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Behav Modif 2009; 33; 537 originally published online Aug 12, 2009; DOI: 10.1177/0145445509341457

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Using Descriptive Assessment in the Treatment of Bite Acceptance and Food Refusal

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The feeding behaviors of two children who maintained failure to thrive diagnoses and displayed food refusal are assessed in their homes. Descriptive assessments are used to identify schedules of consequence provided by each child’s care providers for bite acceptance and food refusal behaviors. Assessments reveal rich schedules of praise and access to social interaction and preferred activities for bite acceptance and escape for food refusal. These schedule arrangements result in hypotheses that modifications to the schedule of praise and access to social interaction and preferred activities for bite acceptance would result in little to no effect and that modifications to the schedule of escape for food refusal would be necessary for treatment success. Successful interventions are subsequently implemented by manipulating the existing schedules of escape for food refusal by each child’s care providers. Implications for the use of descriptive assessments for feeding problems are discussed.

**Keywords:** descriptive assessment; failure to thrive; feeding disorder; schedules of reinforcement

**Authors’ Note:** This research was supported in part by a grant from The Pennsylvania State University, Great Valley Campus, Summer Research Stipend. Address correspondence to Sean D. Casey, The Pennsylvania State University, 30 East Swedesford Road, Malvern, PA; e-mail: Sdc14@psu.edu.
The research base for treatment of children with feeding disorders ranges from treatments that focus on antecedent manipulations (e.g., Ahearn, 2003; Johnson & Babbitt, 1993; Kerwin, Ahearn, Eicher, & Burd, 1995; Luiselli, 2000) to consequence manipulations. However, most of the research in the treatment of food refusal has largely shown that (a) procedures designed to address negative reinforcement (e.g., nonremoval of the food presented) are often vital for treatment success (Cooper et al., 1995; Reed et al., 2004), and (b) with few exceptions (e.g., Casey, Cooper-Brown, Wacker, & Rankin, 2006; Wilder, Normand, & Atwell, 2005), positive reinforcement strategies alone often are insufficient to adequately reduce food refusal and increase bite acceptance. Given these findings, most feeding cases reported in the literature have not included pretreatment assessment procedures beyond that of establishing baseline levels of bite acceptance, food refusal, and/or problem behavior subsequent to the implementation of escape extinction (EE) procedures with and without augmentative procedures (Hillman, 2006).

Escape extinction appears to be the major component in the treatment of food refusal, presumably because food refusal is maintained by negative reinforcement (Hillman, 2006; Ledford & Gast, 2006). Often, positive reinforcement strategies for bite acceptance are combined with EE procedures for food refusal, with one procedure serving as an augmentative procedure for the other (e.g., Cooper et al., 1995; Najdowski, Wallace, Doney, & Ghezzi, 2003; Patel, Piazza, Martinez, Volkert, & Santana, 2002). However, in studies where these procedures have been compared in isolation, positive reinforcement strategies for bite acceptance have often been found to be ineffective relative to EE procedures for food refusal (e.g., Cooper et al., 1999; Dawson, Piazza, Sevin, Gulotta, Lerman, & Kelly, 2003; Hoch, Babbitt, Coe, Krell, & Hackbert, 1994; Hoch et al., 2001; Najdowski et al., 2003; Patel et al., 2002; Piazza, Patel, Gulotta, Sevin, & Layer, 2003). One potential reason for the combination of EE with positive reinforcement strategies is that treatment success may be enhanced with the addition of positive reinforcement strategies (e.g., Reed et al., 2004; Piazza, Patel et al.). A second rationale may be that addition of positive reinforcement procedures can help to mitigate the potential negative side effects associated with EE procedures (Hoch et al., 1994). A third reason may simply be to increase the social acceptability of the procedures to care providers. As mentioned, EE can be associated with several potential negative side effects that may result in some difficulty with its application and undermine the ability or willingness of some care providers to implement this procedure. For instance, it is not uncommon for problem behaviors
during meals to increase in frequency or intensity with the use of EE (Linscheid, 2006). Also, use of EE also can significantly increase the duration of meals, which may also contribute to low acceptability among care providers. As a result, for some care providers, EE may be considered a less preferred treatment option, especially if positive reinforcement procedures alone can be effective. Taken as a whole, pretreatment assessments that can effectively identify conditions under which positive reinforcement procedures produce positive results in the absence of EE represent a significant area of needed research.

Systematic pretreatment assessments of food refusal have been a focus of recent research (Ahearn, Castine, Nault, & Green, 2001; Kuhn & Matson, 2004; Najdowski et al., 2003). For instance, functional analyses of mealtime behaviors were demonstrated by Piazza, Fisher et al. (2003). In this application of functional analysis, the antecedent during every condition was described as the presentation of the spoon with food at 30-second intervals rotating randomly among four food groups. However, when inappropriate mealtime behaviors occurred (e.g., food refusal, negative vocalizations), programmed consequences similar to those in traditional functional analyses followed (i.e., escape from bite presentations, brief attention, tangibles). The prevailing hypothesis in a functional analysis of inappropriate mealtime behaviors, like that in traditional functional analyses, is that conditions associated with relatively higher rates of target behavior would be considered indicative of the variable(s) maintaining problem behavior (i.e., food refusal).

Of note in the Piazza, Fisher, et al. (2003) study is that functional analyses were conducted with therapists, not the primary caregivers. The functional relationships between child behaviors and consequences provided by primary care providers relative to therapists can be very different (e.g., McAdam, DiCesare, Murphy, & Marshall, 2004). Although not the primary focus of their study, Piazza, Fisher, et al. conducted pretreatment descriptive assessments prior to conducting functional analyses of inappropriate mealtime behaviors. Researchers observed the mealtime interactions of each parent and child dyad under natural contingencies (i.e., parents were instructed to feed their child as they would normally). These observations revealed that parents used a variety of consequences (e.g., reprimands, coaxing, withdrawing food, offering preferred items) in response to their child’s inappropriate mealtime behaviors (i.e., refusal, tantrums). Results of descriptive assessments matched functional analysis outcomes exactly for three of six participants, and partially for a fourth, with no differentiation occurring in the functional analyses for the two remaining participants.
Thus, the descriptive assessment methodology advanced by Piazza, Fisher, et al. showed some promise as a potential means for understanding and evaluating specific care provider–implemented antecedents and consequences for food refusal during meals; however, this methodology remains relatively understudied.

Descriptive assessments have been used in a number of investigations to assess the relationship between care provider behavior and a variety of other behavior problems (e.g., Lalli, Browder, Mace, & Brown, 1993; Lerman & Iwata, 1993; Mace & Lalli, 1991; Sloman et al., 2005; Vollmer, Borrero, Wright, Van Camp, & Lalli, 2001). Pretreatment descriptive assessments may be useful for the treatment of food refusal in at least two ways. First, pretreatment descriptive assessments may provide unique information that may be used in the design of more specific experimental analyses of food refusal (e.g., Casey et al., 2006; Piazza, Fisher, et al., 2003). Second, pretreatment descriptive assessments may be useful because they allow clinicians to identify existing mealtime contingencies and potential reinforcement schedules, which in turn may help to identify which caregiver behaviors to target for effective intervention. More specifically, descriptive analyses can assist in identification of specific care provider behaviors that may need to be strengthened or increased (e.g., positive interaction, descriptive praise, contingent access to preferred food items) as well as those that need to be eliminated or suppressed (e.g., use of reprimands, permitting escape/avoidance, coaxing, distraction, etc.). Armed with such information, clinicians might be able to systematically alter mealtime contingencies and consequence schedules not only for food refusal but also for bite acceptance that may ultimately lead to covariation between these behaviors. Clinicians might also be better able to predict when EE will be needed for successful intervention. For example, Casey et al. conducted a descriptive assessment of the mealtime behaviors exhibited by a child with feeding problems. Data from the descriptive assessment revealed that the child’s appropriate feeding behaviors (i.e., bite acceptance, self-feeding) were on a lean schedule of praise and social interaction (VR 30) and that the child’s refusal behaviors (e.g., nonacceptance, expulsions) frequently resulted in escape from bite presentations (VR 2). These results suggested that enriching the schedule of praise and social interaction for bite acceptance might be an effective treatment strategy, given the scarcity of existing reinforcement for positive mealtime behaviors. Subsequent manipulations to the existing schedules of praise and social interaction for bite acceptance supported this hypothesis (i.e., bite acceptance increased).

Results of Casey et al. (2006) presented a rare case in which positive reinforcement manipulations alone affected mealtime behavior changes,
begging the question how might descriptive assessments be used to help prescribe a course of action for other schedule results? Table 1 provides three examples of how descriptive assessment information might be used to serve this purpose. In each case a descriptive assessment could be used to determine existing reinforcement schedules for the two main behaviors targeted in most feeding research: bite acceptance and food refusal. This information would appear to be useful for treatment development and, more importantly, may provide a paradigm for predicting the outcomes of various treatment options (e.g., EE, differential reinforcement).

Thus, the primary purpose of the current investigation was to replicate the methods used by Casey et al. (2006) to further evaluate the utility of descriptive assessments for prescribing treatment recommendations for children (and their parents) who demonstrate feeding difficulties with different schedule arrangements. More specifically, can the use of EE be avoided when the schedules of consequence for bite acceptance and food refusal were similarly rich (Child 2 from the Table 1)?

### Method

#### Participants and Setting

Two children and their primary care providers participated in this investigation. Both participants demonstrated inadequate caloric intake that resulted in the diagnosis of failure to thrive (FTT). Prior to participation in this study, all medical and physiological explanations for inadequate growth had been eliminated.
Nina was a 35-month-old child. She resided at home with her mother and maternal grandmother. Nina’s mother was an emigrant from Pakistan and spoke to Nina in both English and Urdu. Nina’s mother reported that Nina had not accepted solid food since her first birthday and that attempts to offer Nina food often resulted in food refusal, including pushing away offered food, turning away, and tantruming. Nina received 100% of her caloric needs via daytime gastric tube (G-tube; tube that attached directly to the stomach) feedings. Nina’s mother was the primary care provider during this investigation. Nina’s mother was present for all meals; however, she only conducted meals during baseline, the initial treatment evaluation, parent training, and the follow-up phases of this investigation.

Sandy was a 10-month-old child diagnosed with FTT and other medical conditions. Attempts to offer food items frequently resulted in food refusal, including blocking her mouth and turning her head away. Sandy received 100% of her caloric needs via overnight nasogastric (NG; tube that was placed in her right nostril, passed through the esophagus and into her stomach) feedings. Her maternal grandmother and father were the primary care providers and conducted all meals at home with the exception of two meals conducted by staff at her daycare setting during follow-up.

All meals were conducted in the participant’s homes. For Nina, meals initially commenced by having her sit on a couch in the kitchen/living room area. Nina’s care providers permitted her to roam between the kitchen/living room and the bedroom area during meals, which typically ended in the bedroom area, the only air-conditioned room. Both rooms contained a television; however, the television in the bedroom was also equipped with a VCR and this room also contained various toys. Starting with the eighth meal, Nina was seated in a high chair equipped with a strap and a tray in the bedroom. During Sandy’s meals, she was seated in a car seat that also functioned as a highchair. The car seat was strapped to a wooden chair in the kitchen (and on two occasions in the living room during baseline) next to a table covered with various toys (and a television with children’s video’s when meals were conducted in the living room) that were all out of her reach. Both participants were served age-appropriate food items (Gerber® Stage 1 (pureed) and 2 baby food (strained) for Sandy and solid foods broken into bite-sized pieces for Nina).

Response Definitions and Data Collection

All meals were videotaped. Data for child and care provider behaviors were collected using event recording utilizing a pencil-and-paper recording.
system (Cooper et al., 1995, 1999). For child behaviors, bite acceptance and refusal were collected. Bite acceptance was operationally defined as the receipt of a bite of food into the mouth either independently or when fed by an adult. Nina, however, was able to self-feed; therefore, a distinction for Nina was made between self-fed bites (independent bite acceptance) and fed bites (fed bite acceptance) by her mother or a therapist. Therefore, for Nina, bite acceptance depicted in the graphs is the sum of independent bite acceptance and fed bite acceptance. Refusal was operationally defined as turning the head away from a bite, pushing away the spoon, blocking the mouth with hands or a toy when a bite was offered within 1 inch of the mouth, and expelling a previously accepted bite.

It should be noted that bite acceptance and refusal were not mutually exclusive. It was possible that the initial offer of a food item was refused (e.g., head turn), but the care provider persisted and the child subsequently accepted the bite. In such cases, both a bite acceptance and a refusal were scored. Conversely, if the initial offer of a food item was refused but the care providers permitted escape (defined below), a refusal was scored as was an escape (once the care provider abandoned offering the presented bite of food). As a third example, if the initial offer of a food item was accepted by the child, then expelled and ultimately escaped (i.e., care provider did not replace the bite) then the bite was scored as accepted, followed by a refusal (i.e., for the expulsion) and then an escape. Bite acceptance associated with escape was not counted in bite acceptance totals (e.g., 30 bite acceptances with 10 of those associated with escape equaled 20 total bites accepted; 20 bites would be depicted in the graphs). Bite acceptance is depicted as a frequency measure. Bite offers associated with food refusal are depicted as the percentage of food presentations (fed or independent) associated with refusal (e.g., 30 bite acceptances with 15 bite offers associated with food refusal equals 50% of bites offered associated with food refusal (i.e., 15 divided by 30).

During the descriptive assessment, praise and social interaction and escape were the most common immediate consequences for bite acceptance and refusal, respectively. Praise and social interaction was operationally defined as the care provider delivering positive statements of encouragement (e.g., “good job taking that bite,” “that was a good one”). Escape was operationally defined as the care provider removing the bite presentation, presenting a different type of food, or terminating the meal following a refusal. Therefore, schedules of consequence were determined for the occurrence of these behaviors in relation to bite acceptance and refusal for the participants.
Interobserver Agreement

Interobserver agreement was scored by having a second observer (i.e., a combination of the first or second authors with any of the remaining authors) simultaneously, but independently, record the target behaviors during meals. Occurrence agreement for each target behavior was calculated on a point-by-point basis by respectively dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%. Occurrence agreement was calculated in a similar way for refusals. Interobserver agreement was scored during 39% and 33% of meals for Nina and Sandy, respectively, equally distributed across phases. For Nina, occurrence agreement for bite acceptance averaged 97% (range, 86%-100%) and for refusals averaged 96% (range, 80%-100%). For Sandy, occurrence agreement for bite acceptance averaged 97% (range, 75%-100%) and for refusals averaged 98% (range, 75%-100%).

Experimental Design

The initial baseline phase consisted of a descriptive assessment (Casey et al., 2006; Lalli & Goh, 1993; Mace & Lalli, 1991; Vollmer et al., 2001) that was used to identify the schedules of consequence to target for change during the initial treatment phase. A reversal design was implemented to assess the relative effectiveness of the manipulation of two schedules: (1) praise and social interaction for bite acceptance on a FR 1 schedule while maintaining baseline schedules of escape for refusal, and (2) praise and social interaction for bite acceptance on a FR 1 schedule plus EE for refusal. For Nina, parent training was conducted during the final treatment phase of the study.

Descriptive Assessment

Procedures

During the descriptive assessment, each child’s care providers were instructed to conduct each meal as they normally would. A variety of food items was offered during meals (e.g., starches, proteins, vegetables, and fruits). However, no guidance was provided regarding the food items the parents selected during this phase. Nina’s mother typically asked Nina what she wanted to eat and then prepared several food items prior to and during meals, while Sandy’s care providers selected various food items that they
typically offered during meals. For Nina, one to five food items were initially offered, with an additional four to seven different items prepared after the meal was initiated. For Sandy, she was typically offered two food items with her care providers alternating between items as refusal behaviors increased. Despite this, during no meals were all four food groups represented for either child (i.e., for Nina, snack foods usually replaced nutritious foods and these were also rarely consumed). Nina had free access to toys and videos and upon request during all meals. For Sandy, her care providers frequently provided a variety of toys for Sandy to interact with, often switching items when it appeared that Sandy was no longer interested in a toy. Sandy’s care providers and Nina’s mother both reported that activities served as a form of distraction in an effort to obtain bite acceptance (e.g., toy manipulation was incompatible with Sandy’s attempts to block her mouth).

Baseline meals with Nina’s mother were conducted 4 times per day and lasted approximately 30 minutes on average (range, 25-35 minutes). Meals primarily consisted of Nina’s mother following Nina around the apartment verbally prompting her to “take a bite” and intermittently preparing additional items; however, Nina’s mother rarely presented any food item to Nina’s lips. As a result, a highchair with a strap was introduced (prior to the eighth meal), and Nina’s mother was instructed to formally present bites to within 1 inch of Nina’s lips on a VT 30-second schedule. The only instruction was that she had to offer the food to her lips after which she could respond any way she wanted to (she removed the food item after a refusal behavior was displayed on all but one occasion). Baseline meals with Sandy’s care providers were conducted 5 times per day and lasted approximately 24 minutes on average (range, 16-30 minutes).

Results

Schedules of praise and social interaction for bite acceptance and escape for refusal implemented by the care providers in this phase were calculated and applied by the child’s care providers (Nina and Sandy) or by therapists (Nina) in subsequent phases. For ease of implementation in subsequent phases, all schedules of consequence ratios were determined by rounding to the nearest whole number. The schedule of praise and social interaction for bite acceptance was calculated as the ratio of the total number of bites accepted during the initial baseline to the total number of bite acceptances that were followed by praise and social interactions. For Nina and Sandy, respectively, the resulting schedule of praise and social
interaction for bite acceptance was determined to be a VR 3 schedule and a VR 2 schedule. The schedule of escape for food refusal was calculated as the ratio of the number of bites associated with a refusal to the number of bites associated with a refusal that resulted in escape. The resulting schedule of escape for refusals was determined to be a FR 1 schedule for Nina and a VR 2 schedule for Sandy.

**Treatment Assessment**

**Baseline**

Data collected from the meals during the descriptive assessment were used as the initial baseline phase for the treatment assessment.

**General Treatment Procedure**

Nutritious high-calorie foods (representing all four food groups during every meal) were offered as choices at each meal during the initial treatment phase. Three to four bites of each target food were placed on a divided plate (Cooper et al., 1995). For Sandy, bites of food were selected by her care provider, randomly alternating between the choices. For Nina, because she could self-feed, the plate was placed in front of her with a spoon. If she touched a food item or in any other way indicated a choice (e.g., pointing, saying the food item), she was offered that bite of food. If Nina did not indicate a choice within 5 seconds, a verbal prompt was given (e.g., “You pick or I pick”). If after 5 additional seconds no item was selected, a bite of food was selected for her, randomly alternating among the choices. Food was replaced from an exhausted item when a bite of any other food item was consumed. Nina was prompted to eat independently by handing her the bite or the spoon of the selected food (Cooper et al., 1995). If, however, she refused to self-feed, the food item was presented by the feeder (care provider or therapist) by offering the item to within 1 inch of her lips (scored as a fed bite).

All meals were scheduled to last 20 minutes, signaled by a kitchen timer with the exception of the generalization phase for Sandy during which meal duration was decreased to 15 minutes. However, meals associated with EE would not end until after the last bite offered was accepted; therefore, meals could extend beyond the set number of minutes.
Specific Procedures

Rich schedule of praise and social interaction (Phases 2 and 4; accepts: FR 1; refusals: VR 2 or FR 1). Bite acceptance was placed on a FR 1 schedule of praise and social interaction. That is, each bite acceptance resulted in 20 to 30 seconds of praise and social interactions and access to activities. Refusals continued to result in escape from bite offers for 20 to 30 seconds and from that particular food item (e.g., another food item was selected for the next scheduled bite offer) on the same schedule as in baseline (i.e., VR 2 schedule for Sandy and a FR 1 schedule for Nina).

Rich schedule of praise and social interaction and EE for refusal (Phases 3 and 5; accepts: FR 1; refusals: EE). Bite acceptance remained on an FR 1 schedule of praise and social interaction (positive interactions were provided regardless of whether any refusal behavior occurred). In addition, refusals were placed on extinction (via nonremoval of the spoon). That is, if the participant engaged in refusal, the care provider or therapist followed the participant’s mouth with the offered bite of food until she opened her mouth and accepted the bite. No food was forcibly placed into the participant’s mouth during an initial bite offer. However, any food that was initially accepted and then expelled was deposited into the child’s mouth (Cooper et al., 1995).

Generalization (Phase 6). For Nina, praise and social interaction was provided differentially for independent bites. For Sandy, the meal duration was decreased to 15 minutes due to adequate oral caloric intake as well as a shift in focus to liquid consumption. Nina’s mother and Sandy’s care providers were coached to implement the final treatment package (i.e., rich schedule of praise and social interaction and escape extinction). In addition, care providers were given written descriptions of the treatment procedures, and any questions or concerns raised by the participant’s care providers were addressed prior to and after each meal. During training, any departures from the treatment procedures displayed by the care providers were immediately corrected by the observer scoring the meal, and any treatment integrity failures were discussed after meals. Training was also provided to day care staff for Sandy in a similar fashion.

Results

Figure 1 depicts the number of bites Nina accepted per meal (top panel) and the percentage of bite offers associated with refusals (bottom panel). During the initial baseline phase, Nina’s mother provided praise and social
Figure 1
Number of independent (open triangles) and fed bites (open circles) Nina accepted per meal (top panel). Percentage of bite offers associated with refusal (open circles; bottom panel).

Note: Accept = schedule of reinforcement for bite acceptance; refusal = schedule of reinforcement for refusal; VR 3 = Variable Ratio 3 schedule; FR 1 = Fixed Ratio 1 schedule; EE = escape extinction.

*Indicates when therapists started conducting meals.
interaction for bite acceptance on a VR 3 schedule and escape for food refusal on a FR 1 schedule. Baseline levels of bite acceptance were low ($M = 1.3$, range 0-3) and bite offers associated with refusals were high with an increasing trend ($M = 58.0\%$, range 12%-100\%). When baseline procedures for bite presentations were structured, levels of bite acceptance remained low ($M = 0.8$, range 0-2) and bite offers associated with refusal remained high ($M = 96.8\%$, range 93%-100\%). In the first treatment phase (FR 1 for bite acceptance and FR 1 for refusal), when every bite acceptance resulted in the delivery of praise and activities and every refusal resulted in escape, Nina’s bite acceptance remained low ($M = 0.5$, range 0-1) and bite offers associated with refusal remained high ($M = 98.0\%$, range 93%-100\%). When trained therapists (i.e., starting at the third meal of this treatment phase; indicated by ‘**’ on Figure 1) conducted the meals using the same procedures, no changes in bite acceptance and bite offers associated with refusal were observed ($M = 0.0$ and $M = 100\%$, respectively). In the second treatment phase (FR 1 for bite acceptance and EE for refusal), bite acceptance increased during the first meal but then followed a downward trend during the next two meals ($M = 4.0$, range 1-8). Bite offers associated with refusal covaried in a similar way ($M = 70.3\%$, range 44%-100\%). Anecdotally, during bite presentations, Nina’s mother frequently provided attention to Nina by speaking to her in Urdu or pantomiming eating behaviors while therapists were implementing the intervention procedures. It was hypothesized that these behaviors, which continued despite coaching from staff, served to disrupt the integrity of the treatment procedures. As a result, Nina’s mother was removed from the feeding context, and her presence in the room was made contingent on Nina’s bite acceptance. After this manipulation, bite acceptance increased ($M = 21.4$, range 13-27) and bite offers associated with refusal decreased ($M = 17.1\%$, range 0%-31\%) across meals. Positive trends were maintained when Nina’s mother once again remained in the room during bite presentation (Bite acceptance: $M = 25.5$, range 22-31; bite offers associated with refusal: $M = 24.0\%$, range 10%-58\%). When the FR 1/FR 1 schedule was reintroduced, bite acceptance followed a decreasing trend ($M = 12.6$, range 7-19) and the mean percentage of bite offers associated with refusal increased ($M = 41.4\%$, range 26%-55\%). Following a return to the FR 1/EE schedule, bite acceptance increased and remained high ($M = 31.8$, range 24-40) and bite offers associated with refusal decreased to low levels ($M = 14.5\%$, range 5%-45\%). Differential delivery of attention and activities for independent bite acceptance (i.e., self-feeding) resulted in an increase in independent bite acceptance ($M = 25.0$, range 20-30) relative to prior treatment phases ($M = 1.3$, range 0-3) while
maintaining high levels of bite acceptance \((M = 38.5, \text{ range } 37-40)\) and low levels of refusal \((M = 11.0\%, \text{ range } 7\%-15\%)\). During parent training, bite acceptance decreased relative to meals conducted by therapists but overall remained high. Across the phase, bite acceptance remained variable \((M = 26.0, \text{ range } 16-35)\; \text{independent bite acceptance: } M = 21.9, \text{ range } 13-35)\) while the percentage of bite offers associated with refusal decreased \((M = 10.8\%, \text{ range } 0\%-30\%)\). Similar levels of bite acceptance \((M = 28.0, \text{ range } 25-32)\; \text{independent bite acceptance } M = 25.5, \text{ range } 23-31)\) and decreases in the percentage of refusal behaviors \((M = 6.8\%, 6\%-8\%)\) were observed throughout 5 weeks of follow-up.

Figure 2 depicts number of bites Sandy accepted per meal (top panel) and the percentage of bite offers associated with refusals (bottom panel). During baseline, Sandy’s care providers were observed to provide praise and social interaction for bite acceptance and provide escape for food refusal on separate VR 2 schedules. Baseline levels of bite acceptance were low to moderate with a downward trend \((M = 6.8, \text{ range } 1-13)\) and bite offers associated with refusal were moderate to high \((M = 75.1\%, \text{ range } 50\%-100\%)\). In the first treatment phase (FR 1 for bite acceptance and VR 2 for refusal), when every bite acceptance resulted in the delivery of praise and activities and every other refusal resulted in escape, Sandy’s bite acceptance remained low \((M = 3.0, \text{ range } 1-5)\) and the percentage of bite offers associated with refusal remained elevated \((M = 91.5\%, \text{ range } 83\%-100\%)\). In the second treatment phase, when every bite acceptance resulted in the delivery of praise and activities and every refusal was exposed to EE, bite acceptance increased \((M = 17.8, \text{ range } 2-26)\) and the percentage of bite offers associated with refusal decreased \((M = 54.2\%, \text{ range } 25\%-100\%)\). When the FR 1/VR 2 schedule was reintroduced bite acceptance and percentage of bite offers associated with refusal stabilized at a level near the mean of the previous phase \((M = 17.2, \text{ range } 10-21; M = 43.2\%, \text{ range } 28\%-58\%)\). The return to the FR 1/EE schedule resulted in resumption of an increase in bite acceptance \((M = 36.5, \text{ range } 36-37)\) and the percentage of bite offers associated with refusal decreased \((M = 29.5\%, \text{ range } 27\%-32\%)\). When meal duration was decreased to 15 minutes, high numbers of bite acceptance were retained \((M = 26.4, \text{ range } 19-34)\) but a slight decreasing trend was observed overall. The percentage of bite offers associated with refusal also showed a decreasing trend \((M = 13.1\%, \text{ range } 0\%-35\%)\) relative to previous phases. Follow-up probes in two settings (i.e., home and daycare) conducted at 5 days, 3 weeks, 4 weeks, and 6 weeks were somewhat variable in both bite acceptance and bite offers associated with refusal but in general suggested that high levels of bite acceptance \((M = 28.8, \text{ range } 23-35)\) and low levels of refusal \((M = 11.0\%, \text{ range } 7\%-15\%)\) were observed throughout 5 weeks of follow-up.
Figure 2
Number of bites Sandy accepted per meal (top panel). Percentage of bite offers associated with refusal (bottom panel)

Sandy: Bite Acceptance

Sandy - Refusals

Note: Accept = schedule of reinforcement for bite acceptance; refusal = schedule of reinforcement for refusal; VR 2 = Variable Ratio 2 schedule; FR 1 = Fixed Ratio 1 schedule; EE = escape extinction.
Behavior Modification

26-33) and lower levels of food refusal \((M = 20.8, \text{ range } 4\%-35\%)\) were maintained relative to baseline.

The overall mean number of bites accepted and the mean percentage of bites associated with food refusal across treatment phases for Nina and Sandy are displayed in Tables 2 and 3. In addition to these results, Nina’s tube feedings were decreased by 50% by the 5-week follow-up probe and for Sandy overnight tube feedings were decreased from 100% of her caloric needs to 80%, 6 days into the evaluation, and to 40%, by the 3-week follow-up probe.

## Table 2

### Mean Numbers of Bites Accepted and Percentage of Bites Associated With Food Refusal Across Treatment Phases for Nina

<table>
<thead>
<tr>
<th>Phase</th>
<th>Mean Number of Bites Accepted</th>
<th>Mean Percentage of Bites Associated With Food Refusal</th>
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</thead>
<tbody>
<tr>
<td>BL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VR 3 for bite acceptance</td>
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<td>74.2</td>
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<tr>
<td>FR 1 for food refusal</td>
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<td></td>
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<td>FR 1 for bite acceptance</td>
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<td>67.0</td>
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<td>FR 1 for food refusal</td>
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<tr>
<td>FR 1 for bite acceptance</td>
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<td>21.3</td>
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<tr>
<td>EE for food refusal</td>
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<td></td>
</tr>
<tr>
<td>DRA for independent bites</td>
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<td>11.0</td>
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<td>Follow-up</td>
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</table>

## Discussion

In the current investigation, descriptive assessments were used to inform subsequent schedule manipulations during treatment of food refusal exhibited by two children. In both cases, the schedule manipulations indicated by pretreatment descriptive assessments were successful at increasing bite acceptance and decreasing food refusal. These results are consistent with prior research demonstrating that descriptive assessments can be useful in the assessment and treatment of severe behavior problems (e.g., Lalli et al., 1993; Lerman & Iwata, 1993; Mace & Lalli, 1991) as well as feeding problems (Casey et al., 2006; Piazza, Fisher et al., 2003).

These results extend the work of Casey et al. (2006) and Piazza, Fisher et al. (2003) in the use of descriptive assessments for feeding problems in...
several ways. Specifically, the descriptive assessment reported by Casey et al. revealed an existing lean schedule (VR 30) of praise and activities for bite acceptance and a rich schedule (VR 2) of escape for food refusal for that child. As predicted from the descriptive assessment, subsequent manipulations to the schedules of praise, social interaction, and preferred activities appeared to serve as positive reinforcers for bite acceptance and led to successful treatment without reliance on EE procedures. By contrast, the results of descriptive analyses in the current study were different in that praise, social interaction, and activities were already provided by care providers on rich schedules (VR 2 or VR 3 and CRF). As hypothesized through the examples described in Table 1, manipulations to the schedules of praise and activities for bite acceptance resulted in little to no change in bite acceptance or food refusal for the two children described herein. However, manipulations to the schedule of escape for food refusal resulted in treatment success; that is, existing schedules identified in the descriptive analyses predicted that manipulations of schedules of praise and access to social interactions and preferred activities for bite acceptance would be ineffective and that EE for food refusal would be needed for these children because relatively dense schedules of attention and tangible delivery were already present. Thus, any changes to the schedules of praise, social interaction, and activities would not be as salient for either child as they were in Casey et al. (i.e., a change from a VR 3/VR 2 or CRF to FR 1 schedules for the children herein were less significant than changes from a VR 30 to a FR 1 schedule in the previous investigation). Shifts to an FR 1 schedule of praise and social interaction—for both children

<table>
<thead>
<tr>
<th>Phase</th>
<th>Mean Number of Bites Accepted</th>
<th>Mean Percentage of Bites Associated With Food Refusal</th>
</tr>
</thead>
<tbody>
<tr>
<td>BL VR 2 for bite acceptance</td>
<td>6.8</td>
<td>75.1</td>
</tr>
<tr>
<td>VR 2 for food refusal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FR 1 for bite acceptance VR 2 for food refusal</td>
<td>13.1</td>
<td>57.0</td>
</tr>
<tr>
<td>FR 1 for bite acceptance VR 2 for food refusal</td>
<td>23.1</td>
<td>47.1</td>
</tr>
<tr>
<td>EE for food refusal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decreased meal length</td>
<td>26.4</td>
<td>13.1</td>
</tr>
<tr>
<td>Follow-up</td>
<td>28.8</td>
<td>20.8</td>
</tr>
</tbody>
</table>
in the current study—were not associated with increased food consumption (or decreased refusal) until the schedule of escape for food refusal was discontinued altogether (EE).

Beneficial effects of using positive reinforcement in the treatment of food refusal have been demonstrated in several investigations (Cooper et al., 1995; Piazza, Patel, et al., 2003; Reed et al., 2004; Wilder et al., 2005). The theme within most investigations on the treatment of food refusal is that EE was essential to treatment success and ergo a social negative reinforcement function (at least in part) was presumed to maintain each child’s food refusal. While feeding behaviors appear to be very likely maintained by negative reinforcement, functional assessments (either via experimental analyses or descriptive assessments) may provide a valuable means for identifying specific mealtime contingencies (parent behaviors) or potential reinforcement schedules that can contribute significantly to the treatment success (e.g., Patel et al., 2002; Reed et al., 2004; Vollmer et al., 2001) or eliminate the need for reliance of EE procedures for a child like Child 3 in Table 1.

Taken together, findings from this study, as well as those from Casey et al. (2006) and Piazza, Fisher et al., (2003) suggest that descriptive assessment technology has utility in helping clinicians identify specific strategies to both include and exclude during subsequent treatment manipulations. In the current study, NCR was excluded as a treatment option (e.g., Wilder et al., 2005) because the pretreatment descriptive analyses showed that dense schedules of noncontingent reinforcement were already being used heavily (i.e., CRF) by care providers without success. Based on these findings, a potentially ineffective treatment approach (and the time associated with such implementation) was likely avoided. Descriptive assessments at the very least appeared to be helpful for identifying the appropriate mealtime schedules to be targeted for intervention (i.e., the descriptive analyses suggested that eliminating or thinning the schedule of escape for food refusal would be relatively more important than increasing the schedule of praise and social interactions and access to activities for bite acceptance). If descriptive assessments can provide such predictive utility, then this would be a welcome finding for assessment and treatment of feeding disorders. However, more research is needed in this regard.

On a clinical level, several aspects of the current study appear noteworthy. First, both children were initially 100% dependent on a NG tube or G tube for their caloric intake prior to this investigation. By the end of these brief evaluations, each child received a significant amount of their daily caloric needs orally, and tube feedings were reduced by 60% (Sandy), and
50% (Nina), respectively. Second, 5- to 6-week follow-up data indicated that both children had maintained their bite acceptance at levels commensurate to those observed at the end of formal treatment, and in the case of Sandy, treatment efficacy had generalized to the daycare center and their staff adding to sparse literature on follow-up.

An additional extension is that much of the research in feeding disorders has been conducted in carefully controlled hospital- or clinic-based settings (Linscheid, 2006; McCartney, Anderson, & English, 2005). However, children with feeding problems are fairly common and are often treated by early intervention providers, who, in general, implement their treatment model in the family’s home. It is noteworthy that all assessment and treatment sessions in the current study were conducted in each child’s home, which adds to this relatively small research base (e.g., Greer, Dorow, Williams, McCorkle, & Asnes, 1991; Najdowski et al., 2003; Werle, Murphy, & Budd, 1993, 1998) and serves to extend the social and ecological validity of behavioral analytic approaches to feeding disorders.

Several limitations exist with regard to the current investigation. First, the schedule of praise and social interaction for bite acceptance was changed from VR 2 (Sandy) and VR 3 (Nina) schedules to FR 1 schedules across treatment phases for both participants. Also, a change in the schedule of escape for food refusal was never evaluated in isolation (i.e., VR 2 or VR 3 for bite acceptance with EE for refusal). Taken together, the exact contribution of potential positive reinforcement schedule manipulations is still questionable for these participants. However, these changes represented relatively small schedule shifts overall (VR 2 or VR 3 to FR 1) and for both children did not result in improved feeding behavior by themselves. Still, it is possible that the FR 1 schedule of praise and social interaction contributed to the treatment effects. A related limitation is that for both children, initial phases were relatively short (i.e., 2-4 meals). Their reimplementation in the reversal phases of treatment helped to establish the ineffectiveness of some consequence schedules. Future research might be directed toward conducting similar analyses using lengthier schedule evaluations that perhaps include parametric analyses of each schedule component (e.g., Roane, Lerman, & Vorndran, 2001; Worsdell, Iwata, Hanley, Thompson, & Kahng, 2000). Despite these limitations, the results of this investigation extend the literature on the use of descriptive assessments for children with chronic feeding issues to help identify and target important care provider behaviors in the treatment of food refusal and bite acceptance and may provide a framework with which to predict and explore different treatment combinations.


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