Comparing the High-Probability Instructional Sequence with and without Food to Increase Consumption of Nonpreferred Foods in Children with Food Selectivity

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Abstract

The high-probability (high-p) instructional sequence is a non-intrusive procedure involving the presentation of a series of high-p instructions followed by 1 low-probability instruction. To date, 9 studies – with mixed findings – examined its effectiveness to treat food selectivity in children. We used a multielement within a reversal design to compare the effectiveness and efficiency of 2 iterations of the high-p sequence to increase food consumption in 2 food-selective children: high-p with preferred food on a spoon and high-p with an empty spoon. For both participants, neither high-p sequence alone increased consumption. For one participant, consumption increased in the high-p empty spoon condition with the introduction of non-removal of the spoon (NRS). For the other participant, consumption initially increased in the high-p with food condition with the introduction of NRS plus re-presentation but subsequently decreased. Results are discussed within the context of treatment implications and suggestions for future research.

Key words: high-probability instructional sequence, food selectivity, non-removal of the spoon, re-presentation
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Comparing the High-Probability Instructional Sequence with and without Food to Increase Consumption of Nonpreferred Foods in Children with Food Selectivity

A child is diagnosed with a feeding disorder when he or she does not consume a sufficient amount or variety of food for weight gain or growth (Piazza, Patel, Gulotta, Sevin, & Layer, 2003) or when the child engages in challenging behavior when presented with certain foods (Ledford, Whiteside, & Severini, 2018). Feeding disorders are multidimensional and influenced by skill deficits, learned mealtime behaviors, and medical problems (Silbaugh et al., 2016) and can range from severe (e.g., total refusal; dependence on a gastrostomy or nasogastronomy tube) to less severe (e.g., food selectivity; consumption of a limited variety of foods and nutrients; Bachmeyer, 2009; Silbaugh et al., 2016). Feeding disorders can result in a diet that does not provide the nutrients necessary for good health (Penrod, Gardella, & Fernand, 2012) and can have substantial negative impacts on family stress (Singer, Song, Hill, & Jaffe, 1990), child nutrition and health (e.g., nutrition deficits, weight loss, and malnutrition; Bachmeyer, 2009), and can result in IMB (e.g., tantrums, aggression, deficient self-feeding skills; Bachmeyer, 2009). It is estimated that up to 80% of children with autism spectrum disorder (ASD) experience some type of feeding difficulty (Burklow, Phelps, Schultz, McConnell, & Rudolph, 1998).

Food Selectivity

Food selectivity is a type of feeding disorder and is defined as a child refusing to eat a sufficient variety of food based on type, texture, or another dimension (e.g., color, food packaging; Field, Garland, & Williams, 2003). Selective eaters may consume an adequate quantity of food, but an inadequate variety of food such that their diet does not provide the
nutrients necessary for good health (Penrod et al., 2012). This is particularly problematic because food selectivity is the most prevalent feeding disorder among children with ASD (Sharp, Jaquess, Morton, & Herzinger, 2010); it is estimated that up to 70% of children with ASD are selective eaters (Twachtman-Reilly, Amaral, & Zebrowski, 2008). Therefore, it seems prudent to target this behavior for intervention to increase the likelihood that children with ASD consume a balanced, nutrient-rich diet.

**Behavior Chain**

Feeding consists of several complex behaviors; the first of which sets the occasion for the next behavior (Gulotta, Piazza, Patel, & Layer, 2005). As such, feeding is conceptualized as a behavior chain that includes accepting, chewing, and swallowing. Feeding problems can occur at any link in the behavior chain. For example, a child may not accept food (a problem at the accept link), may not have the oral motor skills necessary to break the food down (a problem at the chew link), or may pack the food in his or her cheeks (a problem at the swallow link). As such, it is essential to identify the problematic behavior in the chain to allow for a targeted intervention. However, it is possible that treatment of one problematic behavior in the chain might identify other issues. For example, Riordan, Iwata, Wohl, and Finney (1980) found that differential reinforcement of alternative behavior not only produced an increase in acceptance, but also in packing and expulsion with two children with developmental disabilities. Therefore, after the intervention successfully treated the first link in the chain (acceptance), two additional problematic feeding behaviors emerged at the next link in the chain (swallowing). To treat the children’s packing and expulsions, the researchers included swallowing in the existing contingency and observed an increase in swallowing with both children.
Applied Behavior Analysis to Treat Food Selectivity

To date, behavior analytic treatments are the most empirically supported treatments for food selectivity (Peterson, Piazza, & Volkert, 2016). Behavioral interventions can be classified as intrusive or non-intrusive procedures and focus on manipulating environmental events surrounding inappropriate feeding behaviors to promote acceptance and consumption (Silbaugh et al., 2016). In fact, Silbaugh et al. (2016) recommend that practitioners initiate feeding treatment with the least intrusive procedure because doing so is best practice.

Intrusive procedures. Intrusive procedures tend to be restrictive and typically require the feeder to (a) use physical guidance to help the child bring the feeding utensil to his or her mouth until the child opens his or her mouth at which point the feeder deposits the food in the child’s mouth (e.g., escape extinction, nonremoval of the spoon [NRS]; Bachmeyer, 2009; Silbaugh et al., 2016), (b) use a feeding utensil to help the child open his or her mouth at which point the feeder deposits the food in the child’s mouth (e.g., prompt; Bachmeyer, 2009; Silbaugh et al., 2016), or (c) limit the child’s movement (e.g., using a seat belt or physical prompts; Ledford et al., 2018). Bachmeyer (2009) explained that intrusive interventions such as escape extinction (or NRS) have been associated with undesirable side effects, including response bursts, extinction-induced aggression, and emotional responding. When these side effects emerge, mealtime may become aversive for caregivers, which may subsequently impact the frequency and consistency with which caregivers implement the procedure (Bachmeyer, 2009). Despite these potential side effects, escape extinction and other intrusive procedures may be a necessary component for a treatment to be effective (Borrero, England, Sarcia, & Woods, 2016; Patel, Piazza, Martinez, Volkert, & Santana, 2002; Patel et al., 2006).
**Non-intrusive procedures.** Non-intrusive procedures do not require the feeder to use physical guidance or feeding utensils to help the child open his or her mouth, but rather tend to rely on antecedent manipulations (e.g., noncontingent reinforcement, simultaneous presentation, demand fading; Bachmeyer, 2009) and reinforcement for acceptance and consumption of food (e.g., sequential presentation, differential reinforcement of alternative behavior; Bachmeyer, 2009).

**High-p instructional sequence.** The high-p instructional sequence is a non-intrusive procedure that involves the presentation of a series of high-p instructions with which the individual has a high probability of complying, followed by one low-probability (low-p) instruction with which the individual has a low probability of complying (Mace et al., 1988). To implement this procedure, a therapist first identifies several instructions with which the individual has a high probability of complying (e.g. “touch your nose”, “clap your hands”, “give me five”). Next, the therapist identifies instructions with which the individual has a low probability of complying (e.g. “take a bite of broccoli”). Finally, the therapist asks the individual to complete a series of these high-p instructions followed by one low-p instruction. The entire sequence might look like: “touch your nose,” “clap your hands,” “give me five,” and “take a bite of broccoli.”

The high-p sequence has been found to be effective across many populations, including individuals ranging in ages from preschool children to adults (Lee, 2005) and across individuals with a variety of diagnoses, including moderate to severe intellectual and developmental disabilities (e.g., Sanchez-Fort, Brady, & Davis, 1995), behavioral disorders (Belfiore, Lee, Vargas, & Skinner, 1997), and no diagnosis (Ardoin, Martens, & Wolfe, 1999). Further, researchers have used this procedure to increase compliance across a variety of behaviors,
including academic and social behaviors (Lee, Belfiore, Scheeler, Hua, & Smith, 2004; Wilder, Majdalany, Sturkie, & Smeltz, 2015), medical tasks (Riviere, Becquet, Peltret, Facon, & Darcheville, 2011), and food acceptance (Patel et al., 2007). For a recent review, see Lipschultz and Wilder (2017) for a range of uses of the high-p sequence and practical recommendations.

**High-p instructional sequence and food selectivity.** Relatively little research has investigated the effectiveness of the high-p sequence to treat food selectivity. To date, only nine studies have examined the effectiveness of the high-p sequence to increase the consumption of food. All nine studies were conducted with children diagnosed with ASD, pervasive developmental disorder, or development delay and the findings have been somewhat mixed. One possible rationale for the mixed findings might be the procedural differences across these studies.

Within the nine studies, researchers conducted 23 distinct evaluations. For the purpose of this synthesis, we defined an evaluation as the assessment of one specific high-p sequence procedure with one participant. For example, Dawson and colleagues (2003) compared the efficacy of the high-p sequence with and without escape extinction. The participant received two iterations of the treatment (a) the high-p sequence and (b) the high-p sequence with escape extinction. Because the researchers compared two versions of the high-p sequence with one participant, we considered these two separate evaluations. Taken together, researchers have demonstrated the effectiveness of the high-p sequence in 18 of 23 evaluations (78%), suggesting that the high-p sequence is a reasonably effective treatment for feeding disorders among young children. However, because several studies evaluated different procedural iterations of the high-p sequence, it is not possible to identify the exact procedure(s) that produce reliable food acceptance and consumption. Specifically, researchers have used (a) NRS, (b) different topographies of high-p instructions, (c) a different number of high-p instructions within the high-
p sequence, and (d) different types of reinforcement for compliance with the high-p and the low-p instructions.

**Nonremoval of the spoon.** This procedure prevents the child from escaping the nonpreferred food by continuously presenting the nonpreferred food to the child’s lips until he or she accepts the bite (Bachmeyer et al., 2009; Piazza et al., 2003). This procedure is identical to escape extinction; however, it is typically referred to as NRS when an escape function of the behavior has not first been confirmed by a functional analysis.

The current evidence supports the use of NRS or escape extinction. For example, Piazza et al. (2003) found low levels of acceptance across all four participants when treatment consisted of differential reinforcement of alternative behavior and escape from the bite; acceptance only increased following the addition of escape extinction for all four children with a pediatric feeding disorder. Although this procedure has been shown to be effective, it may produce several undesirable side effects, including response bursts, extinction-induced aggression, and emotional responding (Bachmeyer, 2009). Saini, Kadey, Paszek, and Roane (in press) reviewed 86 published functional analyses of feeding disorders and found that 90% of cases were maintained, at least in part, by negative reinforcement in the form of escape from the bite, drink, plate, or mealtime context. These findings suggest that NRS or escape extinction may be an essential component of feeding interventions.

Of the 23 high-p sequence evaluations in the literature, five evaluations (22%) combined the high-p sequence with NRS or escape extinction (Dawson et al., 2003; McComas et al., 2000; Patel et al., 2006). Of these five evaluations, 100% were effective. Of the 18 evaluations (78%) that did not use NRS or escape extinction, 72% were effective (Ewry & Fryling, 2016; Meier et
al., 2012; Patel et al., 2007; Penrod et al., 2012; Silbaugh & Swinnea, 2018; Trejo, & Frlying, 2018).

**Topography of high-p instructions.** Lipschultz and Wilder (2017) suggested that the topography of the high-p instruction might influence the effectiveness of the intervention; however, to date, only one study (i.e., Trejo & Fryling, 2018) has compared the effectiveness of different topographies of high-p instructions on the consumption of nonpreferred foods. The topography of high-p instructions that researchers used varied across evaluations: (a) motor tasks (N = 11; 48%) in which 64% of these evaluations were effective (Dawson et al., 2003; Penrod et al., 2012; McComas et al., 2000; Silbaugh & Swinnea, 2018; Trejo, & Frlying, 2018), (b) empty nuk brush or spoon (N = 2; 9%) and both of these evaluations were effective (Patel et al., 2006; Patel et al., 2007), (c) liquid on spoon (N = 3; 13%) in which 67% of these evaluations were effective (Patel et al., 2006), and (d) food on a spoon (N = 4; 17%) in which 100% of these evaluations were effective (Ewry & Fryling, 2016; Meier et al., 2012).

**Number of high-p instructions.** The number of high-p instructions researchers presented also varied across evaluations. Researchers have used: (a) three high-p instructions (N = 14; 61%) in which 64% of these evaluations were effective (Dawson et al., 2003; Ewry & Fryling, 2016; Patel et al., 2006; Patel et al., 2007; Silbaugh & Swinnea, 2018; Trejo, & Fryling, 2018), (b) two high-p instructions (N = 2; 9%) in which 100% of these evaluations were effective (Penrod et al., 2012), and (c) varied between three to five high-p instructions (N = 1; 4%) and this evaluation was effective (McComas et al., 2000). Within evaluations, some researchers faded the number of instructions: (a) from three to zero high-p instructions (N = 3, 13%) in which 100% of these evaluations were effective (Trejo, & Fryling, 2018), (b) from three to one high-p instructions (N = 2; 9%) in which 100% of these evaluations were effective (Meier et al.,
2012), and (c) from three to two high-p instructions (N = 1, 4%) and this evaluation was ineffective; therefore, the researchers returned to three high-p instructions and recaptured high levels of acceptance (Meier et al., 2012).

**Reinforcement.** This procedure involves providing the child with praise, a preferred item or activity, or both contingent on the desired behavior (e.g., accepting or consuming the bite of nonpreferred food; Bachmeyer, 2009). Preferred food or drinks, alone or in combination with praise, are used most often (i.e., all 23 evaluations included one or more of these reinforcers). For example, Penrod et al., (2012) increased the food consumption of two boys with ASD by providing verbal praise plus two to three small bites of preferred food contingent on consumption of the low-p bite.

Researchers have used different types of reinforcement for compliance with both the high-p and the low-p instructions. With respect to compliance with the high-p instructions, the most common reinforcer provided was verbal praise (N = 12; 52%) in which 92% of these evaluations were effective (Ewry & Fryling, 2016; McComas et al., 2000; Meier et al., 2012; Patel et al., 2006; Patel et al., 2007; Penrod et al., 2012). Two evaluations did not arrange reinforcement for compliance with the high-p instructions (12%) and 50% of these evaluations were effective (Dawson et al., 2003). Three evaluations provided a piece of preferred food for compliance with the high-p instructions (18%) and none of those were effective (Silbaugh & Swinnea, 2018). The final six evaluations (26%) did not specify if reinforcement was arranged for compliance with the high-p instructions; however, all six evaluations were effective (Trejo, & Fryling, 2018).

Twenty evaluations (87%) provided verbal praise contingent on compliance with the low-p instruction. Researchers in 13 of these evaluations (57%) provided verbal praise alone for
compliance with the low-p instruction and 92% of these evaluations were effective (Dawon et al., 2003; Ewry & Fryling, 2016; Meier et al., 2012; Patel et al., 2006; Trejo & Fryling, 2018). In addition to verbal praise, some researchers provided an additional reinforcer contingent on compliance with the low-p instruction, such as (a) sip of water (N = 1; 4%) and this evaluation was effective (McComas et al., 2000), (b) light physical touch (N = 4; 17%) and 75% of these evaluations were effective (Patel et al., 2006; Patel et al., 2007), and (c) preferred food (N = 2; 9%), and all of these evaluations were effective (Penrod et al., 2012). Three evaluations provided a piece of preferred food for compliance with the low-p instruction (13%); however, none of these evaluations were effective (Silbaugh & Swinnea, 2018).

**Purpose and Significance of the Research**

Given the potential negative health consequences of food selectivity (e.g., nutrition deficits, weight loss, and malnutrition; Bachmeyer, 2009), it is important for clinicians to use the most effective and efficient intervention possible to quickly remediate a child’s disordered feeding. Further, and in line with best practice recommendations, it is important to begin treatment with the least intrusive procedure before resorting to more intrusive procedures (Silbaugh et al., 2016). Due to the procedural differences of the high-p sequence found in the literature, it is not presently possible to identify the most effective iteration of this procedure. Therefore, the purpose of this study was to compare the effectiveness and efficiency of two iterations of the high-p sequence: (a) high-p with a preferred food and (b) high-p with an empty spoon on the consumption of nonpreferred food in 2 children with ASD. We chose these two iterations because Esch and Fryling (2013) suggested that the more similar the topography of high-p and low-p instructions, the more effective the procedure.
Research Questions

1) Which iteration of the high-p sequence is most effective to increase the consumption of nonpreferred foods for children with food selectivity?

2) Which iteration of high-p sequence is most efficient to increase the consumption of nonpreferred foods for children with food selectivity?

General Methods

Participants

I recruited two children with ASD to participate by distributing recruitment posters (see Appendix A) to local autism support centers in the Niagara region. Sam was six years old and Alex was five years old. Caregivers interested in participating contacted the principle investigator for information regarding the study and a consent form (see Appendix B).

Both participants consumed at least 90% of caloric need by mouth and had no difficulty chewing or swallowing foods as determined by the child’s physician (Sam) or caregiver (Alex). Both participants accepted (a) an empty spoon and (b) a preferred food on a spoon during the pre-experimental compliance assessment on a minimum of 90% of trials and consumed at least two nonpreferred foods on 30% or fewer trials during the pre-experimental preference assessments.

Setting

We conducted all sessions at the Brock University clinic (Sam) or the participant’s treatment center (Alex). We conducted one to six sessions within a 1 hr visit, one to two days a week. We conducted all sessions at least 1 hr before and after the participant’s last meal or snack (including liquids) to control for potential motivating operations for food.
Materials

The child sat upright and across the table from the researcher in a regular age-appropriate chair. We included a digital video camera mounted on a tripod, data sheets (see Appendix C to F) and pencils, timers, paper plates, spoons, paper towels, discriminative stimuli (i.e., two different colored scrubs with matching table-cloths, plates, and spoons), and individually determined foods based on preference assessment results. Caregivers provided food for their child to ensure it was prepared as it typically would be in the home.

Design

We used a multielement design within a reversal design. The experiment consisted of three phases: (a) baseline, (b) treatment comparison with intermittent baseline probes, and (c) a 4-week follow-up.

Response Measurement and Data Analysis

Trained observers used paper and pencil to collect trial-by-trial data during all assessments.

Preference assessments. Observers collected data on consumption (primary dependent variable), acceptance, expulsion, and negative vocalizations. Observers scored consumption (clean mouth) when the spoon with a dime-sized bolus (i.e., 17.91 mm in diameter) entered the participant’s mouth and he swallowed the food without expelling it. Observers scored acceptance when the empty spoon or spoon with a bolus entered the participant’s mouth after the researcher’s prompt to try the food (e.g., “This is a _____. You can try it if you want to.”). Observers scored expulsion when the participant emitted food larger than the size of a pea past
the plane of the lips. Observers scored *negative vocalizations* when the participant screamed, whined, cried, or said “No” or “No, thank you.”

We summarized these data for each food item separately by calculating the percentage of trials with each dependent variable by dividing the number of times the participant engaged in the behavior by the number of times we presented each food. Because consumption was the primary dependent variable, we then ranked the food based on consumption percentages; we ranked food consumed on a greater percentage of trials higher than food consumed on a smaller percentage of trials.

**Compliance assessment and treatment comparison.** Observers collected data on consumption (primary dependent variable), acceptance, expulsion, negative vocalizations, and problem behavior. Observers scored *consumption, acceptance, expulsion, and negative vocalizations* using the definitions above. We defined *problem behavior* for each participant individually. Sam did not engage in problem behavior. For Alex, problem behavior was defined as, *pinching* (when the participant’s hand made contact with the therapist’s skin and the participant retracted his fingers or finger nails to squeeze the therapist’s skin) and *hitting* (when the participant’s open or closed fist forcibly made contact with the therapist’s body).

We summarized the data from the compliance assessment by calculating the percentage of trials with each dependent variable per food separately by dividing the number of times the participant engaged in the behavior by the number of times we presented each food. We summarized the data from the treatment evaluation by calculating the percentage of trials with each dependent variable per type of instruction (high-p with food, high-p empty spoon, and low-p) by dividing the number of times the participant engaged in the behavior by the number of times we presented each instruction.
Interobserver Agreement and Procedural Integrity

**Interobserver agreement.** A second trained observer collected data on all dependent variables either post hoc (via video recording) or in-situ. We collected interobserver agreement data during a minimum of 37% (range, 37% to 38%) of sessions for both participants. We calculated trial-by-trial agreement by dividing the number of trials with an agreement by the number of trials with an agreement plus the number of trials with a disagreement and multiplying by 100. An *agreement* was defined as both observers scoring an occurrence or nonoccurrence of the same dependent variable within a given trial. A *disagreement* was defined as one observer scoring one dependent variable and the other observer either scoring a different dependent variable or scoring the nonoccurrence of that dependent variable. Mean agreement was 100% for consumption, acceptance, and expulsions; 97% (range, 66.7% to 100%) for negative vocalizations; and 99% (range, 75% to 100%) for problem behavior across all preference assessment, compliance assessment, and treatment comparison sessions for both children.

**Procedural integrity.** Trained observers collected procedural integrity data during a minimum of 37% (range, 37% to 38%) of sessions across all preference assessment, compliance assessment, and treatment comparison sessions for both participants. We calculated procedural integrity for each researcher behavior (described below) by dividing the number of accuracies by the number of accuracies plus the number of inaccuracies then converting this ratio to a percentage.

**Preference assessment.** Trained observers recorded the accuracy with which the researcher delivered the food, prompt, clean-mouth prompt, and terminated the trial. Observers also recorded the accuracy with which the researcher terminated the trial. Observers scored *correct food delivery* when the researcher placed two foods, each on a separate spoon, 2 in. in
front of the participant’s mouth and said, “Pick your favorite.” Observers scored *correct prompt delivery* when the researcher re-administered the correct prompt (i.e., “Pick your favorite.”) while holding both spoons 2 in, in front of the participant’s mouth. Observers scored *correct clean-mouth prompt* when the researcher (a) ensured the child had swallowed the accepted food and (b) if the child still had food in his mouth, continued to prompt him to swallow the food approximately every 10 s until he swallowed the food. Observers scored *correct trial termination* when the researcher ended the trial after the participant did not accept the food within 5 s of the second prompt to do so. Mean procedural integrity was 100% for correct delivery of the food, prompt, clean-mouth prompt, and terminating the trial.

**Compliance assessment.** Trained observers calculated the accuracy with which the researcher delivered the bite, reinforcer, clean-mouth prompt, and terminated the trial. Observers scored *correct bite presentation* when the researcher said, “Take a bite” and held either a bolus of a preferred food on a spoon or an empty spoon 2 in. in front of the participant’s mouth. Observers scored *correct reinforcement delivery* when the researcher provided verbal praise within 2 s after the participant accepted and consumed the food. Observers scored *correct clean-mouth prompt* and *correct trial termination* using the definitions provided above. Mean procedural integrity was 100% for correct delivery of the bite, reinforcer, clean-mouth prompt, and terminating the trial.

**Treatment comparison.** Trained observers calculated the accuracy with which the researcher delivered the high-p with food, high-p empty spoon, low-p, reinforcer, clean-mouth prompt, and terminated the trial. Observers scored *correct high-p with food delivery* when the researcher said, “Take a bite” and held a spoon with a bolus of preferred food 2 in. in front of the participant’s mouth. Observers scored *correct high-p empty spoon delivery* when the researcher
said, “Take a bite” and held an empty spoon to the participant’s mouth. Observers scored correct low-p delivery when the researcher said, “Take a bite” and held a spoon with a bolus of non-preferred food to the participant’s mouth. Observers scored correct reinforcement delivery when the researcher provided (a) verbal praise or (b) verbal praise and a dime-sized bolus of preferred food after the participant accepted and consumed the food. Observers scored correct clean-mouth prompt and correct trial termination using the definitions provided above. Mean correct clean-mouth check was 91% (range, 25% to 100%) and was 100% for correct delivery of the high-p with food, high-p empty spoon, low-p, and reinforcer, and the termination of the trial.

**Procedure**

**Pre-Experimental Assessments**

**Indirect preference assessment.** The researcher asked the caregiver(s) to complete an indirect preference assessment for their child (see Appendix G) that asked the caregiver(s) to list the top-10 foods their child (a) reliably eats without coaxing and (b) does not eat but that they feel is important for their child to eat (e.g. fruits, vegetables). The researcher also asked the caregiver(s) to identify any food allergies their child had and any specific food items they would like their child to eat during this study.

**Paired-choice preference assessment.** The purpose of the paired-choice preference assessment was to identify and rank the participant’s most preferred foods to use as the target high-p foods during the high-p with food condition. The researcher asked the caregiver(s) to select approximately five of the preferred foods from the indirect preference assessment for inclusion in this preference assessment. Prior to the assessment, the researcher gave the participant the opportunity to sample a dime-sized bolus of each food by labeling each food and asking the participant to try it (e.g., “This is a hot dog. Do you want to try it?”). During the
assessment, the researcher presented two foods, each on a separate spoon, 2 in. in front of the participant’s mouth, labeled each food, and asked the participant to pick one food (e.g., “Pick your favorite.”). If the participant selected one food within 5 s, the researcher gave the participant 30 s to consume that food. If the participant did not accept one food within 5 s, the researcher provided a second prompt to pick one (e.g., “Pick your favorite.”). If the participant still did not accept either food 5 s after the second prompt, the researcher removed the food, ended the trial, and presented the next pair of foods. The researcher ignored all expelled bites. The preference assessment continued until the researcher paired all foods with every other food.

**Compliance assessment.** The purpose of this assessment was to identify a high-p instruction for both conditions. The compliance assessment consisted of 30 trials – five trials of each of the five preferred foods identified by the preference assessments and five trials with an empty spoon. The researcher conducted the compliance assessment twice and average the results. For the high-p with food condition, the researcher selected two foods with the highest percentages of compliance over 90%. For the high-p empty spoon condition, the researcher used the empty spoon if the participant accepted the empty spoon on at least 90% of trials.

The researcher quasi-randomly presented all trials such that the researcher did not present more than two consecutive trials of the same type of high-p instruction. During each trial, the researcher said, “Take a bite” and presented a dime-sized bolus of preferred food on a spoon or an empty spoon held to the participant’s mouth. The researcher presented one trial every 15 s. The researcher provided verbal praise if the participant consumed the food. If the participant did not accept the preferred food on a spoon or spoon, the researcher removed the spoon for the remainder of the 15-s interval. The researcher ignored all expelled bites.
General Procedures

The high-p instruction (hereafter referred to as the high-p bite) consisted of either a dime-sized bolus of preferred food on a spoon or an empty spoon. The low-probability instruction (hereafter referred to as the low-p bite) consisted of a dime-sized bolus of nonpreferred food on a spoon. During all conditions and phases, the researcher presented 6 trials per session. In all conditions, a low-p bite consisted of (a) a verbal prompt (i.e., “Take a bite”) and (b) a nonpreferred food on a spoon held 2 in. in front of the participant’s mouth. We included two preferred foods and four nonpreferred foods for each child. We arranged the nonpreferred foods into two pairs and randomly assigned each pair to one experimental condition. Further, we assigned unique discriminative stimuli to each condition to facilitate discrimination across conditions. The scrubs, table cloth, plate, and spoon were blue during the high-p with food condition, red during the high-p empty spoon condition, and white during baseline and baseline probes.

Baseline

The researcher presented 6 low-p bites every 30 s to equate the time between low-p bites in all conditions. The researcher provided verbal praise if the participant consumed the food. If the participant (a) did not consume the food or (b) engaged in problem behavior, the researcher removed the spoon for the remainder of the 30-s interval. The researcher ignored all expelled bites.

Treatment Comparison

This phase consisted of three conditions: (a) high-p with food and (b) high-p empty spoon, and (c) intermittent baseline probes.
During both high-p conditions, each trial consisted of three high-p bites followed by one low-p bite. Within one trial, the researcher presented a bite every 5 s. The researcher provided the participant with 15 s to consume the low-p bite such that the researcher presented one low-p bite every 30 s (identical to baseline). The researcher provided verbal praise if the participant (a) consumed the high-p bite, (b) accepted the empty spoon, or (c) consumed the low-p bite. If the participant (a) did not consume the food, (b) did not accept the empty spoon, or (c) engaged in problem behavior, the researcher removed the spoon for the remainder of the 30-s interval. The researcher ignored all expelled bites. Although both participants always consumed three high-p bites during all sessions, if the participant did not consume three consecutive high-p bites, the researcher would have removed the bite and terminated the trial. After the participant consumed the third high-p bite, the researcher presented the low-p bite. The mastery criterion was three consecutive sessions with 100% consumption of low-p bites.

**High-p with food.** This condition consisted of three presentations, one at a time, of (a) a verbal prompt (i.e., “Take a bite”) and (b) a bolus of preferred food on a spoon held 2 in. in front of the participant’s mouth. The researcher presented the low-p bite 5 s after the third high-p bite. The low-p bite was identical to the low-p bite described in baseline.

**High-p empty spoon.** This condition consisted of three presentations, one at a time, of (a) a verbal prompt (i.e., “Take a bite”) and (b) an empty spoon held 2 in. in front of the participant’s mouth. The researcher presented the low-p bite 5 s after the third high-p bite. The low-p bite was identical to the low-p bite described in baseline.

**Baseline probes.** The researcher conducted intermittent baseline probes that were identical to baseline sessions and occurred after approximately five sessions per treatment condition.
**Treatment manipulations.** When we observed a stable pattern of low to zero levels of consumption, we introduced a series of treatment manipulations from least-to-most intrusive. Across all treatment manipulations, the researcher continued to provide verbal praise when the participant accepted and consumed the high-p and low-p bites.

**Preferred edible.** All procedures were identical to the high-p with food and high-p empty spoon phase except that the researcher also provided one dime-sized bite of a preferred edible item contingent on consumption of the low-p bite. The researcher (a) asked parents to identify two highly preferred foods to include in this condition and (b) assessed the preference of these foods at the beginning of each session by presenting one bite on a spoon and asking the participant if he wanted to try it. For Sam, the preferred edible items were corn twists and corn chips and were chocolate chips and mini Oreos for Alex.

**Enhanced-preferred edible.** All procedures were identical to the high-p with food and high-p empty spoon phase except that the researcher provided two larger pieces (21.21 mm in diameter) of the same edible item used in the preferred edible condition contingent on consumption of the low-p bite.

**NRS.** All procedures were identical to the high-p with food and high-p empty spoon phase except for the inclusion of NRS. If the participant did not accept the low-p bite, the researcher continued to present the food until the participant accepted the bite or until 30 min lapsed.

**NRS with re-presentation.** All procedures were identical to the NRS treatment manipulation phase except that the therapist re-presented expelled bites. If the participant did not accept the low-p bite, the researcher continued to present the food until the participant accepted the bite or until 30 min lapsed and re-presented all expelled bites.
Follow-up. The researcher conducted weekly follow-up sessions for four weeks for Sam. Follow-up sessions started one week after Sam completed the treatment comparison phase and were identical to baseline.

Results

Treatment Comparison

Figure 1 shows the percentage of consumption of low-p bites for Sam. During baseline, Sam consumed zero low-p bites in both conditions. During the high-p treatment comparison phase, consumption increased in the high-p empty spoon condition ($M = 50\%$, range, 33% to 67%) and remained at 50%. Consumption initially increased in the high-p with food condition ($M = 9\%$, range, 0% to 50%); however, it subsequently decreased to low to zero levels. During the first two baseline probes, Sam consumed 33% of the low-p foods in the high-p empty spoon condition and none of the low-p foods in the high-p with food condition.

A within session analysis of the high-p empty spoon condition revealed that Sam consistently consumed 100% of bites of cauliflower and no lentils. Therefore, we implemented the high-p with preferred edible phase and observed an initial increase in consumption in the high-p empty spoon condition ($M = 76\%$, range, 50% to 100%) while consumption remained at 0% in the high-p with food condition. Sam’s level of consumption subsequently decreased in the high-p empty spoon condition to 50%, at which point we introduced high-p with enhanced-preferred edible; however, consumption remained at 50%.

We observed no change in consumption percentages in either condition when we returned to baseline. Finally, when we introduced NRS to the existing high-p contingencies, we observed an immediate increase in consumption to 100% in both conditions. When we returned to baseline, consumption remained at 100% in the high-p empty spoon condition, but decreased to
0% in the high-p with food condition. When we returned to high-p with NRS, we recaptured 100% consumption in both conditions. Across the four weekly follow-up sessions, Sam’s consumption maintained at 100% in the high-p empty spoon condition but decreased in the high-p with food condition ($M = 46\%$, range, 33% to 67%).

![Bar graph](image)

**Figure 1.** Percentage of low-p consumption for Sam. Squares denote consumption percentages during the high-p with food condition and circles denote these percentages during the high-p empty spoon condition. Black data points denote consumption percentages during treatment and open data points denote these percentages during baseline and baseline probes.

Figure 2 shows the percentage of consumption of low-p bites for Alex. During baseline, Alex did not consume any low-p bites in either condition. During the high-p alone, high-p with preferred edible, high-p with enhanced-preferred edible, and high-p with NRS phases, he continued to show 0% of consumption of low-p bites in both conditions. A within session analysis found that, although consumption did not increase, acceptance increased during the high-p with NRS phase in the high-p empty spoon condition ($M = 100\%$) and the high-p with food condition ($M = 95\%$, range, 80% to 100%). During this phase, Alex expelled every accepted bite. When we returned to baseline, we observed a variable level of acceptance in the high-p empty spoon condition ($M = 68\%$, range, 33% to 100%) and a decrease in acceptance to 0% in the high-p with food condition. Finally, when we introduced high-p with NRS and re-
presentation, acceptance increased to 100% in both conditions; however, consumption remained at 0% in the high-p empty spoon and initially increased before decreasing to low levels ($M = 62\%$, range, 0% to 100%) in the high-p with food condition.

Throughout Alex’s entire evaluation, we were in contact with the family, given the limited success, the clinical team has decided to terminate this treatment and work with the entire clinical team to develop a different treatment approach.

![Figure 2](image_url)

**Figure 2.** Percentage of low-p consumption for Alex. Squares denote consumption percentages during the high-p with food condition and circles denote these percentages during the high-p empty spoon condition. Black data points denote consumption percentages during treatment and open data points denote these percentages during baseline and baseline probes.

**Discussion**

This is one of the first studies to compare different topographies of high-p instructions within the high-p instructional sequence to treat food selectivity in children with ASD. We obtained three noteworthy findings in this study – all of which were inconsistent with those of previous research. First, neither iteration of the high-p sequence alone produced an increase in consumption for either of our participants. This finding is inconsistent with the small majority
(five of eight [63%]) of previous studies (i.e., Patel et al., 2007; Meier et al., 2012; Penrod et al., 2012; Ewry & Fryling, 2016; Trejo & Fryling, 2018) that showed that the high-p sequence alone increased consumption for all participants. Second, we found that the high-p sequence with NRS increased consumption across both high-p conditions for one participant (Sam) but was ineffective for the other participant (Alex). This finding is also inconsistent with all three (100%) previous studies (i.e., Dawson et al., 2003; McComas et al., 2000; Patel et al., 2006) that found that the high-p sequence with NRS increased consumption for all participants. Finally, we found that the high-p sequence with NRS and re-presentation initially increased consumption for Alex; however, it subsequently decreased. This finding is partially inconsistent with both (100%) previous studies (i.e., Dawson et al. 2003; Patel et al., 2006) that found that the high-p sequence with NRS and re-presentation increased consumption for all participants. It is worth noting that Alex’s parents withdrew him from the study; therefore, we were not able to identify a high-p-sequence-based procedure that produced clinically acceptable levels of consumption for him.

Because the high-p sequence alone did not produce an increase in consumption for either of our participants, it was not possible to compare the effectiveness or efficiency of the two iterations of the high-p sequence alone: high-p with preferred food and high-p empty spoon. Therefore, this question remains unanswered. One possible explanation for these results may be that our participants were not appropriate candidates for this study. In particular, previous researchers have suggested that the high-p sequence alone may be more effective for children with less severe feeding difficulties (e.g., food selectivity; Ewry & Fryling, 2016; Meier et al., 2012) and less severe IMB (Ewry & Fryling, 2016). Therefore, it is possible that our participants engaged in relatively more severe topographies of food refusal, higher rates or more severe topographies of problem behavior, or both than those included in previous studies. This point
remains speculative; however, because when we reviewed this literature, it was often difficult to ascertain the participants’ (a) type of feeding difficulty, (b) severity of IMB, problem behavior, or (c) both. However, we found that the majority of these studies included children with food selectivity (N = 7), which is typically considered to be a less severe type of feeding disorder than total food refusal (Penrod et al., 2012). In addition, only two of nine studies included a total of three children who engaged in IMB or problem behavior and neither spoke to the severity of these behaviors. Of these two studies, high-p alone was only effective for one participant (Patel et al., 2006) and NRS was required for the remaining two participants (Dawson et al., 2003; Patel et al., 2006). Therefore, future researchers should evaluate the influence of participant characteristics (e.g., severity of feeding disorder; presence, frequency, and severity of problem behavior; diagnosis; age) on the effectiveness of the high-p sequence alone versus in combination with more intrusive procedures, such as NRS.

Because we were unable to produce an increase in consumption in either high-p condition (i.e., high-p preferred food and high-p empty spoon), we attempted a series of four procedural modifications; we implemented all procedural modifications in both high-p conditions simultaneously. First, we added a preferred edible to the existing high-p conditions. Because this produced no change in consumption in either high-p condition, we increased the amount of the preferred edible (i.e., enhanced-preferred edible) that we provided in both high-p conditions; this modification was also ineffective for both participants. These results are similar to those obtained by Silbaugh and Swinnea (2018) who found that providing preferred food contingent on low-p consumption did not increase the consumption of low-p bites. Conversely, Penrod et al., (2012) found that providing a preferred edible did increase low-p bite consumption. Therefore, it could be the case that the edibles we used, although preferred, were not sufficiently preferred to
function as a reinforcer for either participant. Although we directly assessed both participants’ preference for these foods prior to each session, we used a modified preference assessment procedure wherein the therapist presented one dime-sized bite of the preferred food on a spoon and asked the participant if he wanted to try the food. Although both children consumed this food during every pre-session choice trial, it is possible that this one-trial preference assessment method did not identify the participants’ *most* highly preferred food or may not have identified a food sufficiently preferred to increase consumption of the low-p bite. Future researchers should assess preference more rigorously to ensure the preferred food is the participants’ most (or one of the most) highly preferred food. Researchers can take this a step further and conduct pre-experimental reinforcer assessments using a progressive ratio schedule of reinforcement, for example, to ensure this food functions as a powerful reinforcer.

Next, we added NRS to both high-p conditions and observed an increase in consumption for Sam only. Although this modification did not produce an increase in consumption for Alex, it did result in an increase in acceptance. Given that we observed an increase in acceptance for both Alex and Sam (Sam first accepted each bite that he subsequently consumed) following the introduction of NRS to both high-p conditions, we concluded that the high-p sequence with NRS effectively targeted the first link in the behavior chain (i.e., acceptance). Similar to the results of Riordan et al. (1980), we found that treatment of a problematic first link in a feeding behavior chain identified a problem in a subsequent link in the behavior chain for one of our participants – Alex. That is, once we observed an increase in Alex’s acceptance, we also observed a concomitant increase in expulsions.

Therefore, we then added NRS and re-presentation to both high-p conditions; however, we were unable to decrease expulsions and increase consumption for Alex. In addition, we
observed an increase in mean percentage of trials with aggression (scratching and hitting the therapist) from 2.3% (range, 0% to 33%) in baseline to 39% (range, 0% to 100%) in high-p with NRS and re-presentation. Bachmeyer (2009) explained that intrusive procedures, like NRS, could produce an increase in extinction-induced aggression. To enhance the safety of this procedure for Alex and the therapist, we introduced a back prompter who blocked all instances of aggression and attempts at aggression; this addition produced a decrease in aggression and enhanced the safety of the procedure presumably because Alex no longer had the opportunity to engage in aggressive behavior.

In an attempt to isolate the effects, if any, of the two high-p conditions, we introduced all procedural modifications to both conditions simultaneously. However, it is also possible that the texture of foods we included in each condition influenced this increase in consumption in the high-p with food condition. That is, we assigned broccoli and cauliflower to the high-p empty spoon condition and applesauce and yogurt to the high-p with food condition for Alex. It is possible that the texture of foods in the high-p with food condition required a lower response effort to consume (i.e., these foods do not require a chew response) whereas the broccoli and cauliflower in the high-p empty spoon condition do require a chew response. Therefore, for Alex, it may not have been the topography of high-p instructions that produced the increase in consumption in the high-p with food condition, but rather, the texture of food in both conditions. To avoid this in the future, researchers should arrange foods with similar features (i.e., texture, consistency, or taste) across conditions or have an equal number of foods with these features in all conditions.
Limitations

Despite the strengths of this study, we have identified three primary limitations. First, we did not replicate the effects of the high-p with NRS on acceptance for Alex. That is, we observed an immediate increase in acceptance in both conditions after we added the NRS contingency. When we returned to baseline, we observed a subsequent decrease in acceptance to zero levels in the high-p with empty spoon condition and a decrease to variable levels (M = 71%, range, 33% to 100%) in the high-p with food condition. We could have re-introduced high-p with NRS to determine if a functional relation existed between acceptance and this procedure. However, because acceptance was a secondary measure and this phase did not produce an increase in our primary measure (consumption), we opted to assess the effectiveness of a more intrusive procedure (i.e., high-p with NRS and re-presentation) on Alex’s consumption rather than re-introducing a procedure that had no effect on the primary measure. This was also particularly important to his family and clinical team.

Second, although outside of the scope of the study, we did not systematically assess if treatment gains generalized to the parents, home, or to other food. Therefore, future researchers should conduct systematic generalization probes before, during, and after treatment to assess the extent to which treatment gains generalize to the parents, home, and to other food. Researchers might also consider assessing for generalization to novel foods that share progressively different features (e.g., color, taste, or texture) to the target food. In doing so, it is possible that researchers could identify a generalization gradient that might prove useful when programming for treatment and generalization.

Finally, we did not assess the social validity of these iterations of the high-p sequence since neither was effective alone. Therefore, parent opinion regarding the acceptability of these
two iterations of the high-p sequence remains unknown. Future researchers should collect social validity data on the high-p sequence to identify if this procedure (and its’ variants, when applicable) is socially acceptable and to determine if the treatment gains from this procedure produce a socially significant change for the child and the family.

**Future Research**

Given the numerous procedural differences in the current literature, research comparing the effectiveness and efficiency of these different procedures seems warranted. Some researchers have begun these comparisons. For example, Trejo and Fryling (2018) compared the effects of high-p tasks that are topographically similar (i.e., water on a spoon) and topographically dissimilar (e.g., “Touch head.”) to the low-p task (i.e., food consumption) on the consumption of nonpreferred foods with a 9-year-old child with ASD. Both high-p task topographies increased the child’s consumption suggesting that the similarity of the high-p and low-p tasks may not be of critical importance; however, because this study only included one child, these effects should be replicated before conclusive statements can be made about this variable.

To date, only two other high-p sequence comparison studies have been conducted and both compared high-p alone and high-p with NRS (Dawson et al, 2003; Patel et al., 2006). Both studies found that high-p with NRS was always more effective than high-p alone. However, across both studies, this comparison was only made between two young children with developmental disabilities; therefore, future researchers may consider comparing the high-p sequence alone to the high-p sequence with NRS among a larger number of participants, a more diverse population, with different types (or severities) of feeding disorders, and with participants who do and who do not engage in IMB or problem behavior to allow us to conclude which
procedure (high-p with or without NRS) is most appropriate for participants with certain characteristics.

Researchers can also compare the effectiveness and efficiency of several other procedural variations of the high-p sequence, such as the type or magnitude of the reinforcer provided contingent on low-p bite consumption and high-p bite consumption. With respect to type of reinforcers, researchers could evaluate the effects of praise, edible, or tangible reinforcers. Moreover, researchers could compare different qualities within and across reinforcer classes (e.g., high-quality praise versus low-quality praise, high-quality praise versus high-quality edible). Similarly, researchers could evaluate the effects of different magnitudes of these reinforcers (e.g., 5 s access to a preferred toy versus 5 min access to a preferred toy).

Since the high-p sequence typically involves the relatively rapid presentation of instructions, it might also prove useful for researchers to compare the effectiveness and efficiency of various inter-trial intervals between high-p bites and between high-p and low-p bites. Pits and Dymond (2012) compared 5-s and 10-s inter-trial intervals within the high-p sequence to increase dressing skills among three participants with ASD and found that 5-s intervals resulted in more compliance and a shorter latency to compliance with the low-p instructions. It is worth noting that these high-p tasks were simple, short-duration, and low-effort motor tasks (e.g., “Give me five” and “Clap”). Therefore, it is possible that the response effort and the corresponding amount of time that it takes participants to complete the high-p task may contribute to the success of certain inter-trial intervals. For example, if the inter-trial interval is 10 s and the high-p task is a low-effort and short-duration task that takes the participant 2 s to complete, the participant would have approximately 8 s from the completion of the response to the beginning of the next high-p instruction. However, this duration would be substantially
reduced if the inter-trial interval was only 5 s. Therefore, future researchers should investigate the ideal amount of time between the completion of the high-p instruction and the next response to set the most appropriate inter-trial interval within the high-p sequence.
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Is your child a “picky eater”? Are there only a few foods your child will willingly eat?

**WHO:** Children with or without a developmental disability that eat a limited variety of foods and are often unwilling to eat certain foods and/or try new foods

**AGE:** 2 - 17 years old

**WHAT:** A study conducted through Brock University to compare two versions of a non-intrusive treatment to increase the variety of foods your child eats

**WHEN:** 3-5 days/week for up to 1 hour per visit; for 3-6 weeks

**WHERE:** Applied Disabilities Studies Clinic near Brock or your home

**WHY:** We hope to identify the most effective and efficient non-intrusive treatment to help *picky eaters* eat a wider variety of nutritious foods

For more info please contact
Nancy Leathen (Principal Student Investigator: nleathen@brocku.ca) or Dr. Kimberley Zonneveld (KZonneveld@brocku.ca) or

*This study has been reviewed and received clearance from Brock University (File #17-338)*
Appendix B

Research Consent for Participants

**Project Title:** Comparing High-Probability Demands with and without Food to Increase Food Acceptance

**Principal Investigators (PI):**
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**Principal Student Investigators:**
Nancy Leathen, M.A. Student, Department of Applied Disability Studies; Ph: (905) 688-5550 x3218; Email: nl12ap@brocku.ca

**INVITATION**
Your child is invited to participate in a research project to help us compare two common versions of a non-intrusive treatment to increase the variety of foods your child eats. This procedure is called the high-probability instructional sequence and involves presenting three requests that your child has a high-probability of complying with (e.g., bite of preferred food) followed by presenting one request that your child has a low-probability of complying with (e.g., bite of non-preferred food). One common version of this procedure involves presenting three bites of a preferred food following by a bit of non-preferred food, whereas the other common version involves presenting three bites of an empty spoon (putting an empty spoon into his or her mouth) followed by a bite of non-preferred food.

**WHAT’S INVOLVED**
All assessments and sessions will either take place at the Brock University clinic space in St. Catharines, at your house, school or therapy setting, whichever location you prefer. Sessions will take place 1 to 5 days a week, depending on your child and the researcher’s availability. All session will be videotaped to allow researchers the opportunity to re-watch the session for anything missed during the actual session. The name, pseudonym, or specific location of residence of your child will not be made available in the video. We ask that you provide us with the foods that you would like us to use during this study.

We will begin by asking you to complete a brief survey to identify the foods that your child does eat and a list of foods your child does not eat, but that you feel it is necessary for them to eat. We will also ask for a list of any food allergies your child has.

We will then conduct a brief assessment with the foods you listed, which will involve presenting a small piece of each food and asking your child to try it to further help us identify preferred and non-preferred foods for use in this study. We will present each food to your child three times. The food(s) that your child consistently eats will be considered the preferred foods and the food(s) that your child rarely eats will be considered the non-preferred foods. If your child prefers
all of the foods equally, we will conduct another assessment that ranks the foods to identify your child’s most preferred foods. Next, we will conduct a brief compliance assessment with your child to determine if (a) taking a bite of preferred food and (b) taking a bite of an empty spoon are requests that your child has a high probability of complying with. Because we are comparing these two common versions of high-probability requests on the acceptance of non-preferred foods, it is critical that we first ensure these two different types of requests are highly probable behaviors (i.e., consistently occur).

We will observe your child eating a typical meal prior to the first experimental session, during the study, and after the last experimental session to assess whether treatment gains occur in the home when you, the parents or caregivers, have a typical meal with your child. This procedure will involve me, or another research assistant, observing your child (in person or via videotape, whichever you prefer) eating a regular meal in your home.

Next, we will begin the treatment comparison. First, we will conduct a baseline phase in which no treatment is in effect. During baseline, we will present a small piece of the non-preferred food on a spoon and ask your child to take a bite. Next, we will begin to compare the two versions of the high-probability instruction sequence. When conducting sessions for both versions, we will present three high-probability requests followed by one low probability request (i.e., one bite-sized piece of the non-preferred food presented on a spoon). In one version, the high-probability request will consist of three bites of your child’s preferred food on a spoon. In the other version, the high-probability request will consist of three bites of an empty spoon. Follow up sessions will be conducted once per week for up to six weeks, depending on your child and the researcher’s availability. After the completion of the treatment evaluation, we will ask you to answer some questions about what you liked and did not like about the treatment.

We will work with your schedule to determine how often we will meet with your child during the week. The first two assessments should not exceed two to four weeks, depending on your child’s availability. The length of the treatment comparison phase will also depend on your child’s availability and how quickly your child responds to the treatment.

**POTENTIAL BENEFITS AND RISKS**

Your child may face potential psychological risks during this study. We will be presenting small pieces of a food that has been identified as non-preferred for your child. Some children may engage in problematic behaviors as a result of being asked to eat non-preferred food (e.g. crying or food refusal). To mitigate these potential risks of this experiment, a positive environment will be maintained for the entire experiment. In addition, we will never force your child to take a bite of food. In fact, we will only present the food for 5 seconds. If your child doesn’t want to take a bite within 5 seconds, we will remove that food item. It should also be noted that the session will also be terminated if your child cries for 10 consecutive seconds.

There may be a risk that your child may choke on the food he/she is consuming; however, this risk is not higher than the risk of choking outside of research sessions. However, to ensure that your child is safe in the event that he or she does choke, all researchers conducting sessions with your child will be first aid trained. Your child will be putting the food in his/her mouth, we are not forcing the food into your child’s mouth. This is not a risk that is greater than your child
would encounter in his/her everyday life while eating a typical meal. In addition, Dr. Zonneveld has over 10 years of experience in the assessment and treatment of feeding problems. All research assistants will be trained to competency in all aspect of the study and will be supervised by Dr. Zonneveld.

Food selectivity can have a substantial negative impact on child nutrition and health (e.g., unbalanced diets, growth and nutrition deficits, weight loss, and malnutrition), by participating in this study we hope to increase the variety of healthy foods your child eats. The proposed research will have large effects for practitioners and parents to help treat food selectivity. Specifically, if the results show that one or both procedures are effective, then practitioners can use this method to treat food selectivity. Identifying the most effective method of treatment will increase treatment success for children. If both treatment methods are found to be effective, the length of time required to complete the treatment will be compared. Identifying this will reduce the time children are required to stay in treatment, meaning that children will be more quickly reintegrated into family meals and snacks. In addition, shorter treatment durations will result in children receiving the nutrients from a healthy and balanced diet that are necessary for optimal health.

CONFIDENTIALITY

Your child’s data, video recordings of your child, and any information you provide us is considered confidential. Only members of the research team will have access to your child’s data. We will refrain from using identifying information in e-mail correspondence, during presentations, or in publication of these results. Once your child’s data is being collected, his or her name will be changed into a pseudonym. A master list that links pseudonyms to real names will be stored on a network secured through Brock University’s Information Technology Services. These pseudonyms will be the names that appear on any representation of your child’s data.

Paper data collected during this study will be stored in a locked cabinet behind a locked door. Electronic data, including video recordings will be kept on a network secured through Brock University’s Information Technology Services. All data will be kept for 10 years, after which time paper data will be securely shredded, and all electronic data (excluding video recordings) will be securely deleted from the secure network. If you provide consent for video recordings, all video recordings will be stripped of all personal identifiers and will be kept indefinitely for the purpose of teaching and/or dissemination at conferences.

Only the principal investigator and the research team will have access to the data. If sessions take place at your child’s therapy setting, the clinic will not have access to any of your child’s data and will only be involved in recruitment and providing a room to conduct the study in.

VOLUNTARY PARTICIPATION

Participation in this study is voluntary. You may decline to answer any questions or have your child participate in any component of the study. Further, you may decide to withdraw from this study at any time up to and including the last study session and may do so without any reprisal from Brock University. If you choose to withdraw from the study, you will have the opportunity
to decide what happens to your child’s data. You may ask for it to be securely destroyed, for it to be used in the study, or for it to be returned to you. If you choose to have the data returned to you, Nancy Leathen will be available to meet with you should you have any questions. Your child’s participation, non-participation, or withdrawal from the study will not influence the relationship or service your child is currently receiving or will receive in the future.

We will also obtain verbal assent from your child to participate in this study. For children with limited communication abilities, we will ask for a list of ways they show that they do not want to do something. If a child revokes assent on three consecutive sessions, we will schedule a meeting with you (either via phone or in person) and indicate that she/he has indicated that she/he does not want to participate. We will then ask if you would like us to offer your child another opportunity to attend our research or if you would like to withdraw your child. If your child revokes assent on our next attempt, we will excuse her/him from the study.

**PUBLICATION OF RESULTS**

Your child’s individual results may be published in professional journals and may be presented at conferences or workshops. Please note that only pseudonyms will appear on any representation of your child’s data. Only the province, age, sex, and diagnosis (or lack thereof) of your child will be made available. The name, pseudonym, or specific location of residence of your child will not be made available in any published reports.

If you provide consent for video recordings, all names will be deleted from the video before the video is shown to anyone outside of our research team. Feedback about your child’s results will be made available to you throughout the study. You can receive a graph of your child’s results during the study. Further, you will be able to sit in on any (or all) sessions to observe your child while he or she participates in the study. Feedback regarding the final results of the study will either be mailed or emailed to you (depending on your preference). This feedback will be sent to you one month after the study ends. Throughout the study, you may contact Nancy Leathen, M.A. Student at 905-688-5550 ext. 3218, nl12ap@brocku.ca, or Dr. Kimberley Zonneveld, BCBA-D at 905-688-5550 ext. 6708, or through email at kzonneveld@brocku.ca.

*Please note that none of the members of this research team are psychologists and, as such, are not in a position to provide a clinical assessment of your child.

**CONTACT INFORMATION AND ETHICS CLEARANCE**

If you have any questions about this study or require further information, please contact Dr. Kimberley Zonneveld or Nancy Leathen using the contact information provided above. This study has been reviewed and received ethics clearance through the Research Ethics Board at Brock University #17-338. If you have any comments or concerns about your child’s rights as a research participant, please contact the Research Ethics Office at (905) 688-5550 Ext. 3035, reb@brocku.ca.

**PARTICIPANT CONSENT**

I, ________________________________, agree to allow my child to participate in the study described above. I have made this decision based on the information I have read in this form. I have had the opportunity to receive any additional details I wanted about the study and
I understand that I may ask questions in the future. I understand that I may withdraw this consent at any time.

Please note that members of the research team are under obligation to follow mandatory reporting laws. That is, if any instance of child abuse is disclosed to or observed by a member of the research team, that member is required to report it to child protective services.

**Video Consent:**

Please note that video consent is not required for your child to participate in this study.

If you provide any video consent, the name, pseudonym, or specific location of residence of your child will not be made available in the video. You will have the option to have your child’s face to be blurred and your child’s voice to be stripped from the video.

I agree for video recordings of my child to be used for data-collection purposes. I am aware that these videos will only be viewed by members of the research team.

☐ Yes  ☐ No

I agree for video recordings of my child to be used for educational purposes in (please select all that apply):

☐ Classes  ☐ Workshops  ☐ Conferences

I would like my child’s face to be blurred out in any video used for education purposes to protect the identity of my child:

☐ Yes  ☐ No

I would like all audio removed in any video used for education purposes to protect the identity of my child:

☐ Yes  ☐ No

**Notification of Results**

I would like to be notified of the final results of the study:

☐ Yes  ☐ No

I would like to receive a graph of my child’s progress in the study:

☐ Yes  ☐ No

Child’s Name: _______________________________________

Caregiver’s Name: ________________________________  Ph./Email: _____________

Signature: ________________________________________  Date: _________________
Appendix C
Paired-Choice Preference Assessment

Child: ___________________  Session: _______________  Date: _______________
Evaluator: _______________  Food: _______________  Primary/Reliability

Instructions:
1. Allow the child to sample each item before the session.
2. Place two foods on spoons on the plate in front of the child and say, “Pick one”.
3. If the child selects a food, the child can consume it.
4. If the child consumes the food, there will be no programmed consequences.
5. If the child does not select the food within 5 s, prompt the child to take a bite. After another 5 s, if the child does not select the food then remove the food.
6. If the child attempts to select both foods, block it, and represent the SD.
7. Continue until all foods have been paired together.

<table>
<thead>
<tr>
<th>Item</th>
<th># Consume</th>
<th>% Consume</th>
<th>Rank</th>
</tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
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<tr>
<td>3</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
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Trials:

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<tr>
<td>4 x 5</td>
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Appendix D

Compliance Assessment

Child: ___________________  Date: _____________
Evaluator: _______________  Primary/Reliability

Instructions:
1. Every 15 s, place one food on a spoon on the plate in front of the child and say, “Take a bite”.
2. If the child consumes the food within 5 s, provide praise.
3. If the child does not accept the food within 5 s, remove the food for the remainder of the interval.
4. If the child expels the food, ignore it.
5. If the child engages in problem behavior, remove the food for the remainder of the interval.
6. Continue until all foods and the empty spoon have been presented randomly 5 times.

<table>
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<tr>
<th>Item</th>
<th>Trial 1</th>
<th>Trial 2</th>
<th>Trial 3</th>
<th>Trial 4</th>
<th>Trial 5</th>
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<td>A C E</td>
<td>A C E</td>
<td>A C E</td>
<td>A C E</td>
<td>A C E</td>
</tr>
<tr>
<td></td>
<td>PB V</td>
<td>PB V</td>
<td>PB V</td>
<td>PB V</td>
<td>PB V</td>
</tr>
<tr>
<td></td>
<td>PB V</td>
<td>PB V</td>
<td>PB V</td>
<td>PB V</td>
<td>PB V</td>
</tr>
<tr>
<td>3.</td>
<td>A C E</td>
<td>A C E</td>
<td>A C E</td>
<td>A C E</td>
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</tr>
<tr>
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<td>PB V</td>
</tr>
<tr>
<td>5.</td>
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<td>A C E</td>
<td>A C E</td>
<td>A C E</td>
<td>A C E</td>
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<tr>
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A = Accept  C = Consume  E = Expulsion  PB = Problem Bx  V = Neg. Voc.
Appendix E

Baseline

Child: ___________________  Session: _______________  Date: _____________
Evaluator: _______________  Food: _______________  Primary/Reliability

Instructions:
1. Every 30 s, place one low-p food on a spoon on the plate in front of the child and say, “Take a bite”.
2. If the child consumes the food within 5 s, provide praise.
3. If the child does not select the food within 5 s, remove the food for the remainder of the interval.
4. If the child expels the food, ignore it.
5. If the child engages in problem behavior, remove the food for the remainder of the interval.
6. Continue until all low-p bites are presented.
   a. 5 low-p bites (if only 1 low-p food per condition)
   b. 6 or 9 low-p bites (if multiple low-p foods per condition)

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<tbody>
<tr>
<td></td>
<td>A   C   E   PB   V   N</td>
</tr>
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</tr>
<tr>
<td>2</td>
<td>A   C   E   PB   V   N</td>
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<td>A   C   E   PB   V   N</td>
</tr>
<tr>
<td>6</td>
<td>A   C   E   PB   V   N</td>
</tr>
</tbody>
</table>

A = Accept  C = Consume  E = Expulsion  PB = Problem BX  V = Neg. Voc.  N = No Acceptance
Appendix F

Treatment Comparison

Child: ______________  Session: ____________  Date: _____________
Evaluator: __________  Preferred food (blue)/Empty Spoon (red)  Primary/Reliability

Instructions:
1. **Every 5 s**, place 1 **high-p food** on a spoon on a plate in front of the child and say, “Take a bite”.
   - Consumes within 5 s → praise.
   - No consumption within 5 s → remove food, present high-p bites every 5 s until the child complies with 3 consecutive bites or does not comply with 2 consecutive bites.
2. **After the 3rd high-p bite**, place 1 **low-p food** on a spoon on a plate in front of the child and say, “Take a bite”.
   - Consumes within 5 s → praise
   - No consumption within 5 s → remove the food.
3. If the child expels the food, ignore it.
4. If the child engages in problem behavior, remove the food for the remainder of the interval.
5. Continue until the low-p bite has been presented 5 or 6 times.

A = Accept  C = Consume  E = Expulsion  PB = Problem Bx  V = Neg. Voc.  N = No accept

| Demand | Trial 1 | | Trial 4 |
|--------|---------| |---------|
| HP 1   | A C E   | PB V N  | HP 1   |
| HP 2   | A C E   | PB V N  | HP 2   |
| HP 3   | A C E   | PB V N  | HP 3   |
| LP     | A C E   | PB V N  | LP     |

| Demand | Trial 2 | | Demand | Trial 5 |
|--------|---------| |---------|---------|
| HP 1   | A C E   | PB V N  | HP 1   |
| HP 2   | A C E   | PB V N  | HP 2   |
| HP 3   | A C E   | PB V N  | HP 3   |
| LP     | A C E   | PB V N  | LP     |

| Demand | Trial 3 | | Demand | Trial 6 |
|--------|---------| |---------|---------|
| HP 1   | A C E   | PB V N  | HP 1   |
| HP 2   | A C E   | PB V N  | HP 2   |
| HP 3   | A C E   | PB V N  | HP 3   |
| LP     | A C E   | PB V N  | LP     |

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<td>HP 1</td>
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<td>___%</td>
<td>___%</td>
</tr>
<tr>
<td>HP 2</td>
<td>A C E</td>
<td>___%</td>
<td>___%</td>
</tr>
<tr>
<td>HP 3</td>
<td>A C E</td>
<td>___%</td>
<td>___%</td>
</tr>
<tr>
<td>LP</td>
<td>A C E</td>
<td>___%</td>
<td>___%</td>
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<td>___%</td>
<td>___%</td>
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<td>A C E</td>
<td>___%</td>
<td>___%</td>
</tr>
<tr>
<td>HP 3</td>
<td>A C E</td>
<td>___%</td>
<td>___%</td>
</tr>
<tr>
<td>LP</td>
<td>A C E</td>
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<td>___%</td>
<td>___%</td>
</tr>
<tr>
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<td>A C E</td>
<td>___%</td>
<td>___%</td>
</tr>
<tr>
<td>HP 3</td>
<td>A C E</td>
<td>___%</td>
<td>___%</td>
</tr>
<tr>
<td>LP</td>
<td>A C E</td>
<td>___%</td>
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<tbody>
<tr>
<td>HP 1</td>
<td>A C E</td>
<td>___%</td>
<td>___%</td>
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<td>HP 2</td>
<td>A C E</td>
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<tr>
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<td>___%</td>
<td>___%</td>
</tr>
<tr>
<td>HP 3</td>
<td>A C E</td>
<td>___%</td>
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</tr>
<tr>
<td>LP</td>
<td>A C E</td>
<td>___%</td>
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</table>
Appendix G

Indirect Preference Assessment

Child’s name: ______________________________
Respondent’s name: ______________________________
Relationship to child: ______________________________
Date: ______________________________

Please rank 10 food items that your child enjoys eating (in order of his or her preference):
1. ______________________________
2. ______________________________
3. ______________________________
4. ______________________________
5. ______________________________
6. ______________________________
7. ______________________________
8. ______________________________
9. ______________________________
10. ______________________________

Please list your child’s food allergies (if any):
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Additional comments (including food you want your child to have during this study, if any):
________________________________________________________________________
________________________________________________________________________

Please rank 10 food items that your child does not enjoy eating, but you feel is necessary to eat (in order of his or her least preferred):
1. ______________________________
2. ______________________________
3. ______________________________
4. ______________________________
5. ______________________________
6. ______________________________
7. ______________________________
8. ______________________________
9. ______________________________
10. ______________________________