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CHEWING GUM AS A TREATMENT FOR RUMINATION IN A CHILD WITH AUTISM

DENISE RHINE AND JONATHAN TARBOX

CENTER FOR AUTISM AND RELATED DISORDERS

Rumination involves regurgitation of previously ingested food, rechewing the food, and reswallowing it. In the current study, a child with autism displayed chronic rumination, resulting in the decay and subsequent removal of several teeth. After several treatments failed, including thickened liquids and starch satiation, the participant was taught to chew gum. His rumination decreased significantly when gum was made available. Results suggest that access to chewing gum may be an effective treatment for rumination in some individuals.

DESCRIPTORS: autism, chewing gum, rumination

Rumination involves regurgitation of previously ingested food, rechewing the food, and reswallowing it. The potential negative effects on the quality of life of individuals who display rumination include weight loss, malnutrition, dental decay, halitosis, and electrolyte abnormalities (Chial, Camilleri, Williams, Litzinger, & Perrault, 2003). Early research on the reduction of rumination in individuals with developmental disabilities often involved aversive procedures, such as contingent delivery of aversive tastes (Sajwaj, Libet, & Agras, 1974). A small number of less aversive procedures (e.g., starch satiation) have also been demonstrated to be effective. Starch satiation involves giving an individual unlimited access to starchy foods, typically immediately after meals, and has been demonstrated to be an effective treatment in several studies (e.g., Rast, Johnston, Drum, & Conrin, 1981), in some cases producing long-lasting effects (Dunn, Lockwood, Williams, & Peacock, 1997). In the current study, we evaluated the effects of a novel treatment procedure, access to chewing gum, on the rumination of a young boy with autism for whom starch satiation was ineffective.

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Address correspondence to Jonathan Tarbox, Center for Autism and Related Disorders, 19019 Ventura Blvd, 3rd Floor, Tarzana, California 91356 (e-mail: j.tarbox@centerforautism.com).

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METHOD

Client and Setting

Reggie was a 6-year-old boy with a diagnosis of autism who attended a home-based behavioral intervention program for children with autism during afterschool hours. Reggie was able to communicate his basic needs via three- to four-word mands; other than that, he engaged in very little unprompted speech. According to a recent language assessment (Preschool Language Scales–4), Reggie scored in the 1st percentile on expressive and receptive language, indicating a very significant language delay. According to parental report, Reggie had been ruminating regularly throughout each day for approximately 1 year, and there were no specific activities in which rumination did not occur. No formal data were collected to assess which contexts rumination occurred in most frequently, but his caregivers reported that it occurred in the morning, evening, and afternoon; both in school and at home; and during both educational activities and play time. Reggie's dentist asserted that the decay caused by his rumination had necessitated the removal of five of his teeth. Prior treatments for rumination included thickening of liquids and starch satiation, neither of which produced a reduction in rumination. In the current study, all intervention procedures were implemented and all data were collected as a part of his

regularly scheduled behavioral intervention sessions, which occurred in his home. The primary therapeutic activities during his regular behavioral intervention sessions consisted of naturalistic and discrete-trial approaches to teaching a variety of adaptive skills, including language, socialization, preacademic skills, and activities of daily living. These regularly scheduled therapeutic activities continued for the duration of the study, and all procedures were implemented by his regular therapy team.

Response Measurement and Interobserver Agreement

Data were collected on the frequency of rumination throughout the study and were summarized as an hourly rate. Rumination was defined as the presence of food material in Reggie's mouth at a time other than when he was eating. He was not prompted to open his mouth in order to facilitate data collection; however, his mouth opened regularly throughout the day, typically to vocalize in some manner, so therapists were able to look into it and observe regurgitated food frequently. Reggie also frequently chewed and manipulated regurgitated food with his tongue, and his mouth regularly opened during the course of such movements, thereby giving his therapists a natural opportunity to observe the presence or absence of food. Data were collected on the presence of regurgitated food in the mouth, as opposed to the act of regurgitating, because it was nearly impossible to detect regurgitation. Virtually no neck or head movement (i.e., retching) occurred when Reggie regurgitated. Twenty-two percent of sessions were videotaped, and a second observer viewed the videotapes at a later time and collected data for the purposes of assessing interobserver agreement. Interobserver agreement was calculated using the total method, in which the smaller frequency recorded across a whole session was divided by the larger frequency recorded, and the resulting fraction was converted to a percentage. Mean agreement was 93%, (range, 0% to 100%; only one session produced an agreement of 0%, which consisted of the primary observer tallying one rumination in a 30-min session and the secondary observer tallying none).

Experimental Design and Sequence

A multielement design was used to compare the effects of continuous noncontingent access to chewing gum to the absence of gum. Blocks of sessions were scheduled several times per week, based on therapist and parent availability. For each block of sessions, a coin toss was used to determine the sequence of conditions within that block, with the rule that no condition could be conducted more than three consecutive times. The sequence of sessions within each block of sessions was determined with a coin toss so that inadvertent scheduling of particular conditions before or after meals could not bias one condition or the other toward higher or lower rates of rumination. Prior to the initiation of the gum-chewing treatment, Reggie had reportedly never chewed gum and apparently did not possess the skill to do it (e.g., when handed a piece of gum, he would look at it and do nothing). Therefore, before the therapy team initiated the gum-chewing treatment, the speech and language pathologist in Reggie's special education classroom designed and implemented a skill-acquisition program to teach him to chew gum. Instruction consisted of shaping the behavior by reinforcing compliance with gradually increasing requirements, starting with placing a piece of gum in the mouth, then biting it, then chewing it twice, and so on, until Reggie was able to chew a piece of gum for several minutes.

Procedure

During Sessions 1 through 17, in both gum-chewing and no-gum conditions, the therapist gave Reggie a maintenance task, such as a book to look at or a worksheet to complete. The duration of these initial sessions depended on how long it took Reggie to complete the task

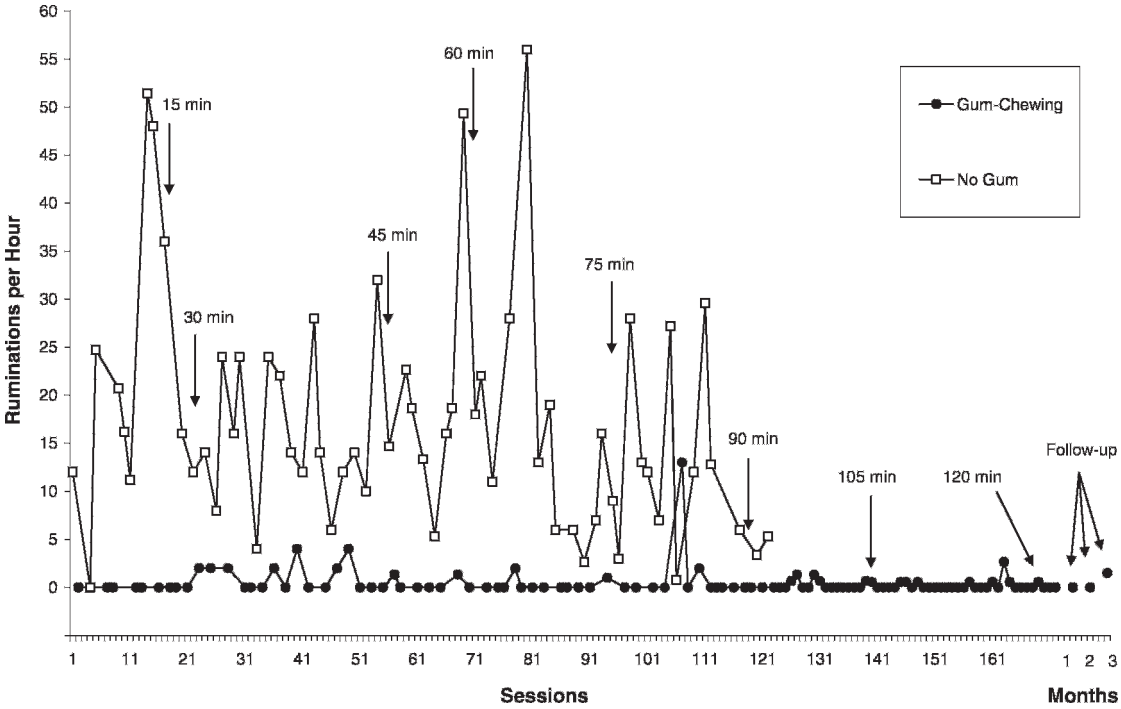

Figure 1. Hourly rates of rumination in gum-chewing (filled circles) and no-gum (open squares) conditions. Session duration was gradually increased to 120 min across the course of treatment. The final three data points represent follow-up data at 1, 2, and 3 months posttreatment.

and ranged from approximately 3 min to approximately 10 min. Starting with Session 18, the duration of sessions was fixed at 15 min and was then gradually increased to 120 min over the course of the study. Sessions were conducted 3 to 5 days per week, two to five times per day. During gum-chewing sessions, Reggie's therapist presented him with one quarter of a piece of chewing gum and told him to chew it. If he did not accept the gum, the therapist held it within 0.3 m of Reggie's mouth. The therapist again told him to chew the gum and repeated this prompt approximately every 3 s until Reggie accepted the gum. If he expelled the gum at any point during a session, the therapist re-presented the gum (or if the gum fell on the floor, the therapist re-presented a fresh piece) and asked him to chew it. Systematic data were not collected on compliance with the directive to chew gum, but therapists reported that Reggie rarely was noncompliant with the initial instruction to chew the gum and rarely expelled the gum. The size of the piece of gum was gradually increased as session duration was increased, moving up to a full piece of gum on Session 27. Sessions of the no-gum condition were identical in every way, except that Reggie was not given gum to chew. Rumination produced no reaction from the therapists during any phase of the study.

RESULTS AND DISCUSSION

Figure 1 depicts rates of rumination in both the gum-chewing and no-gum conditions. The gum-chewing condition produced consistently lower rates of rumination than the no-gum condition. Furthermore, rates of rumination remained low when the duration of sessions was gradually increased to 120 min. Reggie continued to demonstrate low rates of rumination

during follow-up sessions at 1, 2, and 3 months posttreatment. He visited his dentist 1 year after this evaluation was completed, and his dentist reported that Reggie's tooth decay had ceased. This study provides initial evidence that providing access to chewing gum may be an effective treatment for reducing rumination in some individuals with autism or other developmental disorders. Providing access to chewing gum is a relatively inexpensive, low-effort, and nonintrusive treatment. In addition, it may entail the ingestion of fewer calories than a starch satiation procedure in cases when excessive weight gain is a concern.

Several limitations of the current study warrant discussion. First, functional assessment of challenging behaviors prior to implementation of behavioral interventions is widely considered best practice (Hanley, Iwata, & McCord, 2003), and we did not conduct a functional analysis of Reggie's rumination prior to the intervention. The rumination displayed by some individuals may be maintained by automatic reinforcement; until recently, rumination research generally did not include functional analyses (for an exception, see Lyons, Rue, Luiselli, & DiGennaro, 2007), but the lack of a functional assessment in the current study makes any assumption regarding maintaining reinforcers tenuous. However, the fact that rumination did not decrease over the course of 62 no-gum sessions, in which there were never any socially mediated consequences for rumination, provides evidence that rumination was at least partially maintained by automatic consequences.

Second, the method of interobserver agreement calculation employed in this study, the total method, is generally considered to be an insensitive measure of agreement (Repp, Deitz, Boles, Deitz, & Repp, 1976). We elected to use total agreement because the therapist who collected data was also responsible for the implementation of teaching trials and data collection for a variety of other behaviors, and therefore did not have the capacity to record data across multiple intervals of short duration (e.g., 10 s), as would be required for more stringent analyses. Due to the consistent and often large differences in the rate of rumination across conditions, we do not feel that any breaches in measurement agreement affected the validity of the relation demonstrated. Nevertheless, future research on treating rumination via chewing gum should attempt to employ agreement procedures of greater rigor.

Third, no systematic data were collected while Reggie was initially taught how to chew gum, and a precise technological description of the teaching procedure is not available. Thus, replication of that procedure is likely to be difficult for future investigators. In future studies, researchers should document and provide a more technological description of procedures used to teach gum chewing to facilitate replication.

Fourth, the procedures used in this study do not allow any definitive conclusions regarding the behavioral processes that were responsible for the reduction in rumination observed in the gum-chewing condition. It seems most likely that chewing the gum produced an alternative form of oral stimulation that competed with the oral stimulation produced by ruminating. This possible interpretation is supported by previous research on other automatically reinforced behaviors that has shown that providing access to an alternative behavior that results in oral stimulation similar to that produced by the target problem behavior reduces the target behavior (Piazza et al., 1998).

Finally, we did not extend the duration of sessions beyond 120 min to an all-day analysis of the effects of gum chewing on rumination (see Lindberg, Iwata, Roscoe, Worsdell, & Hanley, 2003, for an example of this sort of temporally extended evaluation). Nevertheless, the use of 120-min sessions may be viewed as a strength of the current study, considering the common practice of 10- or 15-min session

durations common in applied behavioral research. Chewing gum also may not be a viable intervention during many educational activities, in which the presence of gum in the mouth may interfere with oral motor activities (i.e., those that require vocal behavior). Although no formal data were collected to evaluate this possible relation, a large proportion of Reggie's educational activities that occurred during this study required vocal responses on his part, and his therapists did not report any increased difficulties with these tasks during gum-chewing sessions.

In conclusion, the primary contribution of this study is that a treatment for intractable rumination that was novel, nonintrusive, and highly effective for our participant was identified. Future researchers should continue to investigate treatments for rumination that are practical in real-life settings and should begin to identify the behavioral processes that occur when these interventions effect appreciable changes in rumination.

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