EVALUATION OF FUNCTIONAL ANALYSIS CONDITIONS AND SUBSEQUENT TREATMENT OF INAPPROPRIATE MEALTIME BEHAVIOR

By

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To Beverly Eidson-Cooley
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Feeding problems are identified when an individual is unable or unwilling to consume a consistent quantity or variety of foods to sustain growth and nutrition. Although feeding problems are not restricted to a specific population, individuals with an autism diagnosis are at an especially high risk for developing restrictive feeding patterns that are likely to continue in the absence of specialized interventions. Further, persistent and untreated feeding problems have been associated with a variety of negative biological, developmental, and social outcomes (Hoch et al., 2001; Greer et al., 2008). Functional analyses are often considered the gold standard in behavioral assessment prior to intervening; however, several methodologies exist for the assessment of inappropriate mealtime behavior. In Experiment 1, we compared conditions using spoon and plate presentations from prior research in the assessment of inappropriate mealtime behavior using a within-subject analysis for five subjects diagnosed with autism. Results indicated the spoon presentation condition does not control for aversive stimulation in the attention condition, producing a false positive result. The purpose of Experiment 2 was to examine the effects of a nonremoval of the spoon procedure on generalized consumption of nonpreferred foods with similar or dissimilar properties to the treatment food. Specifically, escape extinction procedures (e.g., nonremoval of the spoon) are effective in treating pediatric
feeding problems, yet are often implemented across several foods simultaneously. A secondary purpose of Experiment 2 was to assess whether nonremoval of the spoon was effective in altering preferences for nonpreferred foods following treatment. In the current study, we evaluated implementation across one food at a time for four subjects diagnosed with autism who displayed restricted diets in an effort to assess if, at any point, the nonremoval of the spoon procedure was no longer required to increase acceptance. Results showed all subjects increased their consumption of at least one food in their treatment analysis without the nonremoval of the spoon procedure. In addition, pre- and post-treatment preference assessments indicated that preferences were more likely to be altered for foods included in the treatment analysis relative to foods that were not included in the treatment analysis.
CHAPTER 1
INTRODUCTION

Feeding problems are identified when an individual is unable or unwilling to consume a consistent quantity or variety of foods to sustain growth and nutrition. Although the prevalence of feeding problems can be difficult to estimate due to the wide variety of problems that can emerge over the course of an individual’s lifetime, approximately 20-50% of typically developing children and up to 89% of children with developmental disabilities exhibit some form of feeding problem (Benjasuwantep, Chaithirayanon, & Eiamudomkan, 2013; Piazza & Roane, 2008). Similarly, the etiology and persistence of a feeding problem can differ greatly from one child to the next making diagnosing types of feeding problems a challenge. Whereas some feeding problems are resolved without the implementation of specialized interventions, many children will continue to exhibit feeding problems resulting in a variety of negative biological, developmental, and social outcomes. Negative outcomes such as severe weight loss, malnutrition, growth retardation, impaired intellectual development, lethargy, and even death can result from persistent feeding disorders if left untreated (Hoch et al., 2001). Although the aforementioned long-term and delayed effects represent drastic outcomes of untreated feeding problems, many studies have also reported an increased occurrence of inappropriate mealtime behavior exhibited by children with feeding difficulties including self-injury, aggression, tantrums, property destruction, disruption (e.g., food throwing), food expulsion, and vomiting that contribute to significant increases in family stress in the short term (Greer et al., 2008).

Although feeding problems are not characteristic of a single population, restricted and repetitive behaviors are one of the diagnostic criteria for children diagnosed with an autism spectrum disorder (ASD). Some of the ways these restrictive habits might manifest in children diagnosed with ASD is through the display of inflexible feeding routines and other feeding
problems (e.g., food selectivity). Thus, it is not surprising that feeding difficulties were included among the early indicators of ASD (Ritvo & Freeman, 1978). To date very little literature has directly measured the prevalence of feeding problems in children with ASD (see Ahearn et al., 2001 for a notable exception).

Ahearn et al. (2001) measured acceptance and consumption across four food categories (e.g., fruit, vegetable, protein, starch) displayed by 30 children diagnosed with ASD. The experimenters conducted sessions in which 3 foods from each of the previously mentioned categories (i.e., 12 foods total) were presented across sessions. Each session contained one food from each category with each food presented 6 times totaling 24 trials per session. In addition, each session contained three foods presented at a table-top texture (e.g., slice of apple) whereas one was presented at a pureed texture (e.g., pureed potato) in an effort to identify subjects who might be more likely to eat certain textures over others (i.e., texture selectivity). Overall, the experimenters obtained similar patterns of selectivity as reported in previous studies conducted with children who had severe intellectual disabilities (Munk & Repp, 1994). Ahearn et al. reported six possible patterns based on the outcome of their assessment: total food refusal (i.e., rejection of all foods across all categories), overly selective (i.e., consuming foods in one category yet refusing to consume any foods in the remaining categories), moderate selectivity (i.e., consuming foods from several categories but refusing to consume foods from at least one category), mild selectivity (i.e., consuming foods across all categories with an overall low percentage), selectivity by texture (i.e., refusing to consume most foods unless pureed), and high acceptance (i.e., consuming the majority of foods across all categories with an overall high percentage). The authors reported the majority of their subjects to engage in food selectivity, with eight reported as overly selective, three reported as moderately selective, five reported as
mildly selective, and one as selective by texture. Of the eight reported as overly selective, four demonstrated total food refusal (i.e., did not consume any food in the assessment).

Although the results of studies utilizing direct observation to identify the prevalence of feeding problems in children with ASD produce highly objective data, they are not without limitation. For example, Ahearn et al. (2001) restricted their assessment to individuals who had not undergone a prior intervention to treat food selectivity or inappropriate mealtime behavior; as mentioned by the authors, this likely reduced the overall prevalence that was obtained by these researchers. As an alternative, some survey studies report the prevalence of feeding problems among those diagnosed with ASD to be as high as 90% (DeMeyer, 1979). Although conducting indirect assessments does not require an observer to directly measure food selectivity and might inflate the overall prevalence, the outcomes of both direct and indirect research suggest children with ASD are at an especially high risk for the development of restrictive feeding patterns.

Since the advent of functional analysis methodology for the assessment of self-injurious behavior (Iwata et al., 1982/1994), outcomes of function-based assessments have been adapted to inform effective treatments for different topographies of problem behavior (e.g., aggression, elopement, self-injury). Specifically, one extension of functional analysis methodology has been adapted for the assessment of pediatric food refusal by measuring levels of inappropriate mealtime behavior in a variety of test and control conditions (e.g., Girolami et al., 2001; Piazza, Fisher et al., 2003); however, dissemination of this assessment technology for food refusal is limited to a few publications and methodology has unsystematically varied across the published literature.

In the largest study to date utilizing functional analysis methodology to assess pediatric feeding problems, Piazza, Fisher et al. (2003) arranged similar consequences as those described
in the seminal Iwata et al. (1982/1994) paper by examining contingent attention (i.e., social-positive reinforcement) and escape (i.e., social-negative reinforcement) test conditions in comparison with a baseline (control) procedure in which a nonpreferred food was presented for fixed-time 30-s intervals, problem behavior did not result in programmed consequences (neither escape or attention were provided), and highly preferred items and noncontingent attention were delivered throughout the session. However, across all conditions a nonpreferred food was presented and the instruction to eat the food was provided, which could have lead to the overwhelming number of subjects for whom they identified multiple functions. Specifically, nine out of the ten subjects who demonstrated clear outcomes showed sensitivity to a social-negative reinforcement contingency, demonstrating the prevalence and role of negative reinforcement in the maintenance of feeding problems. However, a closer examination of the data in this experiment reveals that the only subject to demonstrate a sole attention function had elevated levels of inappropriate mealtime behavior in the baseline (control) condition producing undifferentiated levels with the escape condition. This pattern suggests a possible need for a control condition that suppresses problem behavior to a greater extent in an effort to identify functions of behavior. Further, eight subjects had at least two functions identified, and three subjects had completely undifferentiated results. Thus, it is possible that the lack of manipulation of the motivation to escape across attention and baseline (control) conditions or other relevant antecedent variables influenced responding in these conditions, producing the potential for false positive results in the attention condition as well as difficulty obtaining a clear escape function for the majority of subjects. In short, holding the spoon to the mouth during the attention condition may have engendered escape behavior.
Since the publication of the Piazza, Fisher et al. (2003), other researchers have altered a few conditions to some extent such as inclusion of highly preferred food in the control condition (e.g., Najdowski et al., 2003, Najdowski et al., 2008, Wilder et al., 2005). These changes, including the use of highly preferred foods in the control condition as well as presenting the nonpreferred food on a plate, have resulted in clear differentiation between test and control conditions. However, to date no research has evaluated the potential advantage of altering motivating operations such as aversive context (e.g., presence of a nonpreferred food or how close the nonpreferred is to the subject) or discriminative stimuli (e.g., presence of a demand to eat relative to no demand provided) within the assessment of inappropriate mealtime behavior.

Therefore, the purpose of Experiment 1 was to compare functional analysis conditions similar to those used in prior research. Specifically, we sought to examine the influence of different presentation methods, notably presenting the nonpreferred food via spoon (Piazza, Fisher et al., 2003) or plate (Najdowski et al., 2003), on the rate of inappropriate mealtime behavior across functional analysis conditions. We accomplished Experiment 1 by measuring inappropriate mealtime behavior across similar conditions used in prior functional analyses on a within-subject basis for five children diagnosed with ASD.

Following a functional analysis, treatments to increase acceptance and consumption of nonpreferred foods as well as decrease inappropriate mealtime behavior are often used based on the result of the assessment. Prior research has shown the importance of accurate identification of functional relationships between inappropriate mealtime behavior and the consequences they produce; treatments that modify the consequences that exacerbate problem behavior have been shown to be effective in increasing consumption and decreasing inappropriate mealtime behavior.
relative to treatments that modify variables that are unrelated to the function of the feeding problem (e.g., Bachmeyer et al., 2009).

Literature on the assessment and treatment of feeding disorders has supported the claim that social-negative reinforcement in the form of escape from eating nonpreferred foods plays a role in the maintenance of feeding problems (e.g., Cooper et al., 1995; Kerwin, Ahearn, Eicher, & Burd, 1995; Patel et al., 2002). Thus, few studies have demonstrated the efficacy of positive reinforcement-based interventions in increasing acceptance and consumption to socially significant levels (e.g., Riordan, Iwata, Finney, Wohl, & Stanley, 1980). In fact, several researchers have shown escape extinction procedures are often necessary in the treatment of pediatric feeding disorders (e.g., Ahearn, 2002; Hoch et al., 1994; Piazza, Patel, Gulotta, Sevin, & Layer, 2003). For example, Piazza, Patel, Gulotta, Sevin, and Layer (2003) compared the effects of positive reinforcement alone, escape extinction alone, and positive reinforcement with escape extinction on consumption and inappropriate mealtime behavior of four children with pediatric feeding disorders. The experimenters demonstrated that positive reinforcement alone was ineffective in increasing consumption. These experimenters also found escape extinction with and without positive reinforcement to be effective in increasing consumption, suggesting the escape extinction procedure was necessary to treat food refusal. In addition they found that incorporating a positive reinforcement component with an escape extinction procedure had the added benefit of reducing inappropriate mealtime behavior relative to implementing the escape extinction procedure in isolation for a few subjects.

When it comes to intervening, researchers and clinicians often implement an intervention across several treatment foods simultaneously (e.g., LaRue et al., 2011). However, this method of implementing intervention does not allow for an analysis of when a component responsible for
increased acceptance might no longer be necessary for increasing consumption of novel foods. Even if treatment was staggered across one food at a time in prior studies, generalization effects were likely not seen due to the limited number of foods used (e.g., Peterson, Piazza, & Volkert, 2016), or foods were highly discriminable from one another (e.g., Meier, Fryling, & Wallace, 2012). Finally, if consumption occurred across foods, generalization was not necessarily the focus of the research study when the effect was found (e.g., Riordan et al., 1984). Thus, it is unclear what arrangements might foster generalization to occur. One notable exception is a study conducted by Kerwin, Ahearn, Eicher, and Burd (1995), who conducted assessment and treatment of acceptance, expulsion, and consumption of different volumes (i.e., empty, dipped, quarter, half, and level spoonful) of pureed food for three subjects. The experimenters found that an escape extinction procedure (i.e., nonremoval of the spoon or physical guidance) increased consumption of the target volume and led to consumption (generalization) of larger volumes without escape extinction. Even though treatment was implemented across multiple types of foods within each session, this study was explicit in the attempt to measure a generalization effect. However, whether generalization occurred across volumes due to the similarity across all purees (i.e., all foods were presented at the same texture) or due to the intervention being applied across all types of foods simultaneously remains unanswered. In addition, whether generalization would have been as pronounced had treatment been applied to only one type of food at a time and whether generalization would have occurred to different types of purees at the same volume remains unclear. Some researchers have noted generalization is more likely when treatment occurs for multiple foods as opposed to one food at a time (e.g., Ahearn, 2002). In addition, the salience between different foods becomes much more pronounced when attempting to measure generalized consumption of foods at a solid texture; thus, it remains unclear if generalization
effects will be seen with populations that consume different textures, especially with foods that are noticeably different from one another.

Thus, the purpose of Experiment 2 was to determine whether implementing a nonremoval of the spoon procedure with a nonpreferred food would influence consumption of untreated nonpreferred foods. Specifically, we sought to identify if consumption of untreated foods was more likely to occur if they shared similar properties (e.g., similar color or taste) to the food(s) being treated via a nonremoval of the spoon procedure. In addition, we assessed changes in preference for foods by comparing pre- and post-treatment paired stimulus preference assessments.
CHAPTER 2
EXPERIMENT 1: FUNCTIONAL ANALYSIS

Rationale

The purpose of Study 1 was to determine the relative influence of food held on the spoon (potential establishing operation for escape) on the rate of problem behavior in the attention and no interaction conditions during functional analyses of inappropriate mealtime behavior. To date, it has been customary for aversive stimulation (i.e., presentation of known aversive or nonpreferred foods, and demand to eat) to be present across all conditions in the analysis of inappropriate mealtime behavior (e.g., Piazza, Fisher et al., 2003). For example, the attention condition usually involves presenting a nonpreferred food close to the subject’s lips for either the duration of the session or at fixed-time intervals (e.g., FT 30-s intervals), in which problem behavior does not result in the removal of food and instead receives attention in the form of reprimands (e.g., Bachmeyer et al., 2009; LaRue et al., 2011; Piazza, Fisher et al., 2003). It is possible that problem behavior, which has been historically reinforced by removal of nonpreferred foods, is therefore placed on extinction (i.e., removal of nonpreferred foods is no longer provided). As a result, the intense and frequent problem behavior observed in the attention condition might reflect an extinction burst, thus resulting in misleading and inaccurate identification of a social-positive reinforcement function. In other words, increased rates of problem behavior in the attention condition might actually reflect the process of extinction for behavior maintained by social-negative reinforcement (i.e., escape). The current experiment was designed to test whether elevated levels of problem behavior occur 1) in the attention condition with higher levels of aversive stimulation (i.e., spoon presentation) relative to other conditions with less aversive stimulation (i.e., plate presentation), and 2) in the no interaction condition (i.e., nonpreferred food present) relative to the control condition (i.e., preferred food present).
Method

Subject and Materials

Five subjects completed Experiment 1. Clara was a five-year-old girl diagnosed with ASD. She primarily ate snack-like foods (e.g., chips, pretzels). She also ate broccoli due to a previous intervention; otherwise, she did not eat any other vegetables or any fruits. Jack was an eight-year-old boy diagnosed with ASD. His primary diet consisted of snack-like foods (e.g., chips, crackers) and fast food (e.g., chicken nuggets). Although Jack ate some starches (e.g., bread), he did not eat any vegetables, fruits, or healthy proteins. Rory was an eight-year-old boy diagnosed with ASD. His primary diet consisted of pizza, crackers, donuts, and various other non-nutritive foods. Rory did not eat fruits, vegetables, or proteins and was reported to be increasingly selective on the location, brand, and time of day that he would consume his preferred foods. Flint was a nine-year-old boy diagnosed with ASD. His primary diet consisted of chips, chicken nuggets, goldfish crackers, and grilled cheese sandwiches. Flint ate a variety of other non-nutritive foods but refused to eat fruits or vegetables. Roman was a seven-year-old boy diagnosed with ASD. His primary diet consisted of macaroni and cheese, cookies, Poptarts®, yogurt, and juice. He would eat some protein such as beef when mixed in with macaroni and cheese or an occasional ham and cheese sandwich, but refused to eat any fruits or vegetables. All subjects engaged in inappropriate mealtime behavior including throwing food, crying, screaming, making negative statements about the food, and pushing the utensils or plate away.

An initial intake meeting was conducted to inform a caregiver(s) of the course of assessment and possible treatments, to obtain consent to have their child participate in the evaluation, to obtain a written statement from a pediatrician, speech and language pathologist (swallowing specialist), or both, confirming the subject would be safe to chew and swallow as well as participate in a behavioral intervention, and to discuss possible foods they would like
their child to consume. Following the intake meeting, caregivers were asked to supply one of the nonpreferred foods to be used in the test conditions and a preferred food to be used in the control condition within the functional analysis.

In an effort to enhance discrimination across functional analysis conditions, flexible colored cutting boards were used as placemats correlated with the different contingencies in place. For example, the red mat was only used for the no interaction condition, the blue mat for both attention conditions, the orange mat for the control condition, and the green mat for both escape conditions (conditions described below).

Response Measurement and Reliability

All functional analysis sessions were 5 min. Sessions were video recorded and electronically coded after sessions using handheld devices (e.g., iPods with data-collection applications). The main dependent variable of interest was the rate of inappropriate mealtime behavior. Inappropriate mealtime behavior was defined separately for each subject and included: negative vocalizations, defined as any negative statement about the food (e.g., “That’s disgusting!”); batting the spoon or plate away, defined as pushing the spoon, plate, or experimenter’s hand or arm away from the subject; throwing food or utensils, defined as subjects throwing food or objects across the room or onto the floor; aggression, defined as any instance of hitting, punching, kicking, scratching, or grabbing the experimenter; expulsions, defined as emitting food past the plane of the lips following acceptance; and crying or screaming, defined as sounds or statements made above typical conversation level occurring for a minimum of 3 s and new occurrences occurring after a minimum of 3 s of silence or appropriate volume.

A secondary trained observer independently collected data for an average of 33% (range, 27%-38%) of sessions across subjects. Interobserver agreement was calculated for inappropriate mealtime behavior by dividing the smaller frequency observed in corresponding 10-s intervals.
over the larger frequency, summing the quotients, dividing by the number of intervals, and converting into a percentage. Interobserver agreement for inappropriate mealtime behavior was 94% (range, 81%-100%) for Clara, 94% (range, 77%-100%) for Jack, 99% (range, 95%-100%) for Rory, 98% (range, 87%-100%) for Flint, and 97% (range, 87%-100%) for Roman.

**Procedure**

**No Interaction.** In the no interaction condition, a nonpreferred food was presented on a plate in front of the subject. No demand to eat the food was provided, and no programmed consequences (i.e., attention or escape) were provided for appropriate or inappropriate behavior. This condition resembled control conditions used in previous studies with the exception that prior studies often used noncontingent attention and toys as additional controls for behavior possibly maintained by forms of social-positive reinforcement (e.g., Piazza, Fisher et al., 2003). Although the current no interaction condition did not incorporate attention or toys, it served as a control comparison to the control condition (see below) where the only difference between these conditions was the degree of preference for food. This change in the no interaction condition from previous studies allowed for examination of the potential influence of aversive stimulation across other conditions. For example, comparison of the no interaction condition to the attention conditions served to identify the reinforcing value of attention as well as escape across plate versus spoon presentation methods. That is, if rates of inappropriate mealtime behavior were lower in the no interaction and the attention (plate) condition relative to the attention (spoon) condition, it would be suggestive that the attention provided in the attention (plate) condition had no added reinforcing value. Further, this pattern would suggest that elevated problem behavior in the attention (spoon) condition might be due to other variables, namely the difference in presentation style and increased motivation to escape, rather than the attention received for engaging in problem behavior.
**Attention (Plate).** This condition was identical to the no interaction condition with the exception that attention in the form of reprimands (e.g., “Stop that!”) was delivered contingent upon instances of inappropriate mealtime behavior. The experimenter refrained from delivering statements resembling encouragement or what might seem as implicit demands (e.g., “You can do it!,” “Come on!”). Increased problem behavior in this condition relative to the control or no interaction conditions would have identified inappropriate mealtime behavior that was maintained by social-positive reinforcement in the form of attention.

**Attention (Spoon).** This condition was identical to the attention (plate) condition with the exception that the nonpreferred food was presented on a spoon approximately 15 cm in front of and level with the subject’s lips. This condition was designed to simulate the attention condition from prior research (e.g., Piazza, Fisher et al., 2003). Just as in the attention (plate) condition, the same forms of attention were provided for each instance of inappropriate mealtime behavior. Increased problem behavior in this condition also identified a social-positive reinforcement function; however, a false-positive was identified if problem behavior was elevated in the current attention condition relative to the attention (plate) condition. That is, elevated levels in this condition were likely related to the increased aversive context (e.g., greater motivation to escape and subsequent extinction burst) rather than the attention received. Increased levels in this condition relative to the attention (plate) condition demonstrated the relative difference in aversive stimulation between the two conditions because the consequences delivered in both were identical.

**Control.** This condition was identical to the no interaction condition in that no programmed consequences were delivered for appropriate or inappropriate behavior. However, a
highly preferred food was delivered on a fixed-time 15-s schedule of reinforcement. It was expected that this condition should result in the lowest rate of inappropriate mealtime behavior.

**Escape (Plate).** This condition was identical to the attention (plate) condition with the exception that inappropriate mealtime behavior did not result in attention being delivered contingent upon the occurrence of inappropriate mealtime behavior. Rather, a three-step prompting procedure (i.e., verbal statement to eat the food, a gesture toward the bite, and finally placing the bite on the spoon to the lips) was implemented. If problem behavior occurred at any point during presentation, the nonpreferred food and feeding materials were removed for 30 s contingent upon each instance of inappropriate mealtime behavior. Increased inappropriate mealtime behavior in this condition identified a social-negative reinforcement function. That is, problem behavior increased and was maintained as a function of escape from consuming nonpreferred food.

**Escape (Spoon).** This condition was identical in spoon presentation as in the attention (spoon) condition; however, the same contingencies as the escape (plate) condition were introduced. Three-step prompting was not employed as the nonpreferred food was presented on a spoon approximately 15 cm from the lips at the start of the session. This condition was also a test for a social-negative reinforcement contingency. However, levels of inappropriate mealtime behavior in this condition elevated above levels in the escape (plate) condition also confirmed a relative difference in aversion between plate and spoon presentations.

**Results**

Results for Clara’s functional analysis are displayed in Figure 2-1. Clara’s rate of inappropriate mealtime behavior was high and stable across both escape conditions regardless of whether the nonpreferred food was presented on a plate or on a spoon. She engaged in high and variable levels of inappropriate mealtime behavior during the attention condition when the
nonpreferred food was presented on a spoon whereas low to zero levels of problem behavior when it was presented on a plate, despite the same consequences being provided across both attention conditions. Clara engaged in low levels of inappropriate mealtime behavior in the no interaction condition and did not engage in a single instance of problem behavior during the control condition. In examining her rates of inappropriate mealtime behavior across test and control conditions, we concluded Clara’s problem behavior was maintained by social-negative reinforcement. Further, a false positive was identified for the attention (spoon) condition due to elevated rates in this condition relative to the attention (plate) condition and no interaction conditions.

Results for Jack’s functional analysis are displayed in Figure 2-2. Jack’s rate of inappropriate mealtime behavior was high and stable across both escape conditions. Jack engaged in slightly higher rates of problem behavior during the escape (spoon) condition relative to the escape (plate) condition suggesting that the spoon presentation method was slightly more aversive than the plate presentation method. He engaged in high and increasing rates of inappropriate mealtime behavior during the attention (spoon) condition relative to the attention (plate) condition. It is possible that high rates of inappropriate mealtime behavior in the attention (spoon) condition contacted an escape contingency when the session terminated following 5 min, resulting in the inadvertent reinforcement of problem behavior on this condition. Jack engaged in low but elevated rates of problem behavior in the no interaction condition suggesting that mere presentation of a nonpreferred food evoked problem behavior despite the absence of programmed consequences in this condition. Like Clara, Jack did not engage in a single instance of problem behavior during the control condition. A social-negative reinforcement function was
identified for Jack’s inappropriate mealtime behavior and a false positive was identified for the attention (spoon) condition.

Results for Rory’s functional analysis are displayed in Figure 2-3. Rory’s rate of inappropriate mealtime behavior was high and stable across both escape conditions. Similar to Jack, Rory also engaged in slightly higher rates of problem behavior during the escape (spoon) conditions relative to the escape (plate) condition, suggesting the spoon presentation was slightly more aversive than the plate presentation method. He engaged in high but decreasing rates of inappropriate mealtime behavior during the attention (spoon) condition and low levels of problem behavior during the attention (plate) condition. When stability was obtained in all other conditions, a series of six attention (spoon) sessions were conducted. Rory’s inappropriate mealtime behavior was extinguished to zero in the final two sessions of the attention (spoon) condition, confirming that his problem behavior was not maintained by social-positive reinforcement. He engaged in low levels of inappropriate mealtime behavior during the no interaction condition relative to the attention (plate) and control conditions, again suggesting that the mere presence of a nonpreferred food evoked problem behavior. Rory demonstrated low to zero levels of problem behavior in the control condition. A social-negative reinforcement function was identified for Rory’s inappropriate mealtime behavior.

Results for Flint’s functional analysis are displayed in Figures 2-4 and 2-5. Flint’s rate of inappropriate mealtime behavior was high and stable across both escape conditions. Unlike the other subjects, Flint engaged in moderate rates of inappropriate mealtime behavior across both attention conditions, suggesting his problem behavior might be maintained by social-positive reinforcement. However, when examining his within-session patterns (Figure 2-5), inappropriate mealtime behavior during the attention (spoon) and attention (plate) conditions was
characteristically high in the first minute of those conditions and rapidly decreased toward the end of the session. Flint engaged in high and decreasing rates across no interaction sessions that eventually reached zero rates when conducted in isolation toward the end of his assessment (sessions 25 through 30). These trends in the attention (plate), attention (spoon), and no interaction conditions suggest that mere presentation of the nonpreferred food result in an increase in problem behavior and are not necessarily a function of the consequences received in those conditions. These patterns are likely due to extinction occurring from repeated exposure to aversive stimulation (i.e., presentation of a nonpreferred food) when problem behavior did not result in its removal. Flint also rarely engaged in any instances of problem behavior during the control condition. A social-negative reinforcement function was identified for Flint’s inappropriate mealtime behavior. The decreasing rates of responding during no interaction sessions in conjunction with the within-session analysis of responding during the attention conditions suggest a false positive identification of a social-positive reinforcement function for Flint’s inappropriate mealtime behavior across both plate and spoon presentation methods.

Results for Roman’s functional analysis are displayed in Figure 2-6. Roman’s rate of inappropriate mealtime behavior was high and stable across both escape conditions. Similar to Jack and Rory, he also engaged in slightly higher rates of problem behavior during the escape (spoon) conditions relative to the escape (plate) condition. He engaged in high and variable rates of inappropriate mealtime behavior during the attention (spoon) condition that increased toward the end of the assessment. In contrast, Roman engaged in moderate to low rates of inappropriate mealtime behavior during the attention (plate) condition. He engaged in slightly higher rates of problem behavior during the no interaction condition relative to the responding displayed in the attention (plate) condition, suggesting that attention as a consequence to problem behavior had
little reinforcing effect. Roman did not engage in a single instance of problem behavior during the control condition. We concluded Roman’s inappropriate mealtime behavior was maintained by social-negative reinforcement, and a false positive was identified for the attention (spoon) condition.

**Discussion**

We identified the function of inappropriate mealtime behavior for five subjects with restricted diets using conditions similar to those described in previous literature. All subjects engaged in inappropriate mealtime behavior maintained by social-negative reinforcement; given the reported prevalence of inappropriate mealtime behavior being maintained by social-negative reinforcement for this population, these results are consistent with previous literature (e.g., Bachmeyer et al., 2009; Piazza, Fisher et al., 2003). In addition to this finding, a few subjects engaged in higher rates of inappropriate mealtime behavior during the escape (spoon) method compared to the escape (plate) method. For example, responding under both escape conditions was clearly differentiated for both Jack and Roman. It is possible this separation could have been increased further had the escape (plate) condition included a repeated instruction to consume the food without bringing the spoon to the lips, or had the time taken to present the nonpreferred food via spoon been delayed. Future research might capitalize on showing behavior under differential levels of aversive control as a means to show functional relationships between parameters of antecedent or consequent variables and inappropriate mealtime behavior. For example, the rate of or latency to inappropriate mealtime behavior under an escape contingency is likely a function of the rate of food presentation as well as how close those foods are to the subject.

All subjects engaged in inappropriate mealtime behavior to some extent in the no interaction condition. For example, Flint engaged in high rates of behavior during the first no
interaction session and displayed a decreasing trend across subsequent sessions. Previous research in the assessment of inappropriate mealtime behavior often used a variation of the current no interaction condition as a control condition. Although prior research often included additional variables such as noncontingent delivery of attention and leisure items within their control condition, they also typically presented the nonpreferred food similar to the no interaction condition used in the current experiment. Given that the ASD population has a high probability of inappropriate mealtime behavior maintained by social-negative reinforcement, manipulating aversive stimulation in the control condition seems warranted. Thus, the current no interaction condition was used as a means to control for all of the variables present in the attention (plate) condition with the exception of the delivery of attention as a means to parse out the reinforcing value of attention delivery in the attention conditions. Future research should continue to examine ways in which aversive stimulation can be manipulated within functional analyses of inappropriate mealtime behavior without potentially removing discriminative stimuli or altering motivating operations relevant for testing other functions.

One of the most crucial findings of the current experiment is that all subjects displayed higher rates of inappropriate mealtime behavior in the attention (spoon) condition relative to the attention (plate) condition despite receiving similar forms of attention contingent upon engaging in problem behavior. Historically, studies using the spoon presentation method are more likely to conclude that attention functions as a reinforcer for inappropriate mealtime behavior (e.g., Piazza, Fisher et al., 2003) relative to those that use the plate presentation method (e.g., Najdowski et al., 2003). The current experiment is the first to directly compare responding under both conditions on a within-subject basis. The results obtained from this experiment suggest that previous research utilizing the spoon presentation method might be more likely to inaccurately
conclude inappropriate mealtime behavior is maintained by social-positive reinforcement (i.e., false positive identification for attention). This claim might be especially true given that our subjects contacted the consequences in both attention conditions and responding was only elevated in the condition in which nonpreferred foods were presented via spoon. It is possible that responding in the attention (spoon) condition is frequent and intense problem behavior evoked by no longer receiving reinforcement (i.e., extinction) for engaging in inappropriate mealtime behavior that has historically been reinforced by removal of nonpreferred foods (i.e., escape) resulting in an extinction burst. Such an outcome may inaccurately identify an attention function. Despite the manipulation used in the current study, we still had one subject (Flint) for whom a clear outcome was not readily obtained. It is possible future research could examine within-session patterns when examining functional analysis data to determine if any alternate variables are in place that might be influencing levels of responding when data are aggregated and plotted on a session-by-session basis. Future studies should examine plotting within-session data when using only the spoon method to assess the function of inappropriate mealtime behavior. It is possible that accuracy might be improved with this method without the need to incorporate the plate conditions as added controls.

Several limitations of this experiment are worth noting. A three-step prompting procedure was in effect for the escape (plate) condition. This condition was an exact replication of the condition used by other experimenters (e.g., Najdowski et al., 2003; Najdowski et al., 2008). However, this condition also resembled all other conditions in which escape was unavailable (i.e., attention and no interaction conditions) and eventually resembled the escape (spoon) condition. That is, progression from plate to spoon occurred in the escape (plate) condition. It is possible that repeated exposure to the escape (plate) condition, or the inclusion of this condition
altogether, influenced responding across other conditions as the subjects learned that presentation of the plate was paired with the demand to eat and inappropriate mealtime behavior resulted in escape. Future research could examine the development of aversion to spoons or plates by way of consistent 3-step prompting and could also examine how the temporal relationship between plate presentation and presenting the spoon to the lips might influence functional analysis conditions in which those stimuli are present but do not result in escape (e.g., attention conditions). In the current study, several subjects quickly learned that the presentation of the plate and delivery of the demand were discriminative stimuli for the availability of escape. However, it is highly likely that a learning history between presence of plates, spoons, the statement to eat, and the presence of nonpreferred food or motivation to escape existed prior to the current assessment. In addition, we attempted to decrease the likelihood of carryover effects by only stating demands to eat the food during the escape conditions; however, this is a departure from the procedures used in other studies (e.g., Piazza, Fisher et al., 2003).

Some subjects’ displayed increasing trends in the attention (spoon) condition whereas some showed decreasing trends. It is possible that inappropriate mealtime behavior was maintained by social-positive reinforcement in the form of attention, and we inaccurately concluded a false-positive attention function. One possibility is that attention might only be valuable under specific stimulus contexts such as when the spoon is placed at the lips or, specifically, when aversive stimulation becomes more intense. However, it is also possible the elevated levels or increasing trends in the attention (spoon) condition were due to a molar escape contingency. That is, frequent and high rates of problem behavior in the attention condition could be reinforced when the session lapses and escape from eating is given. Future research should replicate the current procedures and examine accuracy of the functional analysis outcomes by
treatment inappropriate mealtime behavior with function- and non-function-based treatments. In addition, future research could examine whether delivery of attention under aversive stimulation reduces problem behavior (i.e., either serves an abative effect or functions as punishment), or increases behavior (i.e., functions as a discriminative stimulus for the availability of escape or some other reinforcer).

Finally, it is possible previous functional analyses have used different presentation methods (i.e., spoon versus plate) as a means to mimic the subject’s typical feeding environment. That is, functional analyses conducted with infants or individuals without the skill to self-feed have involved the spoon presentation method, whereas those conducted with individuals who could self-feed have typically used the plate presentation method. The current study only included participants who could self-feed; thus, it remains unclear how younger subjects and those who require a feeder would respond under similar assessments using the plate conditions. Future research should examine whether inappropriate mealtime behavior exhibited by younger children would be influenced in a different way.
Figure 2-1. Functional analysis for Clara depicting rate of mealtime problem behavior across attention (plate) and (spoon), control, no interaction, and escape (plate) and (spoon) conditions.
Figure 2-2. Functional analysis for Jack depicting rate of mealtime problem behavior across attention (plate) and (spoon), control, no interaction, and escape (plate) and (spoon) conditions.
Figure 2-3. Functional analysis for Rory depicting rate of mealtime problem behavior across attention (plate) and (spoon), control, no interaction, and escape (plate) and (spoon) conditions.
Figure 2-4. Functional analysis for Flint depicting rate of mealtime problem behavior across attention (plate) and (spoon), control, no interaction, and escape (plate) and (spoon) conditions.
Figure 2-5. Within-session analysis for Flint depicting rate of mealtime problem behavior across 1-min bins during attention (plate) and (spoon), control, no interaction, and escape (plate) and (spoon) conditions.
Figure 2-6. Functional analysis for Roman depicting rate of mealtime problem behavior across attention (plate) and (spoon), control, no interaction, and escape (plate) and (spoon) conditions.
CHAPTER 3
EXPERIMENT 2: TREATMENT

Rationale

The purpose of Experiment 2 was to examine the effects of a nonremoval of the spoon procedure on generalized consumption of nonpreferred foods that were similar or dissimilar to a treatment food. In addition, a secondary purpose was to identify whether a nonremoval of the spoon procedure influenced preferences for previously nonpreferred foods by examining pre- and post-treatment preference changes. Typically treatments for food selectivity and inappropriate mealtime behavior are conducted across a variety of foods at the same time, resulting in consumption of many foods at once. However, it remains unclear if certain foods would not need to undergo treatment or at what point the nonremoval of the spoon component could be removed; the ability to identify when consumption has generalized to other nonpreferred foods without treatment becomes diminished when treatment is applied across all foods simultaneously. Fading of treatment components can be especially important when relying on intrusive techniques such as a nonremoval of the spoon procedure (i.e., nonremoval of the spoon is not likely to be a desired terminal treatment component). Thus, in the current study we sought to implement treatment with one food at a time to determine if, at any point, treatment components were no longer necessary. In addition, a secondary purpose was to identify if foods that were similar to treatment foods would be more likely to be consumed without a nonremoval of the spoon component relative to foods that were dissimilar. Finally, another purpose of this study was to identify if exposure to treatment influenced preferences for nonpreferred foods relative to foods that did not undergo treatment.
Method

Subject and Materials

Four subjects completed Experiment 2. Rory and Roman participated in Experiment 1. Warren was an eight-year-old boy diagnosed with ASD. He consumed pretzels, dried apples, and water orally. He primarily obtained his caloric needs via a gastronomy tube (g-tube) and was referred for behavioral treatments to improve his oral intake due to an increase in aggression and self-injurious behavior that interfered with his g-tube feeds. Bethany was a 9-year-old girl diagnosed with ASD. She primarily ate rice and beans, fruit snacks, chips, and pureed foods even though she had the necessary oral-motor skills to consume solid textures. Bethany did not consume any other proteins, fruits, or vegetables.

Response Measurement and Reliability

Sessions were either coded while sessions were conducted via pen and paper on a trial-by-trial basis or following session from video recording. The main dependent variable of interest was the percentage of trials with independent acceptance and consumption defined as the subject either placing the food in their mouth or opening their mouth within 5 s of the experimenter presenting the bite on a spoon, and swallowing the food once it was accepted. In addition, subject preference for foods was measured prior to and following treatment. Data were collected on independent selection and consumption of foods during pre- and post-treatment paired stimulus preference assessments (described below; Fisher et al., 1992).

A secondary trained observer independently collected data for 78% (range, 33-100%) of baseline, 50% (range, 31-98%) of DRA, and 49% (range, 33-97%) of nonremoval of the spoon sessions across subjects. Interobserver agreement was calculated for independent acceptance and consumption by examining agreements between two independent observers defined as both observers recording either that the subject consumed the bite or did not consume the bite within
5-s of the bite being presented, summing the number of agreements for that session, dividing by the total opportunities to agree (i.e., agreements and disagreements), and converting to a percentage. Interobserver agreement for independent acceptance and consumption was 100% across conditions for each subject.

A secondary trained observer independently collected data for 100% of pre-treatment and 100% of post-treatment preference assessment sessions. Interobserver agreement was calculated for selection and consumption by examining agreements between two independent observers defined as both observers recording either that the subject consumed the same food or did not consume any food on that trial, summing the number of agreements across trials, dividing by the total opportunities to agree (i.e., agreements and disagreements), and converting to a percentage. Interobserver agreement was 100% for both pre- and post-treatment preference assessments across all subjects.

**Procedure**

**Pre- and Post-treatment Paired Stimulus Preference Assessments.** Caregivers were asked to supply 3 preferred foods and 12 nonpreferred foods for a total of 15 foods (Rory, Bethany, and Roman). Warren’s preference assessment did not include preferred foods due to the limited number of foods he was willing to accept. We opted to shorten his preference assessment and go immediately to treatment due to the severity of his feeding problem. All foods were presented in randomized pairs according to Fisher et al. (1992). For each trial, the experimenter presented two foods approximately equal to the size of a pea to the subject while providing an instruction to choose one food. Subject approaches to the food resulted in access to the food. Simultaneous approaches to both foods were blocked and the trial was presented again. Both foods were removed if the subject did not make a choice within 5 s or problem behavior.
occurred. The same foods were assessed prior to the start of the experimental arrangement and again following treatment.

**General Procedures.** Six foods were selected from the 12 nonpreferred foods identified by parents and ones indicated in the pre-treatment preference assessment (i.e., the subject refused to consume on 100% of trials). The six foods were paired in three sets of two such that each set consisted of two foods with similar properties (e.g., same flavor, color, texture, shape) as a means to test for generalization within similar and across different types of foods.

Each session consisted of 5 trials. Only one food was presented during a session, one bite at a time for a total of five bites per session. Each bite was approximately the size of a pea, was pre-scooped, and placed on a plate within arm’s reach of the subject. A three-step prompting procedure was used across conditions in which an instruction to consume the food (e.g., “Take a bite.”) was delivered. If consumption did not occur, the experimenter restated the instruction and gestured to the bite. Finally, if consumption still did not occur, the experimenter presented the spoon with the bite of nonpreferred food to the subject’s lips. Due to the severity of Warren’s feeding problem, a formal baseline was not implemented and a shortened DRA phase (described below) was used in an effort to treat his food refusal rapidly. A multiple baseline design across foods (concurrently) and across subjects (nonconcurrently) was used to assess the effect of treatment components on generalized consumption across similar and dissimilar foods.

**Baseline.** During baseline, the bite of food and all feeding materials were removed for 30 s if inappropriate mealtime behavior occurred at any point within the prompting sequence. If food was consumed, no praise or other programmed consequences were provided. We opted to forgo an escape baseline for Warren because consumption was extremely unlikely to occur under
those conditions. We opted to begin his treatment evaluation with a shortened DRA phase (described below), again with the attempt to progress to an effective treatment rapidly.

**Differential Reinforcement of Alternative Behavior (DRA).** This condition was identical to baseline with the exception that a preferred leisure item (i.e., iPad; Warren only) or edible was provided contingent upon consumption of nonpreferred foods. Sessions in this condition began by providing a sample of the leisure item (30 s) or preferred food after sitting at the table. The experimenter made a statement of the contingency in place (e.g., “If you eat your broccoli, then you will get more fruit snacks.”). If the subject consumed the nonpreferred food, access to a preferred item for 30 s (Warren) or a piece of preferred food (Rory, Bethany, and Roman) was provided, and praise was delivered.

**Nonremoval of the Spoon + DRA.** This condition was identical to the DRA condition with the exception that consumption of nonpreferred foods was required. Problem behavior no longer resulted in removal of the food and prompts continued as outlined previously. Sessions were terminated either by consuming a bite if 30 min had elapsed or when all five bites were consumed, whichever occurred first.

**Results**

Warren’s treatment results are depicted in Figure 3-1. He rarely consumed any foods in the DRA condition. When the nonremoval of the spoon procedure was employed, Warren began independently consuming foods that he previously rejected. The level of independent consumption increased and the variability of consumption decreased across subsequent implementation of the nonremoval of the spoon component across new foods. Notably, Warren did not need the nonremoval of the spoon procedure to begin consuming pineapple (last tier). He began consuming dried pineapple when dried apricot (third tier), a similar food, reached stability and intervention had begun with rice (forth tier). His pre- and post-treatment preference
assessment results are displayed in Figure 3-2. Prior to intervention, Warren did not select or consume any foods in the paired stimulus preference assessment. Following intervention, Warren selected and consumed foods on 100% of trials demonstrating a clear preference for dried apricot, noodles, and dried pineapple over the other foods.

Rory’s treatment results are depicted in Figure 3-3. Rory did not consume any foods during baseline, and he rarely consumed foods during the DRA condition. When the nonremoval of the spoon procedure was implemented, Rory demonstrated a rapid increase in independent consumption with little variability. On subsequent implementations of the nonremoval of the spoon component, Rory quickly identified that the procedure was in place and began consuming foods. Just like Warren, Rory began to consume one food in the DRA condition without the use of nonremoval of the spoon; Rory began eating ham (last tier) when treatment was introduced for chicken (third tier). His pre- and post-treatment preference assessment results are displayed in Figure 3-4. Rory only consumed Skittles®, Swedish Fish®, and Kit Kat® in the preference assessment prior to intervention. Following intervention, Rory demonstrated an increase in preference for all treatment foods with the exception of green beans and peas. Rory also demonstrated an increase in preference for foods to which he was not exposed during treatment, including one food that was similar to treatment foods (turkey) and one food that was not similar (raspberry). Rory did not consume any other foods to which he had not been exposed to during treatment including blackberry, blueberry, broccoli, and cauliflower.

Bethany’s treatment results are depicted in Figure 3-5. Bethany did not consume any foods during baseline, and she rarely consumed foods during the DRA condition. When the nonremoval of the spoon procedure was implemented, Bethany demonstrated a rapid increase in independent consumption with little variability. Like Rory, Bethany quickly identified when
treatment was in place and began eating only when the nonremoval of the spoon component was introduced. However, Bethany began independently consuming apple (fourth tier), pork (fifth tier), and pear (last tier) without the nonremoval of the spoon component once the treatment package was in effect for chicken (second tier). Her pre- and post-treatment preference assessment results are displayed in Figure 3-6. Prior to intervention, Bethany did not select or consume any nonpreferred foods in the pre-treatment paired stimulus preference assessment and only consumed her most preferred foods, which included fruit snacks, Chex Mix®, and chips. Following intervention, Bethany selected and consumed foods on 100% of trials demonstrating a clear preference for green beans, peas, and apples, some of which outranked previous highly preferred foods. She also showed a higher preference for foods that she was exposed to during intervention relative to foods she was not exposed to during intervention.

Roman’s treatment results are depicted in Figure 3-7. Roman did not consume any foods during baseline or DRA prior to the nonremoval of the spoon intervention. Following implementation of nonremoval of the spoon with mango (first tier), Roman began consuming all other foods without the use of a nonremoval of the spoon component. His pre- and post-treatment preference assessment results are displayed in Figure 3-8. Prior to treatment, Roman only consumed his preferred foods (i.e., cookies, yogurt, and macaroni and cheese). Following treatment, Roman displayed an increased preference for all treatment foods with the exception of mangos and peaches. During the post-treatment preference assessment, he was also willing to try foods to which he was not exposed during treatment. He selected and consumed celery, cucumber, melon, and red grapes once each despite no requirement or programmed reinforcement to do so.
Discussion

All subjects displayed some form of generalization during their experimental evaluations and post-treatment preference assessments. Specifically, Warren increased consumption of one food, Rory increased consumption of one food, Bethany increased consumption of three foods, and Roman increased consumption of five foods without the direct use of a nonremoval of the spoon component during their treatment evaluations. In addition, Rory consumed two novel foods, Bethany consumed five novel foods, and Roman consumed four novel foods in their post-treatment preference assessments even though subjects were not exposed to those foods during their treatment evaluations. One pitfall to employing a nonremoval of the spoon procedure is that it should only be implemented as a last resort after exhausting reinforcement-based interventions due to the expertise required to implement such a procedure. The nonremoval of the spoon procedure is likely to produce increases in problem behavior that caregivers might find difficult to manage on their own or when conducted in nonclinical environments (e.g., subject’s home). Thus, generalization results like the ones listed previously in which the nonremoval of the spoon component is not directly required or no longer needed are especially promising for potentially long-standing treatment gains.

In contrast to generalization effects, Rory’s results are especially interesting from a stimulus control perspective. He was one subject who could readily identify when the nonremoval of the spoon component was or was not in place; typically consumption occurred after he emitted a single instance of problem behavior and the experimenter kept the food present (i.e., refrained from delivering escape). From a practical standpoint, he rarely contacted the nonremoval of the spoon procedure and consumption of new treatment foods rapidly occurred when the nonremoval of the spoon component was implemented. Future research could capitalize on similar effects by pairing the nonremoval of the spoon procedure with salient
stimuli so parents are less likely to have to implement those procedures for novel foods or when wanting to increase consumption in new environments (e.g., when treatment is transferred to home). It is possible a number of other components of the experimental arrangement could come to control responding, such as the instruction to take a bite while placing the plate on the table. Future research should examine the effects of such naturally occurring stimuli and their contribution to transfer of control across foods, environments, and caregivers.

All subject’s generalization effects within the context of the treatment evaluation seemed to be related to several possible forms of generalization. For example, Warren’s preference for pineapple seemed to be related to increasing consumption of apricot following introduction of nonremoval of the spoon; that is, generalization possibly occurred due to the common food property (i.e., color) shared between pineapple and apricot. In addition, Bethany began eating apple, pork, and pear simultaneously when treatment was introduced for chicken. It is possible generalization for her also occurred as a function of the similar color between her treatment foods. Future research should examine the role common colors between foods have on treatment outcomes. Finally, Roman began eating all foods after treatment had been introduced to the first food in his treatment evaluation. Ultimately, we did not demonstrate experimental control over Roman’s consumption and a number of factors could have influenced the likelihood that he consumed. Thus, it is possible that generalization occurred for Roman due to common programmed contingencies between foods (i.e., DRA across all conditions), an inability to discriminate between conditions, or some other variable outside of our control.

Although some subjects did not eat all of the foods in the post-treatment preference assessment, the foods that were most likely to be consumed were those that had undergone treatment. This outcome suggests that the nonremoval of the spoon procedure was responsible
for changes in preferences. However, treatment is still likely necessary for some foods that went through treatment but preference did not increase. The post-treatment preference assessment data also indicate that generalization is not likely to occur, in large part, for foods the subjects were not repeatedly exposed during the treatment evaluation. Future research should continue to examine conditions that produce even greater generalization across treated and untreated foods. Further, it remains possible that the nonremoval of the spoon procedure does not increase preference per se but rather puts the subject into contact with the already existing reinforcers associated with those foods (e.g., taste, smell, satiety; Kerwin, Ahearn, Eicher, & Burd, 1995). Future research might determine whether this is the case by measuring whether prolonged exposure to treatments produces an even greater effect on preference outcomes relative to shortened exposure to treatment.

Warren and Bethany ate all foods in their post-treatment paired stimulus preference assessment. Both subjects might not have readily understood that consumption was not required during the assessment. For example, Bethany consumed many foods under the DRA contingency yet still required nonremoval of the spoon to increase her consumption of green bean; thus, green bean was seemingly the least preferred food in her treatment evaluation. However, green bean was the most preferred food out of the previously nonpreferred foods in her post-treatment paired stimulus preference assessment. Her level of consumption in her post-treatment preference assessment displaced previous highly preferred foods suggesting some of the treatment foods had become highly preferred.

Several limitations of this study should be addressed. The current experiment added components to previous components; that is, DRA remained in effect after nonremoval of the spoon was implemented. Previous research has shown that DRA combined with nonremoval of
the spoon is effective in decreasing inappropriate mealtime behavior relative to nonremoval of
the spoon alone (Piazza, Patel, Gulotta, Sevin, & Layer, 2003). Given previous literature on the
added benefit of a DRA and nonremoval of the spoon treatment package, it is possible that the
DRA component in the current experiment influenced the rapidity with which the subjects
achieved independent consumption, promoted generalization, or was responsible for the
increased preference for foods displayed during the post-treatment preference assessments. Thus,
future research should examine the influence of DRA on these measures.

On a related point, Roman began eating peaches consistently after intervention was
implemented for mango, suggesting a potential generalization effect due to the similar properties
those two foods share. In addition, consumption of any food(s) without the need of the
nonremoval of the spoon component was suggestive of increased preferences for that food(s) for
all other subjects. However, Roman did not independently consume mangos or peaches during
his post-treatment preference assessment. It remains unclear to what extent the nonremoval of
the spoon procedure might be responsible for decreasing preferences for certain foods rather than
increasing preference. Future research should examine whether implementing nonremoval of the
spoon influences preference for foods in an unintended direction and should evaluate additional
components such as noncontingent reinforcement or DRA that might counteract these effects.

Another limitation is that the same experimenter involved in the treatment evaluation
conducted the pre- and post-treatment preference assessments. It remains possible that the
contingencies in effect during the final phase of treatment and the post-treatment preference
assessment were not discriminable, producing consumption that was a function of generalization
rather than a true measure of participant’s preference for those foods. However, not all subjects
consumed food on 100% of trials in the post-treatment preference assessment; thus, some
subjects contacted the escape contingency in place during the final preference assessment. Future researchers conducting pre- and post-treatment measures should consider a novel experimenter or at least one that is not directly related to treatment to be the experimenter responsible for conducting the preference assessments.
Figure 3-1. Treatment evaluation for Warren depicting the percentage of trials with independent acceptance for Warren across DRA and NRS phases. The top panel depicts sessions with noodle, followed by cranberry, apricot, rice, raspberry, and pineapple.
Figure 3-2. Pre- and post-treatment preference assessment results for Warren depicting percentage of trials with consumption during pre- (black bars) and post-treatment (grey bars) paired stimulus preference assessments.
Figure 3-3. Treatment evaluation for Rory depicting the percentage of trials with independent acceptance for Warren across DRA and NRS phases. The top panel depicts sessions with green bean, followed by pasta, chicken, peas, rice, and ham.
Figure 3-4. Pre- and post-treatment preference assessment results for Rory depicting percentage of trials with consumption during pre- (black bars) and post-treatment (grey bars) paired stimulus preference assessments.
Figure 3-5. Treatment evaluation for Bethany depicting the percentage of trials with independent acceptance for Warren across DRA and NRS phases. The top panel depicts sessions with peas, followed by chicken, green bean, apple, pork, and pear.
Figure 3-6. Pre- and post-treatment preference assessment results for Bethany depicting percentage of trials with consumption during pre- (black bars) and post-treatment (grey bars) paired stimulus preference assessments.
Figure 3-7. Treatment evaluation for Roman depicting the percentage of trials with independent acceptance for Warren across DRA and NRS phases. The top panel depicts sessions with mango, followed by peas, broccoli, peach, green bean, and cauliflower.
Figure 3-8. Pre- and post-treatment preference assessment results for Roman depicting percentage of trials with consumption during pre- (black bars) and post-treatment (grey bars) paired stimulus preference assessments.
CHAPTER 4
GENERAL DISCUSSION

In Experiment 1 the function of inappropriate mealtime behavior was identified for five children with ASD using conditions similar to those described in previous research. All subjects responded in a similar manner across conditions and similar outcomes were obtained. All subjects displayed increased inappropriate mealtime behavior in both escape conditions and the attention (spoon) condition, suggesting problem behavior was maintained by social-negative reinforcement. Notably, in the absence of the attention (plate) condition, a social-positive reinforcement function would have been falsely identified.

The results of Experiment 1 extend the current literature on the assessment of pediatric feeding problems by refining assessment methodology. The spoon presentation method used in previous studies increased the likelihood of identifying false positive results, namely that inappropriate mealtime behavior was maintained, at least in part, by social-positive reinforcement. The current method included several controls across test conditions designed to identify the influence of aversive stimulation in the attention and no interaction conditions. Overall, Experiment 1 should influence how clinicians and researchers conduct assessments of inappropriate mealtime behavior by suggesting alternative test and control conditions as well as additional means to analyze patterns produced by functional analysis data.

The prevalence of social-negative reinforcement functions for inappropriate mealtime behavior as well as the necessity of treatment approaches requiring a nonremoval of the spoon component (Piazza, Patel, Gulotta, Sevin, & Layer, 2003), begs the question of how necessary functional analyses are for this population and particular topography of problem behavior. As functional analysis methodology is refined for the assessment of inappropriate mealtime behavior, it is possible that increased accuracy will begin parsing out the likelihood of obtaining
multiple functions that seems to be currently prevalent in the published literature. As assessment methodology becomes more rigorous, it is possible that shortened methods such as brief functional analyses (Wilder et al., 2005) and pairwise analyses (LaRue et al., 2011), or alternative methods yet to be disseminated could become increasingly useful and customary.

One alternative to functional analyses that has yet to be suggested is examining problem behavior in the context of preference assessments. Typically, preference assessments are conducted prior to any feeding evaluation as a means to confirm caregiver report that their child engages in inappropriate mealtine behavior and does not consume the foods that were selected for treatment. However, foods are presented in a similar fashion to the preference assessment utilized in the current study. That is, escape is provided contingent upon refusal, and no other programmed consequences are provided (i.e., a social-negative reinforcement test condition). Further, preferred foods are sometimes used in an effort to identify stimuli that will likely function as reinforcers and to serve as a comparison in post-treatment preference changes (i.e., a control condition). It is possible responding in a preference assessment might be indicative of outcomes under escape and control conditions in a functional analysis. Future research should continue efforts to shorten assessment procedures and examine alternative, accurate methods of assessment so individuals exhibiting feeding difficulties can receive effective treatments quickly.

Research has yet to capitalize on pre- and post-treatment preference assessments as a measure of shifting preferences and potential generalization following behavioral interventions. Experiment 2 adds to the few empirical studies reporting post-treatment preference changes (e.g., Fernand, Penrod, Fu, Whelan, & Medved, 2016). These studies are the first to allude to long-term maintenance as a function of increasing preference for previously nonpreferred foods. Future research should continue to examine the utility of post-treatment preference assessments
in a more experimental fashion. For example, treatment could be implemented across groups of foods while measuring preference for those foods in a staggered fashion, similar to a multiple baseline design. Experimental control could be demonstrated during repeated preference assessments by demonstrating that preference shifts for foods only when those foods have undergone treatment. In addition, data obtained in long-term follow-up sessions demonstrating continued consumption of foods that are preferred as a result of behavioral interventions could be critical in amassing support for behavioral approaches in the treatment of pediatric feeding problems.

Future research should also examine the optimal testing methods for conducting preference assessments. It is possible frequent contact with baseline contingencies (i.e., escape and absence of positive reinforcement) during preference assessments could slow the progress of intervention approaches. This effect was not seen in the current study and the current data are suggestive of a robust treatment effect of nonremoval of the spoon. However, future experiments should examine responding during preference assessments with delivery of noncontingent tokens or praise, as examples, to determine if appropriate behavior is more likely to persist following treatment relative to baseline contingencies. It is possible some form of DRA contingency is more typical of what might occur outside of the experimental environment as well.

Despite a growing understanding of the likely function of inappropriate mealtime behavior, an eye toward preventive measures has not received much attention in the behavioral feeding literature. It is not clear why children initially develop inappropriate mealtime behavior and selective food preferences. The results of Experiment 1 suggest there is a relationship between proximity to the nonpreferred food and an increased probability of inappropriate mealtime behavior. Research examining how this relationship develops could serve as a step
forward in preventing the formation of aversive relationships involving food and the need for intensive treatments such as the one evaluated in Experiment 2.


BIOGRAPHICAL SKETCH

Jonathan received his Bachelor of Arts in psychology from the California State University, Sacramento in 2008. He later pursued a master’s degree in psychology with an emphasis in applied behavior analysis from the California State University, Sacramento in 2012 and a doctoral degree in psychology with an emphasis in behavior analysis from the University of Florida in 2017.