

FUNCTIONAL ANALYSIS AND TREATMENT OF COPROPHAGIA

ANNA D. ING, HENRY S. ROANE, AND REBECCA A. VEENSTRA

MUNROE-MEYER INSTITUTE, UNIVERSITY OF NEBRASKA MEDICAL CENTER

In the current investigation, functional analysis results suggested that coprophagia, the ingestion of fecal matter, was maintained by automatic reinforcement. Providing noncontingent access to alternative stimuli decreased coprophagia, and the intervention was generalized to two settings.

Key words: autism, coprophagia, functional analysis, noncontingent reinforcement

Coprophagia, the ingestion of fecal matter, occurs among some individuals with developmental disabilities and is associated with a variety of health risks (e.g., diarrhea, intestinal parasites, blood-borne pathogens; Parry-Jones & Parry-Jones, 1992). Studies that have evaluated operant-based treatments of coprophagia (e.g., Foxx & Martin, 1975; Friedin & Johnson, 1979) have been limited by a lack of evidence-based assessments (e.g., functional analysis) and poor demonstrations of experimental control.

Coprophagia is commonly regarded as a form of pica (Motta & Basile, 1998), which has been the subject of several behavioral analyses. Piazza et al. (1998) assessed and treated pica in a room that was baited with items that were similar to those consumed by the participants but were deemed to be safe for consumption (e.g., uncooked beans instead of rocks). Treatment consisted of noncontingent access to stimuli that competed with the occurrence of pica (i.e., stimuli that produced relatively high

levels of consumption and relatively low levels of pica). The effectiveness of baited materials to assess pica and noncontingent access to alternative items to treat pica has been demonstrated in subsequent investigations (Hagopian & Adelinis, 2001; Roane, Kelly, & Fisher, 2003). These methods formed the basis of the current analysis.

METHOD

Participant, Setting, and Materials

Sara was a 6-year-old girl who had been diagnosed with autism and who attended daily 90-min outpatient clinic appointments. She had been referred due to concerns regarding coprophagia, as well as fecal smearing, disruption, elopement, and self-injurious behavior. During the functional analysis and initial treatment analysis, sessions were conducted in a therapy room (3 m by 3 m) that was equipped with a one-way observation window. During the generality analysis, sessions were conducted in a public bathroom (4 m by 4 m) or in a different therapy room (3 m by 3 m).

Due to obvious health concerns, Sara could not be allowed to ingest actual feces. Thus, we prepared several types of artificial feces to measure the occurrence of coprophagia and selected the final version based on its resemblance to actual feces. A mixture of flour, water, and food coloring was fashioned to resemble feces. The final version of the artificial feces was brown in color, had a putty-like texture,

This investigation was supported in part by Grant P73 MC00023 from the Maternal and Child Health Bureau.

We thank Carrie Combs and Nitasha Dickes for their assistance with various aspects of these analyses and Terry Falcomata and Joel Ringdahl for their comments on an earlier version of this manuscript.

Anna Ing is now at Western Michigan University.

Correspondence should be addressed to Henry S. Roane, who is now at the Department of Psychiatry and Department of Pediatrics, SUNY Upstate Medical University, 750 E. Adams St., Syracuse New York 13210 (e-mail: roaneh@upstate.edu).

doi: 10.1901/jaba.2011.44-151

contained no food (e.g., pieces of corn), varied in length from 2.5 to 8 cm, and was rolled and formed to resemble fecal matter (instructions for making artificial feces are available from the second author).

Response Measurement and Interobserver Agreement

Data were collected on the occurrence of coprophagia, which was defined as any piece of artificial feces crossing the plane of Sara's lips. During the treatment and generality analyses, data were collected on food consumption, which was defined as any piece of an alternative food item crossing the plane of her lips. For the purpose of data analysis, the number of responses in a session was converted to a response rate by dividing the total number of responses in each session by the length of the session (i.e., 10 min) to yield the number of responses per minute.

Observers seated behind observation windows or in unobtrusive positions in the bathroom collected data on laptop computers throughout all sessions. Interobserver agreement was collected for 43% of all sessions and was calculated by dividing the number of 10-s intervals with agreements (observers recording the same number of responses in a given 10-s interval) by the number of 10-s intervals with agreements plus those with disagreements, multiplied by 100%. Agreement averaged 94% (range, 80% to 100%) for coprophagia and 94% (range, 82% to 100%) for food consumption.

Procedure

Functional analysis. A multielement functional analysis was conducted based on the procedures described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994), with modifications described by Piazza *et al.* (1998). In all conditions, the room was baited with three to four pieces of artificial feces, which were placed on a tray on the floor. The room also contained high-preference toys (for tangible

and toy play conditions) or low-preference toys (for the attention condition), as identified via a paired-choice preference assessment (Fisher *et al.*, 1992). In the demand condition, the therapist continuously presented gross motor imitation instructions (e.g., touching body parts), and if Sara engaged in coprophagia, the therapist discontinued all demands for 30 s. In the attention and tangible conditions, the therapist withdrew attention but delivered either 20 s of attention (e.g., reprimands, statements of concern in the attention condition) or 20-s access to preferred toys (in the tangible condition). In the ignore condition, a therapist was present but turned away from Sara and provided no programmed consequences for coprophagia. In the toy play condition, the therapist delivered noncontingent attention and preferred toys, did not present instructions, and provided no programmed consequences for coprophagia. Following the functional analysis, an extended phase of ignore sessions was conducted to determine whether coprophagia would persist in the absence of social consequences (Vollmer, Marcus, Ringdahl, & Roane, 1995).

Preference assessment. Following the functional analysis, a preference assessment (based on Piazza *et al.*, 1998) was conducted to identify items that competed with the occurrence of coprophagia (i.e., items that produced relatively high levels of interaction and low levels of coprophagia). A variety of food and nonfood items (e.g., a mirror, a ball, toys) were evaluated in the preference assessment. Each item was paired with a tray of the artificial feces, and data were collected on Sara's engagement with the toys and consumption of the food items and artificial feces. Sara did not engage with any of the nonfood items, and the results of the preference assessment suggested that only certain food items (i.e., Froot Loops, M&Ms, Mentos, gummi bears) competed with the occurrence of coprophagia (data available from the second author).

Treatment analysis. The baseline condition of the treatment analysis was identical to the ignore condition of the functional analysis (i.e., a therapist was also present in a room baited with artificial feces). During the noncontingent reinforcement (NCR) condition, the room was baited with artificial feces on the floor, and a tray was present that contained each of the food items identified in the preference assessment. A therapist was in the room with Sara but delivered no social consequences following the occurrence of coprophagia or food consumption, nor did the therapist interact with Sara if she attempted to do so. However, the therapist replenished the items if Sara consumed all of them to ensure that she had continuous access to the items. To decrease the amount of alternative foods consumed during treatment, the NCR schedule was thinned from continuous to fixed-time 30 s, in which the therapist placed one of the food items on the tray every 30 s. The baseline and NCR conditions were compared in a reversal (ABAB) design.

Generality analysis. Additional sessions were conducted to extend the generality of the treatment by transferring the intervention to situations that approximated those in which Sara historically engaged in coprophagia (i.e., feces found in dirty diapers and in unflushed toilets). Thus, NCR was implemented in a bathroom and in a room containing a trash can. In the trash can setting, the artificial feces were inside a cloth diaper that was placed inside a previously unused trash can. In the bathroom setting, the artificial feces were placed inside an unused training toilet. The baseline conditions in both settings were identical to the baseline condition of the treatment analysis. During NCR, Sara had continuous access to a bag that contained the food items identified in the preference assessment (Roane et al., 2003), and the therapist replenished any food items as necessary but did not otherwise interact with Sara. This analysis was conducted in a multiple baseline design across settings.

RESULTS AND DISCUSSION

Results of the functional analysis were characterized by undifferentiated patterns of responding across all conditions (Figure 1, top). Responding persisted during an extended series of ignore sessions ($M = 1.7$ responses per minute; range, 1.2 to 2.2), suggesting that coprophagia was maintained, at least in part, by automatic reinforcement. The initial baseline phase of the treatment analysis (Figure 1, second panel) consisted of those data collected during the extended series of ignore sessions that concluded the functional analysis ($M = 1.7$ responses per minute). When NCR was implemented, coprophagia decreased to zero and food consumption averaged 1.7 responses per minute (range, 1.4 to 1.9). Coprophagia reemerged during the reversal to baseline ($M = 0.7$ responses per minute; range, 0 to 1.3) but decreased again when NCR was reimplemented. Food consumption was similar to that in the initial NCR phase and persisted as the NCR schedule was thinned ($M = 1.8$ responses per minute; range, 1.2 to 2.4). Rates of coprophagia averaged 0.7 (range, 0.3 to 1.2) and 1.7 responses per minute (range, 0 to 3.0) in the trash can and bathroom settings, respectively (third and fourth panels of Figure 1, respectively). When NCR was implemented in the trash can setting, coprophagia decreased to zero and food consumption occurred at relatively high levels ($M = 2.5$ responses per minute; range 1.8 to 3.4). A similar effect was observed in the bathroom setting ($M_s = 0$ and 2.5 responses per minute for coprophagia and food consumption, respectively).

Previous treatments of coprophagia were not based on results of functional analyses, nor did they incorporate empirically derived preferred stimuli. These data, combined with earlier studies (Piazza et al., 1998; Roane et al., 2003), support the use of functional analysis in the assessment of coprophagia and the use of NCR in the treatment of pica and coprophagia. These data also extend those lines of research by

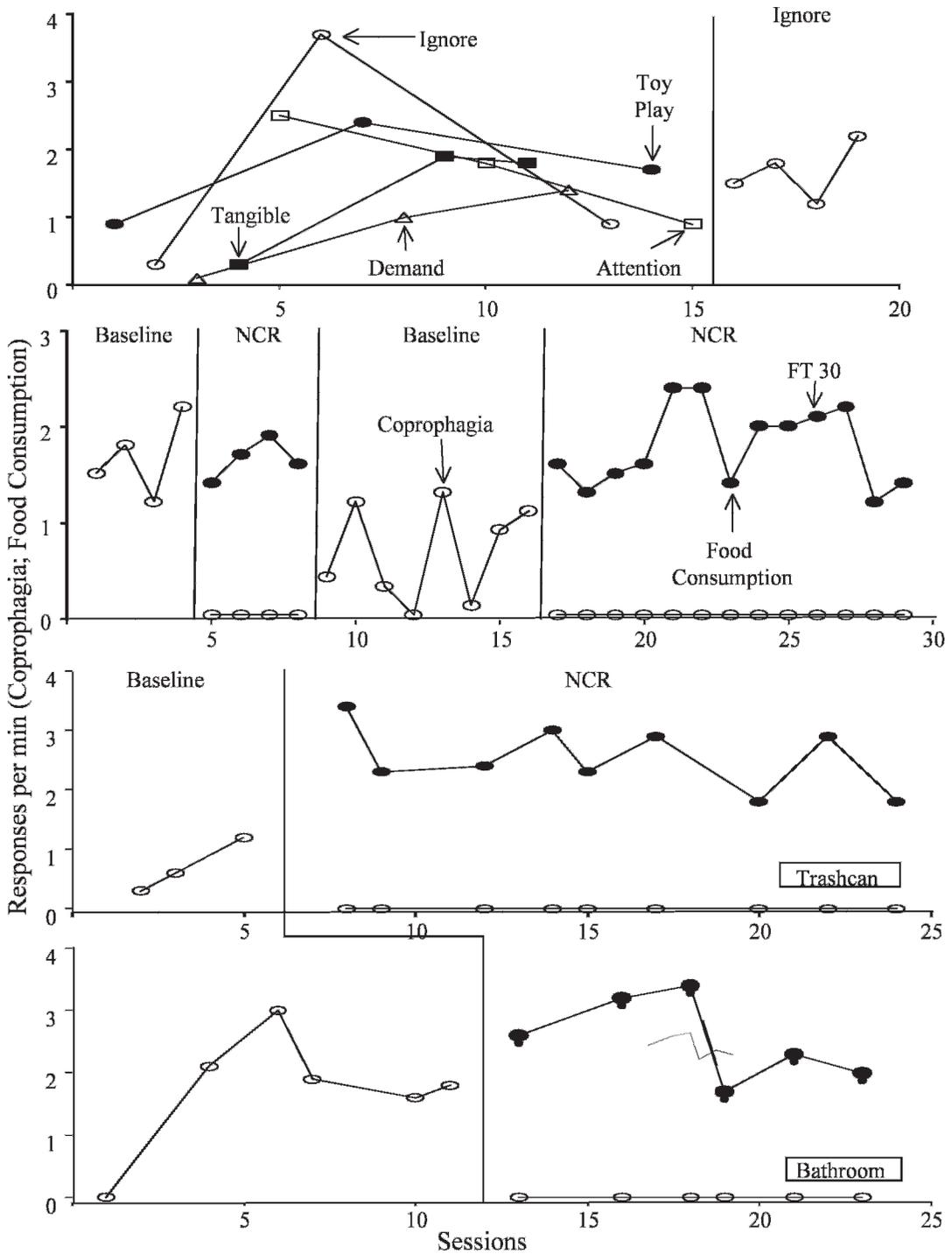


Figure 1. Responses per minute of coprophagia during the functional analysis (top), and responses per minute of coprophagia and food consumption during the treatment analysis (middle) and generality analysis (bottom two panels).

demonstrating the effects of NCR in settings that resembled the environment in which the response was likely to occur.

The current results should be interpreted with caution for a number of reasons. First, this analysis was conducted with only one participant under relatively brief (10 min) periods of close supervision using a rich schedule of reinforcer delivery. Replication with additional participants, for longer periods of time, in the absence of direct supervision, and with leaner reinforcement is warranted. Second, the generality analysis occurred in situations that resembled those in which coprophagia was likely; however, the generality of these outcomes to Sara's home environment remains unknown. Third, the current treatment was evaluated only in the presence of artificial feces, which may not have sufficiently approximated the feces Sara typically ingested (e.g., the olfactory component of feces was not simulated). Nevertheless, the analogue nature of this evaluation and the use of baited materials deemed to be safe for consumption parallels previous research on the assessment and treatment of pica (Hagopian & Adelinis, 2001; Piazza et al., 1998; Roane et al., 2003). Finally, the current treatment involved noncontingent provision of food, which may be associated with potential side effects such as weight gain and satiation. Thus, future research might investigate methods for introducing healthier foods or leisure items into the treatment.

REFERENCES

- Fisher, W., Piazza, C. C., Bowman, L. G., Hagopian, L. P., Owens, J. C., & Slevin, I. (1992). A comparison of two approaches for identifying reinforcers for persons with severe and profound disabilities. *Journal of Applied Behavior Analysis, 25*, 491–498.
- Foxx, R. M., & Martin, E. D. (1975). Treatment of scavenging behavior (coprophagy and pica) by overcorrection. *Behavior Research and Therapy, 13*, 153–162.
- Friedin, B. D., & Johnson, H. K. (1979). Treatment of a retarded child's feces smearing and coprophagic behavior. *Journal of Mental Deficiency Research, 23*, 55–61.
- Hagopian, L. P., & Adelinis, J. D. (2001). Response blocking with and without redirection for the treatment of pica. *Journal of Applied Behavior Analysis, 34*, 527–530.
- Iwata, B. A., Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. S. (1994). Toward a functional analysis of self-injury. *Journal of Applied Behavior Analysis, 27*, 197–209. (Reprinted from *Analysis and Intervention in Developmental Disabilities, 2*, 3–20, 1982)
- Motta, R. W., & Basile, D. M. (1998). Pica. In L. Phelps (Ed.), *Health-related disorders in children: A guidebook for understanding and educating* (pp. 524–527). Washington, DC: American Psychological Association.
- Parry-Jones, B., & Parry-Jones, W. L. (1992). Pica: Symptom or eating disorder: A historical assessment. *British Journal of Psychiatry, 160*, 341–354.
- Piazza, C. C., Fisher, W. W., Hanley, G. P., LeBlanc, L. A., Worsdell, A. S., Lindauer, S. E., et al. (1998). Treatment of pica through multiple analyses of its reinforcing functions. *Journal of Applied Behavior Analysis, 31*, 165–189.
- Roane, H. S., Kelly, M. L., & Fisher, W. W. (2003). The effects of noncontingent access to food on the rate of object mouthing across three settings. *Journal of Applied Behavior Analysis, 36*, 579–582.
- Vollmer, T. R., Marcus, B. A., Ringdahl, J. E., & Roane, H. S. (1995). Progressing from brief assessments to extended experimental analyses in the evaluation of aberrant behavior. *Journal of Applied Behavior Analysis, 28*, 561–576.

Received January 27, 2009

Final acceptance May 28, 2010

Action Editor, Michael Kelley