JOURNAL OF APPLIED BEHAVIOR ANALYSIS 2002, **35,** 65–68 NUMBER 1 (SPRING 2002)

ANALYSIS OF RESPONSE COVARIATION AMONG MULTIPLE TOPOGRAPHIES OF FOOD REFUSAL

BART M. SEVIN, CHARLES S. GULOTTA, BARBARA J. SIERP, LEIGH A. ROSICA, AND LORIONNA J. MILLER

KENNEDY KRIEGER INSTITUTE
AND JOHNS HOPKINS UNIVERSITY SCHOOL OF MEDICINE

This study examined the effects of sequentially introducing treatment across multiple topographies of food refusal. Treatment with nonremoval of the spoon produced an increase in food acceptance and a decrease in disruption, but expulsion of food increased. When expulsion was treated, packing of food increased. Finally, when packing was treated, all refusal behaviors remained low, and acceptance continued to occur at high and stable levels.

DESCRIPTORS: food refusal, feeding disorder, response covariation, children

Behavioral interventions for food refusal, such as nonremoval of the spoon and physical guidance, have successfully increased caloric intake and decreased disruptive behavior during oral feedings for young children with pediatric feeding disorders (Ahearn, Kerwin, Eicher, Shantz, & Swearingin, 1996). These procedures prevent the child from escaping or avoiding opportunities to eat by having the feeder persist until a bite of food has been deposited in the child's mouth. However, treatments that target food acceptance and disruption can be associated with collateral increases in alternative topographies of food refusal, such as expulsion of food (Ahearn et al., 1996). This phenomenon, called *response covariation* (Sprague & Horner, 1992), is an important consideration for clinicians and parents because treatments that target one collateral behavior (e.g., expulsion) may fail to increase food consumption if contingencies are not arranged for other possible collateral behavior (e.g., packing of food in the mouth; Magee & Ellis, 2000). In the present study, response covariation among multiple topographies of food refusal was evaluated.

METHOD

Participant and Setting

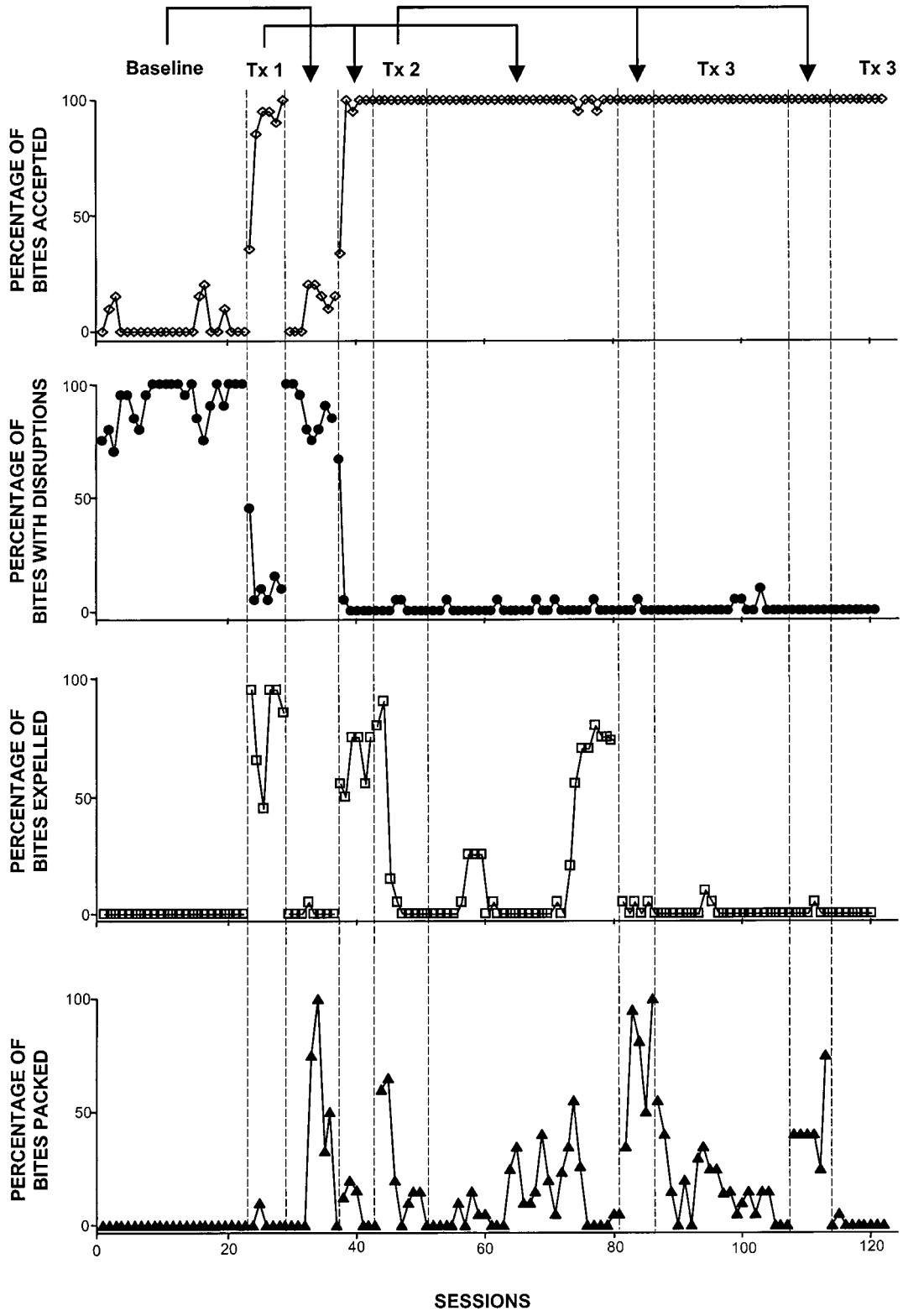
Claire was a 34-month-old girl who had been admitted to an inpatient program for the assessment and treatment of food refusal. Her medical history included Pierre Robin sequence, gastroesophageal reflux, delayed gastric emptying, branchio-oto-renal syndrome, failure to thrive, and nasogastric tube feedings between 11 and 26 months of age. At admission, Claire was drinking 100% of her caloric needs (i.e., Pediasure®); however, she accepted only minimal amounts of solid foods (e.g., yogurt, pudding). Claire received Zantac and Reglan throughout the study. All sessions were conducted in a room (3 m by 3 m) that contained a high chair, table, and the foods and materials necessary to conduct the assessment.

Response Measurement and Interobserver Agreement

Target behaviors were defined as follows: (a) *acceptance*, opening the mouth and al-

We express appreciation to Shannon Byrne and Christina Ricker for their contributions during the course of this study, and to Louis Hagopian, SungWoo Kahng, and Jennifer Dawson for their insightful feedback on earlier drafts of this manuscript.

Reprints may be obtained from Bart Sevin, who is now at the Louisiana Center for Excellence in Autism, Louisiana State University Health Sciences Center, 1100 Florida Ave., Bldg. 138, New Orleans, Louisiana 70119 (e-mail: bsevin@lsuhsc.edu).


Baseline
Tx 1
Tx 2
Tx 3
Tx 3
PERCENTAGE OF BITES ACCEPTED
PERCENTAGE OF BITES WITH DISRUPTIONS
PERCENTAGE OF BITES EXPELLED
PERCENTAGE OF BITES PACKED
100
50
0
0
20
40
60
80
100
120
SESSIONS

lowing placement of the entire bite past the plane of the lips within 5 s; (b) *disruption*, turning the head at least 45° away from midline during bite presentations, making contact with the spoon or the therapist's arm, or covering the mouth when the spoon was present; (c) *expulsion*, producing any food larger than the size of a pea, not already observed to be swallowed, outside the lips at any time; and (d) *packing*, retaining any food larger than the size of a pea in the mouth at least 30 s after the bite was initially deposited. Frequency data were collected for all target behaviors using laptop computers, and the data were expressed as a percentage of trials (i.e., bites). Interobserver agreement data were collected during 39% of sessions, with exact agreement averaging 98.5% (range, 66% to 100%) across target behaviors.

Procedure

Throughout the analysis, foods from each of the four food groups (i.e., protein, starch, vegetable, and fruit) were prepared at a wet ground texture, with approximately 3 g presented on a spoon during each trial. Therapists rotated food groups across trials in random order and provided continuous attention (e.g., typical conversation) on a response-independent basis. Twenty trials were presented with an intertrial interval (ITI) of approximately 30 s. Although the ITI varied during treatment, the maximum session duration was 1 hr, and six to nine sessions were conducted per day. Each bite was presented at midline with a verbal prompt ("take a bite"). Brief praise was provided for acceptance, and a verbal prompt ("show me") was delivered 30 s after the bite was deposited to check for packing. A reversal design was used to evaluate the effects of treatment across food acceptance and the three target behaviors (disruption, expulsion, and packing).

Baseline. The spoon was presented about 2.5 cm from Claire's lips, and the therapist terminated the trial by removing the spoon for 30 s following each occurrence of disruption. If 30 s elapsed without acceptance or disruption, the next trial was presented. These procedures were designed to simulate those observed when Claire's caregiver fed her during the 1st day of her admission.

Treatment 1 (acceptance, disruption). Treatment for acceptance and disruption consisted of nonremoval of the spoon (NRS; Ahearn et al., 1996). The spoon was held to Claire's upper lip until there was an opportunity to deposit the food in her mouth. Disruption was ignored, and the trial was terminated for 30 s contingent on expulsion and packing.

Treatment 2 (acceptance, disruption, expulsion). Treatment for expulsion consisted of re-presenting the expelled bites to Claire's lips within 5 s. The NRS procedure was implemented as described above. Packing continued to result in trial termination.

Treatment 3 (acceptance, disruption, expulsion, packing). Treatment for packing consisted of a redistribution procedure in which the therapist collected the food from Claire's cheek or under her tongue using a soft rubber implement (Nuk®) and redeposited it in the middle of her tongue every 15 s until she swallowed. The NRS and re-presentation procedures were implemented as described above.

←

Figure 1. The percentage of bites accepted and the percentage of bites with disruption, expulsion, and packing during baseline, Treatment 1 (Tx 1), Treatment 2 (Tx 2), and Treatment 3 (Tx 3) for Claire. Treatment 1 targeted acceptance and disruption, Treatment 2 added expulsion as a target, and Treatment 3 added packing as a target.

RESULTS AND DISCUSSION

During baseline, acceptance was low and disruption was high (first and second panels of Figure 1), whereas expulsion and packing never occurred (third and fourth panels). Under Treatment 1, expulsion increased to high levels when acceptance increased and disruption decreased. When treatment was subsequently introduced for expulsion, packing increased. Finally, all topographies of food refusal remained low and acceptance remained high when treatment was introduced for packing.

The effects of treatment on acceptance, disruption, and expulsion were consistent with those reported in previous studies (e.g., Ahearn et al., 1996). However, the treatment components were introduced sequentially rather than simultaneously (cf. Kahng, Tarbox, & Wilke, 2001). This procedural variation provided valuable information about the contributions of each treatment component (i.e., NRS, re-presentation, and redistribution) and the resulting covariation among collateral refusal behaviors. Packing, a previously unreported problem behavior, also was described and successfully treated with a corresponding intervention (i.e., redistribution).

These data are limited to 1 participant and should thus be interpreted cautiously. Nevertheless, they have implications for clinicians and parents who attempt to transfer treatment strategies for food refusal to naturalistic settings. Restricting or reducing one response may differentially affect alternative responses as a function of variables related to those alternatives (e.g., reinforcement history; McEntee & Saunders, 1997). In the present study, an intervention that targeted one refusal behavior at a time failed to increase caloric intake because other, untreated topographies of refusal emerged. One potential explanation for the covariation among refusal behaviors is that the responses comprised a class of escape-maintained behavior. However, a functional analysis of refusal behavior was not conducted. Future studies should delineate functional relations involving multiple topographies of food refusal.

The behavioral mechanisms responsible for the treatment effects also were unclear. The reinforcer commonly hypothesized to maintain food refusal is escape from feeding demands (Ahearn et al., 1996). Although this supposition logically points to escape extinction as the mechanism responsible for treatment effects with NRS, re-presentation, and redistribution, it is possible that one or more of these procedures constituted punishment operations. Future studies could clarify the mechanisms involved in the maintenance and treatment of food refusal by conducting functional analyses to identify the consequences that maintain the behavior and by employing strategies designed to distinguish between extinction and punishment effects during treatment (e.g., Lerman & Iwata, 1996).

REFERENCES

Ahearn, W. H., Kerwin, M. E., Eicher, P. S., Shantz, J., & Swearingin, W. (1996). An alternating treatments comparison of two intensive interventions for food refusal. *Journal of Applied Behavior Analysis, 29,* 321–332.

Kahng, S., Tarbox, J., & Wilke, A. E. (2001). Use of a multicomponent treatment for food refusal. *Journal of Applied Behavior Analysis, 34,* 93–96.

Lerman, D. C., & Iwata, B. A. (1996). A methodology for distinguishing between extinction and punishment effects associated with response blocking. *Journal of Applied Behavior Analysis, 29,* 231–234.

Magee, S. K., & Ellis, J. (2000). Extinction effects during the assessment of multiple problem behaviors. *Journal of Applied Behavior Analysis, 33,* 313–316.

McEntee, J. E., & Saunders, R. R. (1997). A response-restriction analysis of stereotypy in adolescents with mental retardation: Implications for applied behavior analysts. *Journal of Applied Behavior Analysis, 30,* 485–506.

Sprague, J. R., & Horner, R. H. (1992). Covariation within functional response classes: Implications for treatment of severe problem behavior. *Journal of Applied Behavior Analysis, 25,* 735–745.

Received May 8, 2001
Final acceptance November 6, 2001
Action Editor, Dorothea Lerman