AN EVALUATION OF A PROGRESSIVE HIGH-PROBABILITY INSTRUCTIONAL SEQUENCE IN THE TREATMENT OF FOOD SELECTIVITY FOR CHILDREN WITH AUTISM

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A Thesis

by

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Abstract

of

AN EVALUATION OF A PROGRESSIVE HIGH-PROBABILITY INSTRUCTIONAL SEQUENCE IN THE TREATMENT OF FOOD SELECTIVITY FOR CHILDREN WITH AUTISM

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Approximately 90% of parents who have children with an autism spectrum disorder (ASD) report that their children have considerably more feeding problems and eat a significantly narrower range of foods than their children without ASD (Ahearn, Castine, Nault, & Green, 2001; Schreck, Williams, & Smith, 2004). Few studies have examined the effects of high-probability (high-p) instructional sequencing in the treatment of food selectivity, and results of these studies have been mixed (e.g., Dawson, Piazza, Sevin, Gulotta, Lerman, & Kelley, 2003; Patel, Reed, Piazza, Mueller, Bachmeyer, & Layer, 2007). The present study evaluated a high-p instructional sequence with three boys between the ages of 8 and 12 diagnosed with an ASD. Response requirements were gradually increased from responses the child would tolerate (e.g., toughing the food) to the final requirement of chewing and swallowing the food presented. The high-p instructional sequence was implemented in the absence of escape extinction.

Results indicated that the high-p instructional sequence was effective in increasing food consumption for two participants. Further, minimal inappropriate
mealtime behaviors were observed, which has been reported as one of the drawbacks of using an escape extinction procedure. Preference and generalization for non-targeted foods did not occur and consumption of non-targeted foods did not increase until those foods were presented using the high-p sequence the increase. However, results showed that acceptance for the targeted foods generalized across people and environments. Since this treatment protocol did not require physical intervention and sessions were not time consuming, teachers may be successful in implementing this treatment within the school setting. Further research is recommended in order to evaluate the effectiveness of the high-p instructional sequence in the home and school environments.

________________________, Committee Chair
Jean Gonsier-Gerdin, Ph.D.

________________________
Date
DEDICATION

This thesis is dedicated to my dad, whose memory has helped shape me into the person I am today. Not a day goes by when I don’t think about the time we had together.
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Many thanks to both Dr. Gonsier-Gerdin and Dr. Penrod for supporting me throughout the course of this study. To my right-hand man, Jonathan Fernand: Thank you for dedicating your time and patience to being my lead research assistant—I couldn’t have done this without you. I’d also like to thank my other research assistants—Sherrene Fu, Sarah Dickman, and Stacy Eiden—for running sessions, taking data, and for their willingness to be on “standby” over the past year. To my research participants and their families: You were not only my participants, you became my friends. Thank you for making this experience one I will cherish always.

A very heartfelt thanks also goes to my husband, Jeremy, whose words of encouragement during my moments of panic each semester got me through the last three years. Thank you to my family and friends for always believing in me, even when I wasn’t sure of myself. Finally, thank you to The Beatles for writing “Blackbird,” which captured my graduate school experience perfectly.
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Chapter 1

INTRODUCTION

Autism spectrum disorders (ASD) are a set of complex developmental disabilities that affects a person’s ability to relate to others and the world around them. Individuals with ASD usually have significant language delays, social and communication challenges, unusual behaviors and interests, and many also have an intellectual disability (Centers of Disease Control and Prevention [CDC], nd). Symptoms tend to start before age three and range from severe forms of autistic disorder and pervasive developmental disorder-not otherwise specified (PDD-NOS), to a much milder form called Asperger’s syndrome (National Institute of Mental Health [NIMH], 2009). Some individuals who are mildly affected may exhibit only slight delays in language and greater challenges with social interactions. Others who are more severely affected may have little to no verbal language, limited eye contact, and may engage in tantrum or self-injurious behaviors. In addition to deficits in social interaction, verbal and nonverbal communication, and repetitive behaviors or interests, individuals with ASD are often resistant to change and insist on sameness in their daily routines (NIMH, 2009).

Abnormal eating behaviors have been found in many children with ASD (Ahearn, Castine, Nault, & Green, 2001). Studies and reports assert that approximately 90% of parents who have children with ASD report that these children have significantly more feeding problems and eat a significantly narrower range of foods than children without autism (Ahearn et al., 2001; Schreck, Williams, & Smith, 2004). Determining the specific etiological factors that contribute to food selectivity has proven difficult, but
researchers believe that feeding problems include a combination of environmental, behavioral and physical factors (Freeman & Piazza, 1998; Ahearn, Kerwin, Eicher, & Luckens, 2001).

Feeding difficulties and dietary inadequacies have been reported to occur in approximately one third of children with developmental disabilities and 80% of children with severe or profound disabilities (Shore, Babbit, Williams, Coe, & Snyner, 1998). These feeding difficulties range from mild food selectivity to complete food refusal. Food selectivity is a behavior characterized by consumption of a limited variety of food items as well as the rejection of most novel food items from the primary food categories of fruits, vegetables, dairy, proteins, and starches (Levin & Carr, 2001; Ahearn et al., 2001). Both food selectivity and food refusal have been conceptualized as a form of noncompliance in which the child refuses to eat a sufficient volume or variety of food (Dawson, Piazza, Sevin, Gulotta, Lerman, & Kelly, 2003). Although children with food selectivity tend to maintain their weight by eating a large amount of preferred foods, selective food preferences often result in inadequate daily nutritional requirements and restricted caloric intake (Luiselli, Ricciardi, & Gilligan, 2005).

Statement of the Problem

Often, children with a limited food repertoire are left untreated, resulting in the progression from mild food selectivity to complete food refusal (Douglas, 2002). Subsequently, children may end up admitted to an inpatient hospital unit for treatment of the feeding problem, or undergo invasive medical procedures such as placement of a nasogastric or gastronomy tube, and will ultimately experience limitations in social,
emotional, and educational and functional development (Kerwin, 1999). A potential liability to intensive feeding treatments is that these treatments often require invasive physical contact with the child to achieve treatment integrity. There is currently limited research on proactive, non-invasive feeding protocols for children with mild food selectivity; however, food selectivity has serious implications for a child’s overall quality of life. Therefore, it is imperative that proactive treatments for the management of food selectivity are developed before food selectivity progresses into complete food refusal.

Purpose of the Study

The purpose of this study was to develop and examine the effects of an easy to administer, proactive feeding protocol based on the principles of behavior momentum (Mace, Hock, Lalli, West, Belfiore, Pinter & Brown, 1988) and progressive high-probability (high-p) instructional sequencing (Dawson et al., 2003; Patel, Reed, Piazza, Mueller, Bachmeyer, & Layer, 2007). Questions asked when developing the treatment procedure included: (1) Will a behavior momentum protocol treat food selectivity in the absence of more intrusive feeding interventions for children diagnosed with ASD? (2) If the treatment is successful, will it prevent the future need for intensive feeding treatments? (3) Furthermore, if this treatment is successful, is it one which could be administered outside of a clinical setting? The research from this study aimed to answer these important questions.

Theoretical Framework

The framework for this study was based on the theories of behavior momentum and high-probability instructional sequencing. Mace et al. (1988) described behavior
momentum as “a high-probability command sequence which indirectly manipulates the rate of reinforcement to establish what appears to be a ‘momentum’ of compliant behavior that may persist when subjects are asked to perform a task with a low probability of compliance” (p. 124). In other words, behavioral momentum occurs as a result of providing a series of sequential instructions with which the child has a history of compliance. Theoretically, once momentum is established the probability of the child complying with a non-preferred activity increases. Narrow research on the effects of high-p sequencing on food selectivity has been completed with mixed results. Dawson et al. (2003) found that the high-p intervention was only effective once escape extinction was introduced into treatment, presumably because the positive reinforcement available for compliance did not compete with the negative reinforcement provided for escape behavior. However, it must be noted that a major limitation of the Dawson et al. (2003) study was that the high-p instruction was a simple fine motor response not related to eating and the low-p response was a more complex behavior that involved multiple steps associated with eating (i.e., opening the mouth, chewing the food, and swallowing). Patel et al. (2007), on the other hand, found that manipulating antecedent conditions by presenting high-p instructions immediately prior to presenting low-p instructions was successful in increasing food acceptance. It is possible that success with this procedure was attributed to the child displaying passive food refusal (e.g., simply not responding). The authors noted that more research is needed to establish the conditions under which behavior momentum and high-p sequences are likely to increase food acceptance. Neither the Dawson et al. (2003) nor the Patel et al. (2007) studies examined the effects
of presenting complex high-p instructions related to eating. This study aimed to adapt the current theories on behavior momentum by presenting both high-p and low-p instructions which were related to eating without implementing an escape extinction procedure.

Definition of Terms

*Behavior Momentum*

A high-probability command sequence which indirectly manipulates the rate of reinforcement to establish what appears to be a ‘momentum’ of compliant behavior that may persist when subjects are asked to perform a task with a low probability of compliance.

*Compliance*

Behavior related to the child completing a step in the instructional task.

*Food Selectivity*

Occurs when an infant or child selectively limits foods to either texture or type. Children who do not follow the normal developmental pattern and progress to solid foods at the appropriate age are said to have a food selectivity problem based on texture regardless of the range of taste they are willing to consume. On the other hand, many children are fully capable of chewing and swallowing rather difficult textures, but limit their intake to only one or two foods (Ollendick & Schroeder, 2003).

*High-Probability Instructional Sequence*

A series of instructions for which compliance is likely (Mace et al., 1988).
Low-Probability Instruction

A request immediately following a high-probability sequence for which compliance is unlikely (Mace et al., 1998).

Non-Compliance

Behavior related to the child not following the high-p and/or low-p instructions following two verbal/model prompts.

Refusal Behavior

Behavior related to the child engaging in gagging, vomiting, and/or pushing/throwing food or stating, “No” at any point during the food presentation.

Swallow

The act of swallowing. Note: Swallows were counted if the participant independently took small nibbles off the food.

Assumptions

For purposes of this study, it was assumed that children who suffered from food selectivity had a repertoire (albeit limited) of foods that were accepted and preferred. It was also assumed that demands that have a high probability of causing compliant responses were discriminative stimuli for behavior that had produced reinforcement in the past. Therefore, it was further assumed that with a behavior momentum procedure the presentation of a sequence of high-p demands immediately prior to the presentation of a low-probability demand would increase the probability of compliance in children with food selectivity. Lastly, it was assumed that the protocols within this study would be implemented with procedural fidelity.
Justification

Complete food refusal requires intensive and often invasive treatment procedures provided by a team of experienced medical professionals. However, research suggests that less intrusive treatment procedures may be effective for children struggling with food selectivity (Patel et al., 2007). While professional involvement is necessary for any type of disorder which affects a child’s health, applying the behavior momentum procedure gives appropriately-trained parents/legal guardians and educators the opportunity to prevent continued food selectivity in the child’s natural environments. Additionally, if found effective, this procedure may have applicability for children with other types of developmental disabilities as well as for typically developing children.

Limitations

The primary limitation of this study was the small size of the experimental group (i.e., three participants). A small sample size may have affected the interpretation and confidence of results, in particular the potential production of false-positive results or an over-estimation of the magnitude of an association between the treatment and the results. Another potential limitation of this study was that treatment sessions were conducted in a laboratory setting rather than in the children’s’ natural environment. Nevertheless, the goal of this experiment was to demonstrate that the effectiveness of treatment was directly related to the treatment and was not caused by some other variable. This type of controlled setting was chosen to avoid confounding variables which often occur in the natural setting and effect treatment validity.
Organization of the Remainder of the Thesis

The rest of this thesis is organized in the following manner. Chapter 2 will provide a review of the current literature on treatments designed for individuals with food selectivity. This chapter will focus on the following evidenced-based practices: Physical interventions; nonremoval of the spoon techniques; single versus multiple food item presentation protocols; treatments using positive and negative reinforcement with and without escape extinction; simultaneous versus delayed reinforcement procedures; noncontingent reinforcement plus response cost versus differential reinforcement of alternative behaviors plus response cost procedures; treatments designed to differentially reinforcement of the first behavior in a chain versus the terminal behavior in a chain; high-probability instructional sequencing protocols with and without escape extinction; stimulus fading with guided compliance; and fading plus backwards chaining with and without escape extinction procedures. Chapter 2 will also discuss food acceptance generalization across settings and people as well as parent implemented intervention programs. Chapter 3 will describe the participants and setting, the experimental design, and the methods used in the progressive high-probability instructional sequence treatment protocol. Chapter 4 will provide the results from the treatment protocol and Chapter 5 will provide a discussion of the results and limitations as well as implications for future practice and research.
Chapter 2

REVIEW OF THE LITERATURE

This literature review will examine the following topics related to research and practice: (a) factors contributing to food selectivity, (b) feeding problems in children with ASD, (c) applied research procedures used in the treatment of food selectivity and (d) the generalization of food acceptance across settings and people.

Factors Contributing to Food Selectivity

Determining the etiological factors which contribute to food selectivity has occurred as a combination of environmental, behavioral and physical factors (Freeman & Piazza, 1998; Ahearn, Kerwin, Eicher, & Lukens, 2001). Douglas (2002) speculated that food refusal and selectivity appears to be a pattern of behavior developed by the child in response to their learning experiences with their parents, their experiences with food, their temperament, and their medical histories. Douglas further provided several etiological explanations for how food selectivity can be the consequence of unpleasant conditions with feeding due to medical difficulties. This phenomenon is known as post-traumatic feeding disorder (Douglas, 2002). Children who have a medical history of gastro esophageal reflux may feel pain and nausea as a result of eating. Additionally, a history of slow stomach emptying and/or slow gut motility, often associated with prematurity, may lead to similar sensations when eating. Another cause for food refusal may be a delay in the development of oral motor coordination (Douglas, 2002). When children do not display the necessary motor skills for ingestion, they may develop selectivity to eating only certain food textures (e.g., pureed foods). Douglas (2002) also
noted that long term tube feeding, due to problems such as chronic renal failure, may hinder a child from learning to eat normally, resulting in food selectivity.

Although etiology varies and a clear medical diagnosis is not always the cause of food refusal, feeding problems often persist as a result of environmental factors. Research has suggested that reinforcement plays a significant role in the development and maintenance of food refusal (Freeman & Piazza, 1998; Kern & Marder, 1996). For example, refusing food may be positively reinforced when parents attempt to coax their child (e.g., “If you eat your apple, you can watch a video.”) or it may be punished when parents reprimand them for not eating (e.g., “If you don’t eat your apple, you’ll get a spanking.”). Conversely, being allowed to leave the meal early in response to food refusal is a form of negative reinforcement that often maintains this refusal. In other words, the child has learned that by refusing to eat, she is allowed to escape from the demand and leave the table. Furthermore, refusal behavior may be sustained when selective eaters’ parents provide them with only the preferred foods they will consume. When attempts to introduce new foods to the child are met with resistance, non-compliance, and/or tantrum behavior, many parents resort to offering their child a preferred food in order to abate the negative behavior (Kern & Marder, 1996). Many other environmental factors exist which may be attributed to food selectivity and refusal including meal structure, family diet, and mealtime habits. Identifying the specific environmental factors associated with a child’s food refusal is the first step in determining the appropriate feeding treatment to implement.
Food selectivity can be categorized by type, texture, and presentation. Anecdotal accounts (Schreck, Williams, & Smith, 2004) include children who only eat “yellow” foods such as McDonald’s french fries and chicken nuggets or “baby food” diets. Many children only eat items within a categorical type of food (i.e., fruits, vegetables, dairy, proteins, or starches) and may be combined with only accepting certain textures of food, such as soft or pureed meals (Ahearn et al., 2001; Patel, Piazza, Santana, & Volkert, 2002). A frequently encountered problem among children with ASD is the aversiveness of ingesting highly textured foods which results in gagging and potential choking (Shore, Babbit, Williams, Coe, & Snyder, 1998). Another dimension of food selectivity is only accepting food when it is presented in a certain way (Schreck et al., 2004). For example, some children will only eat if their food is presented on a square plate with none of the other foods touching, while they sit in front of the television. Just as it is important to identify the causes of food selectivity when identifying which treatment to use, recognizing the specific type of food selectivity will help further identify the most effective treatment to increase foods accepted into the child’s repertoire.

Feeding Problems in Children with ASD

Schreck et al. (2004) examined and expanded previous literature suggesting that children with ASD tend to have more feeding problems than children without ASD. In their study, the Gilliam Autism Rating Scale (GARS) was completed by caregivers of children ages 5-12 years, and based on the GARS scores and any previous ASD diagnosis, children were either assigned to the autism group (n=138) or a control group (n=298). In addition to the GARS, the Children’s Eating Behavior Inventory (CEBI) and
the Food Preference Inventory (FPI) were sent to caregivers to complete. The CEBI recorded the frequency of 19 different eating behaviors on a five-point scale, and asked caregivers to determine if each eating behavior presented a problem to the family. The FPI provides a list of foods from each of the five food groups and required an indication of whether or not their child would eat an age-appropriate amount of a particular food and whether or not the food was offered during mealtimes and eaten by the family. Results showed that in comparison to the control group, children with ASD had a tendency to: (1) refuse more foods, (2) likely require specific utensils and particular food presentations before accepting a food, (3) likely only accept foods with low textures (i.e., pureed foods) and (4) regardless of texture, eat only a narrow variety of presented foods within each food group. These results supported previous research (Ahearn et al., 2001; Schreck & Williams, 2006), suggesting that children with ASD have different eating habits than typically developing children.

Categorization of Feeding Problems in Children with ASD

Ahearn et al. (2001) attempted to develop methods for assessing the categorization of individual feeding patterns of children with ASD through direct observational assessment. In their study, 30 children, ages 3 to 14 years, were exposed to a repeated measures design with multiple exposures to a variety of foods. All of the children were exposed to three regularly textured food items from each of four food groups; each item was presented twice across six assessment sessions (i.e., 24 trials per session). Acceptance was defined and scored as the participant picking up the presented food with or without using a spoon, opening the mouth, and placing the food in the mouth
within five seconds of a verbal prompt to “Take a bite.” An expulsion was defined and scored if the food was outside the mouth after it had been accepted at some point during the assessment (i.e., spitting the food out). Disruption was defined as any response that interrupted the presentation of the food on the plate (i.e., knocking the food off the table, self injury/aggression when food was presented). [These definitions will be used as operational definitions throughout all remaining studies within this literature review]. Levels of acceptance were also analyzed within each food group to determine the variety of foods accepted. For the Ahearn et al. (2001) study, a low level of acceptance was defined as 11-20 bites within a food group, and a high acceptance was defined as 2-30 bites within a food group. If 75% or more of the accepted bites were in pureed form, the participant was labeled as texture selective.

Results from the Ahearn et al. (2001) study show three distinct food selectivity patterns among children with ASD: (1) food acceptance, (2) complete food refusal and (3) selectivity by type or texture. High overall acceptance of food was shown in only four of the 30 children, while nine children demonstrated moderate levels of acceptance, and low overall acceptance was exhibited in more than half of the participants in the study. Moreover, four of the low acceptance children displayed complete food refusal and 17 of the 30 participants also showed selectivity for food type, with one of them showing selectivity for food texture. Overall, results showed that children with ASD engage in unusual patterns of food acceptance. A major limitation of this study is the lack of a control group comprised of children not diagnosed with ASD; therefore, the
researchers were unable to determine if these types of food selectivity occur as frequently in children without disabilities.

As previously noted, food selectivity and food refusal can be conceptualized as a form of noncompliance in which the child refuses to eat a sufficient volume or variety of food. Limited research exists on the effects of treatment for food selectivity; however, if not treated early, food selectivity often results in complete food refusal (Douglas, 2002). The following literature provides an explanation of the various treatments designed to treat food refusal, but it is plausible that treatments effects would be similar for children with food selectivity.

Applied Research Procedures Used in the Treatment of Food Refusal

*Physical Interventions*

Chronic food refusal has traditionally been treated using physical prompting-based techniques such as forced feeding when positive reinforcement techniques have failed to produced adequate results (Hoch, Babbit, Coe, Krell, & Hackbert, 1994). These authors described forced feeding as an educative physical prompting procedure that both ensures the child’s target behavior (i.e., food acceptance) contacts a positive reinforcement contingency and removes escape or avoidance behaviors. A study by Iwata, Riordan, Wohl, & Finney (1982) provides one example of a forced feeding procedure. In their study, the authors applied pressure to the child’s chin upon non-acceptance of the presented food, resulting in the mouth opening and the food being physically inserted. In a second example of a forced feeding protocol, Ives, Harris, & Wolchick (1978) placed a child on his back while the therapist straddled him. Food was
placed in the mouth or smashed against the teeth if the mouth was closed. When necessary, chewing was physically guided by moving the child’s jaw and covering his mouth with two fingers to present spitting the food out. In both protocols, social reinforcement (e.g., praise, “Good job eating”) was provided contingent on swallowing the food.

Although both treatments resulted in the rapid increase of food acceptance, problems arise when using forced feeding to treat food selectivity. First, because the term “forced feeding” is not operationally defined, variability among these procedures can occur. This is exemplified in the two illustrations described above; the latter procedure was much more intrusive than the first, yet they were both defined as forced feeding. Additionally, forced feeding procedures may pose health risks. For example, aspiration pneumonia, an acute chemical lung injury, may result if, during the course of forced feeding, a child inhales food into the lower airways. Finally, Hoch, Babbit, Sestero, & Cataldo (1991) reported a 56% parental dissatisfaction rate with physical prompting or jaw control, and a 67% parental noncompliance with the generalization of these procedures. Overall, forced feeding procedures, although effective, may cause more harm than good.

**Physical Interventions versus Nonremoval of the Spoon**

Physical interventions are still used today; however, they are no longer referred to as force feeding procedures. Examples of such interventions were shared in a study by Ahearn, Kerwin, Eicher, & Lukens (2001). Specifically, two treatment packages for food refusal were examined using a within subject-reversal (ABAC) comparison. One
treatment included physical guidance (i.e., opening the mouth by applying gentle pressure
to the jaw) and the other included nonremoval of the spoon. The differentiating
characteristics between the two interventions were that in the physical guidance protocol,
failure to accept the food resulted in manually guided acceptance, whereas in the
nonremoval of the spoon protocol, the presented food remained in front of the child until
it was accepted. Results showed that both interventions produced food acceptance;
however, responses were more stable with the use of physical guidance. Ahearn et al.
(2001) speculated that food refusal was maintained by negative reinforcement in the form
of escape from the demand, and that both treatment packages were successful because
escape was placed on extinction; thereby, preventing the participant from escaping the
feeding situation. Additional treatments with negative reinforcement contingencies will
be described later within this literature review.

Single Food Item Presentation versus Multiple Food Items Presentation

Ahearn (2002) conducted a study which examined the quantity of food items
presented during treatment for food refusal. This study compared presenting single food
items to the presentation of multiple food items to determine if one method was superior
to the other. The six children with ASD selected to participate in this study has
previously been treated for food refusal using positive reinforcement-based interventions
which were unsuccessful in producing food acceptance. During the initial assessment,
the participants were allowed to feed themselves the presented foods from four food
groups. None of the participants consumed more than one food item, nor did they
consume that particular food item more than 50% of its presentations. In baseline, the
participants were fed by the experimenter, acceptance of food was rewarded with a highly preferred item, and the food was removed contingent upon refusal. Following the assessment and baseline sessions, participants were placed into either the single-item group (n=3) or the multi-item group (n=3). Criterion for both groups was >80% acceptance, <20% expulsion, and <20% disruption, and response definitions for this study were identical to the Ahearn et al. (2001) study. Participants in the single-item group were presented with one food item at a time until criteria was met for that item. Children in the multi-item group were presented with three items from a particular food group (e.g., apple, banana, orange – fruit group) until criterion was met. Once criterion for the first food item was met for the single-item group, a new food from the same food group was introduced for the second and third items. The fourth item targeted for acceptance was from a different food group. When criterion was met for the multi-item group, a second food group was targeted for acceptance. For both groups, newly introduced foods were presented during the last five trials of the next session. If a child consumed two or more bites of the new food during these trials, food acceptance was considered generalized to the new target. Failure to meet criterion with the first food or failure to maintain criterion after three sessions with the newly targeted foods resulted in a nonremoval of the spoon or physical guidance treatment procedure.

Results of this study (Ahearn, 2002) showed advantages for both food presentation methods. The single-item group reached the criterion in fewer trials than the multi-item group; however, acceptance of new foods during generalization was more probable with the multi-item group. Additionally, all here participants in the multi-item
group met the eating criterion in the food groups without requiring nonremoval of the spoon or physical guidance procedures. Implications of these results suggest that if rapid food acquisition is the primary goal of treatment (e.g., for purposes of weight gain or to prevent weight loss), then introducing a single food at a time is the more appropriate form of treatment. However, if the goal is to generalize consumption within food groups, multiple items should be targeted for acceptance simultaneously. The following section will discuss positive versus negative reinforcement contingencies used in the treatment of food refusal.

*Positive Reinforcement and Escape Extinction*

Research designed to treat food refusal may include various combinations of positive reinforcement as part of the treatment protocol. Piazza, Patel, Gulotta, Sevin, and Layer (2003) compared the effects of escape extinction with and without using social positive reinforcement (i.e., differential reinforcement of alternative behavior [DRA]) to treat food refusal. In their study, four children with total food refusal were exposed to a multielement design to compare: (1) acceptance levels, (2) mouth clean, (3) inappropriate behavior, and (4) negative vocalizations in an escape baseline, DRA plus escape, escape extinction (EE) and DRA plus EE. For each condition, one food item from each of the four food groups was presented each day in three to four session blocks with two to three five-minute sessions.

During the escape condition, participants were presented with a bite or drink every 30 seconds and verbal praise was delivered contingent on acceptance of the bite within five seconds of its presentation. If the food was expelled or refused with
inappropriate behavior (e.g., head turns), the food was removed for 15 seconds. The next bite was presented immediately after the escape period or at the 30 second interval. In the DRA plus escape condition, the procedures were identical to the escape condition, except that the child gained access to reinforcement (i.e., toys and/or attention) for 15 seconds following each mouth clean trial. In this condition, bites were presented on a 30 second interval regardless of the delivery of reinforcement. In the EE condition, procedures were identical to the escape condition except inappropriate behavior and negative vocalizations no longer produced escape from the food presentation. Rather, attempts to escape were blocked and either nonremoval of the spoon or physical guidance was implemented until the bite was placed in the child’s mouth. If the food was expelled, it was scooped up and represented for 30 seconds; this continued throughout all trials. The DRA plus EE was identical to the EE condition except access to 30 seconds of reinforcement was provided following each mouth clean trial.

Results of this study showed that for all four children, positive reinforcement alone was insufficient in increasing food acceptance; however, consumption increased with EE was implemented regardless of whether or not reinforcement was present. Of note, DRA plus EE did effectively reduce levels of crying and inappropriate behavior. Piazza et al. (2003) argued that positive reinforcement alone may have been ineffective because all participants in the study exhibited total food refusal; therefore, they had few previous opportunities to receive positive reinforcement for food acceptance. Even so, DRA plus EE proved to be the most effective method for the treatment of food refusal and reduction of appropriate behaviors in this study (Piazza et al., 2003).
Negative Reinforcement and Escape Extinction

In contrast to the Piazza et al. (2003) study, Ahearn, Kerwin, Eicher, Shantz, and Swearingin (1996) previously argued that the maintaining variables for food refusal are escape and/or avoidance of feeding conditions. Therefore, food refusal is often resistant to interventions that utilize positive reinforcement-based procedures. Their study compared both nonremoval of the spoon and physical guidance to evaluate the effectiveness of using negative reinforcement in the treatment of food refusal, and simultaneously examined the effects of inappropriate behaviors which potentially occurred as a result of the treatment procedures. Both the nonremoval of the spoon and physical guidance procedures were used to prevent escape from the feeding session until the food was consumed; however, independent acceptance of the presented food removed the consequence of both nonremoval of the spoon and physical guidance (i.e., negative reinforcement).

Three children with a history of food refusal were studied using an alternating treatments design comparing the two interventions (Ahearn et al., 1996). Each feeding session consisted of four pureed foods with one food from each of the four food groups. Twenty food presentations were offered during each session, and a bite from each food group was presented. In all conditions, the trial began with the presentation of the spoon to the child’s lower lip and the verbal prompt “(Child’s name) open.” The spoon either remained at the child’s lip for five seconds or until the food was accepted, whichever came first. During the baseline condition, acceptance resulted in access to preferred stimuli and social praise, and refusal resulted in removal of the spoon with no access to
preferred stimuli or social praise. Expelled food was not replaced and problem behaviors were ignored. In the nonremoval of the spoon condition, the child was instructed, “You have to stay in the chair until you take all the bites.” When the spoon was placed under the lower lip, it remained there until the child opened his or her mouth and accepted the food. If the bite was expelled, it was again placed in front of the child’s mouth. If the bite was accepted and swallowed, social praise and access to preferred stimuli were presented for either the remainder of the interval or for 15 seconds, whichever came first. During the physical guidance condition the child was told, “If you do not take a bite, I will have to help you.” If food was expelled once presented, it was represented at the child’s lip for five seconds. If the participant continued to refuse the bite, the therapist physically guided the mouth open and the food was placed in the child’s mouth. When the spoon was placed in the mouth, social praise and access to preferred stimuli were presented for the remainder of the interval or for 15 seconds, whichever came first.

Results of the study showed that both interventions increased food acceptance to above 80% of trials for all three participants; however, physical guidance resulted in more rapid acquisition of acceptance for two of the children. Furthermore, physical guidance produced less problem behavior than did nonremoval of the spoon. These results may have been attributed to physical guidance being more intrusive than nonremoval of the spoon; therefore, accepting the bite to remove the physical guidance contingency was more reinforcing than escaping the nonremoval of the spoon contingency.
Comparing Positive and Negative Reinforcement Treatments

Both the positive reinforcement study by Piazza et al. (2003) and the negative reinforcement study by Ahearn et al. (1996) included the use of escape extinction (EE) through nonremoval of the spoon and physical guidance procedures, and results from these studies showed that EE was a key element in the treatment of food refusal. Results from both studies failed to determine that one method is superior to the other and highlight possible limitations to these procedures. Piazza et al. (2003) explained that their study did not identify the properties that would have established escape as reinforcement; therefore, acceptance of food may have been maintained by negative reinforcement of the ability to escape from the presentation of the food. Ahearn et al. (1996) argued that if the target behavior identified is food refusal rather than food acceptance and physical guidance is contingent upon food refusal, then physical guidance may be considered a punishment procedure because food refusal will decrease as a result of physical guidance. Continued research and replication studies are needed to determine which method is more empirically effective as well as socially accepted.

Simultaneous versus Delayed Reinforcement Procedures

Another area of research in the treatment of food refusal is the effectiveness of differential reinforcement procedures. Kern et al. (1996) conducted a study to evaluate whether simultaneous or delayed reinforcement was more effective in increasing food acceptance in a young boy with ASD. Sessions were conducted daily at breakfast, lunch, and dinner and food items from the four food groups were presented in random order during each session. During the baseline condition, a spoonful of food was presented in
front of the child for 30 seconds. If acceptance did not occur, the food was removed and
the next item was presented. The two food groups that were accepted the least (fruits and
vegetables) were assigned to one of two interventions (i.e., the fruits were assigned to EE
with simultaneous reinforcement and the vegetables were assigned to EE with delayed
reinforcement). One food that the child ate consistently, corn chips, was used as the
reinforcer for both interventions. EE was implemented in all treatment sessions by
presenting the food at the child’s mouth until he accepted it or was represented if he
expelled it. In the simultaneous reinforcement condition, the fruit and corn chip were
presented at the same time. Conversely, in the delayed reinforcement condition, the corn
chip was presented after the vegetable was accepted.

Results from the Kern et al. (1996) study showed that both interventions resulted
in an increase in food acceptance, and reinforcement was faded by meal 58 for both
interventions which suggests that treatment duration was equivalent. The simultaneous
reinforcement procedure proved to be more efficient in that it showed a more rapid
increase in acceptance (i.e., mean rate of 85%), whereas the delayed reinforcement
procedure produced a mean rate of 76%. Kern et al. (1996) hypothesized that the
simultaneous procedure was more effective because the presence of the preferred food
masked the novel food. These results should be taken with caution, since this study was
conducted with only one participant. Further research should include multiple
participants to determine if the results would replicate themselves.
Noncontingent Reinforcement (NCR) plus Response Cost (RC) versus Differential Reinforcement of Alternative Behaviors (DRA) plus RC

Buckley, Strunck, and Newchock (2005) replicated a study by Kahng, Tarbox, and Wilke (2001) to compare the effects of DRA plus RC with NCR plus RC with a five year-old boy diagnosed with an ASD. RC consisted of removing preferred stimuli (i.e., a favorite movie and a container of ‘play rice’) contingent on food refusal to increase food acceptance. In other words, preferred materials were returned to the child contingent upon acceptance of presented food. During baseline sessions, bites of five different foods were presented by the therapist five times each for a total of 25 bites. In 30 second intervals, the therapist presented a spoonful of each food in front of the child’s lip and said, “Take a bite.” If the child rejected the food, it was replaced with a different food at the beginning of the next interval. Food items consumed equal to or less than 20% per session for three consecutive sessions were included in the treatment condition. These foods were divided into two groups and assigned to either the DRA + RC group or the NCR + RC group and each group contained one food from each of the four food groups. The DRA + RC condition was identical to the baseline condition except that the participants were given access to preferred stimuli for 30 seconds prior to and during the presentation of a bite of food. If the food was refused or expelled, the preferred stimuli was removed and returned contingent upon mouth clean during the next food presentation. The NCR + RC condition was similar to the DRA + RC condition except that once preferred stimuli were removed, they were returned to the child after 30
seconds, and the next bite was presented five seconds after the preferred stimuli were returned.

Results of the Buckley et al. (2005) study showed that both the DRA + RC and NCR + RC conditions produced an overall increase in mouth clean and a reduction of problem behaviors; however, NCR + RC produced both a higher percentage of mouth clean and a quicker reduction of refusal behavior than did DRA + RC. These results are important because they demonstrated that response cost is a practical way to increase food consumption without having to use EE procedures which may increase problem behaviors (e.g., negative vocalizations, vomiting, aggression). A potential limitation to this study was that criterion for returning to the preferred materials may not have been met by the participant. As a result, the participant may not receive adequate reinforcement and response cost may potentially undermine the procedure. Another limitation was that the authors did not study each reinforcement contingency in isolation. Future research should focus on evaluating each procedure separately to obtain a more detailed analysis of their effects.

*Differential Reinforcement of the First Behavior in a Chain versus Differential Reinforcement for the Terminal Behavior in a Chain*

Patel et al. (2002) suggested that the behavior of eating is not a single response, rather it is a behavior chain which includes acceptance, chewing, swallowing, and retaining the food or drink. The authors evaluated the extent to which differential reinforcement alone had any impact on increasing food acceptance, and then examined the effects of using differential reinforcement at the acceptance stage of the behavior
chain versus using differential reinforcement at the swallowing stage. In this study, a multielement design was used to measure acceptance (DRA/acceptance) and mouth clean (DRA/mouth clean) using differential reinforcement conditions for three children with pediatric feeding disorders who were fed solely through a g-tube. A rapid reversal design was used to evaluate acceptance and mouth clean using two treatment conditions (DRA acceptance/mouth clean alone versus DRA acceptance/mouth clean + escape extinction (EE).

During the baseline condition, items from the four food groups were presented in 30 second intervals, and verbal praise was given if the food/drink was accepted. No consequences were provided for expulsion; however, the presentation of bites continued. If the child did not swallow the food once accepted, they were told, “You need to swallow your food/drink” on a 30 second fixed-time schedule. If the child engaged in avoidance behaviors, the spoon was removed for 30 seconds then presented again. If the child did not engage in inappropriate behaviors, the spoon or cup remained at the child’s lip for 30 seconds and then a new item was presented. The procedures in the DRA/acceptance and DRA/mouth clean conditions were identical to baseline, but reinforcement (e.g., preferred items and attention) was presented for 20 seconds following either acceptance (the first behavior in the chain) or mouth clean (the final behavior in the chain). Contingencies for both inappropriate behavior and refusal remained the same as in the baseline condition. During the DRA acceptance/mouth clean + EE conditions, procedures for reinforcement remained the same; however, inappropriate behavior no longer resulted in escape from the demand. If holding the
spoon/cup to the child’s mouth did not produce acceptance, the child was told, “(Name), take a bite” on a 30 second fixed-time schedule. If the bite was accepted but not swallowed, he was told, “You need to swallow your bite.” If the child expelled the food, it was scooped up and represented until the bite/drink was swallowed. Additionally, bite presentation continued even if vomiting occurred.

The resulting data from the Patel et al. (2002) experiment showed that differential reinforcement alone was insufficient to increase food acceptance. The implementation of EE procedures was necessary to increase consumption for all three children. These results are similar to those of the Piazza et al. (2003) study in which positive reinforcement alone did not produce adequate results until EE was added to the reinforcement contingency. Patel et al. (2002) hypothesized that one reason for these results may have been that all three participants had total food refusal and had experienced medical complications which caused pain or discomfort while eating. Even after their medical conditions were treated, they continued to refuse food; additionally, their refusal behaviors were reinforced by their families. Therefore, the lack of effectiveness of differential reinforcement alone may have been related to the function of refusal behaviors.

A major limitation of this study was the failure to find differences between the DRA/acceptance and the DRA/mouth clean conditions. This may have been due to the rapidity of the reversal design (i.e., the participants may not have been able to discriminate between which behavior [acceptance or mouth clean] produced reinforcement). Future research should examine these treatments in isolation.
High-Probability (high-p) Instructional Sequencing plus Escape Extinction (EE)

Research has provided positive findings on the effects of high-p instructional sequencing in the treatment of noncompliant behavior (Mace, Hoch, Lalli, West, Belfiore, & Brown, 1998); however, minimal studies have evaluated the effects of high-p treatments on noncompliance in the form of food refusal. One study by Dawson, Piazza, Sevin, Gulotta, Lerman, and Kelley (2003) evaluated the effects of the high-p sequence alone and with EE relative to EE alone in a young girl with a history of food refusal and g-tube dependence. The effects of high-p instructions were evaluated within phases using a multielement component design (i.e., high-p versus no high-p) and the effects of extinction were evaluated using a reversal component (i.e., escape versus EE), resulting in four conditions: (1) escape plus no high-p, (2) escape plus high-p, (3) EE plus no high-p, and (4) EE plus high-p. During condition 1, the therapist presented a bite of food and the low-probability (low-p) instruction to “Take a bite.” Verbal praise was provided contingent on mouth clean (i.e., no food visible in the mouth 25 seconds after acceptance); refusal after five seconds of the presentation resulted in removal of the bite and a new presentation after a 30 second interval. Expulsion, packing, and vomiting were ignored. Condition 2 was identical to condition 1 except that three high-p instructions were presented in random order approximately every five seconds prior to the delivery of the food. High-p instructions were identified prior to the evaluation through a parent-generated list of 13 one-step instructions for which compliance from the child was 80% or greater. Condition 3 was identical to condition 1 except that a 30 second escape period was not provided following refusal behavior; the spoon was held to
the child’s mouth until she took a bite and expelled bites were represented until the bite was swallowed. Condition 4 was identical to condition 3 except that the three high-p instructions were presented in random order approximately every five seconds prior to the delivery of food and three-step guided compliance (i.e., verbal prompt, model prompt, physical prompt) was implemented contingent on noncompliance with the high-p instructions.

Results from the Dawson et al. (2003) study showed that the high-p instructional sequence was ineffective when escape was delivered contingent on noncompliance, and acceptance occurred only during the conditions which included EE (i.e., 100%) regardless of the delivery of high-p instructions. The authors suggested that the high-p sequence was ineffective without an EE component because the positive reinforcement available for compliance did not compete with the negative reinforcement provided for escape behavior. A limitation of this study was that the high-p instructions were simple fine motor responses not related to eating, and the low-p instructions involved multiple steps (i.e., opening the mouth, chewing the food, swallowing, and retaining the food. Future research should evaluate the use of high-p instructional sequences related to the behavior of eating.

High-P Sequences without EE

Patel, Reed, Piazza, Mueller, Bachmeyer, and Layer (2007) further evaluated the effects of high-p instructional sequencing in the treatment feeding related noncompliance without EE. Prior to treatment, a compliance assessment was conducted to demonstrate that the child’s acceptance of an empty spoon would function as a high-p response. The
effects of the high-p sequence were evaluated using an ABAB reversal design. In phase A, the child was presented with low-p instructions every 30 seconds; a spoonful of food was placed in a bowl in front of the participant and up to two verbal instructions to “(Name) take a bite” were provided before removal of the bite. Verbal praise and light physical touch (i.e., high fives) were provided contingent on compliance. A 20 second escape period was provided contingent on inappropriate behavior (e.g., turning head, spitting, etc). The procedures in phase B were identical to those in phase A except that three rapid presentations of an empty spoon (i.e., high-p instruction) preceded the presentation of the low-p instruction.

Results from the Patel et al. (2007) study showed compliance at zero when the low-p instructions were presented in isolation but increased to 100% when the high-p sequence preceded the low-p instruction. Furthermore, the child’s mother was trained to implement the intervention during mealtimes following treatment. These results suggested that a relatively simple, antecedent-based procedure without the use of EE has the potential to be a successful treatment for food refusal. A limitation of the study; however, was that these effects were only tested on one participant; therefore, it is unknown if this treatment would be effective across multiple children. Furthermore, the high-p instructions did not involve any type of eating response (e.g., touching the food to the mouth, touching the tongue to the food). Future research should evaluate the effectiveness of combining the low-p instructions with a high-p instructional sequence involving more complex responses.
Combining Stimulus Fading, Reinforcement, and EE using Guided Compliance

As previously mentioned, one type of feeding disorder among children is selectivity to texture. For many children, consuming high textured foods may result in gagging which can lead to choking and aspiration. One method used to treat this type of food selectivity is texture fading – the gradual addition of higher textures into a child’s diet.

Freeman et al. (1998) combined fading, reinforcement, EE, and guided compliance to demonstrate the effectiveness of treating texture selectivity and behavior reduction in a child with ASD. During the baseline condition, foods from all four of the food groups were presented on a plate and the verbal prompt “(Name) take a bite” was delivered every 30 seconds. The meal ended when the child ate 100% of the food or after 30 minutes, whichever came first. During treatment, meals began with the same verbal prompt as in the baseline condition. If the child did not comply within five seconds, a partial physical prompt (i.e., a verbal prompt plus guiding the child’s hand to the spoon) was provided. If refusal continued, a full physical prompt (i.e., a verbal prompt plus guiding the child to bring a spoonful to his or her lip) was provided. Verbal praise was contingent on consumption of the food, regardless of the prompt level. Each treatment session continued until 100% of the food was eaten or after 45 minutes, whichever came first. During both baseline and treatment conditions, inappropriate behavior was ignored. Fading occurred by increasing food portions by 5% once the participant reached 80% compliance at the current portion for three consecutive meals. If compliance dropped below 80% for three consecutive meals, the food portion was decreased to the previous
level. The treatment condition continued until the child was eating 50% of an age-appropriate meal for all four food groups.

Results of the Freeman et al. (1998) study showed that compliance did not occur with the use of verbal prompting; however, once physical prompting was included consumption steadily increased even when food was faded into the terminal consumption requirement. The authors argued that one advantage of the fading procedure was that it increased the likelihood that the child would come into contact with reinforcement quickly. Since the children were initially only required to consume a small amount of food, they received reinforcement in frequent intervals. Several limitations to this study should be noted. First, because this treatment was delivered in a package which included fading, reinforcement, and EE, it is unclear which of these components actually contributed to the effectiveness of the treatment. Another potential limitation is that the target effects of treatment occurred after a long period of time (approximately 340 meals), and the authors speculated that treatment effects may have occurred more quickly without the fading procedure. Additional research should be conducted to determine how fading procedures may be designed to be effective over shorter periods of time.

_Treating Liquid Refusal with Fading and Backwards Chaining_

While many studies have been conducted to treat refusal of solid foods, limited studies have evaluated methods to treat the refusal of liquids. In a study conducted by Hagopian, Farrell, and Amari (1996), a 12-year-old boy with autism was treated for total food refusal using fading and a backwards chaining procedure. Among admission to the
hospital, the child was receiving all of his nutrition through a central line. Treatment was conducted for liquid only because of co-occurring medical interventions during the study.

The chain for the target response (drinking water from a cup) was described as follows: (a) bringing a cup of water to the mouth, (b) accepting the water into the mouth, and (c) swallowing. During treatment, the child was initially reinforced (i.e., given access to a pleasurable activity) for swallowing after a verbal prompt. In the first phase, water was not presented. Next, the child was required to swallow after an empty syringe was “emptied” into his mouth in order to receive reinforcement. Finally, the child was reinforced for swallowing water placed into his mouth with a syringe. The initial amount the participant consumed was 0.2 cc of water, which was faded to 0.5 cc, 1cc, and finally 3cc. Baseline probes of a 10 cc cup of water were tested prior to intervention, after the 0.2 cc, and again at 3cc in order to monitor the pace of the fading procedure.

Results of the Hagopian et al. (1996) study showed that the child was unable to accept a 10 cc cup of water until after he had successfully consumed the smaller quantities; however, during generalization the child was able to drink up to 90 cc of water and juice. This study demonstrated that when reinforcement cannot be delivered due to total liquid refusal, using a backwards chain to initially require the participant to simply swallow increased his contact with reinforcement at a higher rate than waiting to complete the entire behavior chain. Additionally, fading in higher quantities of liquid in conjunction with backward chaining proved to be an effective method to treat total liquid refusal.
Liquid Fading in the Absence of EE

Another study that demonstrated the effectiveness of using fading procedures in the treatment of liquid refusal was conducted by Luiselli, Ricciardi, and Gilligan (2005). Similar to the Hagopian et al. (1996) study, probe assessments were incorporated to monitor the pace of the fading procedure. At the beginning of this study, the child only accepted a blend of 50% Pediasure and 50% milk and refused to consume milk as a sole beverage. During the baseline condition, the child was given a mixture of four ounces of Pediasure and four ounces of milk, and was instructed to “drink.” Social praise was given each time the child took a drink of the mixture. The verbal instruction to “drink” was repeated any time 60 seconds elapsed without the participant taking a drink. The treatment condition was identical to the baseline condition, except that milk was gradually faded into the Milk-Pediasure mixture in one tablespoon increments once the participant consumed 90% or more of the mixture during three consecutive sessions. Probe assessments were used as a reversal effect and occurred by presenting the child with a cup containing 100% milk during the baseline phase, then again during intervention when the child completed two consecutive fading steps.

Results of the Luiselli et al. (2005) study showed that the child would not drink the cup of 100% milk during baseline; however, by the third probe assessment, she drank all of the milk in her cup across three consecutive sessions. Luiselli et al. suggested that using a periodic “terminal criterion” probe is essential for liquid fading procedures, as it detects early success in the fading sequence which may decrease intervention time.
Generalization of Food Acceptance across Settings and People

Parental Assessment and Treatment of Food Selectivity

Clearly, research has demonstrated that multiple methods exist to treat food selectivity and refusal under controlled conditions. An important aspect to examine is the ability of parents to implement and generalize the treatment procedures into their child’s natural environment. Najdowski, Wallace, Doney, and Ghezzi (2003) evaluated the effects of teaching parents to use a treatment consisting of DRA, EE, and demand fading within the home and restaurant settings. During the baseline condition, non-preferred foods (NPF) from each food group were presented one at a time by the child’s mother who instructed him to take a bite using a three-step prompting procedure. This procedure consisted of verbally telling the child to take a bite, modeling how to take a bite, and a physical prompt (i.e., putting the food to the child’s mouth). During this condition, verbal praise was provided contingent on acceptance of the food; the food was removed for 30 seconds contingent on refusal. The meal ended when the child took one bite of a NPF or escaped all five trials. The DRA condition was identical to the baseline condition except that the meal was terminated after the child accepted one bite or after 30 minutes had elapsed. In addition, the child was told that if he ate one bite of NPF he would be given a plate full of highly preferred foods (HPF). The DRA plus EE was identical to the DRA condition, except that the mother held a NPF to the child’s mouth until he either opened his mouth (the bite was then inserted into his mouth) or until 30 minutes had elapsed. If a bite was expelled or vomited a new bite of the same NPF was presented until the child swallowed it. Once the child accepted and swallowed the required number
of bites for three consecutive meals, the number of swallows required to receive reinforcement was increased by 50%; as the number of NPF bites increased the amount of HPF provided as reinforcement decreased.

Results of the Najdowski et al. (2003) study showed that the child did not increase his consumption of NPF until DRA plus EE was implemented; however, after treatment the child accepted up to 62 bites and 12 bites of NPF at home and in restaurant settings, respectively. This study is important because it showed that treatment packages can be used by parents and professionals alike. Furthermore, results were maintained and generalized across people and settings.

*Parent Implemented Feeding Intervention Combining Antecedent and Positive Reinforcement Procedures*

Gentry and Luiselli (2007) taught a child’s mother to implement an intervention within the home setting which combined several antecedent and positive reinforcement procedures. The child’s mother was given verbal directions by the instructor, as well as rehearsed implementation of the procedures, and was provided performance feedback after being observed using the feeding intervention.

During the first phase of the intervention, the child was presented with a plate which consisted of two preferred foods and one non-preferred food. Additionally, the child was given a plastic game spinner called the “Mystery Motivator” which had different colored sections stating how many bites of food from each item on the plate he needed to consume. Once the child spun the Mystery Motivator his mother told him, “You have spun the number N, that means you can eat N bites from this section, N bites
from this section, and N bites from this section, then you can eat whatever you like.” The child was also shown a reward chart from which he could choose an activity that he could play as long as he ate the required bites of food. Bites on the Mystery Motivator were initially set at one and two, then increased to two and three, and then increased again to three and four as the frequency of eating improved (i.e., changing criterion design). During the second phase of the intervention, the Mystery Motivator was removed, and the child’s mother placed a specific number of bites of NPF on the plate and was instructed to finish eating all the food on his plate. Once the child ate the required amount of food, he was excused from the table and could play with a preferred activity, as described in the initial intervention phase.

Results of the Gentry and Luiselli (2007) study demonstrated that through in-home training, this parent learned to implement a feeding program which increased the amount of food her child consumed (i.e., in the first phase, bites consumed matched the average number specified on the Mystery Motivator; in the second phase, bites matched those specified by the child’s mother and consumption of nonpreferred foods maintained long-term). Implications of this study suggest that training parents to implement feeding treatments in the natural setting may be superior to clinic-based treatment. However, a major limitation of this study was that it only included one parent and participant, so it is unknown if these results would have the same effect on all children with food selectivity. Additional research should be conducted to determine the generalization of the effects of this study among other families of children with food selectivity.
Conclusion

After reviewing the literature, it appears that there are various procedures that have proven to be effective in treating both food refusal and food selectivity in children with ASD. While all procedures described showed that some type of reinforcement (either positive, negative, or differential) had positive effects on food consumption, a large sum of research demonstrated that escape extinction was the key component in the child’s acceptance of food items (Patel et al. (2002); Najdowski et al. (2003); Piazza et al. (2003)). Furthermore, Ahearn et al. (1996), Ahearn et al. (2001), and Freeman et al. (1998) illustrated that both physical guidance and non-removal of the spoon were often necessary to increase food acceptance. It appears that no one method is superior to another; however, Ahearn et al. (2001) argued that the key to successful intervention is to determine the function of the child’s feeding problem in order to establish the appropriate course of intervention for that specific individual.

As stated in the introduction, interventions for food refusal often require invasive physical contact with the child to achieve positive results. Current research is limited in treatments which provide proactive, non-invasive feeding protocols for children with food selectivity; therefore, the remainder of this document describes the development and examination the effects of an easy to administer, antecedent-based feeding protocol based on the principles of behavior momentum (Mace, Hock, Lalli, West, Belfiore, Pinter & Brown, 1988) and high-p instructional sequencing (Dawson et al., 2003; Patel, Reed, Piazza, Mueller, Bachmeyer, & Layer, 2007) in the treatment of food selectivity in three children diagnosed with an ASD.
Chapter 3

METHODOLOGY

Participants and Setting

Three children, Cole (9 years), Liam (12 years) and Colin (10 years) all had a diagnosis of ASD as measured by a positive score on a standardized diagnostic tool (i.e., Autism Diagnostic Observation Scale [ADOS]) and with a history of food selectivity were selected from the Autism Center for Excellence (ACE) at California State University, Sacramento. The children selected as participants in the study were required to have at least an imitative repertoire (i.e., the ability to copy or mimic another person’s actions), and some receptive language skills (e.g., the ability to follow one-step instructions) were preferred. Additional criteria for selection required that the child’s food selectivity was not due to a medical or physiological condition and that the child was resistant to trying new foods and/or had a limited repertoire within at least one of the following food groups: fruit/vegetable, protein, dairy and starch. In order to determine that the children met criteria for food selectivity, parents/legal guardians were asked to complete the Behavioral Feeding Assessment Parent Interview (Budd, 1992) as a means of evaluating mealtime and eating behaviors (see Appendix A). A parent interview was conducted in conjunction with the behavioral feeding assessment in order to identify 12 foods that the child did not prefer from the basic food groups. Prior to the start of the study, Cole’s food repertoire was limited to dairy, starches, and some proteins (e.g., grilled cheese sandwiches, waffles, hamburgers); Liam’s food repertoire was limited to
starches (e.g., cereal with no milk, waffles, pretzels); and Colin’s food repertoire was limited to starches and proteins (e.g., pancakes, bacon, hot dogs).

All treatment sessions took place in the pediatric behavior research laboratory on the CSUS Campus. The treatment room was equipped with a table, chairs, and items relevant to the feeding session (e.g., preferred and nonpreferred (NPF) foods, napkins, utensils, etc). Two to four consecutive sessions (i.e., alternating baseline and treatment sessions), with five minute breaks in between, were conducted two to three times per week. All four sessions were completed within approximately 60 minutes. Child responses were recorded by the experimenter and by a second observer seated inside the room. Child assent was obtained prior to the start of treatment.

Protection of Human Subjects

Protection of human subjects was insured by submitting the research proposal to the California State University, Sacramento Human Subjects Committee for approval prior to beginning any research. Additionally, participation in all research remained voluntary; parents/legal guardians reserved the right to withdrawal their child from the study at any time without penalty or negative impact on services. Participant confidentiality was guaranteed to the extent required by law. Children and parents/legal guardians were informed that they would not be personally identified in any reports or publications that may result from the study and that personal information would not be discussed outside the team of experimenters. Additionally, the children/legal guardians were advised that access to all data would be limited to the experimenter, faculty advisors, research assistants, and the California State University, Sacramento Human
Subjects Research Committee, and would be locked in a file cabinet for three years and then be destroyed.

**Experimental Design**

A multi-element design was used which alternated between two nonpreferred food groupings: One associated with treatment (Group A) and the other associated with baseline (Group B). The dependent variable measured was the percentage (%) of bites consumed following the presentation of the low-p instruction as well as the % of compliance with the progressive high-p instructional sequence. The independent variable was the delivery of low-p instructions preceded by increasingly complex high-p instructions as well as the contingent delivery of high-preferred edibles and social reinforcement. The goal of treatment was to increase the child’s consistent acceptance of novel foods.

Discrete category behavior data were recorded on both child and therapist behaviors using data sheets prepared by the primary investigators (see Appendix B). Percentage of bites consumed was calculated by dividing the total number of bites consumed by 12 (i.e., the total number of low-p instructions presented during the session) and multiplying by 100. Session compliance was calculated by dividing instances of participant compliance to the low-p instructional trial by 12 and multiplying by 100. Data were analyzed by graphing the % of compliance with low-p instructions as well as the % of bites consumed for each session. Procedural integrity data were collected on all trials for therapist prompting and reinforcement and was calculated as the total number of correct implementations divided by the sum of correct plus incorrect implementations,
multiplied by 100. Procedural integrity for prompting was 100%, 99% (92-100%) and 99% (97-100%) for Cole, Liam, and Colin, respectively. Procedural integrity for reinforcement was 94% (92-100%), 92% (78-100%), and 99% (97-100%) for Cole, Liam, and Colin, respectively. Two independent observers collected interobserver agreement (IOA) data for compliance to low-p requests, bites consumed, and procedural fidelity on 36%, 53%, and 52% of sessions for Cole, Liam, and Colin, respectively. IOA was calculated as the total number of agreements divided by the sum of agreements plus disagreements, multiplied by 100; IOA was 100% for compliance to low-p requests, 100% for bites consumed, and 99% (94-100%) for procedural fidelity across all three participants.

Experimental Procedures

*Pre-Treatment Preference Assessment*

Prior to the start of treatment, parents/legal guardians were asked to choose two NPF from each food group; four foods to target during treatment and four to use for baseline measures. A single-stimulus preference assessment designed by Pace, Ivancic, Edwards, Iwata and Page (1985) was conducted to ensure that foods chosen by the parent were truly nonpreferred by the child. Prior to the assessment, the children were prompted to sample each food to ensure that the lack of “preference” was not a function of unfamiliarity with the food. Each assessment trial consisted of presenting one food item to the child for five seconds. If the child failed to approach the food (e.g., reaching towards the food and touching it) within five seconds, the child was prompted to “try the food.” If the child refused the food item during the five seconds following the prompt,
the food was removed and the next trial began. If the child approached the food upon the initial presentation within the time allowed, that item was made available to the child for an additional five seconds before prompting, “try the food.” For all three children, each of the foods chosen by the parent were approached on less that 25% of the trials even after being prompted to try the food and were therefore considered nonpreferred (i.e., NPF).

Following the single-stimulus preference assessment, a paired-choice preference assessment designed by Fisher, Buchanan, & Cherup-Leslie, (2009) was conducted to evaluate relative preferences for high-preferred (HPF) foods that could be utilized as response-dependent reinforcement throughout each phase. Seven items identified as preferred by the children’s parent/caregiver were presented in pairs, and the child was prompted to “Pick one.” The assessment continued until each food had been paired with every other food once, and the 2-3 food items picked most often compared to the others was used as response-dependent reinforcement during each phase. Parents/legal guardians were asked to restrict access to the chosen reinforcers outside of treatment sessions.

Baseline Procedure

During the initial baseline, the food grouping for treatment (Group A) and the food grouping for baseline (Group B) were alternated, with each session consisting of 12 trials (i.e., four foods each presented three times). One bite of food at a time was placed in front of the child. If the child did not take a bite of food within five seconds of the presentation, a verbal prompt was given (e.g., “[Name], take a bite”). If the child failed
to take a bite within five seconds of the first verbal prompt, another verbal prompt was delivered. If the child did not take a bite within five seconds of the second verbal prompt, the bite was removed and the next bite was presented approximately 20 seconds later. If the child vocally refused the food at any time once it was placed in front of him (i.e., “No.”) the food was removed and the next trial began. The child received praise contingent on compliance (i.e., took a bite) following the first or second prompt. Baseline sessions continued with Group B foods into the treatment phase to serve as the control against which the treatment was compared.

**Instructional Procedures**

The starting phase for each child was determined by compliance during the baseline procedure. At the beginning of each session, the child was allowed 10 seconds of noncontingent access to the HPF identified during the preference assessment (i.e., reinforcement). Each session consisted of 12 trials with two high-p instructions and one low-p instruction for each of four targeted foods. Each instruction was presented using verbal and model prompts (e.g., “Touch the food” [while the experimenter touched the food] or “Do this” [while touching the food]) and the experimenter ate the foods with the child (see Table 1). If compliance did not occur after the first prompt, a second prompt was given; however, if compliance did not occur after the second prompt, the bite of food was removed and the experimenter presented the next target food. Compliance with the first two instructions following the first or second prompt resulted in praise from the experimenter and compliance with the last step resulted in praise plus a small portion of the HPF as reinforcement. Criteria for moving from one phase to the next were at least
three sessions with 100% compliance with all instructions; however, if the child engaged in inappropriate mealtime behavior (i.e., gagging or vomiting), phase changes were postponed past three sessions at 100% compliance until the inappropriate behavior no longer occurred. Treatment phases were as follows:

Reinforce kissing the food. During each session, the following steps were completed for each target food: (1) touch the food, (2) smell the food, and (3) kiss the food.

Reinforce licking the food. During each session, the following steps were completed for each target food: (1) smell the food, (2) kiss the food, and (3) lick the food.

Reinforce balancing food on the tongue. During each session, the following steps were completed for each target food: (1) kiss the food, (2) lick the food, and (3) balance the food on tongue.

Reinforce closing mouth with food on the tongue. Note: This phase was added for one child (i.e., Liam) following an unsuccessful transition to biting the food into two pieces. During each session, the following steps were completed for each target food: (1) lick the food, (2) balance the food on tongue, and (3) close mouth with hands in lap.

Reinforce biting the food into two pieces. During each session, the following steps were completed for each target food: (1) lick the food, (2) balance the food on tongue, and (3) bite the food into two pieces.
*Reinforce eating one of the pieces.* During each session, the following steps were completed for each target food: (1) balance the food on tongue, (2) biting the food into two pieces, and (3) eat one of the pieces.

*Reinforce chewing the food into little pieces.* Note: This phase was added for two children (i.e., Cole and Colin) following an unsuccessful transition to eating one of the pieces. During each session, the following steps were completed for each target food: (1) lick the food, (2) balance the food on tongue, and (3) chew the food into little pieces.

*Reinforcing swallowing the chewed food.* During each session, the following steps were completed for each target food: (1) balance the food on tongue, (2) chew the food into little pieces, and (3) swallow the chewed pieces.

Once the participant reached 100% compliance with eating both bites of each of the target foods for three sessions in a row, the experimenter increased the bite requirement to two of each target food (a total of 24 bites of food per session). Next, treatment sessions for Group A were alternated between the experimenter and the research assistant who had previously been associated with the baseline condition, to ensure that participant compliance was not trainer-specific. Criteria for completion of treatment were three sessions in a row of eating two bites of each of the four targeted foods in the absence of verbal prompts.
Table 1

**Prompting across Discriminative Stimulus Instructions within Treatment Phases**

<table>
<thead>
<tr>
<th>Hierarchy of Steps</th>
<th>Verbal and Model Prompts</th>
</tr>
</thead>
</table>
| Touch the food                      | Prompt 1: “Touch the (food).” [while the experimenter touched the food]  
Prompt 2: “Do this.” [while touching the food]                                                                                                                   |
| Smell the food                      | Prompt 1: “Smell the (food).” [while the experimenter smelled the food]  
Prompt 2: “Do this.” [while smelling the food]                                                                                                                |
| Kiss the food                       | Prompt 1: “Kiss the (food).” [while the experimenter kissed the food]  
Prompt 2: “Do this.” [while kissing the food]                                                                                                                  |
| Lick the food                       | Prompt 1: “Lick the (food).” [while the experimenter licked the food]  
Prompt 2: “Do this.” [while licking the food]                                                                                                                  |
| Balance the food on your tongue     | Prompt 1: “Balance the (food) on your tongue.” [while the experimenter balanced the food on own tongue]  
Prompt 2: “Do this” [while balancing the food on own tongue]                                                                                                 |
| Close mouth with food on your tongue| Prompt 1: “Close your mouth.” [while the experimented closed own mouth around food and put own hands in lap]  
Prompt 2: “Do this.” [while closing own mouth around food and putting hands in own lap]                                                                      |
| Bite the food into two pieces       | Prompt 1: “Bite the (food) into two pieces.” [while the experimenter bites the food into two pieces]  
Prompt 2: “Do this.” [while biting the food into two pieces]                                                                                                  |
| Eat one of your pieces              | Prompt 1: “Eat one of your pieces.” [while the experimenter eats one of the pieces]  
Prompt 2: “Do this.” [while eating on of the pieces]                                                                                                         |
| Chew the food into little pieces    | Prompt 1: “Chew the (food) into little pieces.” [while the experimenter chews the food into little pieces]  
Prompt 2: “Do this.” [while chewing the food into little pieces]                                                                                              |
| Swallow the chewed food             | Prompt 1: “Swallow all the pieces.” [while the experimenter swallows the chewed food]  
Prompt 2: “Do this.” [while swallowing the chewed food]                                                                                                       |


Post-Treatment Compliance Assessment

A post-treatment compliance assessment was conducted with the baseline foods (Group B) after the completion of the intervention to determine if the participant had developed a preference for non-targeted foods and the extent to which accepting and swallowing generalized to other NPFs not specifically targeted during treatment. Each food was presented to the participant for five seconds. If the participant accepted the food, it was made available for an additional five seconds; however, if the participant did not approach the food within the time allowed, the experimenter advanced through the progressive low-p instructions until the participant stopped complying with the instructions.

Follow-Up

Follow-up sessions were scheduled upon completion of the treatment sessions as an additional determinate for generalization and maintenance outside the experimental setting. Follow-up sessions were conducted at the child’s home with the researcher and parents/legal guardians present, and the parents/legal guardians were trained to implement the treatment procedure with the baseline foods (Group B). The starting phase for these foods was determined by the level of compliance with the low-p instructions during the post-treatment compliance assessment. Follow up sessions occurred 3, 6, and 12 weeks subsequent to the completion of treatment.
The current study demonstrated that an easy to administer, antecedent-based procedure (i.e., presenting two high-p instructions prior to one low-p instruction) was effective in increasing food consumption for two boys (i.e., Cole and Colin) with food selectivity. Figure 1 depicts Cole’s compliance to low-p requests across both baseline and treatment phases. Compliance remained at zero during baseline, when the low-p instruction (i.e., take a bite) was presented in isolation and increased only when the high-p sequence preceded the low-p instruction. Cole’s compliance decreased during session 28 when the therapist presented the low-p instruction to eat one of the pieces of food; therefore, a subsequent low-p phase was added in which the therapist instructed Cole to chew the bite of food into little pieces. Upon presentation of the new low-p phase, compliance returned to 100% and responding remained high for the duration of treatment sessions. Figure 2 depicts Cole’s bite consumption across phases. Cole was not required to consume any of the food until session 28, where consumption increased to and reached a plateau at 25%; however, with the introduction of the low-p instruction to chew the food into little pieces, bite consumption decreased to zero until Cole was instructed to swallow the chewed pieces. Once this phase was introduced, bites consumed increased to 100% within two treatment sessions. Ultimately, Cole’s treatment lasted four months at four 30-minute sessions per week.

Figure 3 depicts Liam’s compliance to low-p requests across both baseline and treatment phases. Compliance remained at zero during baseline and increased only when
the high-p sequence preceded the low-p instruction. Liam’s compliance decreased to zero upon presentation of the low-p instruction to bite the food in half (session 37). Therefore, a subsequent low-p phase was added in which the therapist instructed Liam to close his mouth while balancing the food on his tongue. Following 100% compliance with this low-p instruction for six sessions, the low-p instruction to bite the food in half was reintroduced; however, compliance again dropped to zero. At this point in treatment, Liam’s mother decided to remove Liam from the study rather than introduce a more intrusive feeding procedure (e.g., nonremoval of the spoon). Liam’s bite consumption remained at zero throughout the course of treatment; therefore, a graph was not included. Liam’s treatment totaled four months at four 30-minute sessions per week.

Figure 4 depicts Colin’s compliance to low-p requests across both baseline and treatment phases. Compliance remained at zero during baseline sessions and increased only when the high-p sequence preceded the low-p instruction. Colin’s compliance decreased during session 54 when the therapist presented the low-p instruction to eat one of the pieces of food; therefore, a subsequent low-p phase was added in which the therapist instructed Colin to chew the bite of food into little pieces. Upon presentation of the new low-p phase, compliance returned to 100% and responding remained high for the duration of treatment sessions. Figure 5 depicts Colin’s bite consumption across phases. Colin was not required to consume any of the food until session 54, where consumption increased to 42%; however, with the introduction of the low-p instruction to chew the food into little pieces, bite consumption decreased to zero until Cole was instructed to swallow the chewed pieces. Once this phase was introduced, bites consumed increased
to and remained at 100% within two treatment sessions. Due to multiple parent cancellations Colin’s treatment lasted seven months and varied between 2-4 30-minute treatment sessions per week.

**Figure 1. Percentage of Compliance: Cole**

**Figure 2. Percentage of Bites Consumed: Cole**
Figure 3. Percentage of Compliance: Liam

Figure 4. Percentage of Compliance: Colin

Figure 5. Percentage of Bites Consumed: Colin
Prior to the completion of treatment, Cole and Colin’s bite requirements were systematically expanded by increasing the volume of food required for consumption prior to receiving reinforcement. At the end of treatment, Cole was eating one piece of watermelon, six kernels of corn, two strawberries, and one slice of cucumber per session. Colin was eating nine bites of chicken, nine noodles, four baby carrots, and nine bites of banana per session.

Following the evaluation of the progressive high-p sequence, a post-treatment compliance assessment was completed using foods presented during baseline sessions (Group B). None of the participants consumed the foods in this grouping, suggesting that preference and generalization for non-targeted foods did not occur. Anecdotally; however, outside of treatment sessions Cole was observed to initiate the high-p sequence when his mother offered him blueberries for the first time). Following the presentation of low-p instructions with foods in Group B, starting levels for Cole and Colin were balance food on tongue and lick the food, respectively. During three follow-up visits, both Cole’s mother was trained to implement the treatment procedure during mealtimes at home. Cole’s compliance and bite consumption remained at 100% during parent implementation of the treatment procedure. At the time this document was written, post-treatment follow up sessions had just been scheduled with Colin’s mother.

In summary, the data indicate that the high-p instructional sequence was effective in increasing consumption of targeted foods for two out the three children in this study; however, generalization did not occur with the novel foods (Group B). These findings will be discussed further in the next chapter.
Chapter 5

DISCUSSION AND RECOMMENDATIONS

Summary of the Study

This research study sought to examine the effects of proactive feeding protocol based on the principles of behavior momentum (Mace et al., 1988) and progressive high-p instructional sequencing (Dawson et al., 2003; Patel et al., 2007). Specifically, this study addressed several research questions through quantitative analysis:

1) Would a behavior momentum protocol treat food selectivity in the absence of more intrusive feeding interventions for children diagnosed with ASD?

2) If the treatment was successful, would it prevent the future need for intensive feeding treatments?

3) If this treatment was successful, would it be one which could be administered outside of a clinical setting?

Data collected included the % of bites consumed following the presentation of the low-p instructional sequence as well as the % of compliance with the progressive high-p instructional sequence. Contingent edible and social reinforcement as well as clear verbal and model prompts to the child served as the independent variables evaluated throughout treatment.

Discussion of the Results

The success of the current study’s intervention for two children corroborate and extend the research by Patel et al. (2007), suggesting that antecedent based treatments may produce increases in food acceptance in children with ASD in the absence of escape
extinction and/or physical interventions. Furthermore, increases in acceptance occurred for both Cole and Colin despite active food refusal behaviors (i.e., spitting, gagging, and vomiting) which had not been observed in the Patel et al. (2007) study. Previous research (e.g., Dawson et al., 2003) suggested that these antecedent-based treatments are ineffective when escape is provided contingent on refusal behavior. A possible reason for this discrepancy is that the instructional sequence used in the Dawson et al. (2003) study involved high-p motor responses not related to eating (i.e., waving) while the low-p response required was a complex behavior which involved multiple steps associated with eating (i.e., opening the mouth, chewing the food, and swallowing). The current study provided high-p instructions and low-p instructions within the same response class which built upon each other as the children moved across phases (e.g., kissing the food, licking the food, and balancing the food on the tongue). Moreover, Patel et al. (2007) demonstrated an increase in food acceptance for children with passive food refusal (i.e., noncompliance only) by presenting an empty spoon as the high-probability instructional sequence prior to presenting a spoon with a bolus of food as the low-p instruction. It is possible that the methods used in the current study may have been a contributing factor to the acquisition of eating behavior in the children with active food refusal (e.g., gagging and vomiting).

While the high-p instructional sequence was effective for two children, it is necessary to consider the reasons why treatment was not effective for Liam. It is possible that with Liam being 12 years-old, he had a longer history of reinforcement for escape maintained behaviors. That is, in the past Liam was allowed to escape the demand of
trying new foods as a consequence for engaging in refusal behaviors such as negative vocalizations (i.e., vocal stereotypy interspersed with saying, “no”) and aggressive behaviors (i.e., pinching and biting others). During treatment sessions, while escape was not provided contingent on these behaviors, they often occurred in close temporal proximity to the end of the trial (i.e., following the second verbal and model prompt, “Do this”). Therefore, the high-p contingency may not have been salient enough for Liam to discriminate between treatment and previous escape contingencies within the home environment.

Limitations

As mentioned in the introduction, the small sample size of three participants may be considered a limitation to this study. Additionally, a limited number of sessions per week (e.g., two sessions) resulted in treatment duration averaging five months. Also, while the results of this study may suggest that repeated exposure to novel foods had a desensitizing effect for the children, this was likely not the mechanism for change given that consumption of baseline foods did not increase until those foods were presented using the high-p sequence. As mentioned previously, Cole’s mother reported that when he was presented with a novel food (i.e. blueberries), he independently initiated the high-p instructional sequence rather than simply trying the food (i.e., balance on tongue, chew it into little pieces, spit it out), suggesting a formation of ruled governed behavior for trying novel foods.
Implications for Practice

An important implication for the current study is that the increase in food acceptance can be generalized across people and environments. For example, Cole’s compliance and consumption remained at 100% once his mother was trained to implement the treatment procedure at home. This is beneficial because there are more opportunities to conduct treatment sessions throughout the day when at home (e.g., prior to beginning each meal), whereas treatment sessions within the clinical setting were limited to no more than four sessions per week. While treatment in the clinic lasted an average of 87 sessions, it is feasible that children may accept novel foods into their repertoire more quickly when sessions can be run in other environments, such as at home or at school. Since this treatment protocol does not require physical intervention and sessions are not time consuming, teachers may be successful in implementing this treatment within the school setting. In order to ensure the student is hungry, the teacher or instructional aide should run treatment sessions in the classroom or cafeteria prior to breakfast, lunch, or snack times. Sessions should be run in the classroom if the student has a history of leaving an instructional area to escape a demand situation; it may be easier to maintain a close proximity within a small area in the classroom than within a large cafeteria. Additionally, the student’s most highly preferred edible reinforcer should be reserved for treatment sessions to increase the likelihood the student will be motivated to participate during treatment. Sessions would be run exactly as described in Chapter 3; however, baseline sessions are unnecessary since they were used within this study only to evaluate the treatment protocol.
Suggestions for Future Research

Many avenues for future research exist. As discussed in Chapter 4, the results from this study suggest that repeated exposure to novel foods may have had a desensitizing effect for the children; therefore, future research should conduct a component analysis of repeated exposure to novel foods versus a progressive high-p instructional sequence. Moreover, future research should examine the possible formation of rule governed behavior as a necessary component to trying new foods in children with ASD which may have occurred with one of the children in the present study (i.e., Cole). It is also recommended that future research examine the applicability of the progressive high-p instructional sequence for children with other types of developmental disabilities as well as for typically developing children. Additionally, future research should examine the effectiveness of conducting treatment sessions within the home and school environments. Currently, it is unknown if the distractions outside a clinical setting (e.g., other children, televisions, ringing telephones) or the history of reinforcement for escape behavior within these environments will have an effect on treatment outcome. Finally, if treatment is shown to be effective outside the clinical setting, future research should also examine the effectiveness of peer involvement in the implementation of the treatment sessions.
APPENDIX A

Behavioral Feeding Assessment Parent Interview
Parent Interview (Budd, 1992)

<table>
<thead>
<tr>
<th>Date</th>
<th>Location</th>
<th>Interviewer</th>
</tr>
</thead>
</table>

Demographics

<table>
<thead>
<tr>
<th>Child</th>
<th>Date of birth</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent/Guardian(s)</td>
<td>Address</td>
<td>Phone</td>
</tr>
</tbody>
</table>

Mother:
Relationship to child:
- [ ] Natural parent
- [ ] Adoptive parent
- [ ] Foster parent (how long?)
Age ___ Ethnicity__________
Total years of formal education (beginning with grade 1) ____________
Occupation ____________________________
Number of hours worked per week _________

Father:
Relationship to child:
- [ ] Natural parent
- [ ] Adoptive parent
- [ ] Foster parent (how long?)
Age ___ Ethnicity__________
Total years of formal education (beginning with grade 1) ____________
Occupation ____________________________
Number of hours worked per week _________

Family:
Marital status:
- [ ] Single
- [ ] Married
- [ ] Separated
- [ ] Divorced
- [ ] Widowed
- [ ] Other

Household composition:
- [ ] Married couple
- [ ] Unmarried,
- [ ] Extended family
- [ ] Stable couple
- [ ] Single parent
Persons living in home other than parent(s) and child: ____________________________
General Developmental Background

Pregnancy/birth history: ____________________________________________________
________________________________________________________________________

Health conditions/problems (inherited conditions, chronic diseases, medications,
neuromuscular conditions, etc.):
________________________________________________________________________

Illnesses, accidents, traumatic events, or hospitalizations (i.e., aversive conditioning
history):
________________________________________________________________________

Overall development (gross and fine motor, language, social, etc.)
________________________________________________________________________

Variations or stresses in day-to-day living conditions (moves, job changes, sibling births,
serious illnesses in family, etc.):
________________________________________________________________________

Feeding History

Onset of feeding problems (e.g., when and how began):
________________________________________________________________________

Changes in feeding problems over time:
________________________________________________________________________

Feeding milestones achieved (in months):

<table>
<thead>
<tr>
<th>milestone</th>
<th>help Needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strained foods (4-6)</td>
<td>Finger feed</td>
</tr>
<tr>
<td>Junior foods (6-10)</td>
<td>Cup</td>
</tr>
<tr>
<td>Chopped fine (10-12)</td>
<td>Spoon</td>
</tr>
<tr>
<td>Regular foods (18-24)</td>
<td>Fork</td>
</tr>
<tr>
<td></td>
<td>Knife</td>
</tr>
<tr>
<td></td>
<td>Straw</td>
</tr>
<tr>
<td></td>
<td>Pours drink</td>
</tr>
<tr>
<td></td>
<td>Gets food</td>
</tr>
</tbody>
</table>

Medical restrictions on certain foods or liquids: _________________________________
Mealtime Habits
Foods and liquids child currently and regularly accepts:

Check types child accepts:

___ fruits
___ vegetables
___ meats
___ dairy products
___ breads/cereals
___ sweets/snacks

Check textures child accepts:

___ strained/pureed
___ chopped
___ crunchy
___ blenderized
___ crisp
___ regular
___ mashed
___ chewy
___ liquid

Foods and liquids child accepted at one time but no longer accepts:

Food and liquids child regularly rejects:

Person who regularly feeds child (e.g., mother, father, varies):

Extent to which child feeds self (e.g., uses fingers, fork) for preferred/nonpreferred foods:

Typical meal schedule (example in parentheses):

<table>
<thead>
<tr>
<th>Meal</th>
<th>Time of day</th>
<th>Length of meal</th>
<th>Location</th>
<th>Where seated</th>
<th>Other eaters</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Lunch)</td>
<td>(9:00)</td>
<td>(30 mins)</td>
<td>(Kitchen)</td>
<td>(on lap)</td>
<td>(sister)</td>
</tr>
</tbody>
</table>
Typical sequences in which food is offered (e.g., liquids last, preferred foods first):

Best description of child’s appetite (e.g., poor, variable, strong):

Proportion of daily intake outside meals (i.e., snacks, breast feeds):

Current Feeding Problems

___ Eats too fast  ___ Eats too little
___ Eats too slow  ___ Eats too much
___ Fails to chew food  ___ Pushes food away
___ Vomits or gags  ___ Fails to suck
___ Spits food out  ___ Refuses to open mouth
___ Throws or drops food  ___ Takes food from others
___ Drools  ___ Cries or tantrums
___ Turns away from spoon  ___ Messy eater
___ Plays with food  ___ Refuses to swallow food
___ Leaves table  ___ Finicky eater
___ Eats non-food items  ___ Ruminates
___ Sneaks or steals food  ___ Other ________________________

Feeding Techniques

Techniques currently used during meals:

___ Coax ___ Forced feeding ___ Ignore
___ Threaten ___ Change foods offered ___ Model
___ Offer reward ___ Distract with play/toys ___ Spank
___ Send in room/ time out ___ Change meal schedule ___ Praise
___ Limit foods ___ Mini meals ___ Use t.v.

Other/explain_____________________________________________________________

Feeding environment used most often for meals:

___ lap ___ booster seat ___ floor
___ infant seat ___ table/chair ___ couch
___ high chair ___ stand/roam ___ other_______
Impressions of most effective techniques:

Professional recommendations received (e.g., vitamins, food supplements, feeding techniques) and results:

Major sources of feeding information (e.g., parent, friend, spouse) and agreement/disagreement with suggestions received:

---

Treatment Plans

Parents’ priorities regarding feeding:

Obstacles to environmental treatment (child’s health, parents’ availability, etc.):

Parents’ availability to participate in treatment (times, location, etc.):

Plan for next contact and instructions given to parent:
APPENDIX B

Sample Data Sheet
<table>
<thead>
<tr>
<th>Participant ______</th>
<th>Date:</th>
<th>Data Collector’s Name:</th>
<th>Condition: Bite the food into two pieces</th>
<th>Session Number:</th>
<th>PRIMARY/ RELI</th>
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<tbody>
<tr>
<td>Food: __________</td>
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% Compliance: _________/12 = ___________
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