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RESEARCH ARTICLE

A Comparison of Descriptive and Functional Analyses of Inappropriate Mealtime Behavior

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Abstract In recent years, rather than being used to assess the potential function of a response, descriptive assessment methods have been applied to evaluate potential consequences or contingencies for problem behavior (Borrero, Woods, Borrero, Masler, & Lesser in *Journal of Applied Behavior Analysis, 43*, 71–88. doi: 10.1901/jaba.2010.43-71, 2010) or to assist with designing baseline conditions to approximate caregiver behavior (Casey et al. in *Behavior Modification, 33*, 537–558. doi: 10.1177/0145445509341457, 2009). It has been shown that descriptive assessments of some forms of problem behavior (e.g., self-injury, aggression) are not good indicators of behavioral function and should not be used exclusively when conducting functional behavior assessments (Thompson & Iwata in *Journal of Applied Behavior Analysis, 40*, 333–338. doi: 10.1901/jaba.2007.56.06/epdf, 2007). However, the extent to which descriptive assessments of inappropriate mealtime behavior can predict behavioral function is not yet clear. We conducted descriptive assessments of inappropriate mealtime behavior and compared the results to functional analyses for ten children with severe food refusal. Results showed that, for 71 % of participants, the descriptive and functional analyses matched. These results suggest that the correspondence between descriptive and functional analyses, at least for inappropriate mealtime behavior, may be higher than that for other forms of problem behavior.

Keywords Descriptive assessment · Descriptive analysis · Feeding · Pediatric food refusal · Inappropriate mealtime behavior · Conditional probabilities

Mealtime difficulties have been reported to occur for 45 % of typically developing children (Bentovim, 1970). Although only 30 % of individuals with developmental disabilities (Palmer, Thompson, & Linscheid, 1975) are reported to have such feeding difficulties, prevalence among those with severe developmental disabilities has been reported to be as high as 80 % (Perske, Clifton, McClean, & Stein, 1977). Pediatric feeding disorders may occur for a number of reasons and may be related to medical concerns (e.g., gastroesophageal reflux); skill deficits or difficulties (e.g., difficulties swallowing or chewing); or due to a history of reinforcement of food refusal (Babbitt, et al., 1994; Bachmeyer, 2009; Piazza, 2008; Williams, Reigel, & Kerwin, 2009). In all likelihood, it may be a combination of these factors that results in the most severe of feeding problems (i.e., lack of sufficient intake to maintain good nutritional status). Regardless of the epidemiology of the feeding disorder, previous research has shown that a behavior analytic approach to assessment and treatment is effective in increasing consumption and reducing refusal (Piazza, 2008). Sharp, Jaquess, Morton, and Herzinger (2010), in a review of 48 studies involving the treatment of pediatric feeding disorders, found that each underscored the use of a behavioral intervention. Consequences, such as the delivery of attention, provided by caregivers following food refusal, or inappropriate mealtime behavior (IMB), during and surrounding mealtimes have been shown to reinforce IMB and result in its maintenance. For this reason, as with problem

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behavior such as self-injury and aggression, the use of functional analysis and function-based interventions provides the best approach to treatment.

Functional analyses of IMB have shown to be effective in identifying reinforcers for food refusal. Piazza, Fisher, et al. (2003) described a method for conducting descriptive and experimental analyses of IMB. To complete the descriptive assessment, they observed caregiver-fed meals for six child–parent dyads, scored both child responses (e.g., food acceptance, refusal) and parent responses (e.g., removal of demand, provision of attention and access to tangibles) and evaluated which parent responses most frequently followed child responses. Results showed that all parents provided escape (via removal of demands), access to attention, and access to tangibles, to some extent following IMB, with escape and attention being the most common parental response. Piazza, Fisher, et al. then conducted functional analyses by comparing test conditions (escape, attention, and tangible) to a control condition, using methods similar to those described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994). Results showed that the functional analyses were effective in identifying the function(s) of IMB, with escape and attention being the most commonly identified reinforcers and escape being the single most commonly identified reinforcer. It should be noted that for three of the six parent–child dyads, the results of the descriptive and functional analyses matched. That is, the same functions were identified for both analyses.

One common finding in the pediatric food refusal literature is the role of escape as a reinforcer for IMB and the effectiveness of escape extinction procedures (e.g., non-removal of the spoon) as part of a treatment package. It has been shown frequently that escape is the most common reinforcer for food refusal and that the most effective treatments typically include some component to prevent the child from avoiding the food presented (Bachmeyer, 2009; Cooper et al., 1995; Piazza, Patel, Gulotta, Sevin & Layer, 2003; Williams, Field, & Seiverling, 2010). In addition, even when other reinforcers such as attention and tangibles have been identified, the *necessary* component to an effective intervention has been shown to be escape extinction, suggesting that any positive reinforcers identified may augment the effects of treatment but may not be solely sufficient to increase food acceptance (Patel, Piazza, Martinez, Volkert, & Santana, 2002; Piazza, Patel, et al., 2003; Reed et al., 2004).

Although Piazza, Fisher et al. (2003) conducted descriptive assessments to identify potential consequences following IMB, the parent responses were grouped into fairly broad categories and they did not specifically compare the likelihood of a parent response (following IMB) to the unconditional probability of the same response. That is, although it is helpful to know that a parent attends to a child following food refusal, this information does not tell us if attention following food refusal is a concern. To identify attention as a potential concern, it is necessary to determine how often the parent attends to the child in general. Descriptive assessment research has stressed the importance of having a relevant comparison when evaluating conditional probabilities (i.e., the unconditional probability of an event; Thompson & Borrero, 2011; Vollmer, Borrero, Wright, Van Camp, & Lalli, 2001). Borrero et al. (2010) conducted an analysis of conditional probabilities during caregiver-fed meals to identify potential contingencies for IMB and food acceptance and to determine how frequently caregivers provided the consequences evaluated during functional analyses. This study was based on the procedures described by Thompson and Iwata (2001). The researchers conducted descriptive analyses to evaluate the frequency with which consequences provided during functional analyses (Iwata et al., 1982/1994) of problem behavior (escape, attention, and tangibles) were observed in the natural environment. Results of the Thompson and Iwata study showed that all consequences commonly tested in a functional analysis were observed, suggesting a strong rationale for testing these conditions in a functional analysis. Borrero et al. (2010), using similar analyses, evaluated how frequently specific caregiver responses (e.g., coaxing, comfort statements, escape, access to preferred food) followed topographies of IMB (disruption, expulsions, emesis). Various forms of attention and escape were observed during caregiver-fed meals, and, similar to the results reported by Thompson and Iwata, all consequences tested during functional analyses of IMB were observed. Specifically, escape was observed following IMB for all participants, attention following IMB was observed for over 90 % of participants, and access to tangibles following IMB occurred infrequently. Results showed that the conditions tested during functional analysis of IMB were similar to typical caregiver responses during mealtimes, supporting the notion that the functional analysis is a useful assessment and likely the best approach to deriving function-based treatments.

Although evidence suggests that the events tested in functional analyses are analogous to caregiver behavior during mealtimes with children who exhibit food refusal, the usefulness of direct observations of caregiver-fed meals as an assessment tool is unclear. Conditional probability analyses of descriptive assessments have been shown to be useful in identifying potential reinforcement contingencies during mealtimes; thus, we sought to determine the extent to which these results corresponded to those of a functional analysis (Piazza, Fisher, et al. 2003). Previous research (see Thompson & Borrero, 2011 for a review) has shown that descriptive assessments of problem behavior such as aggression and self-injury do not correspond well to functional analyses using procedures similar to those described by Iwata et al. (1982/1994), which may limit their utility as an assessment tool. However, the extent to which descriptive assessments can adequately identify potential reinforcers (or areas of concern) for IMB is

unknown. It may be the case that higher correspondence between the two assessments would be observed with descriptive analyses of food refusal, making them a sound assessment tool for practitioners. First, it is possible that there is less variability in response function for IMB, as it is known that escape is almost always identified as a reinforcer. This may just increase the probability for good correspondence with a functional analysis. Also, the demands presented during a descriptive analysis are likely identical to the demands presented during the functional analysis (asking the child to take a bite of food or eat). The mealtime situation during the descriptive analysis may also be quite similar to the natural environment, even if it is conducted in a less naturalistic setting, because many of the stimuli are similar (e.g., foods presented, utensils used, child seated at table or highchair). Parents typically attempt to feed their children in the home prior to seeking services, so it is not likely a novel situation to ask them to feed meals as part of the assessment and they may be comfortable feeding in front of others.

Therefore, the purpose of this study was to compare the results of descriptive assessments and functional analyses of IMB to determine the level of correspondence between the two assessments. This was accomplished by completing comparative probability analysis for descriptive assessments using procedures described by Borrero et al. (2010). We then conducted functional analyses of IMB, using procedures similar to those described by Piazza, Fisher, et al. (2003). Correspondence was evaluated by comparing potential contingencies identified during the descriptive assessment to reinforcers identified during the functional analysis.

Method

Participants, Setting, and Materials

Child participants were 10 children (one female and nine males), between the ages of 2 and 6 years, admitted to an inpatient or day treatment intensive feeding program for the assessment and treatment of severe food refusal and selectivity. Table 1 shows specific information for all child participants. Primary caregivers (i.e., parents) for all children participated in the descriptive assessment portion only and received no feeding services or recommendations from the intensive program prior to admission. Meals were videotaped for the purposes of data collection.

All sessions were conducted in a 3 m × 3 m treatment room equipped with an observation window, chairs for therapists, a table, and a high chair or Rifton® chair for the child. Additional materials in the treatment room included utensils, napkins, web-cams, tangible items (e.g., toys, iPods®, TV), and laptop computers. Caregivers were interviewed by therapists and reported 10 preferred, moderately preferred, non-preferred, and novel foods prior to the descriptive assessment and 6–10 foods were provided during the descriptive assessment. Foods identified by caregivers as non-preferred and foods not consumed readily (i.e., foods that were refused by the child) during the descriptive assessment were provided during the functional analysis. Primary caregivers conducted all descriptive assessment sessions and therapists observed meals from an observation room located behind a one-way window. Trained therapists conducted all functional analysis sessions and data collectors were seated in the treatment room.

Table 1 Age, diagnoses, and reason for admission of all participants

Name	Age (at admission)	Diagnoses	Reason for admission
Barnaby	2 years, 10 months	Gastroesophageal reflux (GERD), prematurity, poor weight gain	Texture selectivity
Buddy	2 years, 1 month	Food allergies, GERD, Nissen fundoplication	Food selectivity
Dillon	2 years, 10 months	Failure to thrive (FTT), GERD, prematurity	Liquid dependence
Enzo	4 years, 3 months	GERD	Liquid dependence
Eric	4 years, 8 months	FTT, nephrogenic diabetes insipidus	Gastrostomy (G) tube dependence
Garrity	2 years, 5 months	GERD, prematurity	Liquid dependence
Mick	3 years, 10 months	Autism, Lyme disease	Food selectivity
Ruby	2 years	Hamangioma (head, airway), prematurity	G-tube dependence
Rufus	6 years, 8 months	Autism, constipation	Liquid dependence
Toby	5 years	Arthrogryposis multiplex congenita, constipation, eosinophilic esophagitis, GERD, tethered spine and cord syndrome vocal cord paralysis, tracheostomy	G-tube dependence

Response Measurement and Interobserver Agreement

Trained data collectors recorded all responses on laptop computers. Individuals were trained to collect data using Instant Data®, a computerized data collection program, and were familiar with response definitions. Data were collected on caregiver, therapist, and child behavior. All sessions were videotaped as part of standard care. For the descriptive assessment, all sessions were either scored from an observation room during the assessment or trained data collectors scored the videos following the session. Data collectors were seated in the treatment room during functional analysis sessions and scored as sessions occurred.

Conditional probability analyses were conducted on the descriptive assessment results. Child responding was evaluated by reviewing responses per min of IMB during the conditions of the functional analysis. Visual inspection was used to identify reinforcers as indicated in the functional analysis. Three Board Certified Behavior Analysts (BCBA; i.e., authors) reviewed the functional analysis results and the comparison of assessment results.

Primary Caregiver Behavior Caregiver responses to IMB identified in previous research (Borrero et al., 2010; Piazza, Fisher, et al., 2003; Woods, Borrero, Laud, & Borrero, 2010) were scored using frequency measures and included *coaxing* (e.g., "come on," "you like this," "dad will be happy if you eat this"). Statements such as "swallow" were initially scored as an instruction following each bite placement, however if repeated within 5 s of the initial instruction were scored as a coax. For example, if the bite was deposited into the child's mouth and the caregiver instructed the child to "swallow," and after 2 s passed repeated the initial statement, "swallow," a coaxing statement was recorded. The frequency of *reprimands* (e.g., "no," "stop that," "don't do that"), *comforting* (e.g., "it's okay," "you're okay"), and *praise* (e.g., "good job") was also recorded. *Bite presentation* was defined as the caregiver bringing a bite toward the child's mouth, regardless of the distance.

Duration measures were recorded immediately upon the occurrence of caregiver behavior and recording ended 3 s after the occurrence of that specific behavior had ceased (Vollmer et al., 2001). Duration measures included *escape*, defined as removing a bite away from the child, regardless of the distance (non-self-feeder), or in the absence of a bite presentation (self-feeder), if 10 s elapsed following an instruction to eat and the child did not take a bite or the caregiver did not provide another instruction. *Demand* was scored anytime the caregiver brought a bite of food toward the child's mouth, regardless of the distance, or instructed the child to eat (e.g., "eat," "take a bite"), without bringing a bite of food toward the child's mouth. *Tangible delivery* was scored each time the caregiver provided the child access to an item to which the child did not previously have access (e.g., turning on the TV, giving the child a toy) or if the caregiver provided the child access to an item at the onset of the session (e.g., turned on the TV before starting the meal). Less restrictive definitions were used for escape, bite presentation, and demand during the descriptive assessment based on general observations of caregiver-conducted meals. It is not uncommon for caregivers to present bites of food without presenting the bite within 2.5 cm from the child's mouth and to remove bites before the spoon reaches the child's mouth. This is slightly different from the manner by which a therapist may present a bite during structured feeding sessions. We opted not to provide any instructions to caregivers that might change their typical feeding styles. Thus, we wanted to account for all possible forms of bite presentation and included a broader definition.

Therapist Behavior Therapist responses to IMB were scored using frequency measures and were scored the same as for caregivers with minor differences. *Bite presentation* was defined as the therapist bringing a bite within 2.5 cm of the child's mouth (for non-self-feeders) or placing a single bite on a plate in front of the child simultaneous with an instruction to take a bite (self-feeders: Rufus and Enzo). Duration measures were scored slightly differently for therapists as well. *Escape* was defined as removing a bite more than 2.5 cm from the child's mouth (non-self-feeder), or if bite presentations did not occur (self-feeder), when 10 s elapsed following an instruction, without the child taking a bite. *Demand* was scored anytime the therapist brought a bite of food within 2.5 cm from the child's mouth, or instructed the child to eat (e.g., "eat," "take a bite"), without bringing a bite of food toward the child's mouth (self-feeder). Tangible delivery was scored as in the descriptive assessment.

Child Behavior Data collectors scored both IMB and appropriate mealtime behavior. IMB was scored as frequency of occurrence and included *refusal* defined as the child hitting the feeder's hand, utensil, plate, or other mealtime materials, throwing food, banging on table or tray, blocking his/her mouth with a hand, and turning his/her head away from utensil at a 45° angle. IMB was converted to responses per min for the functional analysis. Data were also collected on the frequency of *acceptance*, defined as the child allowing any amount of food to enter the mouth. For both analyses, child behavior was only scored and analyzed when a demand was in place (with the exception of the unconditional probability measures).

Procedures and Experimental Design

Descriptive Assessment Descriptive assessments were conducted using procedures described by Borrero et al. (2010). Primary caregivers were instructed to conduct three meals

with the child and to feed as they typically did in the home. They were told that although they could end the meal at any time and for any reason, feeding for at least 15 min was recommended. However, meals lasting less than 15 min did not prohibit the participant from participation. We included these meals, as it was thought that they were possibly realistic meals as compared to therapists asking the caregivers to continue to feed after they reported they were finished feeding the meal.

Primary caregivers were provided with at least six foods, composed of preferred, non-preferred, and novel foods as reported by the caregiver during the intake. Data collectors observed the meals through a one-way-window, and all meals were videotaped and scored following the meal. The primary caregiver was also provided with materials needed for meals, including seating, tangible items (e.g., toys) typically used at home, plates or bowls, napkins, and utensils. If a caregiver declined tangible items, they were not provided, but were always offered prior to the meal and provided following caregiver request. All foods and tangible items remained consistent across all three caregiver-fed meals.

Functional Analysis Following the descriptive assessment, a paired-choice preference assessment (Fisher et al., 1992) was conducted with the foods presented during the descriptive assessment. Therapists conducted functional analyses using procedures similar to those described by Piazza, Fisher, et al., (2003) with non-preferred foods and foods not accepted during the descriptive assessment. A control condition was compared to attention, escape, and tangible (five participants only) using various single-subject designs. A multielement design was used for nine participants, with pairwise comparisons of test conditions and the control conducted for all but one of the nine participants (Eric). A reversal design was used for one participant (Buddy). Tangible conditions were only tested with participants for whom parents used tangibles in the descriptive assessment. Tangibles were not used during caregiver-fed meals for five participants (Barnaby, Eric, Garrity, Mick, and Rufus), and therefore, a tangible test condition was not included in their functional analysis. Sessions were conducted daily during meal blocks designed to approximate breakfast, lunch, and dinner meals. All sessions were 5 min in duration and 4–6 sessions were conducted per meal block. The foods and number of foods presented varied by participant but included at least six foods that had been presented during the descriptive assessment. All foods were presented during all conditions of the functional analysis. The order of food presentations differed across sessions but remained constant during sessions and was randomly determined. For all participants, programmed consequences were delivered following IMB.

The *control* condition was used as a comparison for all test conditions and included non-contingent access to preferred items and attention. The therapist provided access to moderately preferred items, determined through a paired-choice preference assessment (Fisher et al., 1992) and non-contingent attention (e.g., singing, playing with toys). Attention was provided every 15 s for a duration of approximately 5 s. For non-self-feeders, bites were presented 2.5 cm away from the child's mouth using a stationary spoon procedure (i.e., the spoon did not follow the child's mouth; Piazza, Fisher, et al., 2003) or a single bite of food was placed on the tray in front of the child (self-feeder) for a duration of 30 s or until the child accepted the bite, whichever occurred first. No programmed consequences were provided following IMB or appropriate mealtime behaviors. At the end of the 30-s interval, the bite was removed and another bite presented within 5 s. This procedure continued for 5 min.

The *attention* condition was designed to establish whether IMB was sensitive to positive reinforcement in the form of attention. The therapist presented a bite of food within 2.5 cm of the child's mouth using the stationary spoon procedure described above (non-self-feeder) or placed a single bite of food on a plate in front of the child with an instruction to take a bite (self-feeder). For self-feeders, the therapist implemented the non-self-feeder procedures if the child did not take the bite within 5 s of the initial bite presentation. If the child engaged in IMB, the feeder provided the child with 5 s of attention (Piazza, Fisher et al. 2003), in the form of coaxing and the bite remained stationary for the rest of the 30-s interval. This form of attention was used because coaxing was the most frequent form of attention delivered by all caregivers following IMB during the descriptive assessment. If the child did not engage in IMB, the bite remained stationary for 30 s and no verbal attention was provided. At the end of the 30-s interval, the bite was removed and another bite was presented within 5 s. This procedure continued for 5 min. No other programmed consequences were delivered following IMB (i.e., IMB did not result in escape). No programmed consequences were provided if the child accepted the bite.

The *escape* condition was designed to determine if IMB was sensitive to negative reinforcement in the form of removal of the demand of eat (i.e., removal of the food). The therapist presented a bite of food, 2.5 cm away from the child's mouth (non-self-feeder) or placed a single bite of food on a plate in front of the child with an instruction to take a bite (self-feeder). For self-feeders, the therapist implemented the non-self-feeder procedures if the child did not take the bite or engage in IMB within 5 s of the initial bite presentation. If the child engaged in IMB, the bite was removed for 20 s or until the end of the interval (if longer than 20 s). If the child did not engage in IMB, the bite remained stationary for 30 s. At the end of the 30-s interval, the bite was removed and another bite presented, within 5 s. No programmed consequences were provided if the child accepted the bite.

The *tangible* condition was included for only those participants whose caregivers requested and provided tangibles during the descriptive assessment (Buddy, Dillon, Enzo, Ruby, and Toby). The therapist presented a bite of food within 2.5 cm of the child's mouth using the stationary spoon procedure described above (non-self-feeder) or placed a single bite of food on a plate in front of the child with an instruction to take a bite (self-feeder). For self-feeders, the therapist implemented the non-self-feeder procedures if the child did not take the bite within 5 s of the initial bite presentation. If the child engaged in IMB, the feeder provided the child with access to tangibles (e.g., toys, DVD) for 20 s or until the end of the interval (if longer than 20 s), and the bite remained stationary. If the child did not engage in IMB, the bite remained stationary for 30 s. At the end of the 30-s interval, the bite was removed and another bite was presented within 5 s. This procedure continued for 5 min. No other programmed consequences were delivered following IMB (i.e., IMB did not result in escape). No programmed consequences were provided if the child accepted the bite.

Data Analysis

Conditional Probability Analysis (Descriptive Assessment)

Following the descriptive assessment, the data were analyzed for all caregiver-fed meals to calculate the conditional probabilities of caregiver responses following IMB, using methods described by Borrero et al. (2010) and similar to those described by previous researchers (Borrero & Borrero, 2008; Vollmer et al., 2001). Conditional probabilities were analyzed using Instant Analyzer ® with an interval size of 5 s, meaning that for each occurrence of child behavior, the Instant Analyzer ® program lagged forward 5 s in the raw data to determine if a specific occurrence of caregiver behavior occurred. Although a 10-s interval has been used in previous literature, a 5-s interval was selected as a more conservative measure and was closer in duration to the response-reinforcer lag typical in a functional analysis. During functional analyses, potential reinforcers are delivered immediately (but within 5 s) following a response, rather than 10 s following a response. Occurrence of a response was evaluated using a binary procedure (i.e., we asked, did the response occur, yes or no?). Conditional probabilities were calculated for caregiver responses following IMB including: probability of attention (coaxing, comfort, and reprimands), probability of escape, and probability of access to tangibles. Stimulus changes for duration events (i.e., evaluation within potential establishing operations, see Vollmer et al. 2001 for a description) were taken into account for all calculations separately. That is, escape was evaluated in the context of demands, and access to tangibles was evaluated in the context of restricted access to tangibles. No combined stimulus events were evaluated (e.g., demand and restricted access). The purpose of this approach was to identify potential events that altered the child's environment and to avoid artificial inflation of caregiver events.

For each calculation, first, each child response (i.e., instance of IMB) during meals was identified within the relevant potential establishing operation (EO). As an example, when evaluating escape, the analyzer was programmed to identify instances of IMB that occurred when demands to eat were in place. Second, the 5-s window following the child response was reviewed and if the caregiver response occurred during that window, a 1 was scored. If the caregiver response did not occur, a 0 was scored. Finally, all instances of the caregiver response were averaged across the three caregiver-fed meals. To calculate this, the number of times IMB was followed by the caregiver response (occurrences) was added across all three caregiver-fed meals and divided by the total number of instances of IMB across all three caregiver-fed meals within the relevant EO (opportunities). If no instances of IMB occurred during the potential establishing operation, calculation of the conditional probability was not mathematically possible, thus no conditional probability was determined. Conditional probabilities were conducted separately for all caregiver responses.

Unconditional Probability Analysis (Descriptive Analysis)

Unconditional probabilities were calculated as described by Borrero et al. (2010) and served as a comparison for the conditional probability calculations described previously. Observations were divided into 5-s intervals and the total number of intervals including the occurrence of a specific caregiver behavior was divided by the total number of 5-s intervals in an observation period. For example, consider an observation with eight 5-s intervals. If during six of those 5-s intervals an instance of coaxing occurred, the unconditional probability would be 0.75. However, if only four of the eight 5-s intervals included an instance of coaxing, the unconditional probability would be 0.50.

Following data analysis, the conditional and unconditional probabilities of each caregiver response (attention given IMB, escape given IMB, and tangible access given IMB) were compared (separately, for each participant) to the unconditional probability of each caregiver response (attention, escape, and tangibles) to identify potential contingencies in place. A potential positive contingency was identified if the conditional probability of a caregiver response was greater than the unconditional probability of the same response (with a difference of greater than .05). Vollmer et al. (2001) suggested that evaluating comparable probability values may be useful. Thus, we arbitrarily set a minimum discrepancy value of .05. If it was more likely that a caregiver response, such as escape, followed IMB than it did independently of IMB, this was considered a potential positive contingency and likely something that

would be deemed problematic from a treatment perspective, requiring intervention. A potential negative contingency was identified if the conditional probability of a caregiver response was less than the unconditional probability of the same response (with a difference of greater than 0.05). If it was less likely that a caregiver response such as access to tangibles followed IMB than it did independently of IMB, this was considered a potentially negative contingency and not necessarily problematic from a treatment perspective. Potentially neutral contingencies were identified when the conditional and unconditional probabilities were within a difference of at least 0.05, suggesting no difference in caregiver responding based on IMB. If analyzing the conditional probability was not mathematically possible (e.g., a potential EO/reinforcer was not observed at all), comparison of conditional to unconditional probabilities did not occur.

Although a function cannot be identified via descriptive assessment, for the purposes of this study, we will be discussing potential functions. Potential functions were identified based on the comparison of the conditional and unconditional probabilities for caregiver responses (attention given IMB, escape given IMB, and tangible access given IMB). If a potential positive contingency was observed for a caregiver event, this was considered a potential function. In considering what practitioners might do in practice, it seems reasonable that practitioners would evaluate possible caregiver responses following inappropriate behavior and target those for intervention. Thus, it was thought that potentially positive contingencies might highlight problematic caregiver responses in which caregivers did not follow "healthy contingencies" (i.e., not providing attention, escape or tangibles following inappropriate behavior) and might serve to reinforce IMB.

Visual Inspection (Functional Analysis)

Functional analysis results were evaluated via visual analysis, by comparing the test conditions to the control condition for each child and determining if the data paths were differentiated. Three BCBAs evaluated functional analysis results and identified whether or not a function was identified and if data were undifferentiated.

All potential functions (and events not identified as potential functions) of IMB during caregiver-fed meals were summarized and compared to the functions identified via functional analysis using a binary system. If the same potential function was identified for both analyses, correspondence was scored, and the percentage of correspondence was averaged across all participants. Correspondence was scored for each possible function (attention, escape, and tangible) separately to determine if specific functions were more likely to correspond. Also, overall correspondence (i.e., Did all functions and potential functions identified match for a participant?) was summarized using a binary system in an effort to determine if, generally, similar information by which to make clinical treatment decisions would be available with either analysis. When it was not mathematically possible to calculate the conditional and unconditional probabilities (e.g., a potential EO/reinforcer was not observed at all), correspondence for that potential reinforcer and function could not be determined. In such cases, correspondence was evaluated for only those potential functions identified.

Interobserver Agreement and Procedural Integrity

Interobserver agreement (IOA) was assessed by having a second data collector independently score meals, collecting data on both child and caregiver 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 by taking the smaller frequency of the response and dividing by the larger for each interval (Borrero et al. 2010). A mean percentage was then calculated for the entire observation. IOA was calculated for 27 % of descriptive assessment sessions. Agreement scores for frequency measures were bite presentation 96 % (range 86 to 100 %), IMB 95.4 % (range 80.2 to 100 %), acceptance 98.2 % (range 92 to 100 %), coax 93.3 % (range 70.3 to 100 %), reprimand 99.1 % (range 95.9 to 100 %), and comfort 99 % (range 95.5 to 100 %). Agreement scores for duration measures were escape 88.3 % (range 59 to 98.1 %), demand 85.7 % (range 54 to 95.1 %), tangible access 98.4 % (range 91.5 to 100 %), and tangible restriction 98.2 % (range 95.9 to 100 %).

IOA was also scored for 35 % of functional analysis sessions for child and therapist behavior. Agreement scores for frequency measures were bite presentation 95.1 % (range 88.4 to 100 %), IMB 86.1 % (range 73.8 to 100 %), acceptance 99.3 % (range 92 to 100 %), and attention 89.9 % (range 80.4 to 100 %). Agreement scores for duration measures were escape 87.5 % (range 77.4 to 99 %), demand 89.1 % (range 72.4 to 99 %), tangible access 98.7 % (range 89.2 to 100 %), and tangible restriction 97.8 % (range 78.1 to 100 %).

Procedural integrity was scored for at least 34 % of sessions for all participants by reviewing bite presentation, delivery of attention, escape, and tangible delivery. Procedural integrity averaged 89 % for bite presentation, 96 % for attention, 96 % for non-removal of the spoon, and 97 % for tangible delivery. For each procedure, the data streams were reviewed and the number of times a procedure was implemented correctly within 5 s (i.e., correct occurrences) was divided by the total number of times the procedure should have been implemented (i.e., opportunities) and multiplied by 100.

Results and Discussion

During the descriptive assessment, the mean observation time for all three caregiver-fed meals was 76.1 min (range 37.8 to 135.4 min). Across all participants, the mean frequency of IMB was 78.6 (range 19 to 249). Caregiver coaxing and escape (removal of the spoon) were the most frequently observed events following IMB and were observed to some degree for all participants. Reprimands were observed with all participants but were less frequent than coaxing, and comfort statements were observed with 7 of 10 participants. These findings are similar to those reported by Piazza, Fisher, et al. (2003) and Borrero et al. (2010).

Figures 1, 2, 3, and 4 depict the results of the conditional probability analyses for the descriptive assessment (left panels) and the functional analysis of IMB (right panels) for each participant. For the descriptive assessment results (left panels), the conditional probability (striped bars) of each

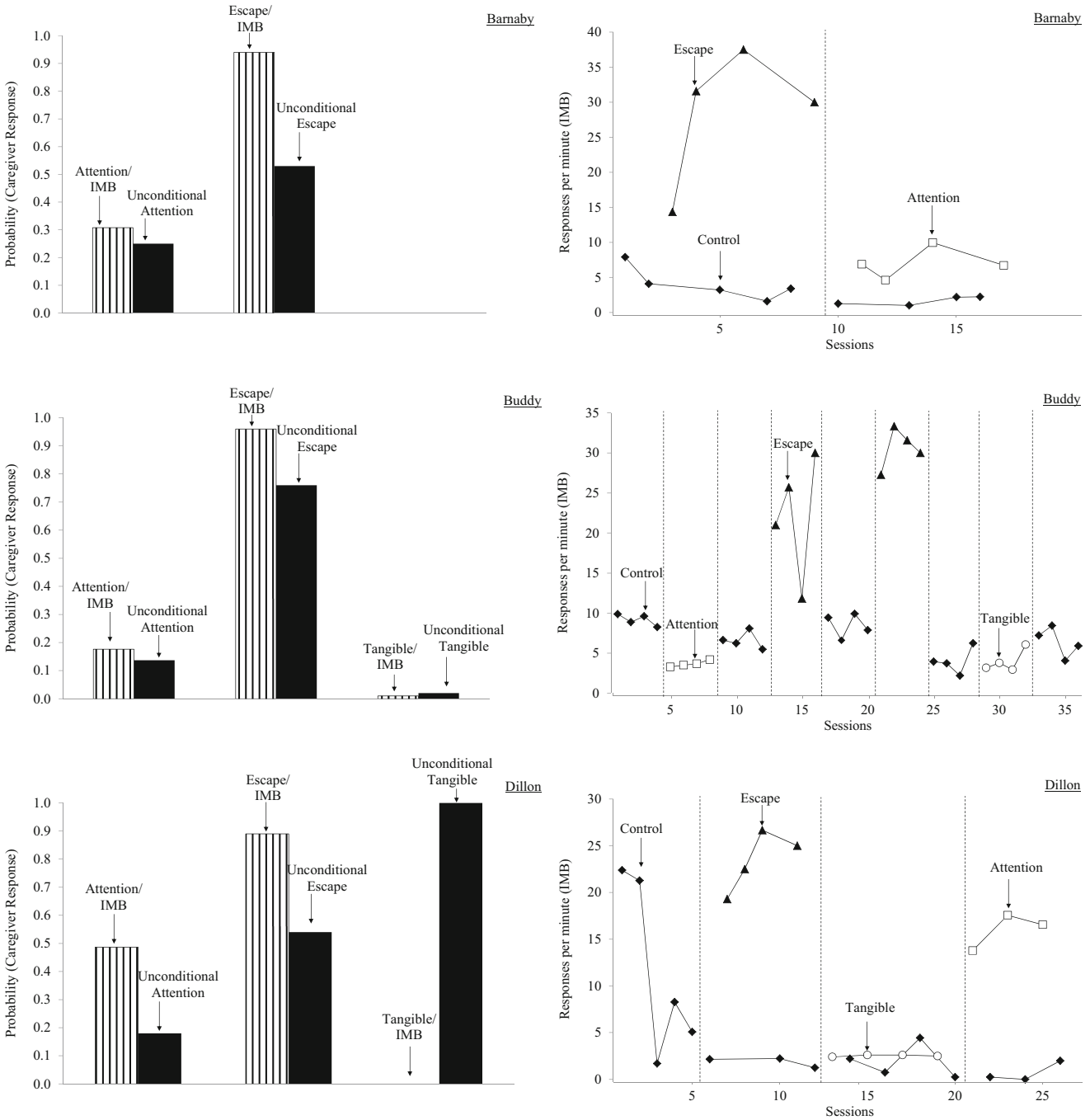

Fig. 1 Results of conditional probability analyses for descriptive assessments (*left panels*) and functional analyses (*right panels*) for Barnaby, Buddy, and Dillon

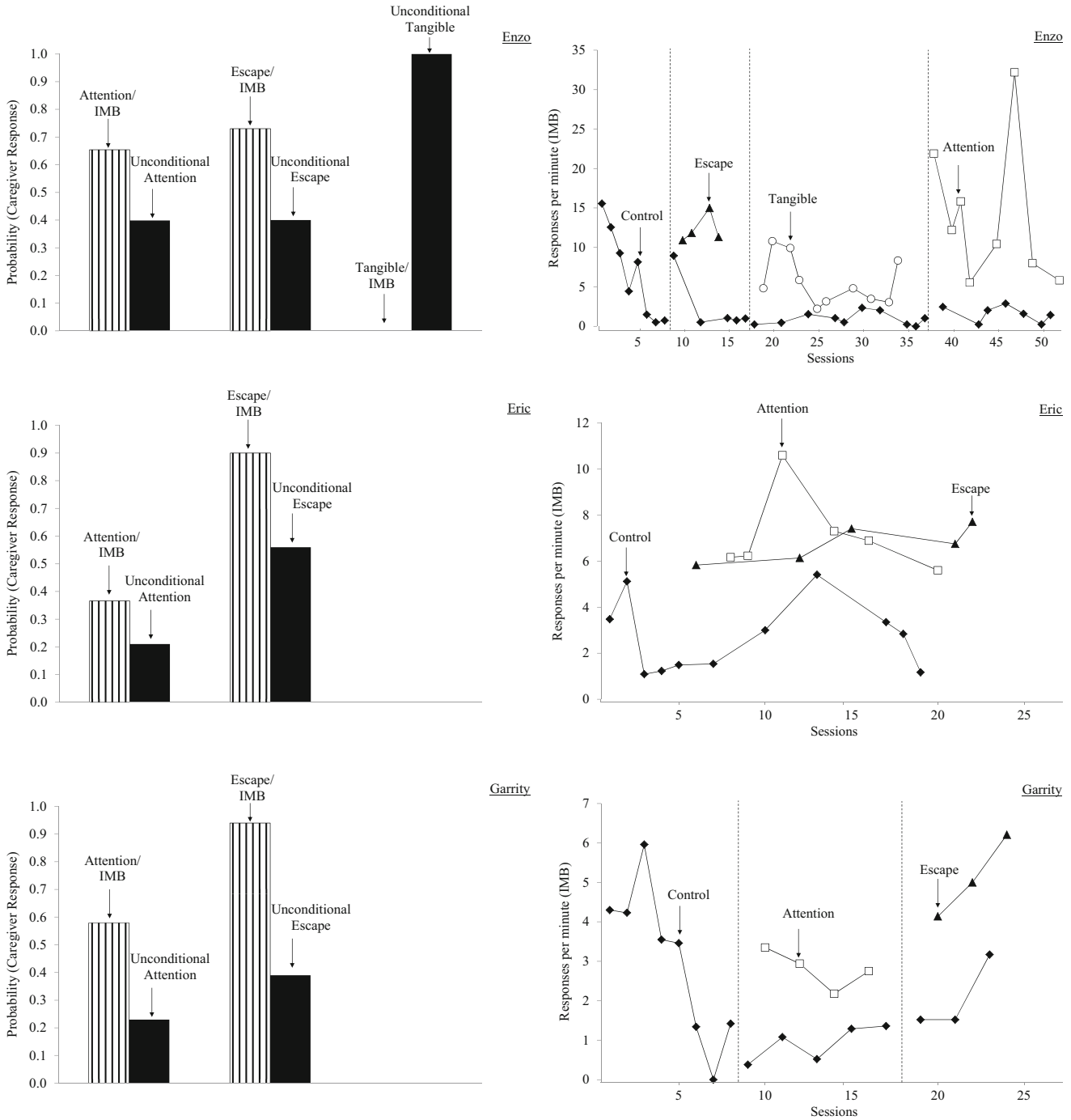

Fig. 2 Results of conditional probability analyses for descriptive assessments (*left panels*) and functional analyses (*right panels*) for Enzo, Eric, and Garrity

caregiver response given IMB (i.e., attention, escape and tangible delivery) is shown next to the unconditional probability (solid bars) of the same event. Attention in the form of coaxing was observed with all caregivers and is shown for all as the probability of attention to provide a direct comparison to the functional analysis attention condition. Other forms of attention, reprimands, and comfort were observed at low to zero levels and no potential positive contingencies were observed for any participants. Specific conditional and unconditional probabilities for all forms of attention are available upon request from the first author.

Figure 1 shows the results for Barnaby (top panel), Buddy (middle panel), and Dillon (bottom panel). For Barnaby, the comparison of the conditional probabilities to the unconditional probabilities showed potential positive contingencies for attention ($p = 0.29$, compared to $p = 0.23$) and escape

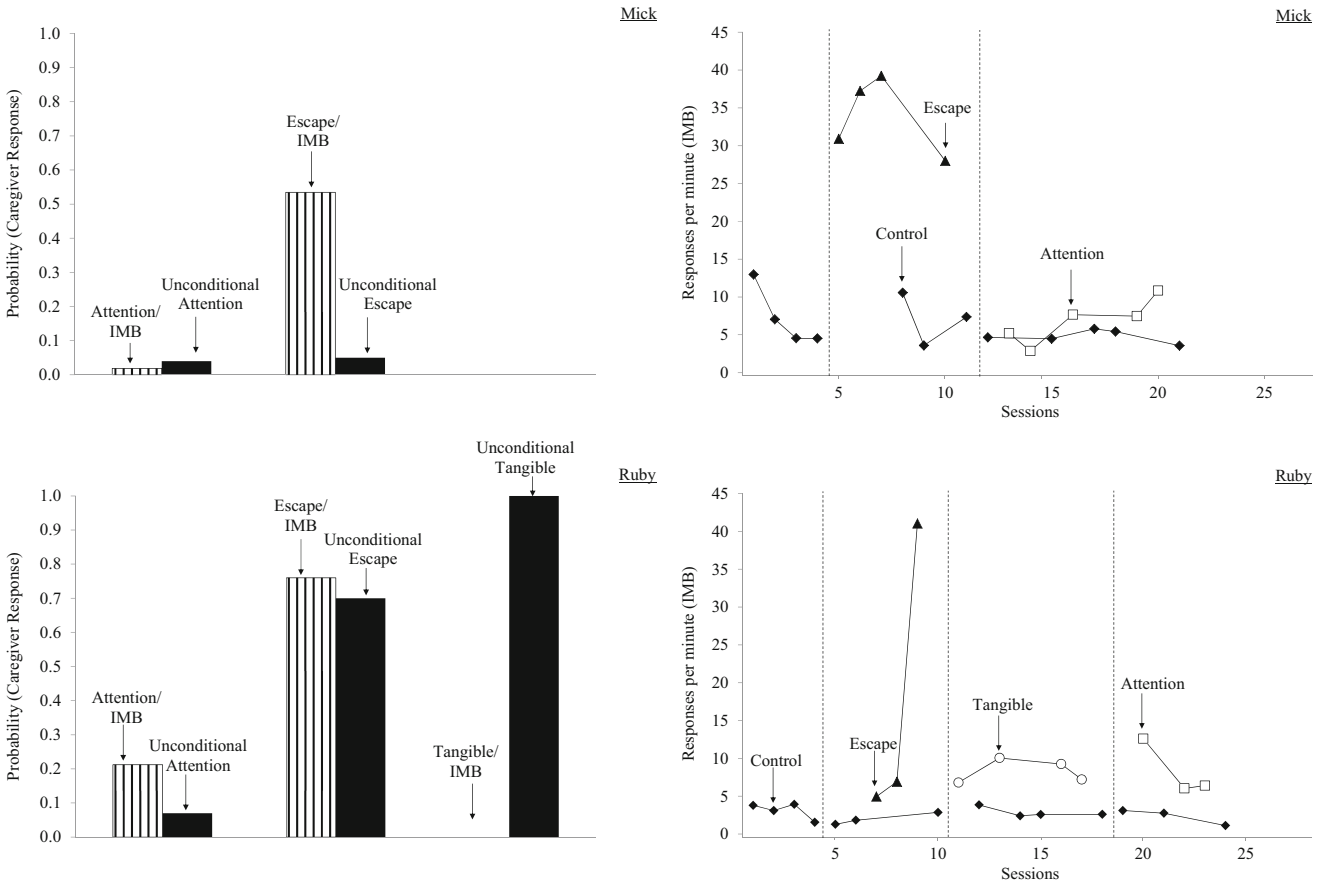

Fig. 3 Results of conditional probability analyses for descriptive assessments (*left panels*) and functional analyses (*right panels*) for Mick and Ruby

($p = 0.92$, compared to $p = 0.53$) following IMB, and attention and escape were identified as potential functions of IMB. The results of his functional analysis demonstrated that attention and escape were reinforcers for IMB. For Buddy, although the conditional probability of attention ($p = 0.16$) was higher than the unconditional ($p = 0.11$), the difference was not greater than 0.05. The conditional probability of escape ($p = 0.96$) was higher than the unconditional ($p = 0.76$). Thus, we identified escape as a potential positive contingency during his descriptive assessment (i.e., potential function for IMB). The conditional probability of access to tangibles ($p = 0.0$) did not exceed the unconditional probability of access to tangibles ($p = 0.03$); thus, tangibles were not identified as a potential reinforcer for Buddy. Results of his functional analysis showed that escape was a reinforcer of his IMB. For Dillon, conditional probabilities for attention ($p = 0.49$; unconditional $p = 0.10$) and escape ($p = 0.89$; unconditional $p = 0.79$) identified potential positive contingencies and potential attention and escape functions for IMB. Although his caregivers used tangibles, they were provided at the beginning of the meal and never removed (i.e., no stimulus from restricted access to access was possible). Because tangibles were never restricted, it was not possible to calculate the conditional probability of tangible delivery following IMB. Access to tangibles remained consistent throughout these caregiver-fed meals and was not more likely to follow IMB (i.e., did not change and IMB did occur) during mealtimes. Results for delivery of tangibles for Dillon were not considered in the overall correspondence between the two analyses for this reason, but tangible delivery did not meet the criteria to be considered a potential reinforcer for IMB. Results of his functional analysis showed attention and escape reinforced IMB.

Figure 2 shows the results for Enzo (top panel), Eric (middle panel), and Garrity (bottom panel). For Enzo, conditional probabilities yielded potential positive contingencies for attention ($p = 0.53$) and escape ($p = 0.74$), as compared to the unconditional probabilities of attention ($p = 0.36$) and escape ($p = 0.40$). These results suggested attention and escape were potential functions of IMB. He was provided with access to tangibles throughout the entire meal, and once they were delivered, they were not removed. Therefore, the conditional probability of access given IMB could not be calculated and his tangible results were not included in the comparison of the two analyses. Because access was not more likely to follow IMB, his results did not meet the criteria and we did not identify tangibles as a reinforcer for IMB. Attention, escape, and tangibles were identified as reinforcers during his functional analysis. For Eric, no tangible items were present during his

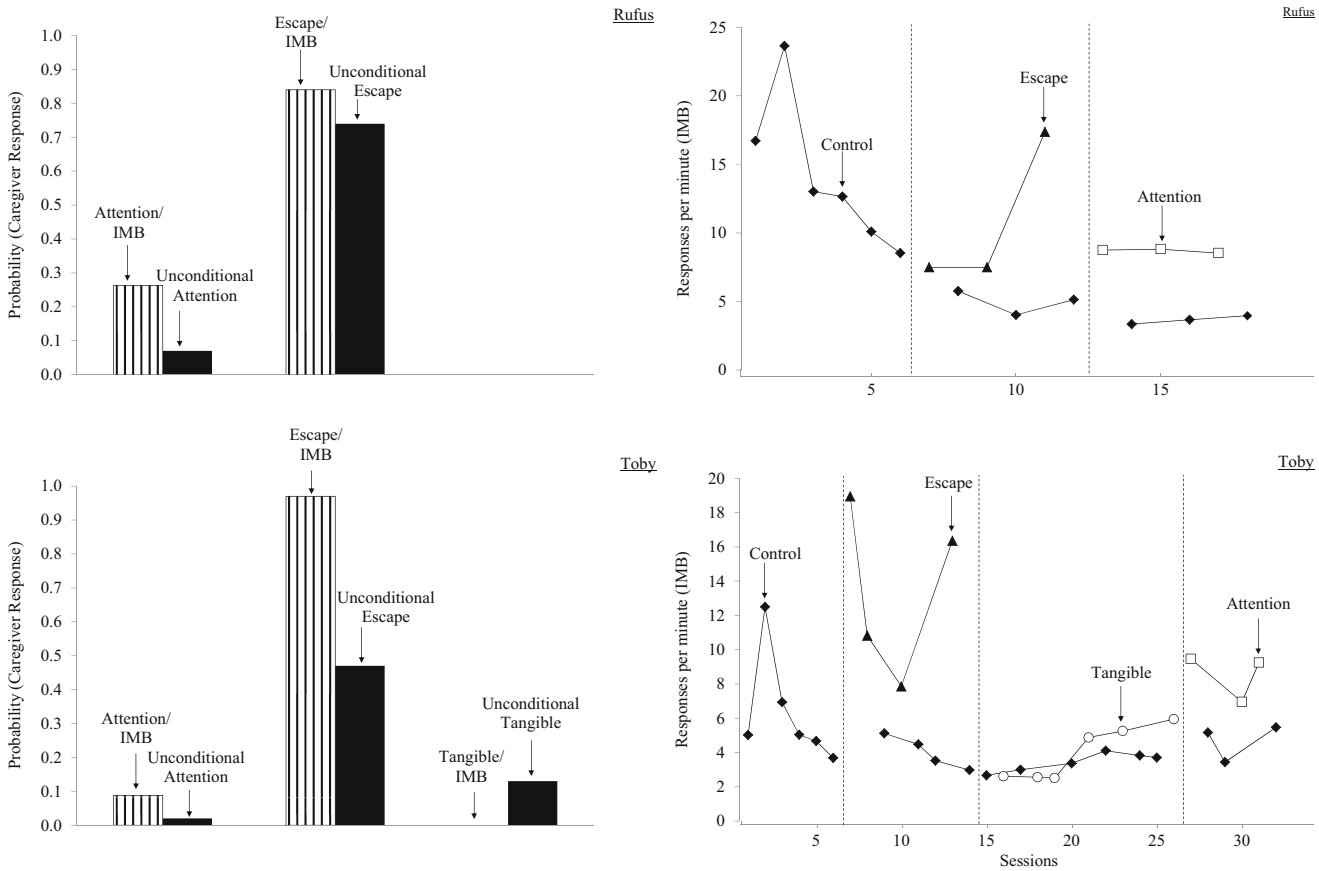

Fig. 4 Results of conditional probability analyses for descriptive assessments (*left panels*) and functional analyses (*right panels*) for Rufus and Toby

descriptive assessment, thus the tangible condition was not evaluated in his functional analysis. We observed higher conditional probabilities for attention ($p = 0.37$) and escape ($p = 0.90$) as compared to the unconditional probabilities of the same events ($p = 0.21$; $p = 0.56$, respectively), suggesting attention and escape were potential reinforcers for IMB. Eric's functional analysis identified attention and escape as reinforcers for IMB. For Garrity, comparisons of conditional and unconditional probabilities for attention ($p = 0.53$ compared to $p = 0.20$) and escape ($p = 0.95$ compared to $p = 0.39$) suggested potential positive contingencies and functions for attention and escape. His functional analysis identified attention and escape functions for IMB.

Figure 3 shows the results for Mick (top panel) and Ruby (bottom panel). For Mick, comparisons of conditional and unconditional probabilities for attention ($p = 0.02$ compared to $p = 0.04$) and escape ($p = 0.53$ compared to $p = 0.05$) suggested a potential positive contingency for escape but not for attention. His functional analysis identified escape and attention as functions for IMB. For Ruby, we observed higher conditional probabilities for attention ($p = 0.21$) and escape ($p = 0.76$) as compared to the unconditional probabilities of the same events ($p = 0.07$; $p = 0.7$, respectively), suggesting attention and escape were potential reinforcers for IMB. Because Ruby was provided with access to tangibles throughout her entire descriptive assessment, the conditional probability of access to tangibles given IMB could not be calculated. Ruby's functional analysis identified attention, escape, and tangible access as functions for IMB.

Figure 4 shows the results for Rufus (top panel) and Toby (bottom panel). For Rufus, comparisons of conditional and unconditional probabilities for attention ($p = 0.26$ compared to $p = 0.07$) and escape ($p = 0.84$ compared to $p = 0.74$) suggested potential positive contingencies and functions for both escape and attention. His functional analysis identified both escape and attention as reinforcers for IMB. For Toby, comparisons of conditional and unconditional probabilities for attention ($p = 0.09$ compared to $p = 0.02$), escape ($p = 0.97$ compared to $p = 0.47$), and access to tangibles ($p = 0$ compared to $p = 0.13$) suggested potential positive contingencies and functions for attention and escape, but not tangible access. However, Toby's functional analysis identified attention, escape, and tangible access as functions of IMB.

Table 2 summarizes the results of the descriptive assessment and functional analysis by separate (potential) functions identified. Conditional probability analyses were calculated for 22 potential functions and yielded potential positive contingencies for 82 % of analyses, potential negative contingencies for 9 % of analyses, and neutral contingencies for 9 % of analyses. In addition, 80 % of participants had potential

Table 2 Comparison of results from descriptive assessments and functional analyses

Participant	Descriptive assessment			Functional analysis		
	Potential function identified			Function identified		
	Attention	Escape	Tangible	Attention	Escape	Tangible
Barnaby	Yes	Yes	N/A	Yes	Yes	N/A
Buddy	No[a]	Yes	No	No	Yes	No
Dillon	Yes	Yes	N/A[b]	Yes	Yes	No
Enzo	Yes	Yes	N/A[b]	Yes	Yes	Yes
Eric	Yes	Yes	N/A	Yes	Yes	N/A
Garrity	Yes	Yes	N/A	Yes	Yes	N/A
Mick	No	Yes	N/A	Yes	Yes	N/A
Ruby	Yes	Yes	N/A[b]	Yes	Yes	Yes
Rufus	Yes	Yes	N/A	Yes	Yes	N/A
Toby	Yes	Yes	No	Yes	Yes	Yes

[a] Indicates potential positive contingency with less than .05 difference between conditional and unconditional probabilities

[b] Indicates conditional probability calculations were not mathematically possible because the participant had continuous access to tangible items (i.e., tangibles were never removed)

positive contingencies for attention, 100 % had potential positive contingencies for escape, and 0 % showed potential positive contingencies for tangible access. Of the five participants having tangible access, 60 % were provided access prior to the meal and items were never removed. These findings illustrate that caregivers were most likely to provide escape and coaxing statements following IMB and provide free access to tangibles. The results of the descriptive assessment, for all participants, showed that the most frequently identified potential reinforcers were attention (specifically, coaxing) and escape. Functional analyses were successful in identifying reinforcers for IMB for 100 % of participants. Similar to the results obtained by Piazza, Fisher, et al. (2003), attention and escape were the most frequently observed functions. We observed that 90 % of the participants had an attention function identified, 100 % of participants had an escape function identified, and of the five participants for whom tangible functions were tested, 60 % had a tangible function identified.

Correspondence between the two analyses across all functions was 71 %, although all measures of correspondence could not be calculated for three participants (Dillon, Enzo, and Ruby). Perhaps a more practical measure of correspondence is to compare the two analyses for each function separately. Correspondence between the two analyses was greater than chance and averaged 90 % for attention functions, 100 % for escape functions, and 50 % for tangible functions. Thus, these results suggest that it may be possible to make an informed decision regarding treatment for IMB based on descriptive assessments (Table 3).

Table 3 Correspondence between descriptive assessments and functional analyses

Function	Correspondence with functional analysis	
	Number of cases	Percentage
Attention ($N = 10$)	9	90
Escape ($N = 10$)	10	100
Tangible ($N = 2$)	1	50
Combined ($N = 7$)	5	71.4

Analysis for the tangible function was only possible for two cases due to undetermined values for conditional probabilities. Three participants were not included in the combined analysis because conditional probabilities were not mathematically possible for the tangible function

Discussion

Previous research has evaluated the predictive qualities of descriptive assessments (Lerman & Iwata, 1993, Thompson & Iwata, 2007) and found low levels of correspondence between descriptive assessments and functional analyses of severe problem behavior, such as self-injury and aggression (see Thompson & Borrero, 2011, for a review). Although, to our knowledge, such correspondence has not been formally evaluated with food refusal, previous studies have shown that the consequences evaluated during functional analyses of IMB do closely link to typical caregiver responses (Borrero et al., 2010; Piazza, Fisher, et al., 2003). The results of this study suggest that descriptive assessments corresponded relatively well to the results of a functional analysis of IMB and with correspondence of the two shown for 71.4 % of participants (80 % if including all possible comparisons for Dillon, Enzo, and Ruby), at a better level than those for more typical problem behavior.

Interestingly, correspondence for individual functions was much higher for attention and escape as compared to tangibles. It is not clear why the differences were so great, but it may be related to the limited opportunities to observe stimulus changes (i.e., access to an item after it has been restricted and vice versa). This is a bit surprising as one common concern when therapists conduct sessions may be that the quality of therapist vs. caregiver attention differs such that therapist attention is not as preferred as caregiver. Of the five children whose caregivers used tangibles during meals, three were provided with access to tangibles and they were not removed again. When reviewing access to tangibles across participants during the descriptive assessment, only Buddy and Toby did not have access for the entire mealtime observation. This limited the number of opportunities for caregivers to provide access to tangibles following IMB (due to the participant already having access to the items) and seemingly made interpretation more difficult. Another possible reason for the contradictory results for tangible access may be that caregivers

historically provided access to tangibles following IMB, but during the observed meals, they avoided even higher levels of IMB by allowing continued access to the items. Results for Enzo and Ruby may support this interpretation, as tangible functions were observed for both of them in the functional analyses, but their caregivers never removed tangibles after they initially provided them. It is not clear if this was a false negative from the descriptive assessment, or a false positive (Rooker, Iwata, Harper, Fahmie, & Camp, 2011) from the functional analysis, given that their caregiver-fed meals suggested a limited role of tangible access following IMB in their food refusal. That is, although refusal during the observed meals did not result in delivery of tangible items, it is possible that parental delivery of tangibles at the beginning of the meal was due to a history of caregivers providing tangibles following IMB. This history could have established tangible access as a reinforcer for IMB, or reinforced caregiver responses if delivery of tangibles resulted in acceptance of food or a reduction in IMB. Either way, the results of the tangible comparison suggest that descriptive assessments may not be sufficient to identify tangibles as a potential reinforcer for IMB.

From a practical standpoint, the results of this study seem to suggest that reasonable and potentially effective treatments could have been designed based on the results of the descriptive assessment alone, particularly given the strong correspondence for attention and escape functions. Even though the tangible function did not match for all participants, the inclusion of uninterrupted access to tangibles by caregivers suggests that the inclusion of tangible might be warranted in treatment. Dillon, Enzo, and Ruby were provided with access to tangibles continuously throughout the meal, making it impossible to calculate a potential contingency, but suggesting that the parents had a history of providing tangibles during mealtimes. Similar observations in practice might suggest to a practitioner that tangibles should be considered as a component of a treatment package, even though no potential function was identified. If tangibles were included but not necessary, this could be determined by a component analysis prior to parent training to ensure parents were only asked to implement procedures necessary to maintain treatment gains.

Correspondence was relatively high; however, one potential limitation of this study is that it is not clear if descriptive assessments are sufficient to thoroughly assess the functions of IMB and prescribe an effective treatment, although previous research has demonstrated the effectiveness of treatments for IMB without the benefit of a functional analysis (e.g., Patel et al., 2002; Reed et al., 2004). We did not evaluate function-based interventions in this study, but all treatments were designed based on both the descriptive assessment and functional analysis (available from first author upon request). Generally, contingencies were altered during treatment for all functions identified (e.g., escape extinction and attention extinction for IMB, spoon removal and praise after acceptance); however, when initial interventions were not sufficient, the most common changes to intervention focused on the escape function. That is, if non-removal of the spoon did not result in increased acceptance, demand fading or physical prompts were the most common changes. Given the prevalence of escape functions for IMB, and the success of escape extinction-based treatments, this may not be surprising. The limited correspondence of the tangible assessment demonstrates that an intervention based solely on descriptive assessments may not address all functions for IMB. It may be the case though that the tangible function does not necessarily need to be addressed to result in a successful treatment. Some research has shown that access to positive reinforcement may lessen IMB but may not be sufficient to increase acceptance of food (Piazza, Patel, et al., 2003; Reed et al., 2004), suggesting that merely addressing a potential or known escape function might lead to a positive treatment outcome. Other research suggests that all functions of IMB must be addressed to ensure the best clinical outcome (Bachmeyer, Kirkwood, Criscito, Mauzy, & Berth, accepted for publication). However, this does not suggest that IMB is not treatable without the benefit of a functional analysis, merely that a treatment should address all functions of IMB. The relatively high correspondence for attention and escape functions suggests that descriptive assessments may be a viable alternative to functional analyses, and future research should evaluate the effectiveness of interventions based solely on descriptive assessments. This is an encouraging finding for practitioners, as many may not be in a position to conduct functional analyses of IMB in less intensive settings (e.g., school or home), but these results suggest a reasonable alternative to a functional analysis.

Although a descriptive assessment may help guide practitioners and clinicians to an effective intervention for IMB, it is not clear if it is the most efficient way of assessing the function(s) of food refusal. In this study, descriptive assessment sessions were videotaped, data were collected using a computer, and training was provided to all data collectors to ensure adequate observation and scoring. Data collection can be quite cumbersome, depending on the topographies of child and caregiver behavior to be scored. A computerized method of data analysis may be more accurate than using paper and pencil data recording or ABC forms, particularly when calculating unconditional probabilities, but this requires training. Thus, although conducting direct observations may be relatively easy (all were completed in approximately 3 h including data analysis), the data collection and analysis required to garner results as described in this study require more substantial training (approximately 2 weeks). On the other hand, the functional analyses were conducted relatively quickly (within 2–4 days) but require extensive training to conduct and interpret. Although the functional analysis sessions were completed quickly, it may be the case that the level of training

individuals receive in practice differs, and some individuals may not have the skills to conduct and interpret functional analyses (Iwata et al., 2000). It may not be feasible to devote the time to complete the functional analysis in some settings, and it may be the case that practitioners are more likely to only conduct descriptive assessments. If simply observing a caregiver's typical behavior could provide sufficient information to proceed with an intervention, this method might be a useful tool for practitioners and provide a bit more structure to a common assessment tool (descriptive assessment). Although computerized data collection was used in this study, the data collected are similar to what might be captured using a simple ABC data sheet, and it may be the case that such a method for data collection would yield useful results and be more efficient as well. Data could be collected on similar measures as used in this study, relatively easily, and then subjected to conditional probability analyses completed by hand using the same formulas. This might be a worthy endeavor for future research, and, as one goal of this research was to provide a "user-friendly" assessment tool for practitioners who do not implement functional analyses, make the assessment of food refusal even more manageable in practice.

Additional information could be gained from descriptive assessments that might not be available via functional analysis. For seven of ten participants, no bites of food were consumed during the functional analysis, making it impossible to identify any child responses following food acceptance. However, some bites were consumed during caregiver-fed meals. As such, the descriptive assessment allowed us to gather information *not* available via functional analyses. We conducted additional conditional probability analyses for specific types of refusal that occurred following acceptance of a bite such as expulsions, gagging, and emesis. For eight participants, similar caregiver responses were observed following gagging and expulsions, such as coaxing, escape, and comfort. This type of information could be useful when designing interventions for IMB and preparing caregivers for complications that may be associated with potential interventions (e.g., increases in other problematic mealtime behavior).

Also, with a response such as gagging or emesis, descriptive assessments may be a more appropriate assessment option. It may not be possible to provide specific consequences following the response (e.g., attention) in a functional analysis, as this is a response one would not necessarily want to reinforce. Gagging is a response all humans engage in, at least at low levels, and should not be eliminated entirely. For that reason, the benefits of reinforcing this response in a functional analysis are not clear, particularly with a child who has a history of food refusal, although gagging must be addressed if it occurs during eating. Descriptive assessment methods may allow practitioners to gather useful information without having to expose such behavior to a functional analysis.

Although conditional probability analyses can be useful in evaluating the likelihood of a potential reinforcer following IMB, interpretations of these data should be drawn very cautiously. In fact, even if correspondence between descriptive and functional analyses is high (>75 %), it is still not possible to identify behavioral function(s) via descriptive analysis. An elevated probability of an event (e.g., escape) following some form of IMB should not, by default, be interpreted as evidence of a contingent relation. High frequency caregiver responses may frequently follow IMB simply because of the frequency with which these events occur (see Thompson & Borrero for a review, 2011). If such an outcome should arise, spurious relations (correlations) may be unrelated to meaningful functional relations (St. Peter et al., 2005). Unconditional probability analyses should address this concern, as they provide information on the overall probability of events occurring, and are a source of comparison for conditional probabilities. In isolation, the probability of some event (e.g., attention) is not particularly informative. When compared to the probability of the same event, given a target behavior, the unconditional probability values become more informative (Borrero & Borrero, 2008; Borrero et al., 2010; Vollmer et al., 2001).

Although this study provides information regarding IMB, additional analyses would have provided a more accurate representation of caregiver-fed meals. For this study, our goal was to focus on information typically obtained during functional analyses of IMB (i.e., reinforcers) to determine if similar information (i.e., potential reinforcers) for the same response could be obtained via caregiver-fed meals. We did not examine all potential forms of food refusal, including expulsions, emesis, and gagging, nor did we evaluate any appropriate behavior or caregiver responses to appropriate behavior. Future research could evaluate additional child responses (or caregiver responses) to evaluate the usefulness of descriptive assessments. We did complete additional analyses for expulsions, gagging, and emesis in the descriptive assessment, although no consequences were provided during the functional analysis for these participants, thus no comparison can be made. However, we did obtain useful information regarding caregiver responses and found that potential positive contingencies were in place for some participants.

The use of a 5-s interval in which to evaluate the delivery of a potential reinforcer and the .05 criteria by which potential contingencies were identified was selected arbitrarily. A 5-s interval was used to provide a more conservative measure to more closely mimic the contingencies designed in a functional analysis of food refusal. That is, although 10-s intervals have been used in other descriptive research (e.g., Borrero et al. 2010, Vollmer et al. 2001), waiting 10 s to deliver a potential reinforcer during a functional analysis would likely be considered a therapist error as consequences are scheduled for immediate delivery. A 1-s interval was determined to be too small, as parents may respond quickly following IMB but

not within 1 s. Although it may be the case that various interval sizes would yield different results (see Vollmer et al. 2001), practitioners may be likely to select a specific interval when conducting such assessments in practice, and a reinforcement effect may be more likely with shorter delays (Leon et al., 2016). Also, from a practitioner standpoint, a small interval such as 5 s would likely be easier for data collectors using ABC forms, since an event could be scored/not scored and data collectors could move onto the next child response/caregiver response.

Similarly, as Vollmer et al. (2001) suggested, we opted to set a minimum difference between probability values of .05, but it is not clear if that value was too small, large, or of consequence at all. Having a set criterion for comparison would likely be easier for practitioners using similar approaches to assessment. In this case, the differences in the results, had we not set a minimum criterion and merely looked for differences in probability values, were minimal for separate functions and would have affected one participant (Buddy). For Buddy, his attention function would not have matched, making the correspondence 80 % rather than 90 % for the identification of attention functions. This would also have decreased the combined correspondence to slightly larger than chance, at 57.1 %. This is certainly worthy of further analysis, and comparisons at different values could be conducted to identify the value at which contingencies shift from positive to neutral to negative.

Another limitation may be that we did not include a tangible condition for four participants, although social positive reinforcement was tested in the attention condition (Iwata et al., 1994). This was directly based on caregiver use of tangibles during the descriptive assessment (Vollmer, Marcus, Ringdahl, & Roane, 1995). Our rationale was that if caregivers did not use tangibles during mealtimes typically, the likelihood of a tangible function for IMB was small, although parents could have, had the assessment continued longer, requested a tangible item at a later point. It is possible that, had we tested a tangible condition, a tangible function would have been identified, although it is not clear if this would have been a true or false positive, given the child's lack of history with tangibles during mealtimes. Having only two potential functions required for full correspondence may have inflated the overall correspondence between the two analyses. In addition, in Borrero et al. (2010), multiple forms of tangible delivery were included in the analyses, including caregiver switching foods, switching from food to drink presentation (and vice versa). These forms of tangible delivery are not typically included in a functional analysis of food refusal (Piazza, Fisher, et al., 2003), and results of Borrero et al. showed that the probability of tangible delivery for these tangible forms was low overall. Therefore, these specific forms of tangible delivery were not evaluated in this study. It could be the case that this information would be helpful in designing treatments and perhaps should be included as part of standard assessment of food refusal.

Similarly, when evaluating attention during the functional analysis, coaxing was provided contingent on IMB, as opposed to reprimands or a different form of attention, and we did not specifically evaluate reprimands. We selected coaxing as the form of attention during the functional analysis because for all participants, the conditional probability of coaxing was higher than the unconditional probability, and coaxing was the most frequent form of attention observed for all caregivers during the descriptive assessment. Alternating the form of attention during the functional analysis (e.g., combined coaxing and reprimands) may have been a closer approximation to typical caregiver attention. Thus, the functional analysis conditions were designed based on procedures described by Piazza, Fisher, et al. (2003) but also informed by the descriptive assessments and may have resulted in higher levels of correspondence than functional analyses not based on descriptive assessments.

Although many clinicians prefer to conduct a functional analysis, and find it to be an efficient and effective tool for identifying functions, in some cases, an alternative might be warranted, due to lack of training or time constraints. For many practitioners, descriptive assessments are commonly used in less intensive settings such as schools or in-home therapy. These data show that descriptive assessments may be a reasonable, practitioner-friendly alternative to a functional analysis, at least for IMB, when working with children with pediatric food refusal.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Research Involving Human Participants All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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