AN EVALUATION OF APPARATUS AND DEMAND FADING TO ESTABLISH
CONSISTENT ACCEPTANCE IN CHILDREN WITH FOOD REFUSAL

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Michelle L. Waddell

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AN EVALUATION OF APPARATUS AND DEMAND FADEING TO ESTABLISH CONSISTENT ACCEPTANCE IN CHILDREN WITH FOOD REFUSAL

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Department of Psychology
Abstract

of

AN EVALUATION OF APPARATUS AND DEMAND FADING TO ESTABLISH CONSISTENT ACCEPTANCE IN CHILDREN WITH FOOD REFUSAL

by

Michelle L. Waddell

Food refusal in children occurs as a result of various factors, (e.g., medical conditions, premature birth), and can lead to oral aversion. In the current investigation, 2 fading procedures were evaluated for children exhibiting total food refusal and behaviors related to oral aversion. Two children received apparatus fading, in which the feeding apparatus was faded from a familiar item to the target utensil. One child received apparatus fading plus demand fading, in which the number of session trials was gradually increased. A multiple probe design was used to determine the effectiveness of both procedures in establishing consistent acceptance without refusal behaviors. Results indicate that apparatus fading alone did not produce consistent acceptance. Apparatus fading combined with demand fading appeared effective in establishing consistent acceptance of the target utensil. One implication is that multiple stimuli may contribute to oral aversion, making it necessary to use multiple fading techniques to achieve acceptance.

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Dr. Becky Penrod

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Food refusal in children can occur as a result of various factors, including medical complications or conditions, physiological abnormalities, and premature birth. Environmental factors such as positive reinforcement in the form of attention or negative reinforcement in the form of escape can also contribute to the development and maintenance of food refusal (Freeman & Piazza, 1998). Food refusal may manifest itself in a number of different ways, including gagging, expulsion, and blocking of bite presentations (Werle, Murphy, & Budd, 1993). Total food refusal can be accompanied by or result in serious medical problems, including failure-to-thrive, constipation, vomiting, diarrhea, dehydration, nasogastric (NG-) or gastrostomy (G-) tube dependence, and even death. While NG- and G-tubes can eliminate some health risks, they also can lead to feeding issues such as lack of effective feeding behaviors (Riordan, Iwata, Finney, Wohl, & Stanley, 1984) and loss of hunger cues, which may further contribute to food refusal and aversion. Even after the initial cause of the food refusal (e.g., gastroesophageal reflux) has been resolved, food refusal may continue to persist. The persistence of food refusal may be a result of inexperience with per oral (PO) feeding, an aversion which developed due to medical or physiological complications, or a combination of several factors.

Before a behavioral treatment for total food refusal is implemented, the child should undergo any recommended evaluations by specialists such as gastroenterologists
or speech pathologists (Munk & Repp, 1994). Such specialists can determine if any medical, physiological, or skill deficit issues need to be addressed prior to or in conjunction with a behavioral intervention. Once any issues have been resolved, a behavioral treatment intervention can be initiated. By following this approach, one can be confident that medical problems or oral-motor dysfunction (e.g., tongue thrust due to a physiological deficit, rather than aversion) that may be contributing to food refusal or oral aversion are not being overlooked. Oral aversion can be defined as the disinclination to allow food and/or non-food items into the mouth. The presence of oral aversion may be evident if the child consistently turns away from or otherwise blocks items presented to the mouth from entering the mouth. For the purpose of this study, oral aversion for food/items presented by a feeder (e.g., caregiver, experimenter) will be examined.

Consequence-based Interventions

Because children with total food refusal and oral aversion lack experience with both solids and liquids, more widely used behavioral interventions targeting negatively reinforced problem behaviors may not be effective. One commonly used intervention for feeding disorders is escape extinction (EE) (i.e., non-removal of the spoon, in which the spoon is held at the child’s mouth until acceptance occurs), which has been shown to be an effective intervention in treating feeding disorders (e.g., Reed et al., 2004; Rivas, Piazza, Patel, & Bachmeyer, 2010). However, for children with total food refusal, this procedure may further intensify the child’s oral aversion. EE is generally presented as part of a treatment package along with fading procedures and/or reinforcement based interventions, in order to minimize any negative side effects that may result (e.g.,
Dawson et al., 2003; Freeman & Piazza, 1998), but this often requires some baseline level of acceptance to be successful (e.g., liquids, thin purees).

Other common behavioral interventions include the presentation of a stimulus (e.g., a preferred toy), and/or the removal of a stimulus (response cost) contingent on acceptance or refusal behavior, respectively; these interventions may not always be effective because it may be difficult to find a stimulus that effectively competes with escape from eating as a reinforcer. This may often be the case for children with total food refusal and oral aversion. For example, in a study by Siegel (1982), differential reinforcement of alternative behavior (DRA) in which TV and play time with siblings was provided contingent on completion of a specified portion of food, combined with punishment (isolation upstairs) upon failure to complete the portion, was found to be ineffective in increasing volume and variety of solids in a child with a highly restricted diet of primarily sweets. Consequently, demand fading (based on the sensory components of eating [tactile, olfactory, and gustatory]) was employed, in conjunction with the procedures described above. This procedure was effective in establishing food consumption. Specifically, the child was first instructed to smell the plate of food, then touch the food with his tongue, hold the food in his mouth, chew the food, and lastly chew the food and swallow. From that point, the volume of food was gradually increased to a complete meal. This procedure eliminated both refusal behaviors as well as adverse physiological responses (vomiting and gagging).
Fading Interventions

In addition to demand fading, other stimulus fading procedures have also been effective in increasing food consumption.

Texture fading

In a study evaluating texture fading to increase acceptance of a variety of foods (Shore, Babbitt, Williams, Coe, & Snyder, 1998), the percentage of beginning texture food presented to the child was reduced in 25% increments as higher texture food was added in (also in 25% increments). Negative behaviors such as bite refusal and expulsion were placed on extinction. This procedure was effective in increasing all participants’ volume and consumption of age-appropriate textures. In another example, Patel, Piazza, Santana, and Volkert (2002), used texture fading to increase consumption of meats for a child who consumed foods at a pureed consistency but expelled foods presented at higher textures. A multielement design was used to evaluate expulsion of a 50/50 mixture of puree and wet ground texture foods when meats were presented compared to when meats were not presented. Expulsions were higher in the condition in which meats were presented, but decreased to zero levels when the texture of meats was reduced to 100% pureed texture. While texture fading was found to be effective in both of the studies described above, it should be noted that total oral aversion was not present for the participants in these studies. In the Shore et al. study, 3 of the 4 children were already accepting preferred foods at low textures, and in the Patel et al. study the child was consuming purees without meat during baseline. Because texture fading implies existing
acceptance of some minimal texture, flavor fading may be more appropriate for children who exhibit total food refusal.

*Flavor fading*

In one flavor fading study, a child who was 100% tube dependent for all caloric needs and nearly all fluid needs (he would drink small amounts of water via cup) was taught to drink milk with Carnation Instant Breakfast® (CIB) (Patel, Piazza, Kelly, Ochsner, & Santana, 2001). Since the child would only accept water, the concentration of milk + CIB in water was gradually increased up to full strength, then the concentration of milk was gradually increased as the water was decreased. The fading procedure in combination with DRA and EE was more effective than DRA and EE alone in increasing consumption of milk + CIB. The fading procedure may have resulted in decreased refusal behavior (i.e., expulsions) and an increase in mouth cleans (swallowing of the bolus so that no liquid remains in the mouth), as it facilitated a gradual change in the characteristics of the liquid. This procedure demonstrates how fading may be more effective than EE alone when a stimulus has aversive properties.

A similar example of flavor fading is described in a study conducted by Tiger and Hanley (2006), in which chocolate syrup was gradually faded from milk in order to increase milk consumption. Flavor fading has also been successfully implemented with solid foods, in which a small amount of non-preferred food was blended into a preferred food, and the ratio of non-preferred food to preferred food was gradually faded until the non-preferred food was consumed (Mueller, Piazza, Patel, Kelley, & Pruett, 2004).
Bite fading

Other forms of stimulus fading have also been implemented to increase acceptance of foods and liquids. For example, the bite requirement can be gradually faded from minimal volume up to age-typical portions. Freeman and Piazza (1998) began treatment with a single bite of food (in this case, a preferred food) plus a partial physical prompt (EE) if independent responding did not occur. Once compliance for fruit consumption was established, the volume of fruit was gradually increased, and then other food groups were introduced and the volume of each food was gradually increased. This procedure was more effective than the baseline condition, in which an age-typical plate of food was presented and only verbal prompts (“take a bite”) were used. In a more recent study, the number of bites was faded from 1 bite to 62 bites of a variety of non-preferred food items over the course of 80 sessions (Najdowski, Wallace, Doney, & Ghezzi, 2003). This bite fading procedure combined with DRA and EE was more effective than DRA alone in increasing consumption of non-preferred foods.

Distance fading

For children with high levels of inappropriate mealtime behaviors related to the presentation of the spoon to the lips, Rivas, Piazza, Patel, & Bachmeyer (2010) conducted a study to implement distance fading to increase bite acceptance. The experimenters determined the distance from spoon to lip that produced low levels of inappropriate behaviors, and then systematically decreased the proximity of the spoon to the lip. In the fading-only condition, data were examined to determine spoon distance when the participant did not meet criterion levels for decreasing distance. In the distance
fading plus escape extinction (EE) condition, the child’s lips were followed with the spoon (at the specified distance) for the entire 30-s interval. Probe sessions were conducted throughout the fading procedure to determine whether continued fading was necessary. Fading and fading + EE were evaluated in a multielement reversal design, and it was found that the EE treatment component was necessary to reduce inappropriate behaviors and increase acceptance of the spoon.

*Apparatus fading*

Fading procedures used in conjunction with some form of reinforcement and/or EE are often successful in establishing acceptance by manipulating the antecedent conditions so that the probability of the child complying increases. However, the aforementioned fading procedures require some existing form of oral intake to be effectively implemented. Apparatus fading is another variation of stimulus fading that may be especially relevant for children who exhibit high levels of negative behaviors in response to the presentation of a feeding apparatus such as a spoon or cup. Many children who engage in negative behaviors (e.g., head turning, mouth clenching, etc.) upon presentation of the feeding apparatus may have experienced multiple attempts by the caregiver to force feed in order to establish intake. Such negative experiences (which may or may not be paired with uncomfortable physical symptoms such as reflux) could result in the apparatus acquiring aversive properties.

In a study conducted by Johnson & Babbitt (1993), apparatus fading, as part of a treatment package, was effective in establishing consumption of solid foods in a child who was bottle dependent (only consumed liquids). Diluted purees were first presented
via baby bottle, then undiluted via bottle, and lastly, via spoon. In a subsequent study conducted by Hagopian, Farrell, & Amari (1996), apparatus fading along with bolus fading and backward chaining was used to treat total liquid refusal. The child was first taught to swallow following the presentation of an empty syringe; this was faded gradually to 90 cc of water presented via cup. Drinks were initially presented via syringe, and then faded to the more appropriate apparatus (cup), which had been refused in the past.

While results of previous research are promising, more research addressing the use of fading techniques for children who have no prior history of solid or liquid consumption PO is needed; total food aversion and oral aversion are two problems that have received relatively little attention in the behavioral feeding literature. Further, in many of the studies described, fading procedures were evaluated in conjunction with EE. While EE has been proven to increase acceptance in a variety of feeding applications, it may not be appropriate for children who exhibit severe oral aversion as earlier described. EE may increase or prolong negative behaviors, impeding acceptance, or if acceptance occurs, the quality of acceptance may be compromised due to negative behaviors that have either not been addressed or have been exacerbated by EE. The topography of acceptance is not always explicitly addressed in the literature (e.g., Johnson & Babbitt, 1993; Hagopian et al., 1996), so it can be difficult to draw conclusions on the quality of acceptance and whether behaviors that may impede successful food consumption are present. Specifically, the child may fail to open his/her mouth widely enough, engage in tongue thrusting, prematurely close their mouth, etc. Issues such as these could continue
to limit intake; even though acceptance is occurring, a limited bolus may be deposited, or immediate expulsion may occur. Therefore, treatments designed to increase bite acceptance while also addressing the presence of behaviors that may negatively impact feeding success are needed.

**Purpose of Study 1**

In this study, a fading procedure was implemented to increase high quality acceptance, defined as acceptance without obstruction of the utensil by the teeth, tongue, or lips. Specifically, the feeding apparatus was faded from a familiar item, such as a finger to the target utensil (e.g., spoon). Rather than referring to these items as utensils (which refers to an item used specifically for feeding) the more generic term ‘apparatus’ is used, as some of the fading stimuli employed during the study are not typically used in feeding but were selected due to the child’s familiarity with the stimulus. The intention of implementing apparatus fading was to first establish consistent acceptance with a familiar apparatus that had not been paired with food/feeding so as to minimize aversion-related behaviors, and then systematically fade the apparatus to a typical feeding utensil (i.e., spoon).
Chapter 2

METHODS

Participants and Setting

The participants in this study were 2 girls, Lily (22 months old) and Jane (21 months old). Participants exhibited total food refusal and oral aversion (i.e., consistent avoidance of food or non-food items being place in the mouth by the caregiver). At the beginning of treatment, both children were 100% G-tube dependent for liquid and caloric intake. PO intake prior to the study was of negligible volume and occurred infrequently. For both children, it was reported that any food or liquid brought to or near the mouth was generally controlled by the child (self-fed), while attempts by the parents to present food or liquid were generally refused. Aversion-related behaviors included clenching of the teeth or lips before or during the presentation of the apparatus, head turning during the presentation, pushing away the apparatus and/or feeder’s hand or arm, and negative vocalizations (crying). Prior to the start of the study, it had been determined by medical professionals that both participants were free of any medical issues that would prevent oral consumption.

Sessions were conducted in each child’s home, in the kitchen. All sessions were conducted with the child seated in a highchair with a tray attached, different from the location used for the child’s regular tube feeds). The regularly scheduled G-tube feedings were conducted during treatment; only a negligible amount of food for caloric and fluid
intake was presented during sessions, so it was not critical that the children were hungry at the time of the sessions.

Procedures

Response Measures

The dependent measure was acceptance without refusal behaviors related to aversion; this is referred to simply as “acceptance.” Acceptance was defined as opening of the mouth to allow the apparatus to be deposited. For bites presented via spoon, acceptance was defined as opening of the mouth to allow the apparatus to be deposited followed by lip closure on the apparatus, as lip closure is needed to remove the food from the spoon. Behaviors indicating the presence of oral aversion included any of the following: premature mouth closure or clenching on the apparatus as it was presented or prior to presentation, head turning, and pushing of the experimenter’s hand or apparatus. Data were collected on a trial-by-trial basis using data sheets prepared specifically for this study. For each trial, data were collected on the presence or absence of acceptance and aversion-related refusal behavior (the latter measure was recorded as “refusals”). For Lily, there were several trials during which acceptance did not occur, but refusal behaviors were not present. In order to better represent her data, refusals were specified as “active” (aversion-type) and “passive.” Active refusal was defined as: crying, pushing away the apparatus or the therapist’s hand or arm, turning of the head in response to the presentation of the apparatus, clenching of the mouth or teeth, and flinching away from the apparatus. Passive refusal was defined as: looking down/turning away (but not upon
presentation of the apparatus), maintaining a closed mouth (but not clenching), staring off or not responding during the presentation.

Interobserver Agreement

Interobserver agreement was assessed for both participants by having two observers record data on acceptance and refusals. One observer recorded data while sessions were being conducted while the second observer recorded data while reviewing the video recorded sessions. For Lily, 36% of sessions were assessed by both observers, and for Jane, 35% of sessions were assessed. Interobserver agreement for both acceptance and refusals was calculated by dividing the number of sessions with exact agreement by the total number of observed sessions. For Lily, IOA was 99% for acceptance and 88% for refusals. For Jane, IOA was 100% for acceptance and 89% for refusals.

Experimental Design

A multiple probe design was implemented to evaluate the effects of apparatus fading and to determine the point at which generalization to the target apparatus had been achieved. This design was selected in order to prevent unnecessary fading steps from being conducted if acceptance had increased and aversion had been minimized prior to the last planned fading step. By using a multiple probe design, the target apparatus could be reached in the most efficient manner.

Baseline

Before beginning the treatment sessions, the planned fading steps were determined based on input from the child’s caregiver. The experimenter’s finger was the
initial apparatus with which the fading procedure was started. Most children are accustomed to accepting a caregiver’s finger for non-feeding related purposes such as teeth brushing and inspection of the teeth and gums. Parent report for both Lily and Jane indicated that the children were generally accepting of a finger being used to inspect the mouth, but that acceptance was variable. However, given low levels of acceptance for other potential apparatuses, the finger was determined to be the least intrusive starting point. Next, baseline probe sessions were conducted. Each baseline session consisted of 10 trials; at least 3 sessions were conducted for each fading step. In the first session, the target apparatus with a taste of puree was presented. The child’s acceptance of the target apparatus in baseline was required to be below the 80% criterion level to be eligible for participation in the study (to demonstrate that oral aversion and total food refusal were present). If the child did not accept the target apparatus with a taste of puree on at least 80% of session trials, then the next fading step was probed; specifically, the least intrusive apparatus (experimenter’s finger) with a taste of puree was probed. Baseline responding determined whether the starting apparatus was initially presented empty or with a small taste of puree during the fading intervention. Since acceptance of the experimenter’s finger with a taste of puree was below 80% for Lily, the fading treatment intervention began with the empty finger.

Jane was kept in extended baseline with the first condition (spoon with taste of puree) while Lily began treatment. Once treatment was started for Jane, the taste of puree on the finger was continued (rather than presenting an empty finger), as negative
behaviors had begun to decrease with the finger and taste of puree in the baseline condition.

For each participant, the appropriate sequence of fading steps beyond the finger were determined based on the participant’s level of aversion, existing oral motor deficits (if any), and history of intermittent acceptance of solids as reported by caregivers. For Lily, the planned fading steps were finger, fingertip toothbrush, and spoon. In Lily’s case, the fingertip toothbrush was selected as the intermediate fading step because the child was familiar with regular tooth brushing. For Jane, the planned fading steps were finger, tongue depressor, and spoon. The tongue depressor was selected as the intermediate step because it was reported that Jane rarely engaged in wide mouth acceptance (she would typically open her mouth only slightly). The flat shape of the tongue depressor is ideal for successfully depositing a puree in the absence of a wide, open mouth. The spoon was the target apparatus for both children, as neither was reported to have any oral motor deficits that would interfere with lip closure on the spoon. For Lily, it was reported that she had occasionally been willing to taste yogurt in the past, and appeared to prefer the flavor, hence this was the pureed food presented for all trials. For Jane, the pureed food selected was sweet potato, because it was reported that this was a food often used in Jane’s tube feeding blends, and the family reported that they would like her to consume it orally in the future.

Treatment

In the treatment condition, each apparatus was presented for 10 trials per session until three consecutive sessions were completed in which at least 80% of presentations
were accepted without refusal or aversion-related behaviors. Trials were presented approximately every 10 s, and sessions were conducted at least 10 min apart. A verbal prompt, “open, ah” (with the experimenter modeling an open mouth) was delivered, and the apparatus was touched to the child’s mouth, past the lips, to deposit the bite. Verbal praise was provided contingent on acceptance. For trials in which acceptance did not occur within 5 s, the apparatus was touched to the outside of the participant’s lips and promptly removed in a modified EE procedure. EE was included based on previous research which has shown that fading in the absence of EE is not successful (e.g., Rivas, 2010); however, in an effort to minimize potential negative side effects so as not to further contribute to the child’s existing oral aversion, a modified EE procedure was used. To accomplish this, a non-removal of the apparatus (following the child’s mouth with the apparatus) procedure was conducted until the experimenter was able to touch the apparatus to the participant’s lips. This procedure is different from the way a non-removal of the spoon procedure is typically implemented in which the spoon passes the plane of the child’s lips when the child opens his or her mouth wide enough, as opposed to simply touching the spoon/feeding apparatus to the child’s lips, then promptly removing the apparatus, as was done in the current study.

Once the child had successfully completed three sessions of a fading step, a probe session was conducted with the target apparatus with a taste of puree. Probe sessions were 10 trials of the target apparatus with a taste of puree. These probes were used to determine whether acceptance was consistent with the target apparatus (so that unnecessary fading steps could be eliminated). If the child did not accept the target
apparatus on at least 80% of the probe trials, the next fading step was conducted. If acceptance occurred for 80% or more of the probe trials, the next treatment session included the target apparatus. The modified EE procedure was not implemented during probe sessions; probe sessions were conducted as in the baseline condition. If the participant did not accept the apparatus within 5 s, the apparatus was removed and the next presentation occurred approximately 10 s later.

If after a minimum of three consecutive sessions of any given apparatus a successful (80%) session did not occur, a modified presentation procedure was conducted. In the modified presentation procedure, the apparatus was briefly touched to the participant’s lip, rather than being deposited on the tongue. This procedure was conducted immediately upon the presentation of each trial, regardless of the presence or absence of refusal or aversion related behaviors. After one session with the modified procedure, the experimenter resumed the standard protocol with the same apparatus. The modified procedure was designed to minimize the intrusiveness of the presentations, help to establish momentum for acceptance, and to allow the child to come into contact with reinforcement (preferred item and/or verbal praise).

For both Lily and Jane, the treatment procedure conducted during this study was a preliminary intervention conducted prior to their intake into an intensive feeding program. Because they began intensive feeding therapy immediately following their participation in the study, parent training was not provided. While acceptance and refusal data were not collected for the children upon beginning intensive therapy, it should be noted anecdotally that both Lily and Jane began consistently accepting volume of purees
on the spoon with very minimal refusal behaviors upon the introduction of the standard EE procedure paired with flavor and volume fading used in the intensive feeding therapy program.
Chapter 3
RESULTS

Figure 1. Percentage of Trials with Acceptance for Lily

Figure 2: Percentage of Trials with Refusal for Lily
Data in Figures 1 and 2 depict percentage of acceptance and active refusal, respectively, for all sessions conducted with Lily. Each figure includes the following fading conditions: baseline with the target apparatus (spoon with a taste of puree) is indicated with closed squares; baseline with the introductory apparatus (finger with a taste of puree) is indicated with closed circles; treatment with empty finger (open circles); and treatment with finger with a taste of puree (closed circles). The open diamonds depict modified presentation sessions. The first modified presentation session was conducted after 8 empty finger sessions. Acceptance levels were on an upward trend and reached criterion level at session 12, however acceptance then decreased in sessions 13 and 14, therefore the modified procedure was implemented. In the treatment session immediately following the first modified presentation session, acceptance increased to 60%, but then fell to low levels. Another modified session was conducted after 3 sessions under criterion levels. Following this modified session, the finger with a taste of puree was introduced. This change was made in an attempt to increase Lily’s levels of attending during the treatment sessions, as passive refusals had increased as the sessions continued and had not been successfully increased with the availability of tangible preferred items contingent on acceptance. Probe sessions were not conducted for Lily, as she did not successfully progress through any of the fading steps (she did not meet criterion levels for advancement to the next step). Treatment was terminated for Lily following an extended period of variable responding without meeting criterion levels.
Data in Figures 3 and 4 depict percentage of acceptance and refusal, respectively, for all sessions conducted with Jane. Each figure includes the following fading conditions: baseline with the target apparatus (spoon with a taste of puree) is indicated...
with closed squares, and baseline with the introductory apparatus (finger with a taste of puree) is indicated with closed circles. The first phase change line indicates the introduction of the treatment condition. Treatment with the introductory apparatus (finger with a taste of puree) is indicated by closed circles and a modified session by an open diamond. The second phase change line indicates a change in treatment from presentations conducted by the experimenter to presentations modeled by the experimenter and self-fed by the child, and the modeling conditions are depicted with open circles (finger with puree) and open squares (spoon with puree). In the modeling condition, the experimenter began the session with a verbal prompt, “Do this,” followed by a verbal prompt “Open, ah.” This verbal prompt sequence was followed immediately by a model prompt in which the experimenter demonstrated bite acceptance with the current apparatus. After modeling acceptance, the therapist then allowed 5 s for Jane to respond by picking up her apparatus and self-feeding. If Jane did not self-feed during the trial, the therapist physically guided her hand to the apparatus in a modified EE procedure. This procedural change was made due to an extended period of low levels of acceptance and variable levels of refusal, as well as continued low levels of acceptance during and following the modified treatment session. Modeling was used as the procedural change because it was reported by Jane’s parents that she was sometimes interested in self-feeding small amounts of food.

The treatment condition for Jane was initiated following low levels of responding during baseline probe sessions. When treatment was introduced, acceptance remained at low levels and high levels of refusal were observed; a modified session was then
conducted to help increase acceptance. While refusal behaviors decreased during and following the modified session, acceptance did not increase. In the modeling plus self-feeding condition, Jane successfully completed the first fading step. A probe session was conducted in which Jane reached criterion levels, so the spoon was introduced as the next and final fading step (the intermediate step of tongue depressor was skipped). However, responding was variable in the modeling condition, and increased acceptance did not appear to be a function of the experimental procedures; during some sessions which met acceptance criteria, Jane’s self-feeding did not follow the experimenter’s prompting; bite acceptance occurred at a faster pace, independent of the experimenter’s intervention. Fluctuations in acceptance may have been due to motivating operations, which may have varied across session days. Sessions were not always conducted at the same time of day, but rather based on the family’s availability. This variation may have contributed to the observed fluctuations in acceptance.
Given that prior research has investigated the fading of a variety of stimuli to increase oral intake, apparatus fading for solid foods appeared to be an area of research that was lacking. The treatment procedures in Study 1 were developed in an effort to establish consistent acceptance and minimize behaviors related to oral aversion. However, the terminal fading step was not reached for either participant in this study. It is possible that in the absence of conventional EE, fading alone is not effective in producing positive results. This is supported by several studies in the literature in which consistent responding was only achieved upon the introduction of EE. While the target apparatus was not reached, variability in responding for both acceptance and refusal behaviors was observed. This may be seen as an improvement from the initial high levels of refusal and low levels of acceptance observed in the baseline condition. However, acceptance did not increase as sessions continued, and refusals remained variable, although at a reduced magnitude than observed in baseline (e.g., infrequent crying/negative vocalizations).

Another potential limitation is that the oral aversion that was present was related not to the presentation of the feeding apparatus, but to some other stimulus or stimulus property (e.g., proximity of the apparatus to the mouth, the presence of food on the apparatus, being seated in a highchair previously paired with unsuccessful feeding attempts). The aversion may have also been the product of a prior history of oral feeding
paired with physical discomfort, or some continued physiological symptom(s) that have not been identified by the child’s doctor or caregivers. It is also possible that the 10-trial sessions did not provide a predictable and salient criterion for session termination. Instead, the use of a timer or the completion of a small volume to signal the end of the session may have improved responding. From a clinical standpoint, this procedure would not be a viable approach to increase acceptance of purees, given the number of sessions required and the inconsistent responding that was produced.

Future research could evaluate this procedure with and without conventional EE, using different purees for the different treatment conditions in a multielement design. Alternatively, a reversal could be implemented (fading only, fading + EE, reverse back to fading). However, once the child has been exposed to the EE condition, a reversal to fading only may not produce a decrease in acceptance (if refusal behaviors are reduced during the EE condition). The percentage of negative behaviors in the fading only condition and fading + EE condition could be compared to see if EE appears to contribute to continued oral aversion (if observed increases in negative behaviors occur during EE). Future research should also control for other environmental stimuli with acquired aversive properties that may contribute to refusal behaviors. In Study 2 (described below), some of the limitations of Study 1 were addressed and demand fading was employed in an attempt to produce more consistent bite acceptance.

Purpose of Study 2

In this study, the fading procedure described in Study 1 was implemented using the same criteria for advancement, but demand fading was included in order to address
some of the potential limitations observed in Study 1. Initially, the acceptance requirement was kept minimal (only one trial) in an effort to encourage contact with reinforcement. Upon progressing through the apparatus fading steps to the target apparatus the number of trials were then systematically increased up to the target of 10 trials. DRA in the form of verbal praise was implemented for all trials with acceptance, and a preferred item or activity was presented at the end of each successful session (the child selected the item/activity prior to the start of each session). As in Study 1, a modified EE procedure was used during the treatment phase to help minimize possible negative side effects associated with the standard EE procedure (i.e., non-removal of the spoon).
Chapter 5

METHODS

Participants and Setting

The participant in this study was a male child, John, aged 22 months. John exhibited total food refusal and oral aversion related to both non-food and food items presented to the mouth by the feeder. At the beginning of treatment, he was 100% tube dependent for liquid and caloric intake. It was reported that John would occasionally lick small tastes of pureed food from the tip of his feeding syringe when he was allowed to hold the syringe independently. However, attempts by the parents to present food or liquid were generally refused. John’s aversion-related behaviors included clenching of the teeth or lips before or during the presentation of the apparatus, head turning at any point during the presentation, gagging, pushing away the apparatus and/or feeder’s hand or arm, and shaking his head “No.” Prior to the start of the study, it had been determined by medical professionals that he was free of any medical issues that would prevent oral consumption. John also had a swallow study during treatment, and he was deemed safe for swallowing.

Sessions were conducted in the child’s home, in the kitchen. Sessions were initially conducted with the child seated in a highchair with a tray attached, but after the first day of data collection, sessions were conducted with the child seated at the kitchen table (the family was in the process of moving). The regularly scheduled G-tube feedings were conducted during treatment, but not at the table used for sessions.
Procedures

Response Measures

The dependent measure was acceptance without refusal behaviors related to aversion; this is referred to simply as “acceptance.” Acceptance was defined as opening of the mouth to allow the apparatus to be deposited. Due to intermittent refusal behaviors, which sometimes briefly occurred prior to acceptance, a presentation was still considered an acceptance if the behavior ceased and acceptance without refusal occurred within the 5-s trial. Refusal behaviors indicating that oral aversion was present included any of the following: premature mouth closure or clenching on the apparatus as it was presented or prior to presentation, head turning, and pushing of the experimenter’s hand or apparatus. Data were collected on data sheets prepared specifically for this study to indicate levels of acceptance and the presence or absence of aversion-related refusal behaviors.

Interobserver Agreement

Interobserver agreement was assessed for John by having two observers record data on acceptance and refusals for 46% of all sessions. One observer recorded data while sessions were being conducted while the second observer recorded data while reviewing the video recorded sessions. Interobserver agreement for both acceptance and refusals was calculated by dividing the number of sessions with exact agreement by the total number of observed sessions. IOA was 100% for acceptance, and 95% for refusals.
Experimental Design

As with Study 1, a multiple probe design was implemented to determine the point at which generalization to the target apparatus was achieved. This design was selected in order to prevent unnecessary fading steps from being conducted if acceptance had increased and aversion had been minimized prior to the last planned fading step. By using a multiple probe design, the target apparatus could be reached in the most efficient manner.

Baseline

For John, the apparatus fading steps were determined to be empty finger, finger with a taste of puree, syringe with a taste of puree, and spoon with a taste of puree. The syringe was selected as the intermediate step because of his reported familiarity with taking tastes from the syringe. Baseline probe sessions were conducted using the same procedure as in Study 1. Three sessions of each of the two fading steps (finger and spoon) were conducted, with 0% acceptance and 100% refusals. Because John did not meet criterion levels with either fading step, the initial fading step in treatment was the empty finger. The puree selected for use in the study was applesauce, as it was reported that John had taken tastes of the flavor in the past, and appeared to prefer the flavor.

Treatment

In the treatment condition of Study 2, each apparatus was presented for 1-trial sessions until three consecutive sessions were completed in which the child accepted the apparatus without refusal or aversion-related behaviors. The 1-trial sessions were conducted at least 10 min apart. A verbal prompt, “Open, ah” (with the experimenter
modeling an open mouth) was delivered, and the apparatus was touched to the child’s mouth, past the lips, to deposit the puree. Verbal praise, immediate removal from the chair, and access to the preferred item was provided once the single trial had been completed with successful acceptance. For trials in which acceptance without refusal did not occur within 5 s, the apparatus was touched to the outside of the participant’s lips and promptly removed using the modified EE procedure previously described. Following the modified EE procedure, the child was removed from the chair without praise and access to the preferred item was withheld.

Once the child had successfully completed three sessions of a fading step, a probe session was conducted with the target apparatus with a taste of puree. Probe sessions were 10 trials of the target apparatus with a taste of puree. As in Study 1, if the child did not accept the target apparatus on at least 80% of the probe trials, the next fading step was conducted. If acceptance occurred for 80% or more of the probe trials, the next treatment session included the target apparatus. EE was not implemented in probe sessions; probe trials were conducted as in the baseline condition. If the participant did not accept the apparatus within 5 s, the apparatus was removed and the next presentation occurred approximately 10 s later. The modified presentation procedure was not implemented in this study, as the variation in presentation would not likely be salient in sessions with only 1 trial.

Once the participant exhibited a minimum of 80% acceptance of the target apparatus with a taste of puree for three sessions, training was provided to the primary caregiver so that the treatment procedures could be continued with high integrity.
Additional recommendations were provided for implementing a bolus fading procedure for purees in the future. Follow-up sessions at 3 months, 6 months, and 12 months will be conducted in order to determine the volume of food consumed following the initial apparatus fading procedure plus the bolus fading protocol. This follow-up procedure may help to demonstrate the utility of the apparatus fading + demand fading procedure not only to increase acceptance and minimize aversion-related behaviors, but also as an initial step toward oral feedings for children who have a history of total food refusal with oral aversion.
Chapter 6
RESULTS

Figure 5. Percentage of Trials with Acceptance for John

Figure 6. Percentage of Trials with Refusal for John
Data in Figures 5 and 6 depict percentage of acceptance and refusal, respectively, for all sessions conducted with John. Each figure includes the following fading conditions: baseline with the target apparatus (spoon with a taste of puree), baseline with the introductory apparatus (finger with a taste of puree), 1-trial treatment sessions with empty finger, 1-trial treatment sessions with finger with a taste of puree, 1-trial treatment sessions with syringe with a taste of puree, and 10-trial treatment sessions with spoon with a taste of puree. After 6 unsuccessful sessions at the empty finger step, a modeling prompt was introduced in which the experimenter began the session with a verbal prompt, “Do this,” followed by a verbal prompt “Open, ah.” This verbal prompt sequence was followed immediately by a model prompt in which the experimenter demonstrated bite acceptance with the current apparatus. After modeling acceptance, the experimenter presented the current apparatus to the child’s mouth, again using the verbal prompt, “Open, ah” as the apparatus was presented. This modeling prompt was included because it was not clear if John understood the instruction “Open, ah.” The modeling prompt was effective in increasing acceptance and decreasing refusals in this fading step. The modeling prompt was continued throughout the remainder of the study for consistency.

After several consecutive sessions without meeting criterion levels of acceptance with the fading step with the syringe, a “helping” prompt was implemented. This prompt consisted of the therapist using physical guidance to bring John’s hand to the syringe as it was presented to his mouth, along with a verbal prompt “you can help if you want to,” or a similar statement. This change was made in an attempt to increase consistency of
responding after the experimenter noted that on some successful trials, John would place his hand on the syringe as the therapist presented it to his mouth. However, this procedure was not effective in establishing consistent acceptance. The second phase change line indicates a change from experimenter presented 1-trial sessions to experimenter modeled 1-trial sessions with self-feeding, conducted using the same procedure as in Study 1 with Jane. Again, this change was made due to an extended period of variable responding. Probe sessions were conducted following the completion of each fading step. Once John met criterion for the 1-trial syringe with a taste of puree step, a probe session was conducted. John met criterion levels for acceptance in the 10-trial target apparatus (spoon) probe, so the demand fading steps for the spoon were not conducted and 10-trial sessions were then initiated with the target apparatus. Criterion levels were met for the next two 10-trial treatment sessions; following 3 successful consecutive sessions, John completed the terminal step in the study.
Chapter 7
DISCUSSION

With the inclusion of a demand fading, the participant in Study 2 successfully progressed through the first two apparatus fading steps before reaching criterion in a target probe session. Following that session, John also successfully completed 2 more target sessions in the treatment condition. Although conventional EE was not implemented in Study 2, it appears that the treatment package of apparatus fading and reducing the response requirement to only one presentation was effective in establishing consistent acceptance and minimizing refusals related to oral aversion. The shorter sessions may have reduced the aversive properties of the apparatus presentations and/or reinforced acceptance more effectively with immediate delivery of reinforcement in the form of removal from the feeding chair. When progression through the fading steps stalled, the implementation of the experimenter modeling condition appeared to be effective in increasing acceptance during subsequent sessions (in both modeling and experimenter presented trials). John’s mother reported that he had begun to self-feed small tastes of a variety of foods (self-initiated, outside of treatment sessions) since the implementation of the modeling condition. This repeated exposure to tastes, outside of experimental sessions, may have helped to desensitize John to the presentation of puree to his mouth. This may in part be responsible for the observed increase in acceptance during treatment sessions.
While stimulus fading was ultimately successful in increasing consistent acceptance for John, a large number of sessions were required before the terminal fading step was achieved, which may not be realistic in a clinical setting. In future research, the implementation of a presentation fading component, modeling with self-feeding faded to feeder-presented bites, early on in treatment (as opposed to using it as an alternative presentation method once the apparatus fading procedure has been deemed ineffective) may make the child more successful with the other fading components (e.g., apparatus fading), especially if the child has shown a preference for self-feeding. This may be especially relevant if there are multiple stimulus properties involved in the feeding process that are negatively affecting acceptance. While the modeling with self-feeding may not result in adequate volume consumption for a child who is 100% tube dependent, it may result in desensitization to the food through successful repeated exposure.
REFERENCES


