

Dr. AZRIN # 118

THE RATE AND AMOUNT OF FOOD INTAKE AS DETERMINANTS OF VOMITING

NATHAN H. AZRIN
JACQUES P. JAMNER
VICTORIA A. BESALEL

Nova University, Fort Lauderdale, Florida 33314

Vomiting of nonmedical origin by retarded persons has been found to be greatly influenced by reinforcement procedures. To explicate the possible influence of the rate and amount of food intake, a satiation procedure and a spaced-eating procedure were provided to three profoundly retarded adults with this problem. Vomiting was found to double or triple after satiation for each subject, and to decrease during spaced eating for each subject; the decrease was especially great for the two subjects who learned to eat most slowly after extended spaced eating training. These results suggest that vomiting is caused in large part by excessive stomach loading and can be effectively treated by reducing the eating rate and/or amount of food intake. This generalization may also apply to infants and to the bulimic binge-purge cycle of nonretarded adults.

Psychogenic vomiting for both retarded and nonretarded individuals has been treated by behavioral procedures (see review by Davis & Cuvo, 1980) such as aversive shock (Lang & Melamed, 1969; Kohlenberg, 1970; Luckey, Watson, & Musick, 1968); time-out (Wright, Brown, & Andrews, 1978); social extinction (Wolf, Birnbrauer, Williams, & Lawler, 1966); liquid irritants (Sajwaj, Tibet, & Agras, 1974); and overcorrection (Azrin & Wesolowski, 1975; Duker & Seys, 1977). Food intake factors have also been found to influence this "psychogenic" vomiting as in the use of satiation (Jackson, Johnston, Ackron, & Crowley, 1975);

Behavioral Residential Treatment, Vol. 2 No. 4 (1987)

© John Wiley & Sons, Inc.

CCC 0884-5581/87/040211-11\$04.00

increased oral stimulation and participation of infants in feeding (Ball, Hendricksen, & Clayton, 1974); and changing food consistency (Ingersoll & Curry, 1977).

A possible cause of psychogenic vomiting may be the discomfort associated with stomach overloading from eating too rapidly or in excess. If so, slowing food intake should decrease vomiting even if the amount of food consumed remains the same. Evidence of this was found for one subject in a preliminary study (Azrin, Jamner, & Besalel, 1986). Similarly, vomiting should increase if the amount of food eaten is increased. The present study evaluated the effect of increased food intake by allowing the persons to eat to satiation. In addition, the role of the rate of food intake was evaluated further with additional subjects by slowing the food intake of their normal-sized meals. If stomach overloading is a factor, vomiting would increase after satiation and decrease after spaced eating.

METHOD

Subjects

The subjects were residents of a public institution for severely retarded persons. Three subjects were selected based on their referral as severe problem vomiters for whom no medical cause could be found after repeated and recent medical examinations. For all three subjects, the institutional records noted continued vomiting for many years. Gross observations indicated that all ate their meals very quickly, were especially likely to vomit when annoyed or when demands were placed on them and seemed most likely to vomit after meal-time.

Subject 1 was a profoundly retarded 21 year-old male, with a Vineland Adaptive Behavior Scale (Sparrow, Balla, & Cicchetti, 1984) Social Age Equivalent of 1 year-2months. He was non-verbal, nonambulatory, had been institutionalized for 17 years and remained in a crib or wheelchair during the day. He was observed vomiting during, as well as after, each meal. He required assistance in eating, but "gulped" the food quickly once in his mouth. Vomiting seemed especially likely when staff members placed demands on him.

Subject 2 was a profoundly retarded 24 year-old female with a Vineland Social Age Equivalent of 1 year-8months. She was non-verbal and had been institutionalized for 15 years. Being non-

ambulatory, she remained in a wheelchair most of the day. She was observed to consume her meals rapidly, after which she began ruminating and vomiting onto her bib, floor, or table-top. When demands were made on her during class training, she often vomited on the table-top puzzles in front of her.

Subject 3 served as a subject in a previous report (Azrin et al., 1986). In the present study, he again received the procedure (spaced-eating) received previously, after reestablishing baseline, for the purpose of replication. He also received the comparison procedure of satiation (see below) for the first time. He was a profoundly retarded 22 year-old male with a Vineland Social Age Equivalent of 2 years - 2 months. He was nonverbal, ambulatory, moderately aggressive, and had been institutionalized for 16 years. After vomiting, he often reconsumed the vomitus. Voluntary control was indicated in that he often reacted to annoyances or demands by others by approaching and vomiting directly on them.

Data Recording

The vomiting response was defined as the forceful expulsion of a large amount of vomitus (several ounces). The ruminative chewing of food was not considered, nor was the passive dripping of food from the corner of the mouth, which sometimes accompanied the ruminative chewing. Recordings were taken during the entire waking day. Since the vomiting response was highly visible, this extensive recording was possible. A second observer independently recorded the behavior every fifth meal to obtain a measure of reliability. Meal duration was recorded as the time from the first bite until meal completion.

Experimental Conditions

Baseline Condition

During the baseline condition, the subjects ate the institutional meal normally provided and at their own rate.

Satiation Condition

During the satiation procedure, the subjects were given double the regular meal as well as all the bread and milk desired. They

were allowed to eat in their normal manner just as they did during the baseline condition and were given the second tray upon completion of the first one. The additional bread and milk were given, until the subject had ceased eating. When five minutes elapsed without eating, the subject was given a prompt to resume. The meal was terminated when five minutes elapsed without eating.

Spaced Eating

The spaced meal-time procedure based on the Mini-meal training program (Azrin & Armstrong, 1973) consisted of dividing each of the regular three meals into five separate portions, each of which was spaced 15 minutes apart; the amount of food per day was the same as if eaten at the regular undivided meal. Further, the subjects were taught to fill the spoon only to a normal level and to do so only after swallowing the previous spoonful. A 5-sec interval of interruption was provided for overloading the spoon or for reloading prior to swallowing the previous spoonful.

The procedural sequence for Subject 1 was baseline - satiation - baseline - spaced eating. For Subject 2 the sequence was baseline - satiation - baseline - spaced eating - baseline - spaced eating. For Subject 3, the sequence was baseline - satiation - baseline - spaced eating.

RESULTS

Interrater reliability was 96% for the baseline periods, 89% for the satiation procedure, and 90% for the spaced eating procedure.

Figure 1 shows that for all three subjects vomiting increased during the satiation procedure relative to the initial baseline level and returned to initial baseline level when the satiation procedure was discontinued. Conversely, vomiting decreased relative to the baseline level for all three Subjects when the spaced eating procedure was in effect. After extended exposure to the spaced eating procedure, vomiting was absent for Subject 3, and near absent for Subject 2 (second introduction). The effect of both the satiation and spaced eating procedures was immediate, as was also each return to baseline for all three subjects.

Figure 2 graphically displays the mean rate of vomiting for the baseline, satiation, and spaced eating conditions. The mean base-

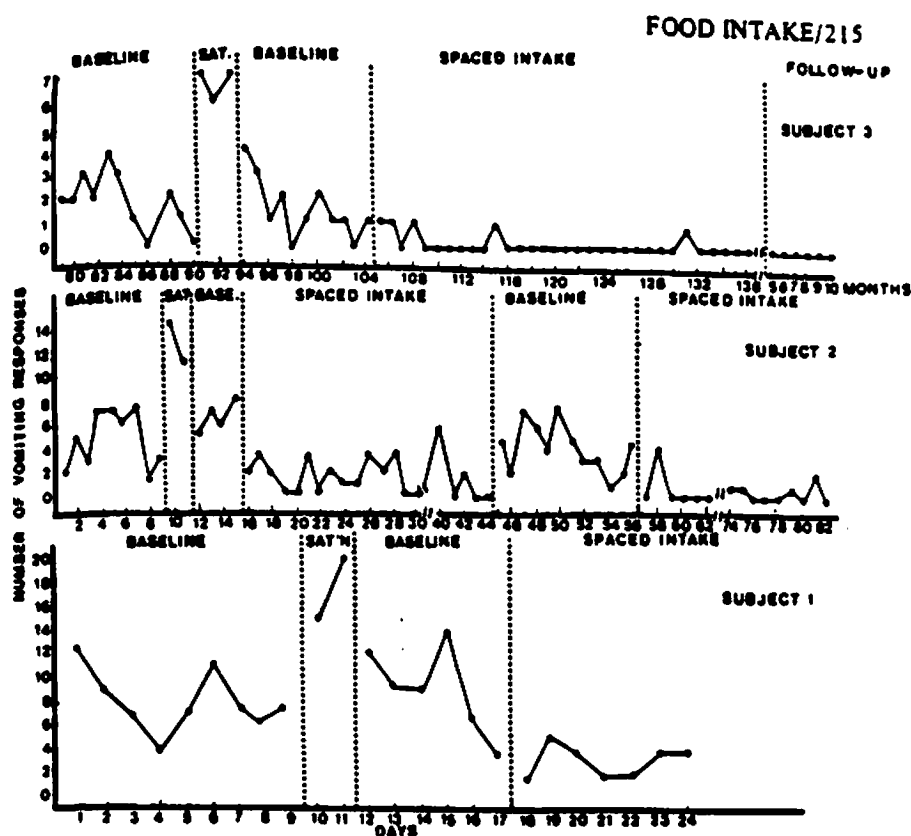


Fig. 1. The number of vomiting responses by three retarded adults during baseline, a satiation procedure, and a spaced eating training program. During Baseline, the subjects ate the regular three meals per day at their own pace. During SAT, the satiation procedure, the subjects were given as much food during the regular three meal-time periods as they could consume. During the Spaced Eating days, all three subjects were taught to eat slowly with each meal broken down into five separate portions spaced 15 minutes apart.

line value included the data from the initial baseline taken; the mean value for the satiation condition included the data of all days under that procedure; and the mean value for the spaced eating condition included the data of all days under the procedure, except for subject 2, where it included only the second application.

The subjects' weight, as measured at the end of the spaced eating condition, increased relative to baseline by 6 lbs for subject 2, 3 lbs for subject 3, and was the same for subject 1. After satiation,

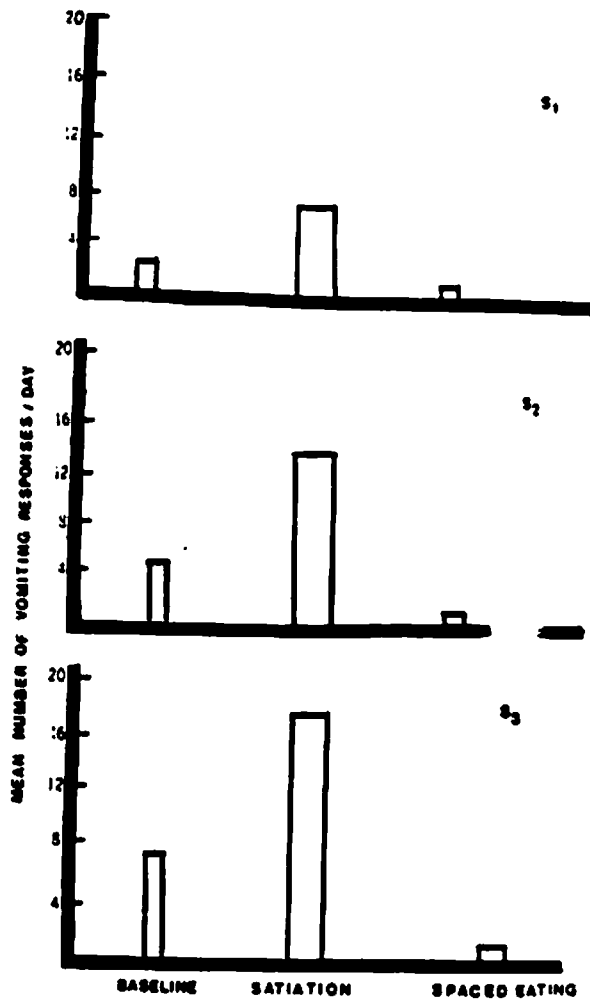


Fig. 2. The mean number of vomiting responses per day during Baseline, Satiation, and Spaced Eating conditions for three subjects.

weight decreased by 2 lbs for subject 3, by 1 lb for subject 1, and was the same for subject 2. The time spent eating during the baseline condition was brief for all three subjects, averaging only 2.4, 4.5, and 7.3 minutes per meal, respectively. The spaced eating condition increased the mean duration of eating about seven-fold for all three subjects: 16.5, 35.5, and 50.1 minutes, respectively. The calculated eating time for the spaced eating procedure ex-

cludes, of course, the four 15-minute forced waiting periods separating the five portions into which the regular meal was divided.

All three subjects were observed to ruminate during all three procedures: baseline, satiation, and spaced eating. No systematic data were taken of this rumination; the general impression was that rumination did not change substantially. Subject 3 learned to eat more slowly such that the supervision was gradually faded out without the need for continued manual guidance and interruption. During the follow-up phase shown in Figure 1, he was given only occasional reminders to eat more slowly. The other two subjects required continuing active supervision to eat slowly; subject 2 required less supervision than did subject 1.

The original experimental design had provided for at least a week of data for the satiation procedure. The unexpectedly high rate of vomiting during satiation necessitated foreshortening out of concern for the health of the subjects, including possible dehydration and weight loss. Subject 1 was discontinued prematurely from the study because of transfer to another unit for medical treatment for an illness unrelated to the vomiting.

DISCUSSION

The present results support the conclusion that vomiting is affected by the degree of stomach loading. When the amount of food intake was increased by the satiation procedure, vomiting increased. When the amount of food ingested was kept constant but the rate of food intake was decreased, vomiting decreased.

The results showed that vomiting was substantially reduced for all three subjects after extended training in spacing food intake. Subject 3 and subject 2 of second phase had learned to eat more slowly with little supervision, which might account for their near-total elimination of vomiting, whereas subject 1 required continued manual interruption and admonitions to slow the rate of food intake. Inasmuch as the amount of food consumed during spaced eating was the same as during the regular undivided meal, the reduction of vomiting was not the result of variations of the amount eaten but rather of the slower intake. The recordings of eating time confirmed that the food was eaten far more slowly during the spaced eating procedure not only because of the forced time elapsing between the five meal portions, but also while eating the five portions. These results replicate and extend with two

additional subjects: the same finding that vomiting is reduced by spaced eating observed in the earlier preliminary study (Azrin et al., 1986), which included subject 3 of the present study.

Satiation resulted in a substantial increase of vomiting for all three subjects. Inasmuch as the subjects were allowed to eat at their normal rate during satiation, this increase does not appear to be the result of an altered rate of eating, but rather of the greater amount of food eaten. Although the recorded duration of eating was found to be greater during this procedure, the increase in time seemed largely due to the extra time needed to consume the increased amount of food made available. A lowered rate of eating was seen only as the subject became satiated at the end of the meal.

The changes in body weight should be interpreted cautiously for subject 1. His weight did not vary by more than one pound between conditions and may have been influenced by his medical condition (cancer) which caused his premature transfer from the unit. The other two subjects gained several pounds during the slowed eating program even though the amount of food was unchanged. The weight change after satiation for these same two subjects was very slight, probably reflecting in large measure the brevity, only 2-3 days, of the satiation condition. Both of them lost weight, however slight, paradoxically after the increased food intake of this satiation procedure.

Stomach loading has also been found to influence the related eating disorder of ruminative regurgitation of retarded persons, but in the direction opposite to that found here for vomiting (Jackson et al., 1975; Rast, Johnston, Drum, & Conrin, 1981; Rast, Johnston, & Drum, 1984; Rast, Johnston, Allen, & Drum, 1985). The present study did not include recording of ruminations. It appears that stomach loading affects forceful vomiting and rumination differentially.

The clinical implications suggested by these results are contrary to what "common sense" might dictate. The severe weight loss resulting from a high level of vomiting would seem to suggest a remedy by increasing food intake. Yet, the present results show that this course of action produces a greater loss of weight and an increase in vomiting. The present findings suggest instead that the rate of eating be decreased and that the amount of food consumed be decreased. Further, the absolute magnitude of the reduction in vomiting between subjects seemed related to the extent to which the rate of food intake was reduced. "Gulping" of

food, rather than chewing and slow swallowing could still occur under the spaced food intake procedure. For subject 3; chewing and slow swallowing became predominant by the end of the spaced-eating program and was associated with the complete absence of vomiting. Conversely, subject 1 continued to "gulp" and did not chew the food during the spaced eating; vomiting was reduced least for her. Subject 2 "gulped" food part of the time; less so at the end of training at which time vomiting was near-zero. It appears, therefore, that vomiting may be reduced entirely if slow mastication and swallowing can be taught in addition to the imposed spacing of the available food. The average time taken per meal during normal eating (Baseline) was seen to be less than 8 minutes for all three subjects, also lending support to rapid eating as the origin of the vomiting problem.

The results of several previous studies of psychogenic vomiting may be explicable on the basis of the present findings. The decreased vomiting of a retarded person that resulted from a reduced viscosity of the food (Ingersoll & Curry, 1977) may be attributed to an increased absorption rate of the food leading to less stomach loading. For vomiting infants, the increased self-control over food intake provided by Ball et al. (1974) may have reduced vomiting by decreasing the rate of food intake to a less aversive level of stomach loading. For nonretarded bulimic adults exhibiting bingeing and vomiting, a component of the treatment program has often consisted of slowing the rate of eating (Kirkley, Schneider, Agras, & Bachman 1985; Fairburn, 1981; Fairburn, Kirk, O'Conner, & Cooper, 1986). These results with the diverse populations of infants, retarded adults, and normal bulimics suggest a possible common etiology and treatment. Nonmedically-caused vomiting may result primarily from excessive stomach loading produced by an excessive amount or rate of eating (binging). The remedy for all three populations may be to reduce the amount or rate of eating.

If stomach loading is the principal determinant of chronic vomiting, how can one explain the apparent operant character of specific episodes in which the person appears to induce vomiting deliberately as a means of obtaining attention or objecting to staff demands. The explanation may be that excessive stomach loading increases the tendency to emit the response to a level where a self-induced response is easily made as a means of obtaining a desired consequence. If the response tendency is sufficiently reduced, as with the present spaced-eating procedure, the vomiting will be eliminated even without altering the operant benefits avail-

able. The eliciting (stomach loading) and operant (avoiding demands) factors may both be present and multiplicative such that the absence of either one allows no response to be made.

This research was supported by a grant from the State of Florida Department of Health and Rehabilitative Services. Grateful acknowledgment is given to U. Davis, the Director of Landmark Learning Center for his support and to Bonnie Goldstein and Ann Santora, Psychologists at Landmark Learning Center for their assistance in the implementation, data collection, and staff supervision of the program. The authors also wish to express their appreciation to the staff at Landmark directly working with the subjects for their services as trainers.

Requests for reprints should be sent to the authors at Nova University, 3301 College Avenue, Fort Lauderdale, FL 33314.

References

- Azrin, N. H., & Armstrong, P. M. (1973). The mini-meal—A method for teaching eating skills to the profoundly retarded. *Mental Retardation*, 11, 9-13.
- Azrin, N. H., Jamner, J. P., & Besalel, V. A. (1986). Vomiting reduction by slower food intake. *Applied Research in Mental Retardation*, 7, 409-413.
- Azrin, N. H., & Wesolowski, M. D. (1975). Eliminating habitual vomiting in a retarded adult by positive practice and self-correction. *Journal of Behavior Therapy and Experimental Psychiatry*, 6, 145-148.
- Ball, T. S., Hendricksen, H., & Clayton, J. A. (1974). A special feeding technique for chronic regurgitation. *American Journal of Mental Deficiency*, 78, 486-493.
- Davis, P. K., & Cuvo, A. J. (1980). Chronic vomiting and rumination in intellectually normal and retarded individuals: Review and evaluation of behavioral research. *Behavior Research of Severe Developmental Disabilities*, 1, 31-59.
- Duker, P. C., & Seys, D. M. (1977). Elimination of vomiting in a retarded female using restitutional overcorrection. *Behavior Therapy*, 8, 255-257.
- Fairburn, C. G. (1981). A cognitive behavioral approach to the treatment of bulimia. *Psychological Medicine*, 11, 707-711.
- Fairburn, C. G., Kirk, J. O'Conner, M., & Cooper, P. J. (1986). A comparison of two psychological treatments for bulimic nervosa. *Behavior Research and Therapy*, 24, 629-634.

- Ingersoll B., & Curry, I. (1977). Rapid treatment of persistent vomiting in a 14-year-old female by shaping and time-out. *Journal of Behavior Therapy and Experimental Psychiatry*, 8, 305-307.
- Jackson, G. M., Johnston, C. R., Ackron, G. S., & Crowley, R. (1975). Food satiation as a procedure to decelerate vomiting. *American Journal of Mental Deficiency*, 80, 223-227.
- Kirkley, B. G., Schneider, J. A., Agras, W. S., & Bachman, J. A. (1985). Comparison of two group treatments of bulimia. *Journal of Consulting and Clinical Psychology*, 53, 43-48.
- Kohlenberg, R. J. (1970). The punishment of persistent vomiting: A case study. *Journal of Applied Behavior Analysis*, 3, 241-245.
- Lang, P. J., & Melamed, B. G. (1969). Avoidance conditioning therapy of an infant with chronic ruminative behavior. *Journal of Abnormal Psychology*, 74, 1-8.
- Luckey, R. E., Watson, C. M., & Musick, J. K. (1968). Aversive conditioning as a means of inhibiting vomiting and rumination. *American Journal of Mental Deficiency*, 73, 139-142.
- Rast, J., Johnston, J. M., Allen, J. F. & Drum, C. (1985). Effects of nutritional and mechanical properties of food on ruminative behavior. *Journal of the Experimental Analysis of Behavior*, 44, 195-206.
- Rast, J., Johnston, J. M., & Drum, C. (1984). A parametric analysis of the relationship between food quantity and rumination. *Journal of the Experimental Analysis of Behavior*, 41, 125-134.
- Rast, J., Johnston, J. M., Drum, C., & Conrin, J. (1981). The relation of food quantity to rumination behavior. *Journal of Applied Behavior Analysis*, 14, 121-130.
- Sajwaj, T., Tibet, J., & Agras, W. S. (1974). Lemon-juice therapy: The control of life-threatening rumination in a six-month-old infant. *Journal of Applied Behavior Analysis*, 7, 557-563.
- Sparrow, S. S., Balla, D. A., & Cicchetti, D. V. (1984). *Vineland Adaptive Behavior Scales*. Circle Pines, MN: American Guidance Service.
- Wolf, M. M., Birnbrauer, J. S., Williams, J., & Lawler, J. (1966). A note on apparent extinction of the vomiting behavior of a retarded child. In L. P. Ullmann & I. Krasner (Eds.), *Case studies in behavior modification* (pp. 364-366). New York: Holt, Rinehart and Winston.
- Wright, D. I., Brown, R. A., & Andrews, M. I. (1978). Remission of chronic ruminative vomiting through a reversal of social contingencies. *Behavior Research and Therapy*, 16, 134-136.