

Treatment of Food Selectivity in a Young Child With Autism

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Children who have autism have an increased risk for food selectivity. In this study, the effects of a therapeutic feeding intervention, implemented within the parameters of a gluten-free/casein-free diet, on the food consumption of a 5.5-year-old boy with autism were assessed. The treatment package used combined task direction, contingent reinforcement, physical prompts, and procedures to introduce food gradually based on the frequency with which the food was offered to the child and the percentage of times he accepted the food (e.g., from food consumed daily 100% of the time to new food items likely to be rejected). During intervention, number and variety of foods consumed increased from baseline. The child's mother was highly satisfied with the intervention. Implications are discussed.

Keywords: *autism; food selectivity; gluten-free/casein-free (GFCF) diet; intervention*

Practitioners commonly work with parents who have tried an unconventional method of treatment for their child's symptoms of autism (Levy, Mandell, Merhar, Ittenbach, & Pinto-Martin, 2003). Nickel (1996) found that up to 50% of parents ($n = 228$) had tried some form of alternative method (e.g., melatonin, vitamins, gluten-free/casein-free [GFCF] diet), and 32% admitted to trying more than one method.

An unconventional treatment that is gaining popularity is the GFCF diet (Levy & Hyman, 2005). One concern with the use of the GFCF diet is that children with autism are already at an increased risk for food selectivity when compared to their typical peers (Schreck, Williams, & Smith, 2004). These children may refuse the GFCF food items, which will exacerbate their preexisting food selectivity.

Although no one has researched the use of a therapeutic feeding treatment within the parameters of a GFCF diet, researchers of feeding interventions for children with autism spectrum disorders have suggested specific treatment elements to increase food consumption (e.g., Ahearn, 2002; Freeman & Piazza, 1998; Levin & Carr, 2001; McCartney, Anderson, & English, 2005; Najdowski, Wallace, Doney, & Ghezzi, 2003; Piazza et al., 2002). Common elements used in these interventions are task directions (e.g., "take a bite"), reinforcement (for food acceptance, consumption of food), physical prompts, and extinction (except Levin & Carr, 2001).

Researchers in a number of these studies also demonstrated an increase in food consumption when, as part of a treatment package, access to preferred food items were contingent on consumption of a target food (nonpreferred food) item (Levin & Carr, 2001; McCartney et al., 2005; Najdowski et al., 2003; Piazza et al., 2002) and/or simultaneously were presented with a target food item (Piazza et al., 2002).

Food selectivity combined with restrictive diets, such as the GFCF diet, can affect the implementation and outcomes of therapeutic feeding treatments. The elements described above, when combined in a treatment package, are promising. However, practitioners and parents are confronted with the complexity of introducing novel foods and identifying preferred food items when working within a restricted diet.

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The use of preferred food items to increase food consumption is easily identified within an unrestricted diet. One can assume that the preferred food item is truly the item of choice for that child. However, working within a restricted diet raises the question of whether the preferred item chosen from a GFCF diet is as reinforcing as a food item freely chosen without restrictions.

In the present study, the literature on therapeutic feeding treatments for children with autism who have food selectivity was expanded by assessing the effect of an intervention implemented within the parameters of a GFCF diet. The treatment package consisted of task direction, contingent reinforcement, and physical prompts and included procedures to introduce food gradually based on the frequency with which the food was offered to the child and the percentage of times he accepted the food (e.g., from food consumed daily 100% of the time to new food items likely to be rejected).

Method

Participant

The participant was Chris, a 5.5-year-old boy who was diagnosed with autistic disorder at the age of 3 years by a psychologist from a local university. Chris scored within the autistic range on the *Childhood Autism Rating Scale* (Schopler, Reichler, & Renner, 1986) and the *Autism Diagnostic Observation Schedule—Generic* (Lord et al., 2000). At the time of the study, Chris followed a visual schedule, was able to express his wants and needs verbally, and was above grade level in reading. During play activities, Chris engaged in rigid play routines or self-stimulatory behavior (visual). However, when prompted by a therapist, Chris engaged in turn taking and some pretend play. Although Chris required help grooming, he could partially dress himself, use the toilet independently, and eat and drink without assistance.

Chris was attending a morning program at an inclusive preschool 5 days a week and receiving 25 hours of discrete trial therapy from a local program for children with autism. Prior to the study, he also participated in therapy sessions with the first author for 2 months (4 hr per week). All therapy sessions were conducted in a room in Chris' home and consisted of structured and embedded skills training (language, fine/gross motor, play skills, and social skills training).

Following Institutional Review Board approval, Chris' mother was informed of the study and provided written permission. Chris was considered for this study due to

his selective eating habits and mealtime problem behaviors. Chris' mother reported that during his last medical exam Chris did not have immediate medical needs due to his food selectivity. At the time of the study, Chris was on a GFCF diet. During an interview, Chris' mother was asked about mealtime problem behaviors, food items that might cause gagging, family eating habits, and any possible food allergies. Once it was determined that no immediate health risks existed, Chris' mother completed a food diary (forms are available from the first author) in which she recorded (a) the amount of food Chris consumed, (b) when it was offered, (c) what specific food was eaten (e.g., eggs, Lay's® potato chips), (d) any food offered and not eaten, and (e) any behavior problems displayed during mealtimes. The food diary was kept for 7 consecutive days.

The researchers assessed the food diary for food selectivity characteristics and noted if specific foods induced gagging and/or were spit out when placed in Chris' mouth. Chris was considered to have food selectivity because, based on the food diary, he met the following criteria: (a) Average daily food calories (drinks were not recorded) were 1,034 (range 712–1,202; FDA dietary guidelines recommend 1,800 calories per day for children 4–6 years old); (b) he did not consume any fruit and consumed only a small number of vegetables when mixed with a preferred item; (c) on 17 occasions, Chris displayed problem behavior during mealtime (e.g., leaving the table, refusing an item, having to be fed the nonpreferred item); and (d) he consumed only eight food items.

Setting and Materials

Fifteen-minute videotaped feeding sessions occurred at least an hour after breakfast or lunch on 4 consecutive days per week. The first author served as the interventionist. Each session was conducted at a child-sized table in a work area in a room in Chris' home where Chris' therapy sessions typically occurred. The table was set with a spoon, plate, and paper napkin, which were used during Chris' regular mealtimes. Paper plates were used during assessment and probe sessions. Food choices were preplanned for each session. Prior to the session, 10 child-sized bites were placed in order of trial presentation in a numbered compartment tray (an ice-cube tray). For example, the first bite was a piece of cracker, the second was a piece of apple, and the third was a piece of cracker. Liquids were not included in the food categories; however, during each session, a drink was available if Chris requested it.

Dependent Variables and Measurement

Child behaviors. The child behaviors measured during this study were food consumption, food rejection, gagging, and escapes. Food consumption was recorded when the entire bite of food was placed in the child's mouth and was chewed and swallowed (no food remaining in the cheeks or under the tongue). Gagging was recorded if the child's neck muscles convulsed or tightened, with or without a retching sound, as if to expel food from the mouth. Any food inducing gagging was removed from the selection of food items and replaced with an item from the same category. Bite rejection was recorded if the child did not consume the entire bite of food presented. Rejection also was recorded if the child kept a portion of the bite in his cheeks or under his tongue without swallowing it. Escape was recorded if the child tried to avoid taking a bite by getting up from the table. Escape was recorded each time the child left the table (e.g., returned to the table and avoided the bite again by leaving the table). If the child moved his head to avoid a bite but did not leave the chair, escape was not recorded.

This study was conducted in three phases. Phase 1 consisted of the selection of food categories and assessment of food item consumption. Phase 2 included baseline sessions, and Phase 3 consisted of intervention and probe sessions. Measures used during each session are described below.

Every session (assessment, baseline, intervention, probe) was timed and terminated after 15 minutes. Data were collected from videotapes and in vivo. Event recording was used to document Chris' responses during each feeding trial. The interventionist recorded if the bite presented was consumed or rejected, if gagging occurred, and if Chris tried to escape the bite. The procedural steps occurring during each trial also were recorded (i.e., task direction, physical guidance to spoon, physical guidance to mouth, and praise). The task direction always initiated the trial bite. Physical guidance to spoon and physical guidance to mouth were recorded only during intervention sessions; these procedures did not occur in assessment, baseline, or probe conditions. The interventionist also recorded if the procedure had to be repeated with a smaller bite during intervention sessions.

Interobserver agreement (IOA). IOA data were collected by a second observer (trained graduate student) from videos on 30% of the sessions in each of three experimental conditions (baseline, intervention, and probe) and on 50% of the assessment sessions. Percentage of IOA was calculated by dividing the number of agreements by

the number of agreements plus the number of disagreements multiplied by 100. An agreement occurred if both observers recorded the same occurrence (or nonoccurrence) of child behavior during the same bite trial (e.g., both observers recorded that food consumption occurred during Trial 2). IOA results per dependent variable were 99% for food consumption, 99% for bite rejection, 100% for gagging, and 100% for escapes.

Treatment integrity. Treatment integrity data were collected by the second observer from videos on 50% of the assessment sessions and 30% of baseline, intervention, and probe sessions using a procedural checklist. The procedural checklist was embedded in the data collection sheet and consisted of the procedural steps needed for the particular experimental condition (i.e., task direction, wait 5 s, hand to spoon, wait 5 s, spoon to mouth). The percentage of treatment integrity was calculated by dividing the number of procedural items completed by the total number of procedural items expected multiplied by 100. Treatment integrity for assessment sessions was 95% (range 90%–100%) and for intervention sessions was 95% (range 94%–100%). Treatment integrity for baseline and probes was 100%.

Experimental Design and Procedures

The design for this study was a multiple probe design across food categories. Criterion levels were predetermined for advancing to the next food category. The multiple probe design was chosen to demonstrate control of the dependent variables (type of food consumed, food refused, number of escapes, and number of bites consumed).

Phase 1: Food category selection and assessment of food item consumption. The researchers and Chris' mother categorized Chris' target food items according to the food diary and past eating habits (per mother). Five food categories emerged (Table 1), organized according to the frequency with which the food was offered to Chris (e.g., items he consumed daily) and the percentage of times he accepted the food (e.g., food consumed 100% of the time).

Four food item consumption assessments were conducted over 4 consecutive days to confirm the parent's estimation of which foods fit in each of the five categories. None of the sessions exceeded 15 minutes. The purpose of Assessments 1 and 2 was to determine whether foods in Category I (eaten daily 100% of the time) were indeed foods the child readily consumed. The purpose of Assessment 3 was to determine if any foods in Category III

Table 1
Description of Food Categories and Items Selected for Intervention

Category	Description
I	Food items readily eaten in the last week (favorites). Food items accepted 100% of the time when offered. Rice bran crackers and Rice Dream [®] ice cream were selected.
II	Items the child has eaten infrequently within the last 1–2 weeks. May have been readily eaten at one time but are rejected 40% of the time. Turkey hotdogs and GF pasta with imitation cheese sauce were selected.
III	Items the child might eat based on similarity to readily eaten foods. For example, the child eats GFCF pancakes; a Category III item would be GFCF waffles. Rejected >50% of the offerings during the food assessment. GFCF waffles and GFCF pizza were selected.
IV	Items offered within the last 1–2 months and rejected by the child. Rejected >80% of the offerings during the food assessment. French fries and Golden Delicious apples were selected.
V	Items the child has never been offered and would likely refuse. Rejected >80% of the offerings during the food assessment. Green beans and cauliflower were selected. Were not introduced during the intervention due to time constraints.

Note: GF = gluten free; CF = casein free.

should be Category I or II foods. During Assessment 4, the researchers used a multiple-stimulus preference paradigm.

During Assessments 1 and 2, two examples of foods from each of the five categories were presented individually to the child; thus, 10 trials (bites) were presented (two foods from each of five categories). The interventionist placed a bite on the child's plate and said the task direction, "Take a bite." If the child took a bite, the interventionist praised the child. If the child did not take a bite, the interventionist said, "OK, let's try this one" and presented a new bite. The order of food across the 10 trials was determined randomly. During Assessment 3, two examples of foods from Categories I, II, and III were presented individually to the child; thus, 6 trials (bites) were presented (two foods by three categories). After the 6 trials (bites) of Categories I, II, and III were presented, 4 more trials (bites) of Categories II and III (two foods by two categories) were presented individually. The interventionist followed the same procedures as used in Assessments 1 and 2. The order of food across the 6 trials (Categories I, II, and III) and, later, 4 trials (Categories II and III) was determined randomly. Assessment 4 involved placing five bites on a paper plate in front of the child. Each of the five bites represented an individual food category (Categories I–V). The interventionist said the task direction, "Take a bite." If the child took a bite, the interventionist praised the child. The task direction was then repeated following the praise of the consumed bite. When the child no longer took a bite, the

remaining bites of food were removed. The interventionist then provided five new bites (Categories I–V), and the procedure was repeated a second time.

Phase 2: Baseline sessions. During baseline sessions, the interventionist followed the same presentation procedures as Assessments 1 to 3; however, the order of the bites presented was different. During these sessions, Chris was presented each bite one at a time for total of 10 bites, with 4 bites from Category I and an accumulated total of 6 bites from Categories II, III, IV, and/or V. The bite order began with 2 bites from Category I followed by 2 bites from a randomly selected category (II, III, IV, or V). The remaining Category I bites were interspersed among the other categories.

Phase 3: Intervention and probe sessions. During these sessions, Chris was presented with a total of 10 preselected child-sized bites. The procedure for the intervention began with each bite being presented one at a time with the task direction, "Take a bite." If at any time during the trial the bite was placed in the mouth and/or consumed by the child, he was praised (e.g., "good job," "good bite"). Following the task direction, if the child did not pick up the spoon within 5 s, the interventionist used hand-over-hand physical assistance to place the child's hand on the spoon. If Chris did not move the utensil to his mouth within 5 s, the interventionist used hand-over-hand prompts to guide the utensil to his mouth. The spoon remained at the child's lips for

5 s. If Chris did not open his mouth, the utensil was returned to the plate. If the bite was not consumed, a smaller portion of the food (a half bite, a quarter bite) was offered with the same procedural steps. Finally, if the quarter bite was not consumed, Chris was verbally prompted to use his tongue to touch the bite ("Touch tongue to bite.").

During each intervention session, Chris was presented with a set number of target food bites from selected categories. These bites were presented in a specific order based on the categories (Table 1). The first sessions involved food items from Category I foods (eaten daily 100% of the time). When criterion for consumption of Category I bites was met and maintained (9 Category I bites out of 10 bites in four consecutive sessions without physical prompts), bites of food from Category II were added. During the remaining sessions (Categories II–IV), Category I bites were used as a reinforcer for consumed target bites (food items from Categories II–IV) as a means of increasing the likelihood that Chris would accept target food items. Prior to Category III food implementation, consumption of Category II bites had to reach two criteria.

The first criterion required Chris to consume three of four bites of the selected category as well as six bites of Category I foods for two consecutive sessions. During these sessions, Category I bites were presented on a fixed ratio schedule of 1 (FR1). Once this criterion was achieved, the second criterion was applied. The second criterion required Chris to consume five of six bites of the selected category as well as four bites of Category I foods for two consecutive sessions. During these sessions, Category I bites were presented on a fixed ratio schedule of 2 (FR2). A modification of the predetermined criteria was made after the child's escape behavior (e.g., leaving the table) increased during the second-criterion sessions for Category II foods. Due to the increase in escapes, Chris did not meet the second criterion, and the reinforcement schedule was returned to an FR1 schedule. The second criterion was not applied for the remaining food categories. Category II foods were returned to the first criterion for five sessions, until Category III foods were introduced. For three sessions, Category III foods remained at the first criterion, requiring Chris to consume three of the four target bites (Category III) as well as six bites of Category I foods. Next, Category II and III foods were presented in combination with Category I items. Two bites from Categories II and III (total of four bites) were presented individually with six Category I bites. When Category II and III bites were consumed at 100% for three consecutive sessions, Category IV foods were introduced. Category V foods were not introduced due to time constraints.

Probe sessions. Probe sessions were conducted prior to the introduction of food Categories II, III, and IV. Probes followed the same procedures as Food Assessment 1 and 2 and were not conducted on the same day as an intervention session.

Results

Food Consumption Assessments (Assessment Sessions 1–4)

During Assessments 1 and 2, Chris consumed rice bran crackers (Category I) on 100% and Rice Dream® (Category I) on 50% of the bites presented. Chris accepted an item from Category II (turkey hotdog); however, the item was not consumed. He rejected the food items from the remaining categories (Categories III–V). During Assessments 3 and 4, Chris accepted only Category I foods (rice bran crackers, 100%; Rice Dream, 50%), rejecting all other food items.

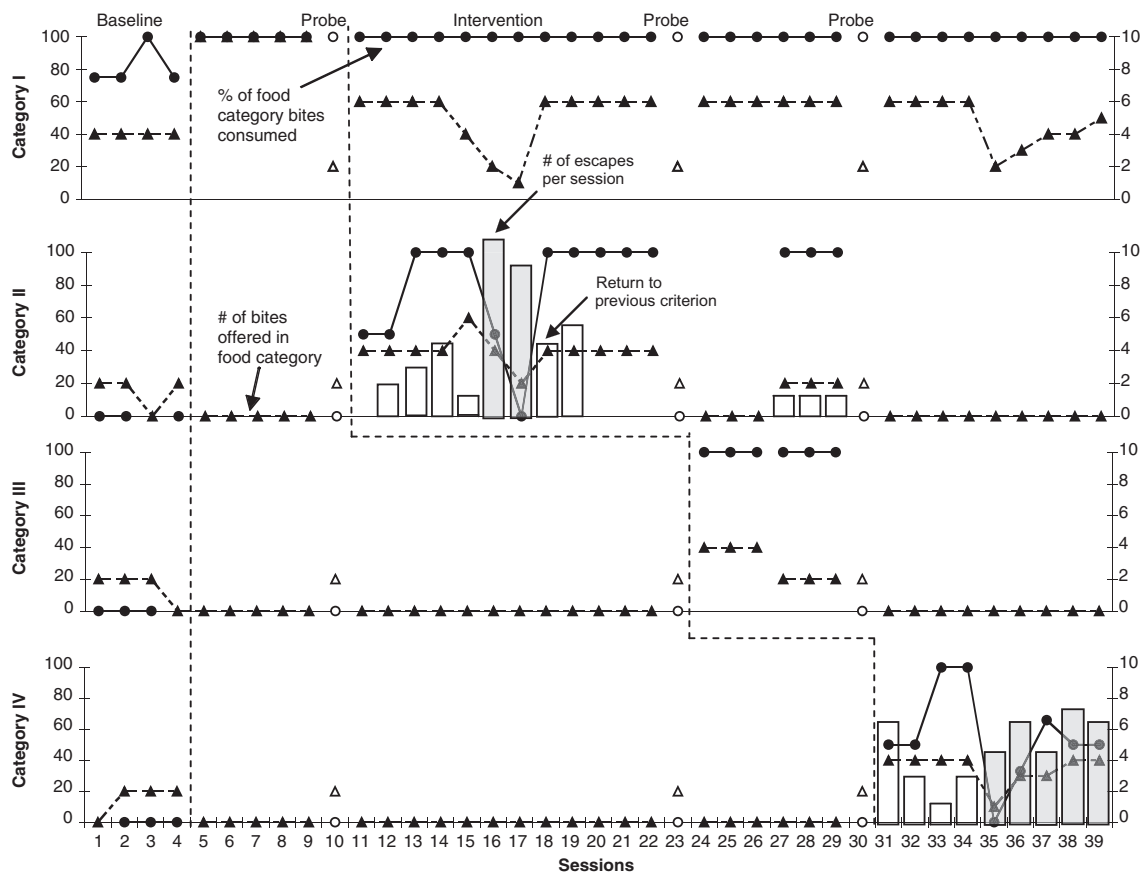
Baseline (Sessions 1–4) and Probes (Sessions 10, 23, and 30)

The percentage of bites consumed and the number of bites offered for baseline sessions are shown in Figure 1. Chris rejected food items from Categories II through V on 100% of the bites presented. During Baseline Sessions 1, 2, and 4, 75% of the Category I bites were consumed (three of four bites presented) in each session. Rice Dream was rejected during Sessions 1 and 4. During Session 3, Category I items were consumed on 100% of the bites presented. Rice Dream was eliminated from Category I foods for the remainder of the study, due to its being rejected in Sessions 1 and 4. Data recorded from each probe session (10, 23, 30) indicated 100% consumption of rice bran crackers (Category I) and zero items consumed from Categories II to IV.

Intervention (Sessions 5–9, 11–22, 24–29, and 31–39)

Food Category I (Sessions 5–9). Category I food was consumed on 100% of the bites presented (10 total bites) during Sessions 5 to 9 (Figure 1). However, during these sessions Chris would verbally refuse the bites in a playful manner (e.g., he laughed, smiled, and said, "no, no, no"). After verbal refusal, he would consume the bite. Planned ignoring was implemented while Chris engaged in these behaviors for Category I foods. For the entire study, Category I bites were consumed on 100% of the bites presented. The amount of Category I bites presented depended on the criterion of

Figure 1
Percentage of Bites Consumed, Number of Bites Presented, and Number of Escapes



Note: Shaded bars represent terminated sessions. Gagging did not occur at any time during the study.

bites presented per session (FR1, FR2) and if the session was terminated (15 min) before all the bites were offered.

Food Category II (Sessions 11–22 and 27–29). Category II foods were introduced at Session 11. In this session, levels increased from zero at baseline and Probe 1 (Session 10) to 50% of bites presented (two of four bites) during two consecutive intervention sessions (Sessions 11 and 12). The number of escapes remained at 0 for Session 11 and increased to 2 during Session 12; data on escapes are shown in Figure 1. During the following two sessions, consumed bites increased to 100% of bites presented (four bites) and escapes increased to 3 (Session 13) and 4 (Session 14). When criterion for Category II bites presented increased to six per session (second criterion), acceptance of these bites decreased. During the first session at the second criterion (Session 15), consumed bites remained at 100% and number of escapes decreased to 1. During Session 16, consumed bites decreased to 33% and the number of escapes

increased to 10. Session 17 bites decreased to zero and number of escapes decreased to 8. Sessions 16 and 17 were terminated after 15 min due to increase in escapes. Category II bite criterion was returned to four bites presented per session (first criterion) beginning with Session 18. Session 18 data demonstrate an increase to 100% of Category II bites consumed, and the number of escapes decreased to 4. High levels of Category II food consumption were maintained for five consecutive sessions (Sessions 18–22). Number of escapes was 5 for session 19 and decreased to 0 for Sessions 20 and 22. Session 21 had 1 escape recorded. During Session 27, two bites of Category II foods were reintroduced with Category III bites. Category II bites consumed remained at 100% for three consecutive sessions. Occurrences of escapes during Category II bites remained at 1 for three sessions.

Food Category III (Sessions 24–29). Category III foods were introduced during Session 24. Levels of consumption increased from 0% at baseline and Probe 2 (Session 23) to 100% of bites presented (four bites)

during three consecutive intervention sessions (Sessions 24–26). The number of escapes remained at zero. During the following three sessions (Sessions 27–29), two bites of Category II foods were reintroduced. Consumption of Category III bites remained at 100%. Occurrences of escapes during Category III bites remained at zero.

Food Category IV (Sessions 31–39). Category IV foods were introduced during Session 31. Levels of consumption increased from 0% at baseline and Probe 3 (Session 30) to 50% of bites presented (four bites) during two consecutive intervention sessions (Sessions 31 and 32). Number of escapes per bite increased to six during Session 31 and decreased to three during Session 32. During Session 33, consumed bites increased to 100% and escapes decreased to one for the session. During Session 34, consumed bites maintained at 100%; however, number of escapes returned to three for the session. During Session 35, Category III bites decreased to zero and escapes increased to four. The session was terminated at 15 min due to the increase in escapes. The remaining four sessions (Sessions 36–39) also were terminated at 15 min. Category IV bites increased to 33% of the bites presented during Session 36 and continued to increase, to 66%, during Session 37. Escapes increased to six during Session 36 and decreased to four during Session 37. During the final two sessions (38 and 39), 50% of the Category IV bites were consumed. Escapes increased to seven for Session 38 and decreased to six during Session 39. During Sessions 36 to 39, the same food item (apple) from Category IV foods was refused while the other food item (french fry) continued to be accepted when offered.

Food Category V. Category V food items were not introduced during the intervention due to time constraints.

Gagging. Gagging did not occur at any time during the study. If gagging had occurred, the food item would have been removed from the food list for the remainder of the study and replaced with another food item.

Parent Satisfaction (Social Validity)

After completion of the study, Chris' mother completed a social validity questionnaire adapted from the *Intervention Rating Profile–15* (Witt & Elliott, 1985). The adapted form consisted of six Likert scale questions that addressed whether the intervention was reasonable, effective, and appropriate for children with food selectivity. The mother used a 6-point scale (1 = *strongly disagree*; 6 = *strongly agree*) to rate study components

(e.g., food diary, postsession questionnaires) and her satisfaction with the intervention. The mother agreed (rating of 5) that the study made a positive difference in her child's eating habits and that the intervention seemed to benefit her child. She also agreed (rating of 5) that she would recommend the intervention to other parents and that it was appropriate for children with food selectivity. She strongly agreed (rating of 6) that the time involved to complete the paperwork was appropriate. The mother did not rate Question 5 (changes to study); however, she did recommend parent training following the intervention to promote generalization.

Discussion

This study is useful for expanding the literature on interventions for children with autism who have food selectivity in two ways. First, a therapeutic feeding intervention was implemented within the parameters of a GFCF diet. Second, using a specially designed treatment package (task direction, contingent reinforcement, physical prompts, and target food presentation), four new food items (GFCF pizza, GFCF waffle, apple, and french fries) were introduced, which increased the number of food items Chris consumed.

Escape data were variable across food categories. Escapes did not occur during the introduction of Category III foods. Although the food items were novel to Chris, they were similar to familiar food items (e.g., familiar item, pancake; new item, waffle). The similarity of the food items to familiar foods could be the reason for the lack of escapes when the new items were presented.

On the other hand, escapes occurred during a majority of the Category II and Category IV food sessions. No escapes were recorded during any of the baseline or probe sessions; however, when physical prompts were used for target food categories, escapes increased. The increase in escapes from baseline and probe conditions could have been due to the addition of contingencies for food refusal (e.g., physical prompts).

When Category I bite reinforcement was thinned from an FR1 to an FR2 schedule during presentation of Category II foods, escapes increased, resulting in termination of the session. Possibly the criterion for presentation of target bites was changed too quickly (e.g., first to second criterion). Two days may not have been enough time to shape Chris' food consumption of Category II foods. The increase in escapes also could have been due to beginning with a reinforcement schedule that was too rich. A variable ratio schedule might have increased and maintained a steeper rate of food consumption.

Initial escapes during Category IV foods could have been due to the new food items; however, escapes continued for the remaining sessions, resulting in five terminated sessions. During Category IV sessions, Chris was rejecting only one item (apple). These data suggest the reinforcer was not powerful enough to decrease escapes and increase food consumption of the apple. Chris had access to the reinforcer (Category I food item, rice bran cracker) throughout the day. Levin and Carr (2001) demonstrated that restricting access to preferred food items during the day tended to be more powerful in decreasing problem behavior and increasing food consumption than allowing children with access to the preferred food throughout the day.

Another explanation for Chris' rejection of the apple is that the Category I reinforcer was not a preferred food item. The rice bran cracker was selected based on 100% of consumption within a GFCF diet; however, Chris may have selected a different item if he had had access to a more extensive diet. A preferred item selected from unrestricted items might have been powerful enough to reinforce consumption of the apple.

Although the number of bites consumed from each food category increased from baseline sessions, probe data suggested the effects of the intervention were not maintained when the treatment procedures were not being used. Patel, Piazza, Martinez, Volkert, and Santana (2002) reported a similar lack of effects when only praise was used as the independent variable to increase food consumption during treatment. Food consumption remained at zero during the intervention phase until escape extinction (spoon to mouth) was added to their intervention.

A possible explanation for refusal during probes in the current study could be that a pattern of refusal was created as a result of the eight sessions (assessment and baseline) without consequences for food refusal. Chris demonstrated signs of a refusal pattern during the Category I phase of the intervention. He would say, "no, no, no" (a response similar to his response to unwanted food items during assessments and baseline), followed by "Chris, take a bite." He would repeat this at least two times before eating the rice bran cracker. It was easy for Chris to discriminate a probe session from an intervention session because during a probe session, the rejected food item was removed without physical prompts.

Limitations

One major limitation in this study is the single participant. Although the data are promising, results may not replicate with other children. Another limitation is

the use of a multielement treatment package (task direction, contingent reinforcement, target food presentation, and physical prompts). The combination of variables does not allow an identification of which component or components had the greatest effect on Chris' food consumption.

Another concern with the intervention was the lack of generalization data collected during typical meals. Chris' mother did report instances when Chris ate a french fry. However, there was no procedure to track changes in daily eating routines. Generalizing to mealtimes also could have been limited because the intervention sessions were organized similarly to therapy sessions (e.g., at the same table in the child's room). The bites were presented one at a time rather than presented as a meal at the dinner table.

A variable not controlled, which could have affected food consumption, was hunger. The sessions were implemented at least an hour before or after a meal. The parent reported that Chris occasionally had not eaten (or partially eaten) his lunch at school. The lack of lunch on these days could have increased the strength of the reinforcer.

Future Research

Research of children with autism who have food selectivity is limited. This study adds to the literature by demonstrating a manageable effective treatment package that could be implemented within the restrictions of a GFCF diet. One suggestion for future research is to examine different causes of food selectivity in children with autism (e.g., sensitivity to texture, problem behaviors at meal time, rigidity in types of food consumed, lack of meal time structure). Identifying specific types of food refusal would enable researchers to develop individualized interventions. Parent involvement in interventions for food selectivity also is limited in the literature (McCartney et al., 2005). Parent involvement is important in addressing the anxiety most parents feel when their child's eating habits are atypical. Parent involvement might assist the child in generalizing to family mealtimes.

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