Combining repeated taste exposure and escape prevention: An intervention for the treatment of extreme food selectivity

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Abstract
Repeted taste exposure has been used to introduce novel foods in several settings, but none of these efforts have targeted clinical populations. This study describes an intervention that combines repeated taste exposure and escape prevention in the treatment of extreme food selectivity in two children with autism. Future applications of repeated taste exposure are discussed.

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Introduction
Repeated taste exposure can increase liking and acceptance of novel foods in toddlers (Birch & Marlin, 1982), preschoolers (Sullivan & Birch, 1990), and schoolchildren (Loewen & Pliner, 1999). Changes in food preference require actually tasting the novel food; only looking at novel foods does not change preference (Birch, McPhee, Shoba, Piork, & Steinberg, 1987).

While the aforementioned studies were not designed to address clinical issues, further research has demonstrated repeated taste exposure can increase diet variety in natural settings. In a home-based study, parents were asked to have their children taste vegetables daily over a 14-day period (Wardle et al., 2003). These researchers found children exposed to the novel food reported liking this food more than controls who only received nutritional information about the food or no intervention. In school-based study, Wardle and her colleagues compared the effects of repeated exposure and repeated exposure plus reward (Wardle, Herrera, Cooke, & Gibson, 2003). Children in the exposure only condition tasted a novel food daily for 10 days, children in the exposure plus reward condition tasted the novel food and were rewarded with a sticker, while children in the control condition were not offered daily tastes. Children in both the exposure only and the exposure plus reward conditions reported a greater change in liking of the novel food and they ate more of the food than controls when pretest and posttest measures were compared.

Although Wardle’s studies provide a sound rationale for using repeated taste exposure to increase diet variety in natural settings, their research is limited in several ways. These studies addressed only one or a few novel foods, did not demonstrate maintenance of the behavior, and addressed only children without selective eating. No research has demonstrated the utility of repeated taste exposure as a treatment for children with extreme food selectivity.

While a range of behavioral interventions have been used to address childhood feeding problems, most interventions for treating severe problems include an escape prevention component which prevents the child from avoiding eating (Kerwin, 1999). One successful form of escape prevention involves meal termination criterion based upon the child eating a specified amount of food prior to leaving the meal (Farrell, Hagopian, & Kurtz, 2001).

Children with autism exhibit more problems with eating than typically developing children, including restricted use of various food types and textures, as well as food refusal.
The current study shows the effectiveness of an intervention combining repeated taste exposure and escape prevention in the treatment of extreme food selectivity in two children with autism spectrum disorders.

**Method**

**Participants and setting**

Jim was a 3½-year-old boy diagnosed with autism referred for food selectivity. Prior to treatment, Jim received the majority of his calories from drinking milk and eating grilled cheese sandwiches and hot dogs. Jim’s parents reported that he was always a poor eater who displayed aggression and disruptive behaviors during meal times including crying, tantrums, and food refusal.

Kim was a 5-year-old girl diagnosed with autism referred for the treatment of food refusal. Prior to treatment Kim was totally dependent upon a gastrostomy tube for 6 months. Before she stopped eating after an acute illness, Kim had eaten a diet limited to hot dogs, bacon, peanut butter, eggs, toast and chocolate. She also engaged in undesirable mealtime behaviors such as crying, tantrums, and throwing food.

The children’s interventions were conducted in a pediatric feeding center in treatment rooms equipped with table, chairs, kitchen timer, and video camera. The children’s parents either observed via one-way mirror or participated in all treatments. Neither child was receiving medications or was being treated for any comorbid chronic illnesses.

**Procedure**

Prior to intervention, parents were given a list of 139 common foods and asked to select foods eaten by the family. The foods endorsed by parents were presented in treatment. We offered fruits, vegetables, meats, dairy products, and starches to both children. The repeated taste exposures took place in a treatment room.

In initial sessions, a single pea-sized bite of food was presented to minimize response effort and increase compliance with tasting. Children are more likely to accept food when the volume on the spoon is small (e.g. 1/4 spoonful) and less likely when the volume on the spoon is greater (e.g. full spoonful) (Kerwin, Ahearn, Eicher, & Burd, 1995). The single bite was presented on a spoon and when this criterion was met, a new bite of the same food was presented. Inappropriate behaviors were ignored.

After the bite was eaten and the child left the room, a timer was used indicate when the next taste session would begin. A minimum of 5 min was given between each taste session. Between sessions the child was allowed to go into other areas of the clinic, some of which contained toys or books, or go outside with his or her parents.

When a child ate a bite of a particular food within 30 s for three out of four taste sessions, the size of the bite for that food was increased in size. After this pea-size criterion was met, half spoonfuls of food were presented, and when this criterion was met, full spoonfuls of food were presented. Once criterion was met for a full spoonful of a particular food, this food was reintroduced in subsequent probe meals to evaluate the effects of the repeated taste exposure. Each of the foods not eaten during probe meals was presented in a rotating basis in taste sessions. Therapists conducted all taste sessions during the first week of treatment. Parents were then trained to implement the intervention and initially paired with therapists before conducting taste sessions alone. Parents were also trained to implement probe meals and were provided with feedback on their implementation of the intervention.

During probe meals, each participant was presented with three tablespoons each of three to four foods on a plate accompanied by regular utensils and a drink in a small cup. The foods were not part of the child’s pre-treatment diet and were selected from all food groups. We offered either novel foods or foods presented in previous probe meals and taste sessions. Probe meals lasted 10 min and meal termination was indicated by the ringing of a timer. During the probe meal, the feeder instructed the child to take a bite and no other prompts were given. Unlike taste sessions, the child was not required to eat any of the food. All inappropriate behaviors were ignored and if the child took a bite of any food, praise was provided. If the child ate the entire portion of a food during a probe meal, that food was not presented during taste sessions. If the child did not taste one or more of the foods in the probe meal, the child received a 5-min break followed by taste sessions.

The number of taste sessions and probe meals per day varied depending on how quickly the child took bites in taste sessions; probe meals were conducted when the child had met criterion (ate a full teaspoon in 30 s in three of the four sessions) for at least three foods.

Generalization meals were conducted by the children’s parents outside of the treatment setting to demonstrate acceptance of novel foods in environments outside of the clinic. The parents were either given foods or a list of foods presented during probe meals and taste sessions and asked to offer them to their children. These generalization meals followed the same format as probe meals, and the children were not required to eat any of the foods offered. Parents recorded the number of bites taken as well as the frequency of inappropriate behaviors. The goal of treatment was to increase the variety of foods eaten by each child, multiple taste sessions and probe meals were conducted each day of treatment. Treatment was conducted for 13 days for Kim and 15 days for Jim.
Dependent measures

For taste sessions, data were collected on the length of time until bite consumption and the number of foods that met the criterion for a full spoonful (consumption in less than 30 s in three of the four taste sessions), as well as the number of sessions required to meet this criterion. Data were also collected on inappropriate behaviors. If a child exhibited either expulsion (food that was previously inside the mouth was visible outside the lips prior to the next bite) or a negative vocalization (the child screamed, cried, said “no”, or made negative statements about the food such as “I don’t like it”), this was scored as inappropriate behavior. Each bite presentation in taste sessions and each bite taken during probe or generalization meals was counted as a trial. Data on inappropriate behaviors were taken for each trial and calculated as percent occurrence per total number of trials.

We calculated the percentage of foods eaten during probe and generalization meals. For a particular food to be considered eaten, at least three spoonfuls of that food had to be consumed. For probe meals, separate data were taken for novel foods and foods previously presented.

Results

The treatments we used increased the variety of foods eaten by both participants. Fig. 1 shows the number of foods eaten consistently prior to treatment and the number of foods that met criteria either through taste sessions or probe meals after treatments. Prior to treatment, Jim consistently ate two foods, while Kim was totally dependent on the gastrostomy tube for nutrients. After 15 days of intensive treatment, Jim had met our criteria for success with 65 foods. After 13 days of intensive treatment, Kim had met our criteria for success with 49 foods and she no longer required the gastrostomy tube.

We had two criteria for determining whether a food was eaten successfully; either three full teaspoons of a particular food consumed in a probe meal or full spoonfuls of this food eaten in less than 30 s in three of the four taste sessions. We examined the number of times each food was presented in both probe meals and taste sessions. Across the course of treatment, the number of food presentations required to meet one of our two criteria decreased as the children ate more of the foods presented in probe meals and took bites more quickly in taste sessions. This was especially true for Kim who required 10–27 food presentations for the first four foods, after which the number of presentations was usually less than five, with most foods eaten in probe meals. Although Jim’s responses were more variable, the number of trials required to meet criteria never exceeded 15 and the last eight foods were eaten in probe meals. The percentage of novel foods eaten in the first week of probe meals averaged 48% for Jim and 36% for Kim. During the second week of treatment, Jim ate 58% of novel foods while Kim ate 86% of novel foods. Finally, during the last week of treatment, Jim ate 73% of novel foods and Kim ate 69% of novel foods presented in probe meals.

The treatment also reduced rates of inappropriate behaviors, including both negative vocalizations and the expulsion of food. Kim’s frequency of inappropriate behavior dropped from 68% on the first day of treatment to 14% or less per day for the remainder of treatment. While Jim’s responses were more variable, his frequency of inappropriate behavior each day did not exceed 29%, and most of his inappropriate behavior consisted of saying, “no” when a break was terminated and he was taken for a taste session.

Importantly, the treatment was also effective at home, where parents offered their children foods in probe meals in the evenings and on weekends. In the generalization meal after the first day of treatment, Jim ate 25% of foods offered to him by his mother. In subsequent generalization meals, Jim ate up to 89% of the foods offered and did not drop below 40%. Kim ate 60% of the foods offered to her in the first generalization meal and subsequent generalization meals ranged from 72% to 100% of foods offered.

At 3-month follow-up appointments, parents of both children were asked to review a list of 139 common foods and indicate which foods their children were eating and add any foods not contained on this list. At follow-up, parents reported Jim to be eating 53 foods and Kim 47 foods. The children also ate foods not eaten prior to treatment in a meal conducted during this follow-up appointment. Although Jim was eating fewer foods at follow-up due his parents’ decision to become vegetarians, both children continued to eat a variety of foods. Parents of both children continued to use taste sessions outside of meals to introduce novel foods not accepted in meals. Parents of both children rated the intervention acceptable and effective in a treatment satisfaction questionnaire.

Discussion

This study demonstrated an effective intervention combining repeated taste exposure and escape prevention to treat severe food selectivity in two children with autism.
These results are consistent with previous research on repeated exposure (Birch & Marlin, 1982; Loewen & Pliner, 1999; Sullivan & Birch, 1990) in that repeated tasting led to increased acceptance and liking of novel foods. At the beginning of treatment, one child was eating only two foods while the other was dependent upon gastrostomy tube feedings. At the end of treatment, one child was eating 49 foods and the other 65 foods and the need for gastrostomy tube feeds had been eliminated.

Wardle et al. (2003) reported that daily tastes of foods increased their children's willingness to try novel foods. The current study also demonstrated that the intervention increased participants' willingness to eat novel foods. Across the course of treatment, the children ate more of the foods presented in probe meals and taste sessions were not required to have the children taste novel foods.

Our study extends previous research on repeated taste exposure by demonstrating its utility as a component in a clinical intervention for children with autism who exhibited extremely selective eating patterns. While it is not clear the degree to which either escape prevention or repeated testing were responsible for the children's changes in eating, both were essentially linked in practice. Escape prevention required the children to actually taste the foods, and repeated tasting of the foods changed the children's pattern of acceptance. Escape prevention is an effective component in interventions for food refusal and selectivity (Kerwin, 1999). During treatment, the children ate an increasing number of foods in probe and generalization meals, when there was no demand to eat, and we attribute this behavior to repeated tasting of the foods. Repeated taste exposure allowed the children to learn the foods offered were acceptable, and even desirable, as the children demonstrated in later probe meals, it is unlikely the children would have learned to accept novel foods if they were never required to taste them (Wardle et al., 2003).

This study also made use of fading, or slowly changing the environment to help the child learn a response, by initially requiring only minimal effort on the part of the child (pea-sized bites) and slowly increasing the effort (bite-size) based on the child's performance. Fading is an important component for the treatment of food refusal (Kerwin et al., 1995). In the taste sessions, the children were told they could “go play” after they ate a bite. While no specific toys or activities were provided contingent on consumption, the children were allowed to leave the treatment room and engage in any activity they chose, which could be interpreted as reinforcement for eating. Verbal praise also was used in both probe and generalization meals. While the effectiveness of verbal praise has not been demonstrated in treating childhood feeding disorders, we included this component to increase the acceptability of the intervention by parents and make the meals similar to those provided in natural environments.

In summary, our research demonstrated the effectiveness of an intervention that involved escape prevention, repeated taste exposure and fading to treat significant feeding problems. Future research could (1) replicate these interventions and use component analysis to determine the individual effects of each facet of the intervention, and (2) develop less intensive versions of this intervention that could be implemented by therapists in outpatient settings or by parents at home.

References


