethan manipulated foods with crisp or crunchy textures more often than foods with softer textures; celery and raw green pepper were chosen for the study.

Research was conducted at the school and clinic (same location) in the kitchen, lunchroom, or a classroom. Materials included a variety of non-preferred foods, large and small paper plates, high-preferred foods, a video recording device (i.e., phone, tablet, or camera), data sheets, and writing utensils.

### **Response Definition and Measurement**

Trained observers observed and recorded data via paper and pencil (see Appendix B for data sheet example). The primary dependent variables were the percentage of trials of acceptance ( $\# \text{ of acceptance} / \text{total number of trials} \times 100\%$ ) and non-acceptance ( $\# \text{ of non-acceptance} / \text{total number of trials} \times 100\%$ ) of food during each session. *Acceptance* was defined as the entire bite of food presented entering the mouth, past the plane of the lips within 5 s of presentation and the lips closing. The entire piece of food had to come out of the fingers to count as acceptance. Examples of acceptance include, placing the bite into the mouth, chewing, and swallowing (no expulsion); taking small bites of the food until the entire bite of food is consumed without spitting pieces out in-between bites (within 5 s); and placing the bite into the mouth, chewing, and swallowing without expulsion even if vocal protests occur during the process. *Non-acceptance* was defined as the entire bite of food was not consumed within 5 s. Examples of non-acceptance include, placing the bite into mouth, but still holding it in fingers; placing bite into mouth with no chewing or swallowing; eating only part of the food; pushing the plate or food away, or saying “no” when food is presented; grabbing food but not placing it in

mouth within 5 s; pushing food away or saying “no” during the 5 s; placing the entire bite into the mouth, playing with food (e.g., chewing, scraping teeth along food, licking, biting), and spitting out; and placing the entire bite into the mouth, then spitting the bite out. *Problem behavior* for Kishan was defined as flopping to the ground, leaving chair, grabbing researcher or materials, whining (must occur for at least 2 s to be scored), and crying. Chase’s problem behavior included leaving chair, grabbing researcher or materials, vocal protests, and whining. Problem behaviors for Ethan included grabbing researcher materials, vocal protests, and whining. When problem behavior was present during a trial, a (+) was score; when no problem behavior occurred, then a (-) was scored. A trial’s starting point was the beginning of the instruction to eat and ended immediately before the next instruction was presented.

All sessions were video recorded and later scored by a second, independent observer for interobserver agreement (IOA). The secondary observer also scored sessions in-vivo when scheduling allowed. IOA was scored using the total-trial method ( $\frac{\# \text{ agreement trials}}{\text{total \# trials}} \times 100\%$ ) for an average of 46% (range 33%-100%) of baseline, choice, and choice + DRA sessions for all participants. For all three participants, IOA was 100% for acceptance across baseline, choice, and choice + DRA. For Kishan’s occurrence of problem behavior, scores were 100%, 95% (range of 90%-100%), and 93% (range of 80%-100%) across baseline, choice, and choice + DRA sessions, respectively. Ethan’s occurrence of problem behavior IOA scores were 100% for both baseline and choice + DRA, and 95% (range of 90%-100%) for choice sessions. During baseline, Chase’s score for occurrence of problem behavior was 93% (range of 80%-100%), and 100% for both choice and choice + DRA.

## **Experimental Design**

A multiple baseline across participants design was used to determine the effectiveness of providing choices on increasing non-preferred foods in children diagnosed with ASD.

### **Preference Questionnaire and Pre-Assessment**

One or both parents were interviewed concerning their child's preferred and non-preferred foods using a modified version of the Reinforcement Assessment for Individuals with Severe Disabilities (RAISD) (see Appendix C). The modifications were including only questions about preferred and non-preferred foods. A pre-assessment was conducted to observe food consumption and problem behaviors. The pre-assessment contained four non-preferred and two preferred foods, each presented three times in random order, with the instruction "eat this." The participant had 5 s to consume the food. If the participant accepted the bite, the 10 s inter-trial interval (ITI) occurred and the next bite was presented. If the participant did not accept the bite or engaged in problem behavior, the bite was removed, the 10 s ITI followed, and the next bite was presented. No consequences were provided for acceptance, non-acceptance, or problem behavior (other than being returned to the table). Brief praise, not related to eating was provided for good sitting at the end of the pre-assessment.

### **Procedures**

Sessions occurred at various times throughout the day, which was dependent upon mutual availability of researcher and participant. Sessions occurred at least one hour after the participant had a significant meal, snack, or high-caloric drink to ensure that satiation did not interfere with food acceptance. Ten trials were conducted during each session; each trial lasted no longer than 30 s, for a maximum of 5 min per session. A maximum of four sessions were

conducted one to four days per week, with the exception of 0 sessions run during a week due to a participant and researcher being on vacation. The researcher sat across from or next to the participant at the designated eating area.

**Baseline.** During baseline sessions, the participant was presented with a 1-1.5 cm bite (Meier et al., 2012) of a non-preferred food on a small paper plate and told, “Take a bite.” Five bites of each of the two non-preferred foods were presented randomly by using an online random list generator ([www.random.org/lists](http://www.random.org/lists)) with the rule that the same food could not be presented more than two times consecutively. If the randomly generated list did not follow this rule, it was regenerated until it met the criteria. The bite remained on the plate in front of the participant for 5 s or was removed if the participant engaged in problem behavior or pushed the food or plate away. An inter-trial interval of approximately 10 s followed each accepted or non-accepted bite, after which the next bite was presented. There were no consequences for acceptance, non-acceptance, or problem behavior, except for returning the participant to the table if they left. During the study, Chase started training for appropriate requests for a break, which resulted in a 30 s break on a nearby mat on the floor. If Chase requested a “break,” it was provided as described above. Anecdotally speaking, the request for “break” happened a few times during one or two sessions only. After ten trials were presented, brief praise, not related to eating was provided, such as, “Thanks for sitting with me, you did great.”

**Choice.** During choice sessions, the participant was presented with a 1-1.5 cm bite of two non-preferred foods on a small paper plate and told “Pick one and eat it.” Ten bites of each of the two non-preferred foods were presented randomly from left to right on the plate by using an online random list generator ([www.random.org/lists](http://www.random.org/lists)) with the rule that the same food could not



be presented more than two times consecutively in the same placement. If the randomly generated list did not follow this rule, it was regenerated until it met the criteria. Contingencies for acceptance, non-acceptance, and problem behavior were the same as in baseline, as were the remainder of the procedures.

**Choice + DRA.** If the participant did not accept the food for 30% or more trials on six consecutive choice sessions, then the choice + DRA condition was implemented. During choice + DRA sessions, the participant was presented with a choice of non-preferred foods as in the choice session; however, he was also told, “Pick one and eat it, then you get (name of preferred food).” (e.g., “Pick one and eat it, then you get cookie.”). The 1-1.5 cm bite of preferred food was on a separate, small paper plate, in view, but near the researcher. The presentation and removal of food, and ITI were the same as in baseline and choice, but consequences were different. Contingent upon accepting one or both of the non-preferred foods, the participant was given the bite of preferred food and brief, behavior specific praise. For non-acceptance of either bite, the preferred food was removed and the researcher turned away from the participant during the ITI. To determine the preferred food to use in choice + DRA, a paired-choice preference assessment (Fisher et al., 1992) was conducted with two to three foods from the modified RAISD for the first session of each day. Each child had previous experience with the foods presented during the preference assessment as they were used commonly at the school and clinic for edible reinforcement, so sampling the foods before the preference assessment did not occur. The food selected during the preference assessment was used for the remainder of sessions on the same day it was conducted. The participants consistently chose the same preferred food

during each preference assessment with the exception of Chase choosing a different type of cracker during one.

### Chapter III

#### RESULTS

Figure 1 (see Appendix D) shows the percentage of occurrence of problem behavior and acceptance per session for each participant. During baseline, Kishan's acceptance was 0% of trials whereas problem behavior averaged 53% of trials (range of 30%-70%). During the choice condition, his acceptance remained at 0% and trials with problem behavior decreased to an average of 38% (range of 10%-70%). Acceptance continued at 0% in choice + DRA and trials with problem behavior remained similar with an average of 37% of trials (range of 10%-90%). Problem behavior descriptions were recorded during sessions as anecdotal data and showed that problem behavior appeared more severe in baseline compared to choice and choice + DRA sessions. For example, during baseline, Kishan engaged in screaming, crying, and whining that lasted a significant duration. Also, his elopement was also more intense; he would get up from the chair, flop to the ground, make his body limp when the researcher attempted to place him back in his chair, and refuse to stay seated during baseline. In choice and choice + DRA phases, Kishan's elopement consisted of getting up from the chair, with less resistance going back to the chair and laughing more often than crying.

Ethan's acceptance was 0% of trials during baseline with occurrence of problem behavior averaging 85% of trials (range of 40%-100%). Acceptance did not change during choice (0%) and problem behavior occurrence decreased to 65% (range of 30%-100%). During choice + DRA, acceptance remained at 0% and occurrence of problem behavior returned to near baseline levels of an average of 80% (range of 20%-100%). Anecdotally, the severity of Ethan's problem behavior remained fairly constant throughout all phases. Ethan would whine and engage in a

few vocal protests, such as repeating the instruction or saying the name of the reinforcer during the choice + DRA phase. On occasion, the whines would elevate in pitch and volume, but these attributes occurred during all three phases. On one trial during choice + DRA Ethan grabbed the reinforcer. After the researcher removed the reinforcer from his hand, he picked up the piece of celery and placed the entire bite into his mouth before expelling it.

During baseline, Chase accepted 0% of foods each trial and occurrence of problem behavior averaged 93% of trials (range of 80%-100%). Responding remained stable during choice with 0% acceptance of bites and problem behavior occurring during an average of 97% of trials (range of 80%-100%). Choice + DRA did not influence responding; Chase accepted 0% of bites and engaged in problem behavior during an average of 95% of trials (range of 90%-100%). It should be noted that the majority of Chase's problem behaviors occurred as vocal protests, which occurred as him saying "no" or "yes." Chase confused the terms "no" and "yes" as was evident from prior knowledge, and when he said "yes" he shook his head from side-to-side and pushed the food away. An anecdotal account of Chase's problem behavior showed that intensity of problem behavior remained fairly stable across phases. Chase's most severe problem behaviors were grabbing the researcher or researcher's materials, making a squeaking noise, and vocal protests accompanied by foot stomps. These behaviors occurred throughout all treatment phases.

## Chapter IV

### DISCUSSION

Neither the antecedent manipulation of choice nor the antecedent + consequent intervention of choice + DRA increased acceptance of non-preferred foods for three children diagnosed with ASD. There are several hypotheses as to why choice and choice + DRA were not effective.

During choice and choice + DRA, two of the three participants did not actually make a choice between the two non-preferred foods. Chase and Kishan pushed the plate of food away or engaged in problem behavior rather than selecting one of the non-preferred foods. Both Chase and Kishan were capable of making a choice between two items when the items were preferred, as evidenced in the preference assessment, but it is possible that choice making did not generalize to non-preferred items. In the literature showing choice to be effective, the participants actually followed through with making a choice (Romaniuk et al., 2002; Tasky et al., 2008).

Schmidt et al. (2009) evaluated the preference of choice of educational worksheets with high-preferred and low-preferred items (i.e., edible items and neutral stickers). They concluded that the opportunity to choose was preferred over having the researcher choose for both high and low-preferred items. A point of future research made by Schmidt et al. was to evaluate whether or not choice of a less-preferred consequence would increase the reinforcing effectiveness of the less-preferred consequence. In the present study, it appears that choice between two non-preferred items did not increase the reinforcer effectiveness of the non-preferred consequence as none of the three participants accepted a bite of non-preferred food after being given the

instruction to pick one. Therefore, participants may prefer to choose items of neutral preference, such as plain office stickers (Schmidt et al., 2009), but not items that are non-preferred, such as celery and tomatoes, especially with the consequence of consuming the bite of food.

Rost, Hemmes, and Alvero (2014) conducted research that supports the idea mentioned above. Participants were allowed to pick a card on a computer screen which either produced a choice between three cards or a single card only, which points were accrued from. In the first condition, the points received from the choice condition were the same as the no-choice condition; in the second condition, more points could be earned during the choice condition compared to the no-choice condition; and in the last condition, fewer points could be earned during the choice condition compared to the no-choice condition. Rost et al. concluded that participants preferred the choice condition over no-choice condition as long as the points earned were equal to or more than the no-choice condition. When the points earned were lower in the choice condition, then preference of the choice condition decreased. Rost et al. stated the preference of choice was affected by either the presence of reinforcement or punishment which was associated with the choice or no-choice conditions. It is likely that the participants from the current study did not choose a non-preferred food because engaging in the choice would result in punishment (i.e., having to eat a non-preferred food) rather than reinforcement (e.g., escape from demands).

Hendy et al. (2005, 2011) provided choices of fruits and vegetables to typically developing students during the “Kid’s Choice” school lunch program, which resulted in an increase in fruit and vegetable consumption. Although the “Kid’s Choice” program focused on increasing fruit and vegetable intake similar to the current study, it differed in that the fruit and

vegetable choices provided were not non-preferred foods specific to each child. In the present study, only non-preferred food items were presented for each participant to choose from. Hendy et al. (2005, 2011) presented two fruits and two vegetables to each child, one of which may have been a preferred food. This supports the notion that participants may prefer choosing between preferred or neutral items (i.e., reinforcement present or absence of punishment), but not those that are non-preferred (i.e., punishment is present) (Rost et al., 2014).

Janczyk, Nolden, and Jolicoeur (2015) discussed free-choice versus forced-choice. In free-choice, there are many responses which satisfy a task and each of the responses produce a correct and favorable response to the specified task. In forced-choice, although there are multiple responses to choose from, there is only one response which will satisfy the task; each response correlates to a specific task and they cannot be interchanged. During forced-choice, there appears to be a choice, but it is not the same type of choice-making situation as in free-choice. This brings to question whether or not presenting two non-preferred foods to a child constitutes a choice at all. Presenting two non-preferred options appears more closely related to a forced-choice than a free-choice as both options do not produce favorable outcomes to the child. Perhaps the current study could have incorporated a free-choice model by having the children choose between moderately-preferred foods, rather than non-preferred foods. For example, Kishan's mother reported that he would tolerate bananas and pureed mango. These two foods were not high-preferred foods, but they were not non-preferred either. The choice between bananas and pureed mango would constitute a free-choice more than would a choice between grapes and carrots (i.e., non-preferred foods).

Choice or choice + DRA may have been effective when used in combination with other interventions. Ethan was the only participant that picked up a non-preferred food during choice and choice + DRA. During the first two choice sessions, Ethan picked up celery on 10 trials and green pepper on 4 trials, each time biting the food in half but not accepting it (i.e., he bit the food in half but removed both pieces from his mouth without chewing or swallowing). On the fifth trial of the second choice session, Ethan picked celery and consistently picked up celery and bit it in half for 100% of trials for the remainder of choice and choice + DRA sessions. It is possible that shaping may have been effective, with the first approximation to acceptance being biting the food in half. Successive approximations to acceptance of the non-preferred food may have been chewing the food twice, chewing the food multiple times, swallowing part of the bite, and finally swallowing the entire bite. In shaping, a behavior that resembles the target behavior is reinforced. As the behavior becomes closer to the target behavior, previously reinforced approximations are placed on extinction and differential reinforcement is provided for successive approximations to the target behavior (Cooper et al., 2007).

Penrod et al. (2012) used a high-p instructional sequence paired with demand fading, which was similar to shaping. Participants were instructed to engage in behaviors that resembled eating, while slowly fading in the demand to the terminal target of eating a bite of low-preferred food. For example, kiss the food, lick the food, and put the food on your tongue preceded behaviors of biting food in half, chewing one half, and swallowing chewed half (Penrod et al., 2012). A shaping or demand fading procedure may have been effective for Ethan as he consistently picked up one food and bit the food in half.



In Romaniuk et al. (2002), participants had the opportunity to choose between educational tasks. If they did not respond in the correct manner after choosing the task, then researchers used a three-prompt sequence which consisted of instructions, modeling, and physical prompting. Also, Penrod et al. (2012) used model prompts and repeated instructions when using a high-p instructional sequence plus demand fading for two boys diagnosed with ASD with food selectivity. It is possible that participants in the current study may have benefited from a prompting sequence, such as model prompts for choosing a food and eating it, or repeated instructions. For instance, the researcher could have said, “pick one, like this” while modeling choosing a food, and then “eat it, like this” while modeling chewing and swallowing the bite. The instruction could have been repeated a second time as well.

Future researchers should explore the use of escape extinction (EE), such as non-removal of the spoon (NRS), combined with choice as an intervention for acceptance of non-preferred food. Non-removal of the choice would also need to be conducted in which the two bites of non-preferred food would not be removed until the participant chose one of them. Model prompts could be provided in which the researcher modeled choosing one of the non-preferred foods at random so as to not influence the choice of the participant. Previous researchers have used EE in combination with other interventions that were not effective in isolation (Patel et al., 2002; Reed et al., 2004; Volkert & Vaz, 2010). Seubert, Fryling, Wallace, and Jiminez (2014) reviewed current food acceptance literature from the *Journal of Applied Behavior Analysis* on antecedent interventions alone, EE alone, and antecedent interventions + EE. Results of analysis show that the effects of EE were enhanced by various antecedent interventions (e.g., fading, simultaneous presentation, high-probability, chin prompt, flipped spoon, and NCR) by 67% for participants

with food refusal. Choice was not an antecedent intervention that was reviewed in Seubert et al. It is possible that choice would be effective at enhancing the effectiveness of EE.

Also, future researchers should examine the level of problem behavior and compare choice + EE to EE in isolation for acceptance of non-preferred foods. In previous literature, problem behaviors decreased when they were escape-maintained and choice of task was provided (Romaniuk et al., 2002), which may also occur during acceptance of non-preferred foods. This is of particular concern as EE can produce an extinction burst, emotional responding, or aggression (Cooper et al., 2007), which may decrease parental acceptance and follow-through of the procedure (Bachmeyer, 2009). Adding the antecedent intervention of choice to EE may decrease extinction bursts or emotional responding, thus increasing the effectiveness and parental acceptance of the intervention. In the present study, problem behavior decreased by 15%-20% of trials for two of three participants during the choice phase compared to baseline. In addition, on an anecdotal account, the problem behavior severity decreased from baseline to choice for one participant for elopement and whining and crying behaviors.

### **Limitations**

The investigation has several limitations. First, conducting sessions one hour after participants had eaten a meal or snack may not have been a long enough duration to control for satiation effects. It is possible that participants could have been satiated from a previous meal or snack and therefore the motivating operation to engage in acceptance of food was absent. Future researchers should examine the efficacy of choice when participants have been deprived of food for longer periods, such as upon waking or immediately before a meal.

A second limitation was that participants did not sample reinforcement before each session during the choice + DRA phase. Preference assessments were only conducted for the first session of the day, which meant that before some sessions the reinforcement was sampled, and before other sessions it was not. A consistent sampling of reinforcement may have affected the results of the study. Penrod et al. (2012) allowed each participant to sample a high-preferred food for 10 s prior to the start of a session to establish a motivating operation for compliance with the task.

Third, the preferred food may not have functioned as a reinforcer for eating the non-preferred food, as evidenced by acceptance of non-preferred foods did not increase when the preferred food was available. It is worth considering that the contingency between acceptance of the non-preferred food and access to the high-preferred food was not clear as none of the participants experienced the contingency. Cooper et al. (1999) had two contingencies in place for food acceptance and each one was shown to the participant prior to starting treatment. Using a model prompt to highlight the contingency is in need of investigation. In addition, the preferred foods used during the study were given regularly at the clinic and school as edible reinforcers for other tasks and it is possible that there was not enough deprivation of the preferred food. For example, the participant may have just had cookies an hour before the choice + DRA condition. It would be worth investigating the effects of specifically reserved high-preferred edibles on acceptance of non-preferred foods.

Lastly, the magnitude of the reinforcer during the choice + DRA phase may not have been large enough. Penrod et al. (2012) presented participants with 2-3 small bites of high-preferred food contingent upon acceptance of one bite of a low-preferred food. Cooper et al.

(1999) evaluated the effects on reinforcer magnitude and quality for a 3-year-old girl diagnosed with poor physical growth and development during food acceptance. The results showed that the girl chose the bite of food which was associated with two bites of preferred food and social interaction that was double in duration and better quality than the bite of food associated with one bite of preferred food and a short duration of social interaction. Increasing the magnitude of the potential reinforcers used during the present study may have increased acceptance of the non-preferred food.

In the present study, the antecedent manipulation of choice and the antecedent + consequent manipulation of choice + DRA were not effective at treating the food selectivity of three male children diagnosed with an ASD. EE should be added to choice or choice + DRA to determine if the combination of these interventions would yield an effective treatment package for increasing non-preferred foods in children diagnosed with ASD.

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**Appendix A**  
**Recruitment Flyer**

# Research Participants Needed

## Providing Food Choices to Decrease Food Selectivity

We are looking for children who meet the following conditions:

- Display food selectivity, or are a “picky eater”
- Have Autism Spectrum Disorder
- Between the ages of 4 and 10
- Are able to chew and swallow normally
- Do not possess medical problems that interfere with eating
- Are able to choose between 2 items
- Are provided with parental consent to participate

If your child qualifies, or you think they may qualify, please contact the lead researcher, **Star Lipe** by phone, email, or text.

**Star Lipe**

Phone: 320-221-1443

Email: [scst1002@stcloudstate.edu](mailto:scst1002@stcloudstate.edu)

## Appendix B

### Data Sheet Sample

Condition: \_\_\_\_\_ Participant: \_\_\_\_\_

Date:		Session:		Researcher:	
Trial #	Acc/Non-Acc	Problem Bx	PBx Description	Food Presented	Food Chosen
1	A/ N-A				
2	A/ N-A				
3	A/ N-A				
4	A/ N-A				
5	A/ N-A				
6	A/ N-A				
7	A/ N-A				
8	A/ N-A				
9	A/ N-A				
10	A/ N-A				

Condition: \_\_\_\_\_

Date:		Session:		Researcher:	
Trial #	Acc/Non-Acc	Problem Bx	PBx Description	Food Presented	Food Chosen
1	A/ N-A				
2	A/ N-A				
3	A/ N-A				
4	A/ N-A				
5	A/ N-A				
6	A/ N-A				
7	A/ N-A				
8	A/ N-A				
9	A/ N-A				
10	A/ N-A				

## Appendix C

### Preferred and Non-Preferred Food Assessment for Individuals with Severe Disabilities (Modified RAISD)

Participant's Name \_\_\_\_\_

Date \_\_\_\_\_

Recorder \_\_\_\_\_

We would like to gather information on your child's preferred and non-preferred foods. You will first be asked about preferred foods, then non-preferred foods and, finally, foods that you would like incorporated into your child's diet.

1. Some children really like fruits, such as apples, oranges, bananas, pears, grapes. Which fruits do you think your child likes to eat most?

Response(s) to probe questions:

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2. Some children really like vegetables, such as carrots, broccoli, peas, celery, and tomatoes. Which vegetables do you think your child likes to eat the most?

Response(s) to probe questions:

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3. Some children really like meats, such as hot dogs, chicken, pork chops, and hamburgers. Which meat do you think your child likes to eat the most?

Response(s) to probe questions:

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4. Some children really like grains, such as cereal, bread, bagels, noodles, pancakes, and waffles. Which grain do you think your child likes to eat the most?

Response(s) to probe questions:

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5. Some children really like dairy products, such as milk, cheese, yogurt, and smoothies. Which dairy product do you think your child likes to eat the most?

Response(s) to probe questions:

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6. Some children really like sweet and salty foods, such as French fries, candy, chocolate, cookies, and potato chips. What sweet and salty foods do you think your child likes to eat the most?

Response(s) to probe questions:

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7. Some children do NOT like fruits, such as apples, oranges, bananas, pears, grapes. Which fruits do you think your child does NOT like?

Response(s) to probe questions:

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8. Some children do NOT like vegetables, such as carrots, broccoli, peas, celery, and tomatoes. Which vegetables do you think your child does NOT like?

Response(s) to probe questions:

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9. Some children do NOT like meats, such as hot dogs, chicken, pork chops, and hamburgers. Which meat do you think your child does NOT like?

Response(s) to probe questions:

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10. Some children do NOT like grains, such as cereal, bread, bagels, noodles, pancakes, and waffles. Which grain do you think your child does NOT like?

Response(s) to probe questions:

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11. Some children do NOT like dairy products, such as milk, cheese, yogurt, and smoothies. Which dairy product do you think your child does NOT like?

Response(s) to probe questions:

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12. Some children do NOT like sweets and fats, such as fried foods, candy, chocolate, cookies, and baked goods. What sweets and fats do you think your child does NOT like?

Response(s) to probe questions:

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13. Is there any other information that you would like me to know about your child's food likes and dislikes, foods that you would like incorporated into your child's diet, or foods not allowed in your child's diet?

Response(s) to probe questions:

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Appendix D

Figure 1

