AN EVALUATION OF EMERGING PREFERENCE FOR NON-PREFERRED FOODS TARGETED IN THE TREATMENT OF FOOD SELECTIVITY

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Several studies have shown that the acquisition of food consumption does not occur until after escape prevention is implemented. However, the mechanism responsible for the maintenance of food consumption may be due to participants contacting the reinforcing properties of food targeted during intervention such that the food naturally reinforces food consumption. The present study extended the literature on feeding disorders by conducting pre- and post-treatment preference assessments to determine if preference for non-preferred foods (NPFs) had developed after exposure to a treatment comparison of sequential and simultaneous food presentation; presentation methods were implemented alone and combined with escape prevention in the form of a non-removal of the spoon (NRS) procedure. Results for three participants with food selectivity indicated that preference for NPFs developed after being exposed to those foods during either treatment sessions or generalization probes. Copyright © 2010 John Wiley & Sons, Ltd.

INTRODUCTION

The current study focuses on the category of feeding problems known as food selectivity. Levin and Carr (2001) define food selectivity as consuming a restricted variety of foods and rejecting or refusing foods that are novel. Food selectivity can occur with respect to food texture (e.g., eating only pureed foods); food type (e.g., eating only pizza and French fries); food group (e.g., eating only sweets/snacks); and/or commercial brand (e.g., eating only Burger King’s® French fries). When treating food selectivity, foods may be presented in a sequential fashion (otherwise known as differential reinforcement), in which a high-preferred food (HPF) is presented contingent on acceptance of a non-preferred food (NPF), or in a simultaneous fashion in which an NPF and an HPF are presented together.

Studies comparing the relative effectiveness of sequential and simultaneous food presentation have found that simultaneous food presentation is more effective.

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than sequential presentation. Kern and Marder (1996) demonstrated that both simultaneous and sequential presentation resulted in increased food acceptance when combined with escape prevention, however, acquisition of food acceptance occurred in fewer sessions when food was presented simultaneously than when it was presented sequentially. Piazza, Patel, Santana, Goh, Delia, and Lancaster (2002) found that for two participants, simultaneous presentation resulted in an immediate increase in food acceptance relative to sequential presentation; for a third participant, acceptance in the simultaneous condition increased after physical guidance and representation of expelled bites had been introduced. Piazza et al. suggested that flavor–flavor conditioning might be responsible for increased food acceptance of NPF during simultaneous presentation. In other words, following repeated associations of the NPF and HPF, the NPF may acquire reinforcing properties of the HPF. However, neither study evaluated whether simultaneous presentation of NPF and HPF resulted in increased consumption of NPF in the absence of HPF.

Mueller, Piazza, Patel, Kelley, and Pruett (2004) sought to extend the work of Kern and Marder (1996) and Piazza et al. (2002) by evaluating consumption of NPF in the absence of HPF following a simultaneous presentation procedure which involved blending NPFs into HPFs and then gradually increasing the ratio of NPF to HPFs. Periodic generalization probes were conducted throughout treatment to determine if preference developed for previous NPFs. Results indicated that simultaneous presentation increased acceptance of novel foods. Furthermore, participants continued to consume NPFs in the absence of preferred foods following the blending treatment. Although the simultaneous presentation procedure was evaluated in conjunction with a non-removal of the spoon (NRS) procedure, results of this study suggest that the development of preference for previous NPFs may have been responsible for the continued consumption of NPF when presented independent of HPF.

While several studies have shown that the acquisition of food consumption does not occur in the absence of escape prevention, the study conducted by Mueller et al. (2004) along with studies that have reported follow-up data demonstrating that food consumption maintains after the termination of intervention (e.g., McCartney, Anderson, & English, 2005) suggest that there may be variables other than negative reinforcement that are responsible for the maintenance of food consumption. One possibility is the development of preference for foods targeted during treatment.

Although food preferences are often assessed through interviews with care providers as well as direct observation, systematic preference assessments have not been incorporated in interventions designed to treat food selectivity. Preference assessments are often used to identify stimuli that may function as reinforcers. Methods for conducting preference assessments include presenting stimuli individually (Pace, Ivancic, Edwards, Iwata, & Page, 1985), in pairs (Fisher, Piazza, Bowman, Hagopian, Owens, & Slevin, 1992), or presenting several stimuli in a
concurrent arrangement (DeLeon & Iwata, 1996; Roane, Vollmer, Ringdahl, & Marcus, 1998; Windsor, Piche, & Locke, 1994). When conducting preference assessments, response measures may include the amount of time during which stimuli are manipulated or the frequency that one stimulus is chosen in comparison to another; these measures provide information regarding one’s relative preference for various stimuli. Stimuli identified as highly preferred are often more likely to function as reinforcers than those stimuli identified as less preferred (Penrod, Wallace, & Dyer, 2008).

In the context of treatments for food selectivity, preference assessments can be used not only to identify HPFs that can be delivered as a consequence for consumption of novel foods, but may be used to inform the selection of foods to target during intervention. In addition, preference assessments could be used as an outcome measure of treatment. The purpose of the current study was to evaluate whether preference for NPFs developed after exposure to sequential and simultaneous presentation procedures that were compared in a multi-element design (see VanDalen & Penrod, in press).

**METHOD**

**Participants and Setting**

Three children with food selectivity participated in the study. Participants were included in the study based on the following criteria: They ate fewer than five foods (not including snacks or sweets) and/or were refusing foods from at least one food group (i.e., vegetable, fruit, protein, starch, and dairy) and they were able to feed themselves. A behavioral feeding assessment developed by Budd (1998), and a pretreatment nutritional assessment developed by the first author (available upon request), was used to determine whether participants met these criteria. For two participants (Emilio and Kevin), preference assessments and treatment sessions were conducted in a research room at California State University, Sacramento (measuring approximately 3.7 m by 4.6 m). The research room was equipped with a table and chairs and materials used for feeding (e.g., plates, paper towels, utensils, etc.). For one participant (Ronnie), preference assessments and treatment sessions were conducted at the kitchen table in his home. Sessions were conducted 2–3 times per week. Preference assessments were approximately 30–45 min in duration and treatment sessions were terminated after 30 min had elapsed or the child finished their meal (whichever occurred first).

Emilio was a 5-year old boy diagnosed with an Autism Spectrum Disorder (ASD). At intake, Emilio consistently ate four foods, including pancakes, scrambled eggs, cheerios and Spanish rice. Snacks and sweets Emilio typically ate included crackers,
chips, and cookies. When asked to try new foods, Emilio typically engaged in inappropriate mealtime behaviors such as pushing the food away, negative vocalizations, and running away from the table.

Ronnie was a 4-year old boy with sensory, visual–motor, and oral–motor delays. At intake, Ronnie consistently ate four foods, including peanut butter sandwiches, applesauce, Captain Crunch® cereal, and raisins. Snacks and sweets Ronnie regularly consumed included chips, licorice, and fruit snacks. When asked to try new foods, Ronnie typically responded with negative vocalizations, tantrums/crying, and running away from the table.

Kevin was a 4-year old boy diagnosed with an ASD. At intake, Kevin’s meals consisted of only French Fries. Sweets and snacks Kevin regularly consumed included fruit snacks and Lays® potato chips. When presented with novel foods, Kevin typically engaged in inappropriate mealtime behaviors such as pushing the food away, negative vocalizations, and running away from the table.

Response Measurement and Interobserver Agreement

During pre- and post-treatment preference assessments, event data were collected on the number of times each food item was selected and consumed. This number was then converted into a percentage by dividing the number of times each food item was selected and consumed, by the total number of times each item was presented and multiplying by 100%.

Interobserver agreement (IOA) was calculated by dividing the number of agreements by the number of agreements plus disagreements and then multiplying that number by 100%. Two trained independent observers collected data during 100% of preference assessments. Mean IOA for child selection and consumption was 100%.

Pre-treatment Preference Assessments

Preference assessments were conducted before treatment to identify both HPFs and NPFs that were used during treatment. NPFs were defined as those foods selected and consumed less than 10% of trials, and HPFs were defined as those food items selected and consumed more than 80% of trials.

An initial parent interview was used to determine six HPFs and six NPFs. A paired choice preference assessment, described by Fisher et al. (1992), was conducted to corroborate parents’ reports. A paired choice format was used in order to identify the child’s relative preferences. The HPF that had the highest percentage of selection was then used during intervention. Prior to the start of the preference assessment, the child was given the opportunity to pre-sample each food item. Preference assessments were conducted at least 2 h before or after meals in order to control for possible deprivation.

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or satiation effects. During the preference assessment, each food item was paired once with every other food item according to procedures described by Fisher et al. Two food items were placed on separate plates next to each other, both at an equal distance in front of the child. The child was allowed to consume whichever food he chose and the item not chosen was removed. In the event that the child approached both food items, he was blocked from doing so. In the event that no approach toward either food was made, the experimenter prompted the child to sample both items, following which the same two food items were represented. If, during this second trial, no approach was made, both items were removed by the experimenter and a new trial was initiated.

A second preference assessment, including 10–12 NPFs (none of which were included in the first preference assessment described above) was conducted in order to identify a variety of additional foods to present during treatment conditions and generalization probes. During the second preference assessment, NPFs were presented to the child singly as described by Pace et al. (1985). Each food was presented three times each in a random order. A single stimulus format was used in the second preference assessment in that this assessment included only NPFs. Based on parent reports, it was not expected that any of the foods included would be selected and consumed; hence, it was thought that presenting foods in a single fashion would be more efficient.

Treatment Evaluation

Foods identified in the preference assessments were divided into two groups such that each group included one food from at least three different food groups. Foods assigned to Group A were used in a sequential presentation condition and foods assigned to Group B were used in a simultaneous presentation condition. A multi-element design was used to compare the two presentation conditions and a multiple probe design was used to periodically assess generalization of food consumption (defined as a clean mouth following food acceptance) for NPF items not targeted during treatment.

During baseline, NPFs were presented on a trial-by-trial basis using a three-step prompting procedure (e.g., verbal instruction to ‘take a bite’, model to take a bite, followed by a physical prompt to take a bite, in which the food was brought to the child’s mouth). Verbal praise was provided contingent on consumption of NPFs on a fixed ratio (FR) 1 schedule. Inappropriate mealtime behavior (e.g., expulsions, verbal protests, pushing food away) resulted in a 30-s escape from demands to consume NPFs.

In the sequential condition, the HPF identified during the initial preference assessment was delivered contingent on consumption of NPFs on a FR 1 schedule. In the simultaneous condition, the HPF was presented on the same spoon as the NPF (i.e., the HPF was placed on top of the NPF) and verbal praise was provided contingent on consumption of the paired bite on a FR 1 schedule. In both conditions, bites were presented on a trial-by-trial basis using a three-step prompting procedure.
and inappropriate mealtime behaviors resulted in a 30-s escape from demands to consume the NPF.

Neither presentation method was effective in increasing food consumption; consequently, both presentation methods were combined with escape prevention in the form of an NRS procedure plus representation of expelled bites. When the NRS procedure was implemented, a bite fading procedure, in which the number of bites was gradually increased, was also employed in an effort to minimize any adverse side effects associated with the NRS procedure. After the NRS procedure was introduced, consumption in both conditions increased. For a more detailed description of results as well as a graphical representation of results, see VanDalen and Penrod (in press).

Generalization probes were conducted throughout treatment and consisted of NPFs identified during the second preference assessment that were not targeted during intervention, and that were never selected during preference assessments. During generalization probes, the same procedures utilized in baseline were employed. Results indicated that for all three participants, consumption generalized to other NPFs not targeted during treatment conditions (see VanDalen and Penrod, in press).

**Post-treatment Preference Assessments**

Following the completion of treatment, the same foods included in the initial preference assessments were assessed in a paired choice format (Fisher et al., 1992), in an effort to determine if participants’ preference for NPFs had shifted after being exposed to those foods during either treatment or generalization probes.

**RESULTS**

**Pre-treatment Preference Assessments**

All three participants chose 12 or more food items less than 10% of opportunities. Thus, each child had a sufficient number of NPFs to target during treatment and generalization probes. Each child also selected one food item more than 90% of opportunities, and that item was selected to use during both presentation conditions.

For Emilio, three foods never chosen (hot dog, banana, and bread) were targeted in treatment using simultaneous presentation. Three additional foods never chosen (chicken nugget, apple, and pasta) were targeted in treatment using sequential presentation. Twelve foods never chosen (yogurt, cheese, cucumber, tomato, carrots, mashed potato, tortilla, fish stick, bacon, corn, grapes, and mandarin oranges) were selected to target during generalization probes. Chocolate cake, chosen 100% of opportunities was selected as the HPF used in both presentation conditions.
For Ronnie, three foods never chosen (hot dog, hash brown, and corn) were targeted in treatment using simultaneous presentation. Three additional foods never chosen (hamburger, pasta, and green bean) were targeted in treatment using sequential presentation. Ten foods never chosen (carrots, peas, scrambled egg, chicken, bologna, generic fruit snacks, white raisins, cereal, grapes, and salami) were selected to target during generalization probes. Fruit snacks, chosen 91% of opportunities were selected to use during treatment. It should be noted that licorice was also selected 91% of opportunities in the initial preference assessment, but due to reported availability in Ronnie’s household, fruit snacks were ultimately chosen as the HPF.

For Kevin, three foods never chosen (cucumber, apple, and bologna) were targeted in treatment using simultaneous presentation. It should be noted that cucumber was an NPF selected from the second pre-treatment preference assessment. Three additional foods never chosen (carrot, orange, and turkey) were targeted in treatment using sequential presentation. Six foods never chosen (green bean, corn, bananas, grapes, chicken, and cheese) were selected to target during generalization probes. Potato chips, chosen 100% of opportunities, were selected as Kevin’s HPF used in both presentation conditions.

**Post-treatment Preference Assessments**

Following all treatment conditions, a paired choice preference assessment consisting of the original HPFs and NPFs was administered to assess whether preference for the previous NPFs shifted following treatment. Additionally, the foods included in the second preference assessment were also presented post-treatment in a paired choice format.

Figures 1–3 depict results from the pre- and post-treatment preference assessments for Emilio, Ronnie, and Kevin, respectively. For all three participants, the top left panel depicts results from the initial pre-treatment preference assessment including both HPF and NPF items. The top right panel depicts results from the pre-treatment preference assessment including only NPF items. The bottom left panel depicts results from the post-treatment preference assessment including both HPF and NPF items and the bottom right panel depicts results from the post-treatment preference assessment including only NPF items.

**Emilio**

Although consumption was optional during both post-treatment preference assessments, Emilio willingly selected one item of food during each trial, indicating that preference for NPFs developed following exposure to target foods used during treatment and generalization probes. Specifically, with the exception of hot dog during the first post-treatment assessment, and fish stick during the second post-treatment assessment, Emilio selected and consumed all previous NPFs at least once post-treatment.
Furthermore, it should be noted that during two trials, Emilio selected and consumed two previous NPFs over HPFs (e.g., apple over Oreo, and chicken nugget over chocolate pudding). Additionally, during the second post-treatment preference assessment, Emilio selected cheese 100% of opportunities, and selected six novel foods more than 50% of opportunities.

**Ronnie**

Similar to results observed with Emilio, during both post-treatment preference assessments, Ronnie willingly selected one item of food during each trial, indicating that
preference for previous NPFs developed following exposure to target foods used during treatment and generalization probes. Specifically, with the exception of pasta during the first post-treatment assessment, and scrambled egg during the second post-treatment assessment, Ronnie selected and consumed all previous NPFs at least once post-treatment. Furthermore, it should be noted that during three trials, Ronnie selected and consumed two previous NPFs over HPFs (e.g., hash brown over fruit snack, hash brown over popcorn, and hot dog over popcorn; popcorn, though not selected during the initial preference assessment, was anecdotally reported to be a preferred food item by Ronnie’s parents). Additionally, during the second post-treatment preference assessment, Ronnie selected five novel foods more than 50% of opportunities. It should be noted that two additional novel foods (e.g., yellow fruit loops and pretzels) were added to the second post-treatment preference assessment. The additional two foods utilized had been presented informally by Ronnie’s mother during the course of treatment.
Kevin

Similar to results observed with Emilio and Ronnie, during both post-treatment preference assessments, Kevin willingly selected one item of food during each trial, indicating that preference for previous NPFs developed after exposure to target foods used during treatment and generalization probes. Specifically, with the exception of
orange during the first post-treatment assessment, and cucumber during the second post-treatment assessment, Kevin selected and consumed all previous NPFs at least once post-treatment. Furthermore, it should be noted that during five trials, Kevin selected and consumed four previous NPFs over HPFs (e.g., chicken nugget over cookie crisp, chicken nugget over licorice, turkey over licorice, apple over licorice, and carrot over licorice). Additionally, during the second post-treatment preference assessment, Kevin selected chicken 100% of opportunities, and selected four novel foods more than 50% of opportunities.

DISCUSSION

Although previous literature has cited various methods for treating food selectivity, no studies till date have reported on preference for novel foods developing over the course of treatment. The development of preferences for previous NPFs has strong implications in terms of generalization and maintenance of food consumption; the development of preferences for novel foods over the course of treatment may increase the likelihood that treatment effects will maintain over time.

While acquisition of food consumption did not occur until after the NRS procedure was implemented, the mechanism responsible for the maintenance of food consumption during treatment may have been due to participants contacting the reinforcing properties of the food targeted during intervention. In other words, the NRS procedure may have been instrumental initially in allowing the child to come into contact with the NPFs; however, the mechanism responsible for the increased consumption of novel foods over the course of treatment may simply have been due to the food naturally reinforcing consumption after the child had come into contact with the reinforcing properties of the food.

Although this study corroborates prior research which has indicated that escape prevention is a necessary component in the treatment of food selectivity (e.g., Kern & Marder, 1996; Piazza et al., 2002), future research is needed to further evaluate the mechanism responsible for the maintenance of food consumption. Research should continue to evaluate the acquisition of preferences for novel foods and the necessity of the NRS procedure (i.e., how many trials of the NRS procedure are necessary before preferences begin to shift).

A limitation of this study concerns the fact that the format used in the pre-treatment preference assessment including only NPF items differed from the format used in the post-treatment preference assessment including the same items. Given research that indicates that some individuals display a preference for choice (e.g., Tiger, Hanley, & Hernandez, 2006) it is possible that participants in the current study may have been more likely to consume NPFs during the post-treatment preference assessment simply
because the foods were presented in a choice paradigm. Future research should control for presentation format when evaluating shifts in preference over time. Given that assessment formats used pre- and post-treatment were different, it is not possible to make a direct comparison of changes in preference following treatment. However, given that the single stimulus preference assessment tends to overestimate preference, the fact that few food items were selected during this assessment suggests that the food items assessed were truly non-preferred prior to the introduction of treatment; results of the paired choice preference assessment suggest that these food items were preferred following treatment.

Another potential limitation concerns the fact that only one pre-treatment preference assessment was conducted; this precludes a demonstration that participants’ preferences were stable before implementing treatment. Several pre-treatment preference assessments demonstrating that preference for NPF items did not change over time may have strengthened the conclusion that implementation of the feeding treatment was responsible for increased preferences for food items during the post-treatment preference assessments. Future researchers evaluating preference for NPFs targeted in the treatment of food selectivity might consider conducting multiple pre-treatment assessments prior to the introduction of treatment.

REFERENCES


