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FUNCTIONAL ANALYSIS AND TREATMENT OF DIURNAL BRUXISM

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An analogue functional analysis identified attention as a function for a 5-year-old boy's bruxism (teeth grinding). Functional communication training resulted in a reduction of bruxism and an increase in alternative mands for attention. Results were maintained 3 weeks following the intervention.

Key words: bruxism, autism, functional analysis, functional communication training, intervention

Diurnal bruxism is a self-injurious behavior that involves clenching or grinding one's teeth while awake (Barnoy, Najdowski, Tarbox, Wilke, & Nollet, 2009). Chronic bruxism may cause damage to teeth, bone, and gums and is associated with oral-facial pain, headaches, and tooth loss (Lang et al., 2009). Although prevalence data are limited, bruxism appears to occur more often in individuals with developmental and intellectual disabilities than in the general population (Cocchi & Lamma, 1999; DeMattei, Cuvo, & Maurizio, 2007; Dura, Torsell, Heinzerling, & Mulick, 1988).

Lang et al. (2009) reviewed research on the assessment and treatment of bruxism in individuals with developmental disabilities, and found that positive punishment was the most commonly used operant-based intervention (e.g., Blount, Drabman, Wilson, & Stewart, 1982; Gross & Isaac, 1982). Only Barnoy et al. (2009) included an assessment to determine the operant function for bruxism. In that study, results of an indirect assessment using the Questions about Behavioral Function scale (Matson & Vollmer, 1995) suggested that bruxism was maintained by automatic reinforcement. This current study extends previous research by reporting a case in which an analogue functional analysis identified attention as the reinforcer that maintained the bruxism of a 5-year-old boy with autism. Further, we evaluated a function-based intervention that did not involve punishment (i.e., functional communication training; FCT).

METHOD

Participant and Setting

Bennett was a 5-year-old boy who had been diagnosed with autism. He scored a 30.5 on the Childhood Autism Rating Scale (Schopler, Reichler, Devellis, & Daly, 1980) which indicated mild to moderate autistic symptoms. At the time of this evaluation, Bennett had been engaging in diurnal audible bruxism (grinding sound could be heard) for more than 2 years. His

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parents reported that he began engaging in bruxism when he was 2 years old during a period of severe ear infections. The ear infections were resolved successfully, and subsequent dental and medical screenings identified no physical etiology for his bruxism.

Functional analysis and intervention sessions were conducted in a university-based autism clinic. The clinic room included a table, chairs, and a shelf that contained toys and instructional materials. The clinic room also contained a video camera and a ceiling-mounted microphone.

Response Measurement and Interobserver Agreement

Previously trained data collectors observed all sessions from a separate room via the clinic's video and audio surveillance equipment. During all phases of the study, 10-s partial-interval recording was used to quantify the occurrence of bruxism. Partial-interval data were converted to a percentage by dividing the number of intervals with bruxism by the total number of intervals and then multiplying by 100. Because bruxism was difficult to observe, the occurrence of the grinding sound was recorded. This sound could be heard easily through the surveillance equipment. Alternative mands were defined as the unprompted occurrence of verbal approximations of the two therapists' names. For example, "Ca," "Co," and "Co-ney" were accepted for the therapist named Courtney and "J," "Je," and "Je-fer" were accepted for Jennifer. During each FCT session, the therapist created opportunities for Bennett to mand for her attention by turning and moving away from him. The percentage of these opportunities in which Bennett said the therapist's name was calculated by dividing the number of alternative mands by the number of total opportunities and multiplying by 100.

Data on interobserver agreement were collected for bruxism and alternative mands during 50% of functional analysis and FCT sessions. For bruxism, agreement was calculated by dividing the number of intervals with agreement by the total number of intervals (i.e., agreements plus disagreements) and converting the result to a percentage. For bruxism, mean agreement was 96% (range, 80% to 100%). For alternative mands, agreement was calculated by dividing the number of opportunities to mand in which the data collectors agreed on the occurrence or nonoccurrence of the alternative mand by the total number of opportunities presented by the therapist in each session and converting the result to a percentage. Mean agreement for alternative mands (saying the therapist's name) was 100%.

Procedure

Functional analysis. Alone, attention, demand, and play conditions were conducted in a manner similar to those described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994). Conditions were presented in a multielement design, and all sessions lasted 5 min. Three or four sessions were conducted daily. During the alone condition, Bennett was in the room by himself and there were no programmed consequences for bruxism. During the attention condition, the therapist said "you play by yourself while I work" and then began another activity. The therapist provided brief attention by moving closer and asking Bennett to "stop grinding" contingent on bruxism. During the demand condition, the therapist used a three-step prompting sequence to present demands continuously and, contingent on bruxism, removed the demand materials for 10 s. During the play condition, there were no programmed consequences for bruxism, Bennett had access to toys that were identified as preferred via a free-operant preference assessment (Roane, Vollmer, Ringdahl, & Marcus, 1998) prior to the study, and the therapist provided attention on a fixed-time 5-s schedule.

FCT evaluation. Prior to beginning this study, Bennett was receiving discrete-trial training in our university-based autism clinic to improve communication and adaptive and academic skills. During a typical training session, Bennett was given a 5-min break from instructions

approximately every 10 min. During the break, he was expected to play independently with a set of preferred toys. This break also was used by the therapist to prepare materials for subsequent instruction. Observation prior to this study revealed that this 5-min break was the time in which bruxism was most likely to occur. Therefore, baseline and FCT sessions were conducted during this regularly scheduled break and lasted 5 min. The effects of the intervention were evaluated in a multiple baseline across his regular therapists.

In baseline, the therapist implemented a physical cue procedure in which the therapist told Bennett to "stop grinding" while lightly touching his bottom jaw contingent on bruxism. This procedure was selected for baseline because it is supported by previous research (e.g., Barnoy et al., 2009) and was the intervention used by caregivers at the inception of this study. However, it is important to note that the inclusion of the physical cue (i.e., light touch on bottom jaw) in baseline differed from the procedures used in the attention condition of the functional analysis.

Following baseline, FCT was implemented. First, a most-to-least prompting hierarchy was used to teach Bennett to say (or verbally approximate) the therapists' names. Prompting began with a combination of a gesture prompt that involved pointing to a name tag being worn by the therapist and a simultaneous verbal prompt (e.g.,"say, 'Courtney"'). After five consecutive occurrences of the alternative mand, this combined prompt was faded to a gesture prompt (i.e., pointing to name tag) only. Before beginning each FCT session, Bennett was prompted to say the therapist's name until only the gesture prompt was required. When the 5-min session began, the therapist said, "If you need me, just say my name." To present Bennett with an opportunity to mand for attention, the therapist then moved away from Bennett to prepare materials. Contingent on the first occurrence of bruxism in each session, the therapist prompted the alternative mand again and delivered minimal attention (i.e., "Good job saying my name."). The therapist ignored all subsequent occurrences and provided no further prompts for mands. When Bennett said the therapist's name without being prompted, the therapist provided 5 s of social interaction consisting of verbal praise (e.g., "Good job saying my name!") and physical touch (e.g., pats on the back, hugs, or tickles). The therapist then turned away from Bennett to present another opportunity to mand for attention. If he did not mand after the therapist had turned away for 30 s, the therapist moved back toward the table briefly and then moved away again to present another opportunity.

Maintenance sessions began 3 weeks after the conclusion of FCT. The therapist provided no prompts, ignored all occurrences of bruxism, and delivered attention contingent on mands.

RESULTS AND DISCUSSION

Figure 1 (top) displays the results of the functional analysis. Bruxism occurred most often in the attention ($M = 44\%$ of intervals) and escape conditions ($M = 16\%$ of intervals). The lowest rates of bruxism were recorded in the play ($M = 6\%$ of intervals) and alone ($M = 9\%$ of intervals) conditions. Overall, these data support both an attention and an escape function. However, the attention condition contained the highest levels of bruxism relative to the control condition; thus, an attention-based intervention was implemented.

Figure 1 also depicts the results of the FCT evaluation. During baseline, the mean occurrence of bruxism was 16% and 17% of intervals for Therapist 1 (middle) and Therapist 2 (bottom), respectively. Alternative mands for attention were not observed with either therapist. During FCT, levels of bruxism dropped to a mean of 2% of intervals with both therapists, and the mean of unprompted alternative mands for attention increased to 40% and 33% of opportunities with Therapists 1 and 2, respectively. During the maintenance phase, the mean percentage of intervals with bruxism was 0% and 1% with

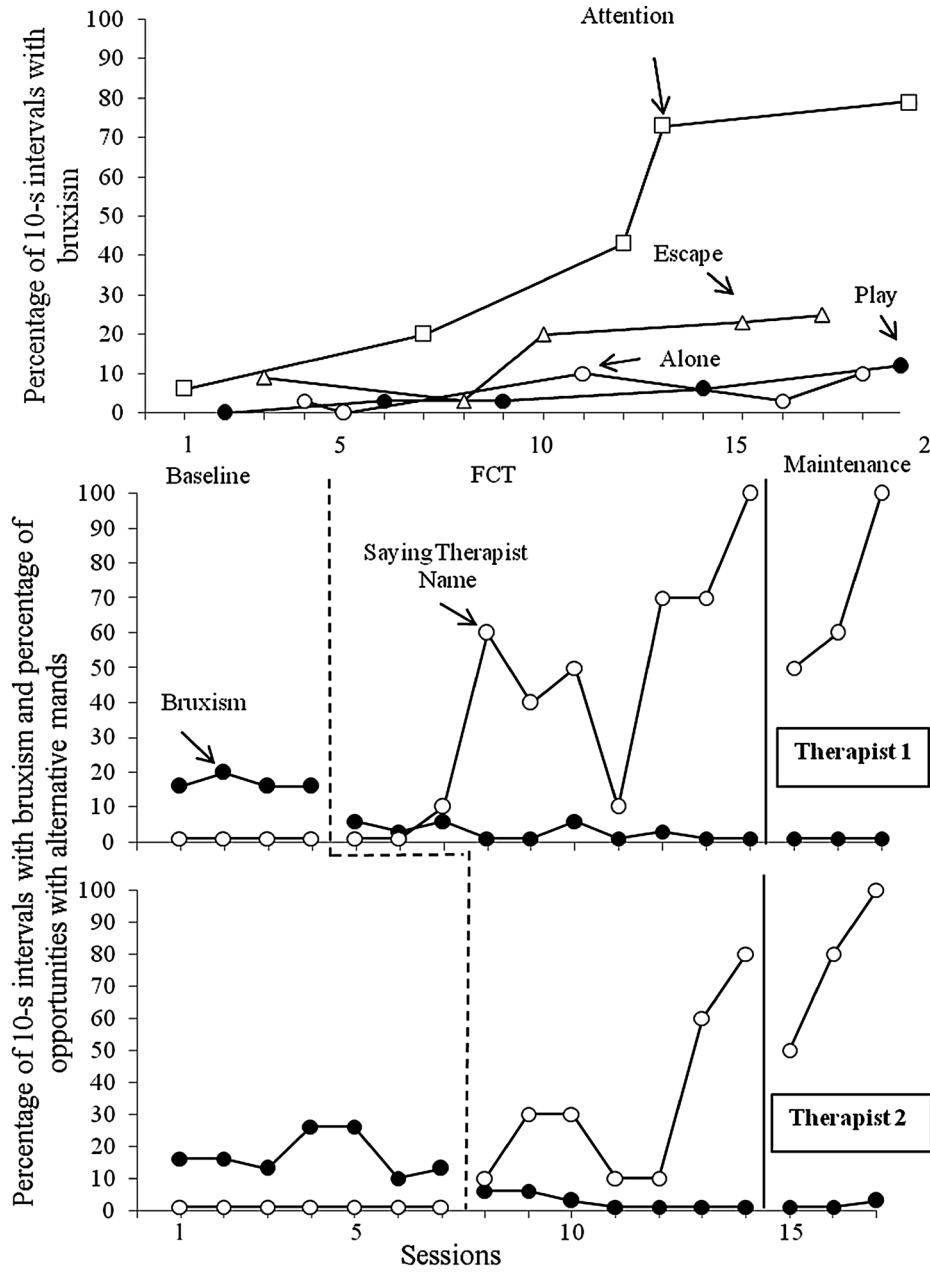

Figure 1. Percentage of 10-s intervals with bruxism during the functional analysis (top) and with Therapist 1 (middle) and Therapist 2 (bottom). Percentage of opportunities with alternative mands with Therapist 1 and Therapist 2.

Therapists 1 and 2, respectively. Alternative mands for attention averaged 70% and 77% of opportunities with Therapists 1 and 2, respectively.

Previous authors have suggested two potential etiologies for this behavior: dental-medical or psychological issues (Glaros & Rao, 1977; Lang et al., 2009). In terms of medical-dental issues,

individuals may grind their teeth because of malocclusion or as a side effect of certain medications (Glaros & Rao, 1977). When psychological causes of bruxism are considered, the most common assumption is that bruxism is related to anxiety or is maintained by automatic reinforcement (Glaros & Rao, 1977; Lang et al., 2009). The current results provide a demonstration of bruxism maintained by socially mediated consequences and replicate previous research in which response topography is an inadequate predictor of operant function (e.g., Kennedy, Meyer, Knowles, & Shukla, 2000).

It is possible that the physical cue provided contingent on bruxism during baseline functioned as a punisher (Barnoy et al., 2009) and may explain why levels of bruxism were substantially lower in baseline than in the attention condition of the functional analysis (in which the physical cue was absent). However, the physical cue had been in place in Bennett's home and school for more than 6 months, and bruxism persisted during that time. Bruxism was not reduced until an alternative means of obtaining attention was taught. In addition, it is important to note that there were topographical similarities between bruxism and the alternative mand (i.e., both involved using the mouth to form the response), which could have altered the effort associated with engaging in one response over the other.

A potential limitation is that the alternative mand was reinforced on a continuous schedule, which may be impractical in some settings. Also, during the functional analysis, different reinforcement intervals were arranged across test conditions (i.e., 5-s attention, 10-s escape). Unequal durations of reinforcement across conditions may alter the relative occurrence of problem behavior and influence the interpretation of functional analysis results (Fisher, Piazza, & Chiang, 1996). Third, the functional analysis data suggested that bruxism also served an escape function, which was not addressed in this study. Despite these limitations, this study appears to be the first to demonstrate a socially mediated function for bruxism and to treat bruxism successfully using positive reinforcement-based procedures.

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