THE EFFECTS OF CHOICE BETWEEN NONPREFERRED FOODS ON THE FOOD CONSUMPTION OF INDIVIDUALS WITH FOOD SELECTIVITY

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Previous research has concluded that presenting individuals with the opportunity to choose is a viable treatment for escape-maintained behavior. Considering that food refusal behavior has been generally described as avoidant behavior, the present study aimed to evaluate the role of choice between nonpreferred foods on the food consumption and problematic mealtime behavior of two children with food selectivity. Each participant was allowed to choose between four nonpreferred foods in the choice condition and was not allowed to choose in the no-choice condition. Further, the role of choice as an antecedent manipulation in mediating extinction-induced responding was evaluated when choice alone was demonstrated to be ineffective in increasing consumption and a nonremoval of the spoon procedure was introduced. Results indicated that providing choices was effective in increasing the food consumption of one participant and was advantageous in decreasing emotional responding when a nonremoval of the spoon procedure was introduced for the second participant. Copyright © 2015 John Wiley & Sons, Ltd.

Food selectivity is a problem commonly observed in children with autism spectrum disorder and can involve selectivity by type, texture, presentation, or brand (Ahearn, Castine, Nault, & Green, 2001; Hoch et al., 2001). Some researchers have conceptualized food selectivity as a form of noncompliance in which the child refuses and escapes eating a sufficient variety of foods (Dawson et al., 2003). Thus, interventions including a nonremoval of the spoon (NRS) component are thought to be effective because the escape contingency between refusal behavior and removal of the demand to eat is terminated (Tarbox, Schiff, & Najdowski, 2010) making extinction of escape one of the likely mechanisms responsible for the effectiveness of the NRS procedure (Piazza, Patel, Gulotta, Sevin, & Layer, 2003). Although NRS is considered an empirically validated treatment for food selectivity, as with any escape

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extinction procedure, a number of negative side effects may result (Lerman & Iwata, 1996) and thus deter caregivers from attempting to implement or wanting to implement such a procedure (Penrod, Wallace, Reagon, Betz, & Higbee, 2010). Therefore, antecedent manipulations have been suggested as useful treatment components because of such procedures reducing problem behavior induced by consequence-based interventions (e.g., Babbitt, Shore, Smith, Williams, & Coe, 2001).

Although several antecedent manipulations have been found to be effective in increasing food consumption, other techniques that have shown promise with different topographies of aberrant behavior (e.g., noncompliance to complete academic tasks) have received little attention in the feeding literature, notably providing choices. Providing choices to individuals with disabilities has been encouraged as a means to develop independence in the community at large (Fisher, Thompson, Piazza, Crosland, & Gotjen, 1997). A number of investigations have shown that allowing individuals to make choices between tasks or reinforcing consequences can be an effective technique in both decreasing maladaptive behavior and increasing compliance with instructions (Powell & Nelson, 1997; Romaniuk et al., 2002).

Despite ample research on the effectiveness of providing choices when addressing escape-maintained problem behavior, few studies within the literature on feeding disorders have evaluated the effects of providing choices on the food consumption and mealtime problem behavior of individuals with food selectivity. In one such study, Cooper et al. (1995) implemented different multi-component treatment packages for four children with various feeding problems and identified which components were critical in the ongoing maintenance of food acceptance by conducting post-treatment component analyses. Treatment packages consisted of a combination of several of the following components: a warm-up period; choice between foods; contingent attention, toys, and/or preferred edibles; noncontingent toys and attention; and/or escape extinction. Overall, results of the study indicated that each treatment package was effective in increasing food consumption across all participants. Moreover, the authors were able to identify critical components within the treatment packages responsible for the maintenance of food consumption for each participant by systematically removing components that appeared to be unnecessary or resource intensive. However, because of the withdrawal design, the authors were not able to make any claims as to which components were necessary for the initial increase in food consumption. For example, for one participant, they determined that a choice component was not necessary for the maintenance of food consumption; however, it is possible that the choice component was necessary for the initial increase in acceptance and/or consumption of nonpreferred foods. In addition, the authors did not report on the mealtime problem behavior of the two participants for whom providing choices was a component within their prescribed treatment packages. It may be possible that several of the treatment components that were determined to be
unnecessary in the maintenance of food consumption may have helped in keeping maladaptive behavior at low levels while the intervention took place, making those components critical in the overall efficacy and acceptability of those treatment packages.

Thus, given the previous research on the advantageous effects of providing choices on noncompliance to demands and escape-maintained behavior, the purpose of this study was to evaluate the effects of choice between nonpreferred foods on the food consumption and problematic mealtime behavior displayed by individuals with food selectivity. Further, this study aimed to assess the role of choice as an antecedent manipulation in mediating the potential negative side effects induced by NRS.

**METHOD**

**Participants**

Participants were Kyle, a 7-year-old boy, and Ava, a 6-year-old girl, both diagnosed with an autism spectrum disorder. Both participants were highly selective and actively refused novel foods when presented. Prior to the study, Kyle’s diet consisted mainly of corn, white rice, chicken nuggets, pizza, hamburgers with cheese and no bun, carrots, French toast, hot dogs without the bun, cereal, fruit snacks, and sausage links. Ava consumed cereal, one brand of yogurt, Cheetos, one brand of fruit snacks, chocolate milk, French fries, and pancakes with various hidden items in the batter (e.g., apple sauce and banana). In addition, Ava was reported to be eating the same meal every day throughout the course of the study as her guardian stopped presenting a variety of foods during meals. So, although she was reported to eat a variety of different foods, Ava’s actual diet mainly consisted of pancakes, fruit snacks, and chocolate milk. Kyle and Ava were both able to self-feed and follow complex instructions including vocally repeating instructions back to the experimenter and verbally indicating a choice given an array of different stimuli.

**Measurement of the Dependent Variable**

Data were collected for Kyle and Ava via observation of video recordings. Dependent measures were frequency of accepted bites, defined as the nonpreferred bite of food passing the plane of the participant’s lips; frequency of mouth clean, defined as no food remaining in the participant’s mouth after it had been accepted; and frequency of expulsions, defined as any piece of food passing back through the plane of the lips after it had been accepted. Further, the percentage of sessions with other problem behavior, defined as negative vocalizations about the food, crying with
and without tears, whining, and screaming, was measured for Ava by recording whether problem behavior occurred on a second-by-second basis for the entire duration of the meal. Because of the episodic nature of these topographies coupled with the likelihood they co-occurred with one another (i.e., tantrums), a duration measure was chosen as a better representation of overall problem behavior than frequency for Ava’s particular refusal behavior.

Interobserver Agreement and Treatment Integrity

A second observer independently collected data, and interobserver agreement was calculated for accepts, mouth clean, expulsions, and whether the participant indicated a choice defined as the participant verbally indicating which items she or he wanted to remain on the plate. Interobserver agreement was calculated for 72% of sessions for Kyle and 58% of sessions for Ava on a trial-by-trial basis for all measures, by dividing the number of agreements by the number of agreements plus disagreements and converting the ratio to a percentage. Agreements were defined as both observers indicating the occurrence of a behavior during the same trial (or interval for problem behavior). A disagreement occurred when only one of the two observers recorded the behavior in a corresponding trial or interval. Agreement for accepts, mouth clean, expulsions, and indicating a choice was 100% for both Kyle’s and Ava’s sessions. Data were also collected on the prompt level at which a bite was consumed, session duration, and duration of problem behavior for 58% of sessions during Ava’s final phase; interobserver agreement for these measures was 98% (range: 87–100%), 100%, and 97% (range: 92–100%), respectively.

Treatment integrity for delivering instructions defined as making a statement to signal the start of the meal (e.g., ‘Here’s your snack’), allowing escape (baseline only; absence of prompting in any form to consume the food), presentation of bites (i.e., correct implementation of allowing choice or no choice), and prompting within the NRS condition (i.e., following the prompt sequence in order of verbal, gesture, and NRS) was evaluated for 73% of sessions for Kyle and 87% of sessions for Ava. Treatment integrity was 100% across all sessions that were evaluated. Further, two observers independently collected interobserver agreement on treatment integrity measures for 82% and 99% of Kyle’s and Ava’s respective sessions. Using the agreement method described previously, interobserver agreement for treatment integrity measures was 100% across both participants.

Experimental Design

Treatment components were introduced in a sequential fashion and evaluated using a multi-element design with an initial baseline phase (Penrod, Gardella, &
Fernand, 2012). Three food sets with four different foods in each set were associated with separate contingencies (i.e., two as continuous baselines and the other being associated with the treatment condition). For Ava, when choice alone had no effect on food consumption, NRS was applied to one of the continuous baseline conditions and was added to the treatment condition such that NRS alone could be evaluated against NRS plus a choice component (described later). To further enhance discrimination between the conditions associated with each of the three food sets, three different therapists were also associated with a specific condition.

Assessments

Paired-choice Preference Assessments

Two pretreatment paired-choice preference assessments and two corresponding post-treatment paired-choice preference assessments were conducted for each participant following procedures described by Fisher et al. (1992), including a mixture of preferred and nonpreferred items identified by caregiver report. Foods that were never consumed during any of the preference assessment trials (pretreatment) were randomly assigned across each of the three food sets such that each contained roughly an equal number of foods from various food groups (e.g., one fruit, one vegetable, one starch, and one protein). Kyle’s first set of baseline foods, second set of baseline foods, and treatment set included raspberries, strawberries, tomatoes, and beans; pears, kiwis, bell peppers, and yams; and plums, peaches, broccoli, and ravioli, respectively. As for Ava, her continuous baseline foods, baseline for change (in which an NRS procedure was added later in the study), and the treatment set included apples (changed to strawberries on session 15), broccoli, turkey, and mashed potatoes; grapes, beans, hot dog, and macaroni and cheese; and oranges, carrots, chicken nuggets, and peanut butter and jelly sandwich, respectively.

PROCEDURE

Baseline

During the baseline phase, each food set associated with a different experimenter was alternated to demonstrate that no food-specific or experimenter-specific effects were present. During the beginning of baseline sessions, the experimenter showed the participant all four foods for the set that corresponded with that experimenter. Following the presentation of all four foods, the experimenter chose eight bites of food (i.e., four bites of two different nonpreferred foods) according to a prescription sheet that randomized the order in which foods were presented, and the experimenter
transferred those bites to the participant’s plate. The experimenter then removed the two foods that were not selected for that session and instructed the participant to eat their meal. The experimenter presented each food a minimum of one time during baseline such that the participant had an opportunity to consume each of the four foods across all three sets. During all experimental conditions, consumption of food did not result in differential consequences (e.g., praise, preferred food, or leisure items). However, the experimenters engaged in conversation that was unrelated to food throughout all sessions (e.g., ‘What are you going to do today?’ and ‘I like the shirt you are wearing’). The experimenter terminated the session after the participant consumed the entire meal (all eight bites) or after 10 min had elapsed, whichever came first.

**Choice 1**

In this condition, a choice component was implemented with one food set, while the other two food sets continued to be presented following the baseline procedures previously described. This condition was identical to baseline, with the exception that the participant was asked to choose two foods she or he would like among the four that were presented. If the participant did not choose within 10 s, then the experimenter gave a verbal prompt to select two foods, or the experimenter would choose instead. If the participant did not make a choice within an additional 10 s, then the experimenter chose two foods and removed the remaining two. Just as in the baseline condition, the experimenter would then systematically choose the two foods to be removed if a forced choice needed to be implemented. However, it should be noted that a forced choice did not have to be implemented for either participant throughout the course of the study.

**Choice 2**

If the choice component described earlier was ineffective in increasing food consumption, then the choice array was manipulated in an effort to increase the motivation to choose. During each session, the experimenter replaced one of the nonpreferred foods with a more preferred food (foods selected more than 0% of opportunities during pretreatment preference assessments). In this condition, a nonpreferred food was rotated out and replaced by the more preferred food but was rotated back into the array during the next session such that each nonpreferred food was missing from the array only once every four sessions. Once again, if no choice was made within 10 s, then the experimenter would go through the same forced-choice procedure previously described. All other procedures were identical to the baseline condition.
Choice 1+Nonremoval of the Spoon Versus Nonremoval of the Spoon

Choice 1 + Nonremoval of the Spoon

During this condition, the experimenter presented all four nonpreferred foods and prompted the participant to select two foods just as in the choice 1 condition. The Choice 1 component was continued in the final phase as opposed to the Choice 2 component, in which a nonpreferred food was substituted by a preferred food, so that the preference for foods was held constant across all conditions in the current phase and the only variable that differed was the choice component; this isolated the effects of choice as a mediating variable when implemented in conjunction with NRS. After the participant selected two foods, the experimenter removed the two foods not selected and instructed the participant to eat her meal. If the participant did not self-feed a bite within 5 s of the instruction being delivered, then a vocal prompt was issued (‘Take a bite’) followed by a gestural prompt (the experimenter pointed toward the food) and then NRS, with 5 s between each prompt. During NRS, the experimenter held the spoon within approximately 2.3 cm of the participant’s lips and inserted the bite when the participant opened her mouth.

It should be noted that prior to NRS being implemented, the participant was given approximately 15 s to self-feed a bite; if the participant did not initiate self feeding by picking up a bite with her hands or a utensil within 5 s following the gestural prompt, then NRS was implemented, and the bite was then experimenter fed. The experimenter terminated the session when the participant consumed all eight bites or following the first consumed bite after 30 min had elapsed, whichever occurred first.

Nonremoval of the Spoon

This condition was the same as the Choice 1 + NRS condition with the exception that the participant was not offered a choice between nonpreferred foods; instead, the experimenter systematically chose two foods just as in the baseline condition.

RESULTS

Treatment

The frequency of nonpreferred bites consumed for Kyle (top panel) and Ava (bottom panel) is shown in Figure 1. During baseline, Kyle did not consume any nonpreferred foods. When the choice component was implemented with one food set, Kyle chose and consumed all eight bites in that condition with the exception of the first session. During this phase, refusal of all other nonpreferred foods from the continuous baseline conditions
persisted, and Kyle did not start consuming from the other food sets until the choice component was implemented across all three sets. In the final phase when Kyle was allowed to choose from the foods within each set, consumption became variable; however, this still marked an increase in consumption relative to each set’s respective baseline.

Ava did not consume any nonpreferred bites during baseline or the choice treatment phases. However, during one continuous baseline session during the first
treatment phase (Choice 1), Ava started consuming apple. It was reported by her caregiver that she was given apple the previous night and under similar procedures to the choice condition. Following that session, apple was discontinued and replaced with strawberry, an alternate nonpreferred fruit from the preference assessment, under the assurance that the caregiver would not continue to intervene with the current treatment foods. Consumption remained at zero during the Choice 1 phase after the replacement of apple with strawberry. When the experimenter implemented the Choice 2 procedure, Ava selected and consumed the preferred food (not depicted in the graph); however, the change in preference within the array did not have an effect on her consumption of nonpreferred foods. In the Choice 1+NRS versus NRS-alone phase, Ava consumed all eight bites of nonpreferred food in both conditions. During this phase, her consumption during the continuous baseline sessions remained at zero. It was not until the experimenter trained the caregiver to implement the treatment package (i.e., Choice 1+NRS) with the final food set did Ava start consuming the nonpreferred foods in that set.

A more detailed analysis of Ava’s final phase is depicted in Figures 2 and 3. Specifically, Figure 2 shows the total duration of problem behavior during each session of the final phase (i.e., Sessions 37–48). Although both the NRS-alone condition and the Choice 1+NRS condition are differentiated from the continuous baseline condition, Ava demonstrated the largest extinction burst within the NRS-alone condition and emitted lower levels of problem behavior during the Choice 1+NRS condition in comparison. When comparing the Choice 1+NRS and continuous baseline conditions, Ava emitted less problem behavior within the baseline condition in which the nonpreferred foods were not required to be consumed. Given the duration of sessions varied across the three conditions in the last phase, we also looked at the percentage of each session with problem behavior in order to determine if the increase in problem behavior observed in the NRS-alone condition was proportionally different from the other conditions and not simply a function of having more time in which to engage in problem behavior. Figure 3 represents the percentage of each session with problem behavior during Ava’s last phase, of which a similar analysis can be made. The percentage of sessions Ava engaged in problem behavior during the continuous baseline condition remained low throughout the evaluation and served as a control for which the other two conditions were compared. During the NRS-alone condition, initially, the sessions lasted longer than the other conditions with the longest session taking approximately 25 min; these sessions were accompanied by almost continuous emission of problem behavior. The level of problem behavior depicted as a percentage of session during the Choice 1+NRS condition was elevated above the continuous baseline sessions yet below the NRS condition.
Percentage of trials with consumption during the pretreatment and post-treatment paired-choice preference assessments is portrayed in Figures 4 and 5. When comparing responding across both preference assessments for each participant, Kyle (Figure 4) demonstrated an increase in preference for five previously nonpreferred foods, and Ava (Figure 5) indicated an increase in preference for 13 previously nonpreferred foods. Also, when comparing preference before and after treatments, on a few occasions during the post-treatment assessments, both participants selected previously nonpreferred items as often or more frequently than previously preferred items (e.g., comparison of Kyle’s selection of rice and pear in the top panel).
DISCUSSION

Previous research has suggested that utilizing antecedent manipulations within a feeding context, especially when combined with consequence-based interventions, may be an effective way to reduce problem behavior (Babbitt et al., 2001). Furthermore, the use of choice as an antecedent manipulation has been widely researched mostly in contexts unrelated to feeding disorders and has been recommended as an effective intervention for decreasing behavior maintained by social-negative reinforcement (Romaniuk et al., 2002). Based on the previous research in these areas, we thought it plausible that offering a choice between nonpreferred foods not only would be a practical application but also would be effective in decreasing problem behavior when consequence interventions (e.g., NRS) are needed. Data obtained from both participants support this in that one participant, Kyle, consumed nonpreferred foods in the absence of any programmed consequences and the other, Ava, showed decreased levels of problem behavior when choice was implemented in conjunction with NRS as compared with when NRS was implemented alone.

As previously mentioned, although increased consumption for Kyle was demonstrated to be functionally related to the intervention for the first set of foods, a replication was not observed with the introduction of treatment for the second and third food sets. Kyle’s variability in the final phase could be due to a multitude of factors including differences in preferences between nonpreferred foods. Anecdotally, both participants were more likely to choose certain foods over others throughout the study; thus, it is possible that foods selected more frequently were more preferred than those that were unlikely to be selected. Even though all foods included in the study were foods selected 0% of opportunities during the pretreatment preference assessments, it is possible that participants had differential preferences between the nonpreferred foods that were not identified with the response measure we selected (consumption). Future studies may want to determine if other measures such as an approach response, levels of problem behavior with food items, or even verbal ranking could determine relative preferences between nonpreferred foods. These dependent measures may help to identify foods that the individual would be more successful with when introduced within a feeding intervention.

Other possible explanations for the variability observed in Kyle’s last treatment phase are different histories between food sets (continuous baselines having a longer history with refusal producing reinforcement) and hunger (we had no control as to what parents were feeding participants prior and following sessions despite providing parents with rules about when best to do so). Although the strength of the effect was not replicated with the second and third food sets, an increase in consumption relative to each set’s baseline was still observed. Whereas it was our intention to incorporate a reinforcement-based intervention to obtain increased stability in responding, Kyle’s
parents opted to end the evaluation at that point, expressing that they were extremely satisfied with his progress, suggesting that even the increased variability/likelihood of consumption was a good clinical outcome for the family.

Overall, results of this study indicate that providing a choice may be an effective means to increase the consumption of nonpreferred foods in the absence of NRS as well as decrease problem behavior evoked by consequence-based interventions (i.e., NRS) when necessary to introduce. Thus, clinicians should be encouraged to utilize protocols that incorporate antecedent-based procedures as well as monitor the effectiveness of these variables within ongoing treatments for food selectivity.

A limitation of the current study, as previously mentioned, is that consumption was used as a measure of preference for foods reported to be nonpreferred. Because none of these foods were ever consumed during the initial preference assessments, we cannot be sure if the foods included in the study were equally nonpreferred. Some of the
foods may have been more disliked than others, and this may have influenced results of the study. Future research should ensure that target foods are of equal preference by selecting measures that are more likely to provide information on relative distaste for foods reported to be nonpreferred.

A second limitation is that session duration was not held constant during the final phase of the study for Ava. Consumption increased in both the NRS-alone condition and the Choice 1 + NRS condition relative to the continuous baseline condition; however, it is important to note that the continuous baseline condition continued to be 10 min in duration while the duration of sessions in the two treatment conditions increased (up to 25 min). Although unlikely, it is possible that consumption increased simply as a function of having more time with the foods included in the NRS and Choice 1 + NRS conditions. Future research should control for this by holding session duration constant across experimental conditions.

Figure 5. Percentage of trials with consumption for Ava. The top panel depicts data from Ava’s nine-item pretreatment and post-treatment paired-choice preference assessments, and the bottom panel depicts data from her 10-item assessment.
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