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Descriptive Analyses of Pediatric Food Refusal: The Structure of Parental Attention

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Abstract

Mealtime observations were conducted and occurrences of appropriate and inappropriate mealtime behavior and various forms of parental attention (e.g., coaxing, reprimands) were recorded for 25 children admitted to an intensive feeding program and their parents. Using the data from the observations, lag sequential analyses were conducted to identify changes in the probability of child appropriate and inappropriate mealtime behavior before and after various forms of parental attention. A combination of univariate and repeated measures ANOVAs using frequency of child behavior were also conducted to corroborate conclusions drawn from the visual analysis of individual participant data. Results showed that parental attention was frequently followed by temporary decreases in inappropriate mealtime behavior and increases in bite acceptance. Moreover, various forms of parental attention resulted in statistically significant changes in child behavior, which supports the clinical utility of these data.

Keywords

attention, descriptive analysis, lag sequential analysis, pediatric feeding disorders

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Pediatric food refusal is one of the most common problems affecting young children, especially children with developmental and intellectual disabilities (Kerwin, 1999). A child is diagnosed with a feeding disorder when he or she fails to consume a sufficient quantity or variety of food, resulting in failure to gain weight, weight loss, or failure to meet nutritional needs (Shore & Piazza, 1997). Some children may refuse solid foods completely and must have their nutritional needs met through other means (e.g., gastrostomy tube, bottle feeds). Other children may be food selective, only consuming certain types or textures of food, putting them at risk for vitamin and mineral deficiencies. Estimates suggest that approximately 25% of typically developing children experience feeding problems whereas the prevalence of feeding problems has been reported to be as high as 80% for children with developmental disabilities (Babbitt, Hoch, & Coe, 1994; Chung & Kahng, 2006; Lifschitz, 2001; Shore & Piazza, 1997). Furthermore, an estimated 26% to 90% of children with physical disabilities and 10% to 49% of children born prematurely present with food refusal (Manikam & Perman, 2000).

Pediatric food refusal can be classified as organic (i.e., medical), nonorganic (i.e., behavioral), or mixed in etiology (Budd et al., 1992; Lifschitz, 2001). For instances of nonorganic or mixed etiologies the behavioral literature on food refusal has shown that the majority of cases demonstrate that children engage in refusal (e.g., bat the spoon away) because the removal of requests to eat (i.e., escape) reinforces the behavior (e.g., Cooper et al., 1995; Dawson et al., 2003; Piazza, Patel, Gulotta, Sevin, & Layer, 2003). In other words, a child may engage in disruptive behavior due to a history of parents or caregivers ceasing to ask the child to eat when she or he engages in disruptive behavior. However, given the nature of mealtime arrangements, caregiver attention is a largely immutable component of all social interaction. Thus, research that characterizes structural aspects of these interactions might provide a better sense of the functional properties of these interactions that support food refusal and further identify how specific forms of attention affect food refusal. The structure of caregiver attention refers to the form of attention provided (e.g., Does the parent reprimand inappropriate mealtime behavior?). The functional properties of these interactions attempt to determine: (a) why a child engages in inappropriate mealtime behavior, and (b) why parents respond to inappropriate mealtime behavior as they do.

One method that can be useful in characterizing how these interactions support inappropriate mealtime behavior is through descriptive analysis (Bijou, Peterson, & Ault, 1968) of parent–child interactions during mealtimes. Though descriptive analysis methods do not involve experimental manipulation, rather only direct observation of naturally occurring events, a functional

relation between events cannot be determined. However, potential behavior–environment relations that are identified may be useful in formulating hypotheses concerning the function of behavior, and conclusions drawn from direct observation data can be augmented by way of significance testing. Several studies have demonstrated that potential reinforcers identified via descriptive analysis are useful in arranging experimental conditions and may be found to be reinforcing consequences when experimentally tested (Lalli, Browder, Mace, & Brown, 1993; Mace & Lalli, 1991).

Few descriptive studies involving direct observation have been conducted in which children with food refusal are involved. Casey et al. (2009) used results of descriptive analyses to identify reinforcement schedules (e.g., escape from meals, presentation of tangible items) during naturally occurring meals. Results of the descriptive analyses were then used to manipulate schedules of escape, which produced increases in consumption for 2 participants. The study by Casey et al. illustrates the logic between linking results of descriptive analyses to treatment development.

In another representative study, Piazza, Fisher et al. (2003) conducted descriptive and experimental analyses of inappropriate mealtime behavior. During the descriptive observations, observers simply watched parents feeding their children (i.e., there was no formal independent variable manipulation). Six child–parent dyads participated in the descriptive portion of the study, and for all 6 dyads, parents provided both attention and escape (e.g., stopped asking the child to continue to take bites of food) following the child's inappropriate mealtime behavior. In 2 of the 6 cases, attention was provided more frequently than escape following inappropriate behavior. As it relates to the current research, one of the most important contributions of the study by Piazza et al. was a detailed description of the various *forms* of attention (e.g., coaxing, reprimands, statements of concern) and forms of escape (e.g., spoon removal, termination of the meal) observed during descriptive analyses. Piazza, Fisher, et al. then linked results of the descriptive observations to results of experimental analyses in which inappropriate mealtime behavior resulted in very specific and experimentally arranged consequences. During this portion of the assessment (termed the functional analysis, Iwata, Dorsey, Slifer, Bauman, & Richman, 1994), an experimenter (not the caregiver) delivered attention in the form of a reprimand in one condition (the attention condition), brief periods of escape from the mealtime routine in another condition (the escape condition), and brief periods of access to preferred toys and activities in another condition (the tangible condition). Each of these test conditions (attention, escape, tangibles) was compared to a control condition in which bites of food were presented every 30 s without removal, and free

access to toys and attention was available. If inappropriate mealtime behavior was elevated in one or more of the previously described conditions, then the reinforcer for inappropriate mealtime behavior was ascribed. Functional analyses were conducted for the 6 children included in the descriptive analyses and 9 additional children. For 10 of 15 children, environmental consequences reinforced inappropriate mealtime behavior. Escape was a reinforcer for 9 of the participants (60%) and attention was a reinforcer for 8 (53%) of the participants.

Although Piazza, Fisher et al. (2003) found that escape functioned as a reinforcer for inappropriate mealtime behavior most frequently (9 of 15 cases), results also showed that positive reinforcement in the form of attention functioned as a reinforcer in almost as many cases (8 of 15 cases). As previously stated, most interventions for food refusal have focused on escape as a reinforcer; however, given that Piazza, Fisher, et al. found attention to be a reinforcer in almost as many cases, interventions that involve the manipulation of this variable may also be viable.

An abundance of research has shown that other forms of problem behavior are frequently followed by attention. Thompson and Iwata (2001) observed adults in a residential facility who exhibited self-injury, aggression, and disruptive behavior. Attention from staff was the most common event observed to follow problem behavior. Similarly, McKerchar and Thompson (2004) conducted a descriptive analysis in a preschool classroom of 14 children, and found attention to be the most common consequence following problem behavior.

Although many studies have shown that attention reinforces problem behavior, not all forms of attention function as reinforcers. For example, a functional analysis conducted by Fisher, Ninness, Piazza, and Owen-DeSchryver (1996) indicated that attention (verbal reprimands) reinforced the destructive behavior of a boy with autism and oppositional defiant disorder. An analysis comparing contingent attention related to the target response (i.e., a reprimand) and contingent attention unrelated to the target response indicated that reprimands were more reinforcing than unrelated attention (i.e., the child preferred reprimands to other forms of attention). Results reported by Fisher et al. suggest that not all forms of attention have the same effect on behavior.

This implication was supported by Piazza et al. (1999) who used concurrent schedules of reinforcement to evaluate the effects of different types of attention on the destructive and appropriate behavior of two individuals whose severe problem behavior was reinforced by attention. For both participants, responding was allocated toward activities that resulted in verbal reprimands

when both reprimands and praise were available. Praise was only an effective reinforcer when reprimands were not available. For one participant, Piazza et al. identified a form of attention that effectively competed with verbal reprimands (tickles). When both reprimands and tickles were available, the participant allocated responding toward responses that were correlated with tickles. Results of this study suggest that the attention delivered for appropriate behavior may need to be in the same form that reinforced the problem behavior for an intervention to be effective.

One method of assessing descriptive data involves conditional probability analyses although a number of methods have been described previously (e.g., Harding et al., 1999; Langdon, Carr, & Owen-DeSchryver, 2008). Conditional probabilities compare the probability (or likelihood) of one event given some other event (Catania, 2007). For example, the probability of rain on a cloudy day could be compared to the overall probability of rain (without regard to clouds or any other factors). Otherwise, the probability of parental attention given problem behavior could be compared to the overall probability of parental attention. Several studies have applied conditional probability analysis to descriptive data focusing on severe problem behavior (e.g., self-injurious behavior) and caregiver responses (e.g., Asmus, Vollmer, & Borrero, 2002; Borrero & Borrero, 2008; Thompson & Iwata, 2001; Vollmer, Borrero, Wright, Van Camp, & Lalli, 2001). However, fewer have involved assessments of food refusal exhibited by young children. Borrero, Woods, Borrero, Masler, and Lesser (in press) conducted descriptive analyses of parent-conducted meals for 25 children with histories of food refusal and calculated the conditional probability of attention, escape, and the delivery of tangible items following food refusal. Results showed that for 24 of the 25 participants, parental attention was provided following food refusal and different forms of attention were provided more frequently than others. Coaxing was the most frequently observed form of attention and followed food refusal for 92% of participants. Reprimands followed food refusal for 76% of participants, statements of concern or comfort followed food refusal for 64% of participants, and threats followed food refusal for 12% of participants. Borrero et al. also found that the type of attention differed depending on the form of refusal. For example, coaxing was most commonly observed following a disruption, but a reprimand was most commonly observed following expulsions. However, the results reported by Borrero et al. were correlational and not substantiated by tests of statistical significance.

Although useful, the method used by and Borrero et al. (in press) does not provide a full description of behavior through time because it is a static, rather than a dynamic, method of analysis (Thompson & Borrero, in press).

In more recent work, researchers have begun using methods of lag sequential analysis to evaluate behavior-environment relations on a second-by-second basis both before and after a target response. This method illustrates how the probability of an environmental event changes before and after a target response, again, on a very molecular scale (second-by-second, in some cases).

Methods of lag sequential analysis have been applied in several recent studies to assess various forms of more traditional problem behavior (e.g., SIB, aggression, disruption). Sloman et al. (2005) conducted descriptive analyses of 5 individuals who exhibited severe problem behavior and their caregivers (parents and siblings) and compared the frequency of problem behavior in each of the 10 s preceding a reprimand to the frequency of problem behavior in each of the 30 s following a reprimand. Results showed that problem behavior decreased in the seconds following a reprimand for all 5 participants. Sloman et al. suggested that caregiver reprimands might be negatively reinforced by a momentary decrease in child problem behavior and that this is why parents continue to reprimand despite potentially reinforcing problem behavior.

Samaha et al. (2009) gathered descriptive data on problem behavior and events occurring before and after instances of problem behavior for 4 individuals with developmental disabilities. Functional analyses were then conducted for each participant to identify reinforcers for problem behavior. Lag sequential analysis was used to assess the descriptive data for second-by-second changes in the probability of the functional reinforcers before and following instances of problem behavior. Results showed that lag sequential analysis was a useful method for identifying potential reinforcement contingencies. Calculations similar to those used by Samaha et al. were used by Borrero and Borrero (2008) to identify precursors to problem behavior. By using lag sequential analyses, Borrero and Borrero showed that the probability of a potential precursor increased immediately prior to an instance of problem behavior and the probability of problem behavior increased immediately following a precursor.

The body of work described previously leads to some general conclusions regarding the role of attention and inappropriate mealtime behavior. First, previous work has shown that attention often follows problem behavior (e.g., aggression) in the natural environment (e.g., Thompson & Iwata, 2001). Second, experimental data have shown that attention too may reinforce inappropriate mealtime behavior (i.e., not just escape, Piazza, Fisher et al., 2003). Third, experimental data have shown that not all forms of attention are equal (Fisher et al., 1996). Thus, the present study was designed to assess various forms of attention delivered in the context of inappropriate mealtime behavior using lag sequential analysis.

Method

Participants and Setting

Twenty-five children admitted to either an inpatient program or an intensive day treatment program for the assessment and treatment of food refusal and their parents participated in this study. Child participants included 15 males and 10 females ranging in age from 1 year 5 months to 8 years 2 months. The majority of the sample consisted of Whites ($n = 17$). However, the sample also included 3 African Americans, 2 Asians, 1 American Indian, and 2 others/unknowns. The mean duration of treatment from admission to discharge was 43 days, with 11 participants enrolled in the inpatient program and 14 in the day treatment program. Participants were grouped in one of the following categories based on the way in which they received their daily caloric needs upon admission: (a) tube dependent, (b) liquid dependent, or (c) food selective. Children who were tube dependent required tube feedings for all or some of their daily caloric needs. Children who were liquid dependent were not receiving any tube feeds, and received at least 75% of their daily caloric intake from liquids orally. Children who were food selective were not receiving any tube feeds and did not meet criteria for the liquid dependent group. Instead, they received all or some of their caloric needs by solids alone or a combination of solids and liquids; however, they were selective about which solids or liquids they consumed. These categories were mutually exclusively in that no child was in more than one group. Overall, 60% of children ($n = 15$) were categorized as tube dependent, 20% ($n = 5$) were liquid dependent, and 20% ($n = 5$) were food selective. Although subsequent analyses were not conducted for specific categories, and the previously mentioned categories are not empirically determined, the categorical information is included to provide a general description of our sample. Data for 24 of the 25 parent–child dyads were previously reported by Borrero et al. (in press) as molar conditional and unconditional probability values. The present study differs from Borrero et al. in which changes in behavior over time in relation to specific forms of parental attention were examined, and data were also exposed to statistical analysis in the present investigation.

Descriptive assessments are a routine part of admission to both the inpatient and intensive day treatment programs. A more detailed description of these specific programs is provided in Greer, Gulotta, Masler, and Laud (2008), and the efficacy of these intensive programs in the treatment of feeding disorders has recently been established for various populations (e.g., Greer et al., 2008; Laud, Girolami, Boscoe, & Gulotta, 2009). Beginning on the first day of admission, parent-conducted meals were observed. Observations were conducted in treatment rooms equipped with a table and

chair, high chair, or Rifton chair based on parent request, and a one-way mirror. Additional items such as toys, games, or videos were available upon parent request. All meals were videotaped, and all parents were aware that they were being observed and videotaped; however, child participants were not told that they were being observed. Parents supplied or were provided with foods and drinks that the child was reported to consume or had previously consumed but eliminated from his or her diet. Novel foods and drinks that the child had never consumed were also provided to allow for observation of parent and child responses when a parent attempted to get their child to try a new food. Parents were instructed to feed their child as they typically would at home, and no specific instructions were provided concerning the conduct of the meal to make the meal as naturalistic as possible. Observations began with the first meal following admission and continued for 2-3 meals over a period of 1-2 days. The duration of meals was determined by naturally occurring events (e.g., the parents determined the duration of the meal) or 60 min, whichever occurred first. Total observation time for all participants, including all meals, was 1,198.5 min, with a mean of 44.4 min (range, 7.7 min to 120.7 min).

Response Measurement and Data Collection

Trained graduate students in a masters-level behavior analysis program and a doctoral level behavior analyst served as data collectors. All data collectors had at least 10 hours of training in computerized data collection. Observations were scored using a computerized data collection system to collect data on specific parent and child responses. Data were collected on both child appropriate and inappropriate mealtime behavior. Appropriate mealtime behavior was scored as a frequency measure and included *acceptance,* defined as the child depositing a bite of food or liquid or allowing the parent to deposit a bite of food or liquid into his or her mouth. Inappropriate mealtime behavior included several topographies of food refusal. Topographies of food refusal were scored separately as a frequency measure, and included disruptive behavior, expulsions, gagging or coughing, vomiting, negative vocalizations, and other problem behavior. *Disruptive behavior* was scored if the child batted the spoon or cup, pushed the food/drink away, turned his or her head away from the spoon/cup, or covered his or her mouth. *Expulsion* was scored if the child discharged food past the plane of the lips, which had not been swallowed. *Gagging or coughing* was scored if the child retched (with or without audible noises) or expelled air from the lungs sharply with a noise. *Vomiting* was scored anytime previously swallowed food was emitted past the plane of

the lips. *Negative vocalization* was scored anytime the child screamed, cried, or made inappropriate comments regarding the meal (e.g., "No," or "I don't like this."). *Problem behavior* included aggression, scored anytime the child hit or kicked another person; and self-injury, scored anytime the child hit him or herself with a closed or open hand. To reiterate, the larger category of "inappropriate meal time behavior" included instances of disruptive behavior, expulsions, gagging or coughing, vomiting, negative vocalizations, and problem behavior.

Data were also collected on forms of parental attention. Instances of parental attention were scored as frequencies and included *reprimands* (e.g., "Stop it" or "Don't do that"), *coaxing* (e.g., "Come on, take a bite" or "Take a bite, you like this"), and *concern or comforting statements* (e.g., "You're okay"). These forms of parental attention were reported as common forms of parental attention that followed inappropriate mealtime behavior in studies by Piazza, Fisher et al. (2003) and Borrero et al. (in press), and as such, these forms were selected for further analysis in the present study.

Data Analysis

Lag sequential analysis. Lag sequential analyses were conducted to assess the probability (p) of inappropriate behavior in each of the 50 s preceding (lag –50) each form of parental attention and following (lag +50) each form of parental attention. A window of ±50 s was selected because it was considered large enough to capture a potential reinforcement effect (e.g., Sloman et al., 2005). For every 1-s value the number of instances in which inappropriate behavior occurred was divided by the total instances of parental attention. As a graphic illustration, Figure 1 represents a modified version of illustrations previously reported by Sloman et al. and Borrero and Borrero (2008). Figure 1 shows that three reprimands occurred (one at second 7, one at second 11, and one at second 13). Further inappropriate behavior occurred at seconds 4, 6, and 10. When assessed in relation to one another, Figure 1 permits evaluation of the p of a reprimand given that an instance of inappropriate behavior occurred contiguously. Based on these hypothetical data, the p of inappropriate behavior occurring at lag –1 would be 2/3 or 0.67. Likewise, the p of inappropriate behavior occurring at lag +3 would be 1/3 or 0.33, because only 1 instance of inappropriate behavior occurred during the 1-s value occurring 3 s following a reprimand (the reprimand occurring at second 7 is followed by an inappropriate behavior at second 10). An increase in the p of inappropriate behavior in the 1-s intervals preceding a form parental attention and a subsequent decrease in the p of inappropriate behavior in

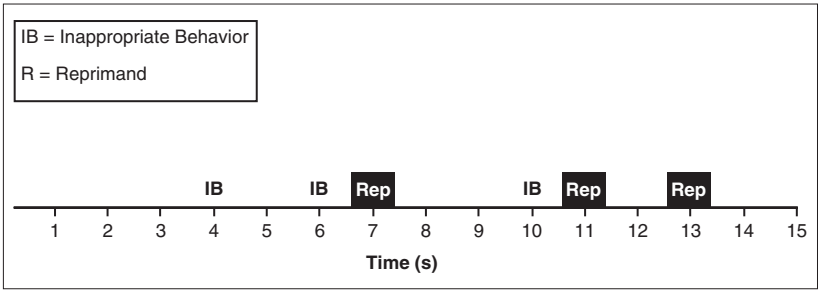

Figure 1. Graphic illustration of lag sequential analysis calculations

the 1-s intervals following that form of parental attention would indicate that inappropriate behavior reliably precedes that form of parental attention.

Similar analyses were used to assess probabilities of each form of parental attention during each of the 50 s preceding and following an instance of inappropriate behavior; the probability of acceptance during each of the 50 s preceding and following each form of parental attention; and the probability of each form of parental attention.

Unconditional p analyses. The unconditional *p* of inappropriate behavior, acceptance, and each form of parental attention was calculated and used as a point of comparison in the lag sequential analyses. The unconditional *p* for each response was calculated by dividing the total number of responses by the number of opportunities for that response to occur. In Figure 1, three instances of inappropriate behavior occurred and there were 15 opportunities for inappropriate behavior to occur (i.e., the duration of the observation was 15 s). Therefore, the unconditional *p* of inappropriate behavior would be 3/15 or 0.2.

Significance Tests

To augment the graphical analyses, tests of statistical significance were also conducted. More specifically, univariate and repeated measures analyses of variance (ANOVAs) were used to delineate differences in frequencies of child behavior for each descriptive comparison.

Interobserver Agreement

Interobserver agreement (IOA) was assessed by having a second data collector independently score videotaped meals, collecting data on both child and parent responses. Data were calculated using the partial-agreement within

intervals method. Each observation was divided into 10-s intervals and agreement between both observers was assessed across each interval. The smaller number (in each 10-s interval) was divided by the larger number and a mean was calculated for the entire observation. IOA was calculated for 40% of meals for all participants (range, 33.3% to 100%).

For all participants, mean IOA for child behavior was 98.1% for disruption (range for all participants, 93.4% to 100%), 99.3% for gagging and coughing (range, 86.4% to 100%), 99.9% for expelling food (range, 98.3% to 100%), 99.7% for emesis (range, 93.3% to 100%), 99.9% for severe problem behavior (range, 98.4% to 100%), and 99.3 for acceptance (range, 96.1% to 100%). Mean IOA for parent responses was 96.4% for coaxing (range, 86.8% to 100%), 98.7% for reprimands (range, 88.3% to 100%), and 99.3% for statements of concern and comfort (range, 93.1% to 100%).

Results

Over the course of the study, 76 meals were observed for 18.7 hr of observation time (range, 8 min to 121 min) with a mean of 43.1 min per participant. The total number of instances of inappropriate mealtime behavior for all participants was 5,084 (range, 4 to 745), and the total number of instances of food acceptance for all participants was 1,413 (range, 4 to 134). The total number of reprimands was 552 (range, 0 to 131), the total number of instances of coaxing was 1,775 (range, 0 to 245), and the total number of statements of concern or comfort was 372 (range, 0 to 372). A univariate ANOVA was conducted to determine differences in the frequency of parental attention used irrespective of child behavior. Coaxing was found to be the most significantly frequent form of parental attention observed, $F(2, 74) = 15.00$, $p < .05$, whereas frequency of reprimands and statements of concern or comfort were nonsignificant.

Inappropriate Behavior Given Parental Attention

For 46.2% of participants a decrease in the probability of inappropriate behavior was observed immediately following a reprimand, and for 3.8% of participants an increase in the probability of inappropriate behavior was observed immediately following a reprimand. For 50% of participants no change in the probability of inappropriate behavior was observed immediately following a reprimand. For 19.2% of participants a decrease in the probability of inappropriate behavior was observed immediately following coaxing, and for 11.5% of participants an increase in the probability of inappropriate behavior was observed immediately following coaxing. For 69.3% of participants no change in the probability of inappropriate behavior was observed immediately

following a coax. For 50% of participants a decrease in the probability of inappropriate behavior was observed immediately following a statement of comfort or concern; an increase in the probability of inappropriate behavior immediately following a statement of comfort or concern was not observed for any participants. For 50% of participants no change in the probability of inappropriate behavior was observed immediately following a statement of concern or comfort.

To assess differences in frequency of inappropriate behavior before and after parental attention, a repeated measures ANOVA was utilized. Results yielded a main effect of time, $F(1, 66) = 6.72$, $p < .05$, such that the mean frequency of inappropriate behavior before parental attention was significantly greater than after parental attention. A main effect of parental attention was also significant, $F(2, 66) = 8.95$, $p < .05$. A Tukey's post hoc test revealed that both reprimands and comfort resulted in a significantly greater difference in the frequency of inappropriate behavior than coaxing; that is, coaxing appeared to be least effective in reducing inappropriate behavior.

Acceptance Given Parental Attention

For 11.5% of participants an increase in the probability of acceptance was observed immediately following reprimanding; no change in the probability of acceptance was observed following a reprimand for 88.5% of participants. For 38.5% of participants an increase in the probability of acceptance was observed immediately following coaxing; no change in the probability of acceptance was observed following coaxing for 61.5% of participants. For 7.7% of participants an increase in the probability of acceptance was observed immediately following statements of concern or comfort; no change in the probability of acceptance was observed following a statement of concern or comfort for 92.3% of participants. A decrease in the probability of acceptance immediately following parental attention was not observed for any participants.

A repeated measures ANOVA was conducted to determine if frequency of acceptance before parental attention was significantly different than after. Results yielded a main effect of time, $F(1, 66) = 7.14$, $p < .05$, such that the mean percentage of acceptance after parental attention was significantly greater than before. A main effect of parental attention was also significant, $F(2, 66) = 7.75$, $p < .05$. A Tukey's post hoc test revealed that coaxing resulted in a significantly greater difference in the rate of acceptance than either comforts or reprimands.

Table 1 shows statistical results regarding changes in the frequency of inappropriate mealtime behavior and acceptance before and after all forms of parental attention in the upper panel, as well as the mean frequency of

Table 1. Analysis of Variance for Changes in Child Behavior Before and After Parental Attention[a]

	Before Parental Attention	After Parental Attention	Change	*df*	*F*	*p*
Within subjects						
Inappropriate behavior	20.20	16.71	3.49	66	6.72	.012*
Acceptance	.80	2.30	1.50	66	7.14	.009*
	Reprimand (*n* = 24)	Coax (*n* = 25)	Comfort (*n* = 20)	*df*	*F*	*p*
Between subjects						
Inappropriate behavior	9.60	35.76	7.45	2	8.95	.000*
Acceptance	.44	3.50	.45	2	7.75	.001*

a. $N = 25$.
*$p < .05$.

inappropriate mealtime behavior and acceptance for each form of parental attention in the lower panel.

Case Examples

Figure 2 shows case examples for changes in the probability of child behavior given parental attention for 6 participants. Data for Sophie, Jesper, and Annabella depict changes in the probability of inappropriate behavior given various forms of attention (reprimands for Sophie, coaxing for Jesper, and statements of comfort or concern for Annabella). For Sophie (top left panel) the mean probability of inappropriate behavior decreased from 0.15 in the 4 s preceding a reprimand to 0.04 in the 4 s following a reprimand. This suggests that, for Sophie, reprimands may have been effective in temporarily decreasing inappropriate behavior. For Jesper (top right panel) the mean probability of inappropriate behavior decreased from 0.54 in the 4 s preceding a coax to 0.08 in the 4 s following a coax. This suggests that Jesper's parent may have used coaxing to attenuate his inappropriate behavior. For Annabella (middle left panel) the mean probability of inappropriate behavior decreased from 0.33 in the 4 s preceding a statement of concern or comfort to 0.06 in the 4 s following a statement of concern or comfort. However, as the

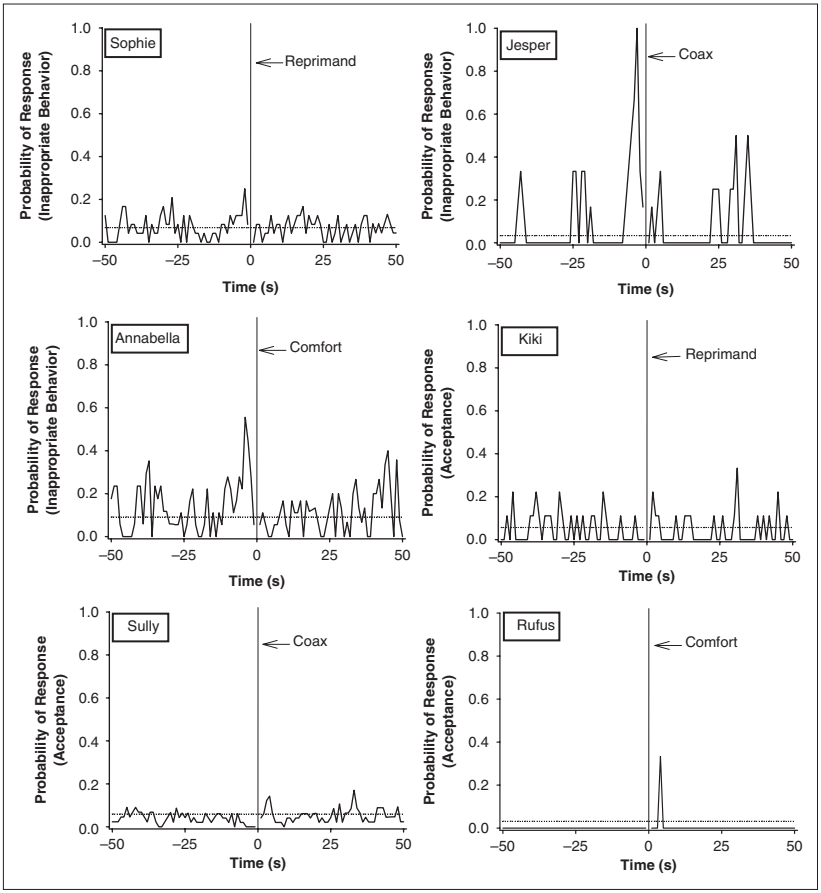

Figure 2. Illustrative examples for changes in the probability of child behavior given parental attention

Note: The vertical line at second 0 represents all instances of the given form of attention. The dashed horizontal line represents the unconditional probability of child behavior.

time between the statement of comfort or concern and inappropriate behavior increased, levels of inappropriate behavior tended to increase gradually.

Figure 2 also depicts cases for which the probability of acceptance may have been altered by the form of attention provided. For Kiki (middle right panel) mean probability of acceptance increased from 0.02 in the 4 s preceding a reprimand to 0.11 in the 4 s following a reprimand. Although the

change was not immediate (i.e., there was no change in the 1-s immediately following problem behavior), the overall local effect of the reprimand is visually apparent. For Sully (bottom left panel) the mean probability of acceptance increased from 0 in the 4 s preceding a coax to 0.09 in the 4 s following a coax, suggesting that parental coaxing may have been effective in getting Sully to take a bite or drink. For Rufus (bottom right) the mean probability of acceptance increased from 0 in the 4 s preceding a statement of concern or comfort to 0.08 in the 4 s following a statement of concern or comfort. Although many of the observed changes in behavior are small, relatively speaking (i.e., relative to behavior prior to the occurrence of the various forms of attention) behavior change is visually apparent. Furthermore, from the perspective of the person feeding a child, *any* improvements might be sufficient to have parents continue with a particular strategy.

Figure 3 shows case examples for changes in the probability of parental attention given child behavior for 6 participants. For Gigi (top left panel) the mean probability of a reprimand increased from 0.01 in the 4 s preceding inappropriate behavior to 0.04 in the 4 s following inappropriate behavior. This suggests that Gigi's parent was most likely to deliver a reprimand following inappropriate behavior. For Tobias (top right panel) the mean probability of a coax increased from 0.05 in the 4 s preceding inappropriate behavior to 0.08 in the 4 s following inappropriate behavior. For Pedro (middle left panel) the mean probability of a statement of concern or comfort increased from 0 in the 4 s preceding inappropriate behavior to 0.04 in the 4 s following inappropriate behavior. For Rufus (middle right panel) the mean probability of a reprimand decreased from 0.01 in the 4 s preceding acceptance to 0 in the 4 s following acceptance. For Micah (bottom left) the mean probability of a coax decreased from 0.04 in the 4 s preceding acceptance to 0.01 in the 4 s following acceptance. In other words, Micah's parent would coax him prior to accepting a bite or drink and would stop coaxing following acceptance. For Kiki (bottom right) the mean probability of a statement of concern or comfort decreased from 0.01 in the 4 s preceding acceptance to 0 in the 4 s following acceptance.

Discussion

Descriptive analyses were conducted for appropriate and inappropriate mealtime behavior and for parental attention for 25 children receiving treatment for pediatric food refusal and their parents. Data from the descriptive observations were analyzed using lag-sequential analyses to evaluate moment-to-moment changes in the probability of child behavior given parental attention. In addition, group statistical analyses were used to corroborate conclusions

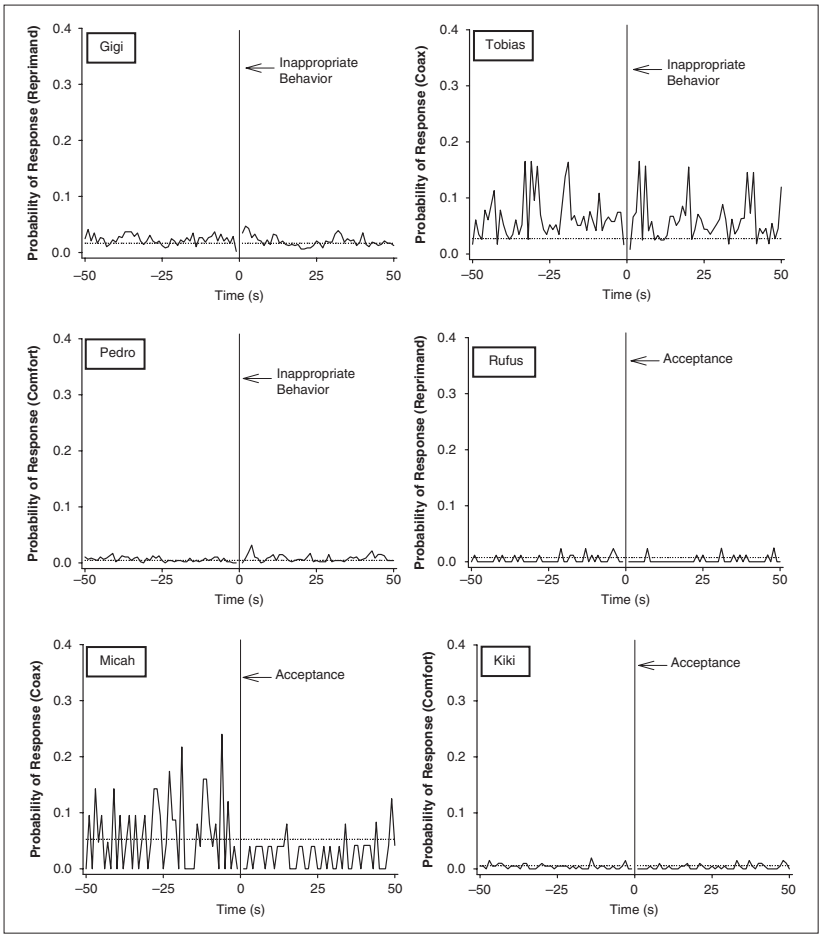

Figure 3. Illustrative examples for changes in the probability of parental attention given child behavior

Note: The vertical line at second 0 represents all instances of child behavior (inappropriate or acceptance) and dashed horizontal line represents the unconditional probability of the form of parental attention.

drawn from the visual analysis of individual participant data. The use of lag sequential analyses in this study may have allowed for a better picture of behavior over time compared to static summaries of behavior, such as those used by Borrero et al. (in press). Furthermore, the inclusion of inferential

statistical tests may suggest that the phenomena identified in the present study also occur for the larger body of individuals who suffer from pediatric feeding disorders.

Results showed that all forms of parental attention evaluated were more likely to result in a temporary decrease in probability and frequency of inappropriate behavior, and reprimands and statements of concern or comfort were more likely to result in a temporarily significant decrease in inappropriate behavior than coaxing. These results were similar to those of Sloman et al. (2005), who found that reprimands were followed by a temporary decrease in problem behavior. It is possible that the temporary decrease in inappropriate mealtime behavior following reprimanding, coaxing, showing concern, or comforting may reinforce parent responses, thereby explaining the reluctance of parents to cease engaging in these responses. It is important to note that the decreases in inappropriate behavior were only temporary and often increased following a brief attenuation. It is possible that the forms of parental attention evaluated in this study and observed by Piazza, Fisher et al. (2003) and Borrero et al. (in press) may function as reinforcers as suggested by Piazza, Fisher et al. These descriptive data would suggest that the form of attention programmed in functional analyses of food refusal be made as similar to that provided naturally by parents or caregivers.

Results also showed that all forms of attention, with coaxing being most likely, were more likely to be followed by temporarily significant increases in acceptance than decreases in acceptance. It is possible that these forms of attention delivered by caregivers may be positively reinforced by a temporary increase in food acceptance. Considering that all forms of parental attention resulted in decreases in inappropriate behavior and increases in acceptance for at least some participants, future research would benefit from evaluating mealtime arrangements in terms of potential sequential dependencies. For example, a child may refuse food, his or her parent may deliver a reprimand, the child may then stop refusing and take a bite, and the parent may stop providing attention until the child begins to refuse again. If such sequential dependencies do exist, it is possible that a disruption in the chain (e.g., reprimands) may result in a decrease in inappropriate behavior.

Results of this study may have implications for the treatment of pediatric food refusal and parent training. Although many studies of food refusal focus on escape as a reinforcer and escape extinction as the primary treatment component (e.g., Cooper et al., 1995), the results of this study, as well as those of Piazza, Fisher et al. (2003) and Borrero et al. (in press) suggest that some manipulation of attention may be useful in formulating a more potent treatment package. In addition, if a parent frequently delivers attention

following inappropriate behavior, parent training may need to focus more on providing appropriate attention rather than providing attention for inappropriate behavior especially if changes in child behavior following attention were previously reinforcing (e.g., child inappropriate behavior temporarily ceased or the child took a bite).

One limitation of the current investigation is that functional analyses were not conducted; therefore, it could not be determined if parental attention reinforced inappropriate mealtime behavior or if child responses following parental attention functioned as reinforcers for the parents. However, using lag sequential analyses to evaluate descriptive data may be useful for arranging conditions of a functional analysis. For example, if a parent is observed to reprimand frequently following inappropriate behavior, reprimands should probably be used in the attention condition rather than coaxing or comforting. In addition, future research could experimentally evaluate parent or caregiver behavior in relation to changes in child mealtime behavior. It is possible that over time, as parents and children are faced with new challenges (e.g., introducing new foods or textures) parents may resort to tactics that have worked in the past (e.g., coaxing, reprimanding) when faced with increased refusal (resurgence of behavior; Lieving & Lattal, 2003). Understanding the reasons why parents continue to deliver attention when it only temporarily changes behavior may aid in formulating better treatment and training protocols.

Another potential limitation of this study is that only three forms of parental attention were evaluated. As previously mentioned, these were the forms of attention observed most frequently by Piazza, Fisher et al. (2003) and Borrero et al. (in press). Borrero et al. also observed threats following inappropriate behavior, but threats occurred with few participants and were not included in the current analyses. It is possible that some parents delivered other forms of attention such as general conversation or excessive talking about the meal, and to the extent that the forms of attention assessed in the current study do not represent an exhaustive summary of the possible forms of attention, future research may be designed to capture other potentially important forms of attention.

It should be noted that results of the study could have been affected by the fact that the parents knew that they were being observed (Brackett, Reid, & Green, 2007; Kazdin, 1977) and that the observations were conducted in a hospital setting rather than a home setting. This could have potentially affected how they interacted with their children. For example, a parent may have wanted to show that he or she was persistent with his or her child at mealtime and used more coaxing than typically would be used in the home environment. This may have inflated the results obtained for coaxing. In

addition, a parent who would typically reprimand his or her child during a meal may have made an effort to reprimand less than normal which would have deflated the results obtained for reprimanding. In the future, it may be beneficial to obtain home video recordings of meals prior to the child's hospital admission. Although the parents would still know that they are being observed in this case, the meal may be more natural for both the parents and the children.

Although a large majority of feeding research focuses on escape as a maintaining variable, there is evidence that attention plays a role in the mealtime environment. This should come as no surprise given that attention is ubiquitous in social interaction. However, the current research, and earlier research suggests that various forms of attention may differentially affect the probability of various forms of behavior. The methods used in this study allowed for an examination of changes in child behavior in relation to parent attention. These methods also permitted for an evaluation of potential reinforcers for parents in regard to mealtime interaction.

Author's Note

This study was completed in partial fulfillment of the master of arts degree from UMBC by the first author, under the direction of the second.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interests with respect to the authorship and/or publication of this article.

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