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# DENTIST-IMPLEMENTED CONTINGENT ESCAPE FOR MANAGEMENT OF DISRUPTIVE CHILD BEHAVIOR

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We evaluated the effectiveness of a dentist-implemented intervention in which brief escape from dental treatment was provided to manage disruptive child behavior during restorative dental treatment. Within a multiple baseline design across subjects, 4 children, aged 3 to 7 years, were provided temporary escape from dental treatment contingent upon brief periods of cooperative behavior. Disruptive behavior decreased when the appropriate escape contingency was used at least 80% of the time. The escape contingency required no more time than traditional management procedures (e.g., tell-show-do, reprimands and loud commands, restraint) to bring disruptive behavior under control. Independent ratings by two dentists provided social validation of the efficacy of the escape contingency.

DESCRIPTORS: escape, negative reinforcement, dentistry, disruptive behavior, children

The adequacy of the behavior management skills of pediatric dentists has recently become a topic of debate, and with much justification. A recent survey found that over 60% of pediatric dentists expressed concern about ethical, legal, or safety issues related to invasive management procedures, such as physical restraint, sedation, and a hand-over-mouth procedure. The survey found that nearly 25% of all children served present moderate to severe management problems, and the respondents requested alternatives for safe and cost-effective management of these difficult children. In response to these types of requests, the American Academy of Pediatric Dentistry recently issued a mandate to encourage and support research of new behavior management technology and to improve the education and training of dentists in behavior management techniques (American Academy of Pediatric Dentistry, 1988).

In spite of the apparent need for alternative management techniques, dentists have been slow to accept new management procedures that require a large investment of time to prepare and/or implement. Cumbersome techniques, such as enhanced distraction (Stark et al., 1989), contingent distraction (Ingersoll, Nash, & Gamber, 1984), relaxation skills (e.g., Treiber, Seidner, Lee, Morgan, & Jackson, 1985), filmed modeling (e.g., Melamed, Weinstein, Hawes, & Katin-Borland, 1975), and desensitization (e.g., Klesges, Malott, & Ugland, 1984) have been effective, but require substantial time to prepare or implement. Because dentists are not paid for their time, but instead are paid for specific procedures completed, time investment is critical to the acceptance of new management techniques (Allen et al., 1990). Consequently, there is a need for cost-effective procedures that require minimal time to prepare and/or implement (Allen & Stokes, 1989).

The use of contingent escape in the dental operatory is one management strategy that may be implemented easily with minimal preparation. Escape is one of the most common and potent sources of reinforcement available (Iwata, 1987) and is an unavoidable feature of the typical restorative dental visit. In fact, the common practice of stopping dental treatment in response to disruptive behavior may, in many cases, serve to maintain disruptive

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behavior (Allen & Stokes, 1989). The use of reinforcers and brief escape from dental treatment contingent upon cooperative behavior was effective for managing disruptive children during dental treatment when they were exposed to the contingency during reinforced practice sessions prior to dental treatment (Allen & Stokes, 1987; Allen, Stark, Rigney, Nash, & Stokes, 1989). Unfortunately, the practice sessions make the procedure cumbersome and impractical for practicing dentists. An alternative, however, may be the elimination of the practice visits and the implementation of similar contingencies by the dentist during restorative treatment as the principal behavior management strategy.

This study examined whether the delivery of escape and praise contingent upon cooperative behavior can be used effectively to reduce disruptive behavior exhibited by children during restorative dental treatment.

## METHOD

### *Subjects and Setting*

Subjects were 4 children, ranging in age from 3 to 7 years, recruited from a university-based pediatric dental clinic. Beth and Ray were 3, Jenny was 4, and Brian was 7 years of age. The children required at least three additional visits for tooth preparation (drilling) and restorative procedures, including placement of amalgam or a stainless steel crown. During multiple previous experiences with dental treatment, each child had exhibited moderate to severe levels of disruptive behavior. Ray and Brian were referred by pediatric dentistry residents for moderate levels of disruptive behavior on two previous visits, whereas Beth was referred by a community dentist for severe levels of disruptive behavior during several previous visits. Jenny was also referred by a pediatric dentistry resident who had scheduled her for Demerol® sedation due to excessive disruptive behavior at one previous visit.

The project dentist was a resident seeking certification in pediatric dentistry through advanced training in technical applications and patient management. All treatment was conducted in an operatory (3 m by 4 m) physically separated from other operatories in a multichair dental clinic.

### *Dependent Measures, Data Collection, and Reliability*

*Child behavior.* Disruptive behavior was recorded using two categories from a revised disruptive behavior code (Allen & Stokes, 1987; Stark et al., 1989). Body movements and crying, moaning, or complaining were scored on a 15-s interval recording system. Scoring began when the dentist looked at and touched the child's mouth. Data collection stopped 5 s after the dentist looked away or ceased touching the child's mouth.

Videotapes were made of each visit for later scoring of child behavior by a psychologist and a predoctoral intern, who alternated as primary observers, and an undergraduate practicum student in psychology who served as reliability observer and was naive to the experimental hypothesis. Each observer was trained to 85% agreement. Reliability observations were conducted on 47% of the data. Interobserver reliability was determined by calculating the number of agreements between observers on the occurrence and nonoccurrence of each of the targeted disruptive behavior classes, dividing by the number of agreements plus disagreements, and multiplying by 100. Overall interobserver reliability was 93% for disruptive behavior (range, 81% to 100% per session), 92% for body movements (81% to 98.2%), and 96% for crying, moaning, or complaining (90.5% to 100%).

*Dental ratings.* The videotapes were also rated by two pediatric dentists. Both were unfamiliar with the children and the nature of the investigation, although one did work regularly with the project dentist. The dentists were asked to view randomly presented videotapes and to provide independent ratings of the children's cooperation. A rating reflected overall cooperation during each restorative treatment visit. Ratings were made using a 6-point

Likert scale (6 = extremely disruptive, 3 = cooperative, 1 = extremely cooperative). The scale has been described previously (Stark et al., 1989) and has been found to correlate highly with observations of disruptive behavior (Allen & Stokes, 1987). The interrater agreement between the dentists' cooperation ratings was calculated to be .83, using a Pearson product moment correlation.

*Time devoted to behavior management.* The amount of time the dentist spent managing behavior that competed with the completion of dental work was recorded. Time was recorded when the dentist looked at and touched anything except the client's mouth. Although the dentist engaged in behavior management (e.g., praise, reassurance, distracting talk, reprimands) while restorative treatment was in progress, only the time spent engaged in management that interfered with restorative treatment (e.g., restraint, hand-over-mouth, lecturing, escape from treatment) was recorded.

### *Independent Measures*

*Dentist behavior.* To ensure the integrity of the independent variable, the project dentist's use of the escape contingency was recorded. Escape from dental treatment provided contiguous with (less than 1 s from) a response by the child that was scored on the disruptive behavior code was considered inappropriate escape. Escape provided following appropriate behavior (lying still and quiet) was considered appropriate escape. A simple frequency count of the occurrence of each was maintained by the same observers described previously, and the proportion of appropriate escape was calculated by dividing the number of appropriate escapes by the total number of times the dentist permitted escape of any kind. Interobserver reliability on the escape contingency was calculated on 75% of dental visits and was found to be 95% (range, 91% to 100%).

### *Experimental Design and Procedures*

*Design.* The treatment procedures were introduced sequentially in a multiple baseline design across subjects.

*Baseline.* Baseline restorative treatment visits were conducted as a typical visit to the pediatric dentistry clinic. Dental procedures were explained to the children in the tell-show-do format as treatment progressed. Each child also received praise for cooperation and a small trinket following treatment, regardless of his or her behavior. These two procedures remained in effect throughout baseline and treatment conditions. During baseline only, other traditional behavior management procedures (e.g., reprimands, physical restraint, hand-over-mouth) were used as the dentist deemed necessary to control disruptive behavior.

*Training.* During training, the dentist was taught to provide escape and praise (i.e., "OK! you are lying so nice and still and quiet that we are going to take a little rest break") contingent upon brief demonstrations of cooperative behavior with each procedure. Initially, the dentist was instructed to require only 1 to 3 s of cooperative behavior before providing escape, working toward 10 to 20 s of cooperative behavior prior to each escape sequence. No instructions were provided about how long escape should last. Disruptive behavior was ignored, and treatment continued until cooperation was regained. If a dental procedure was completed and cooperation was not yet evident, the dentist left the instrument(s) in the mouth, simulating continued treatment, until cooperative behavior was demonstrated. During disruptive behavior, the dentist was permitted to provide one reminder to each child of the contingency that was in effect (i.e., "when you are calm, and quiet, and lying still, I will stop for a rest break"). Initially, the dentist reviewed the procedures and practiced with the senior author. Training the project dentist required approximately 90 min and involved discussion of escape contingency, modeling of the escape procedure, and rehearsal with feedback. Training was considered complete when the dentist used the procedure with 85% accuracy or higher during a criterion test, in which a child exhibiting mild disruptive behavior was recruited from the clinic. During this test, the dentist used appropriate contingent escape 89% of the time. The project dentist was instructed to use the appropriate escape con-

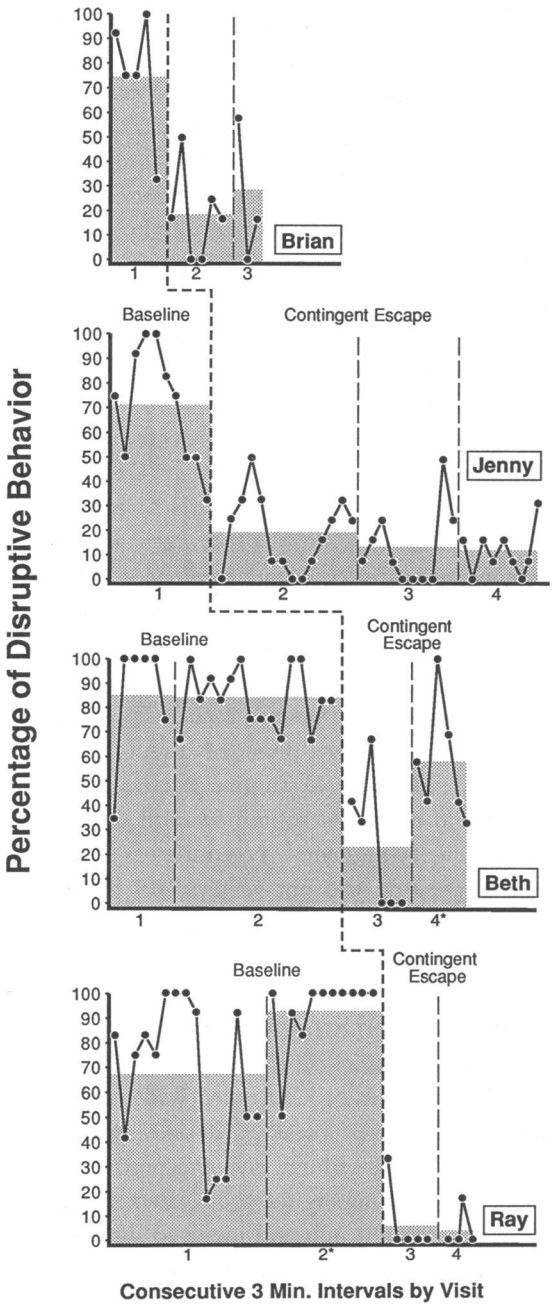


Figure 1. Percentage of 15-s intervals containing disruptive behavior per 3 min of treatment for each child during each visit. Consecutive dental visits are separated by dashed vertical lines. Shaded regions indicate the mean disruptive behavior per visit. The asterisk by Ray's second baseline visit denotes that it was intended to be an intervention visit; however, the independent variable was not implemented to criterion. The asterisk by Beth's fourth visit indicates another visit in which the dentist failed to implement the independent variable to criterion.

tingency a minimum of 80% of the time during each visit in the intervention phase.

*Intervention.* Prior to the first intervention visit, the children were told that during treatment they could earn opportunities to stop treatment briefly as long as they remained quiet and still. They were not told how long they needed to be quiet and cooperative, only that it was required if they wanted to experience "rest breaks." The dentist demonstrated this contingency with several of the operatory instruments, including the least invasive (i.e., mirror) as well as the more invasive (i.e., high speed drill) instruments. No instrument was removed until the child was calm and cooperative.

## RESULTS

The frequency of occurrence of disruptive behavior for each child during each restorative dental treatment visit is presented in Figure 1. During baseline, high and persistent rates of disruptive behavior were stable or increased across visits for each child, ranging from 67% to 93% ($M$ = 75%). The descending baselines for Brian and Jenny are a common occurrence during dental treatment, because procedures in the latter part of a visit are less invasive (i.e., less noise, less vibration and pinching, less discomfort) and tend to occasion less escape behavior. Consequently, results are best evaluated by comparing mean disruptive behavior as well as by comparing baseline visits and intervention visits interval by interval. The asterisk (Figure 1) on Ray's second visit denotes that the visit was intended to be an intervention visit. However, no change was observed in the dentist's use of appropriate contingent escape, so that session was considered an additional baseline visit. Following that visit, the dentist expressed uncertainty about how long to wait for cooperative behavior in extremely disruptive children such as Ray. As a result, a 5-min limit on the wait period for cooperative behavior was established, after which an active dental procedure could be terminated, even in the presence of disruptive behavior, and the dentist could move on with treatment (this limit was never reached with any child).

When the dentist implemented the appropriate escape contingency to criterion (80% appropriate escape), each of the children showed immediate and marked reductions in disruptive behavior. For example, Ray improved from 93% disruptive behavior during his second baseline visit to 6% during implementation of the escape contingency. In addition, both Ray and Jenny continued to improve with subsequent visits. The asterisk (Figure 1) on Beth's fourth visit indicates an intervention visit for Beth in which the dentist failed to implement the independent variable at the 80% criterion. Overall, however, upon implementation of the escape contingency at criterion, disruptive behavior occurred during only 16% of the intervals. In addition, a review of treatment records indicated that Brian, Ray, and Jenny have each returned for additional treatment (the dental work completed during the study was reportedly completed satisfactorily) and were described as either cooperative or apprehensive but cooperative.

Figure 2 depicts the mean percentage of disruptive behavior per session and the mean percentage use of the appropriate escape contingency during the same session. Analysis of the use of the escape contingency, both in baseline and after training, indicated an inverse relationship between disruptive behavior and the percentage use of the appropriate escape contingency during each session (Pearson $r = -.69, p < .01$). Figure 2 shows that when the dentist applied the appropriate escape contingency a minimum of 80% of the time, disruptive behavior averaged 15.3% (range, 4% to 28%). However, when the percentage of appropriate escape was below criterion, as in each baseline session and during Beth's fourth session, disruptive behavior was more frequent, averaging 76.1% (range, 58% to 93%), $t(15) = 11.57, p < .01$.

The average time devoted to behavior management in baseline was 10.3 min per visit (range, 7 to 15.2 min), whereas the average time during intervention phases was 8.7 min per visit (range, 4.5 to 14.1 min). Analyses of the appropriate escape sequences throughout the intervention phase for each child indicated that, on the average, 5 to 6 s of cooperative behavior was exhibited before escape was provided by the dentist. Periods of cooperative behavior ranged from 1 s to 22 s before escape was provided, and these periods tended to lengthen with repeated intervention visits. Escape typically lasted 4 to 6 s, although some were as long as 3 min, because the dentist occasionally used the escape sequences to select new instruments, to prepare a filling, or to talk with the child about what to expect next.

The two pediatric dentist-observers rated the children as very disruptive during baseline sessions, with ratings typically 5 or above (i.e., very disruptive) and averaged 5.4 (range, 5 to 6). During visits in which the escape contingency was implemented at criterion, all ratings were 3 or below (i.e., cooperative) and averaged 2.6 (range, 2 to 3).

## DISCUSSION

The results of this investigation support and extend previous research suggesting that exposing children to temporary escape during dental treatment, contingent upon cooperative behavior, can be an effective way for a dentist to manage difficult children in the dental operatory (Allen & Stokes, 1987; Allen et al., 1989). High levels of disruptive behavior in children as young as 3 years of age were brought under control in no more time than that required with traditional management procedures and with no additional preparation time. The strong relation between the use of an appropriate escape contingency and treatment outcome clearly supports its efficacy, suggesting that equal attention should focus on the training and maintenance of implementation by dentists.

Although each of the children was extremely disruptive in baseline, the dentist did not have to wait long periods for cooperative behavior to occur before implementing the escape contingency. Anecdotal observations suggested that the most disruptive behaviors were the end product of a response chain that began early in each visit. Thus, introduction of the escape contingency early in the visit may have interrupted the chain, preventing more frequent and intense disruptive behavior.

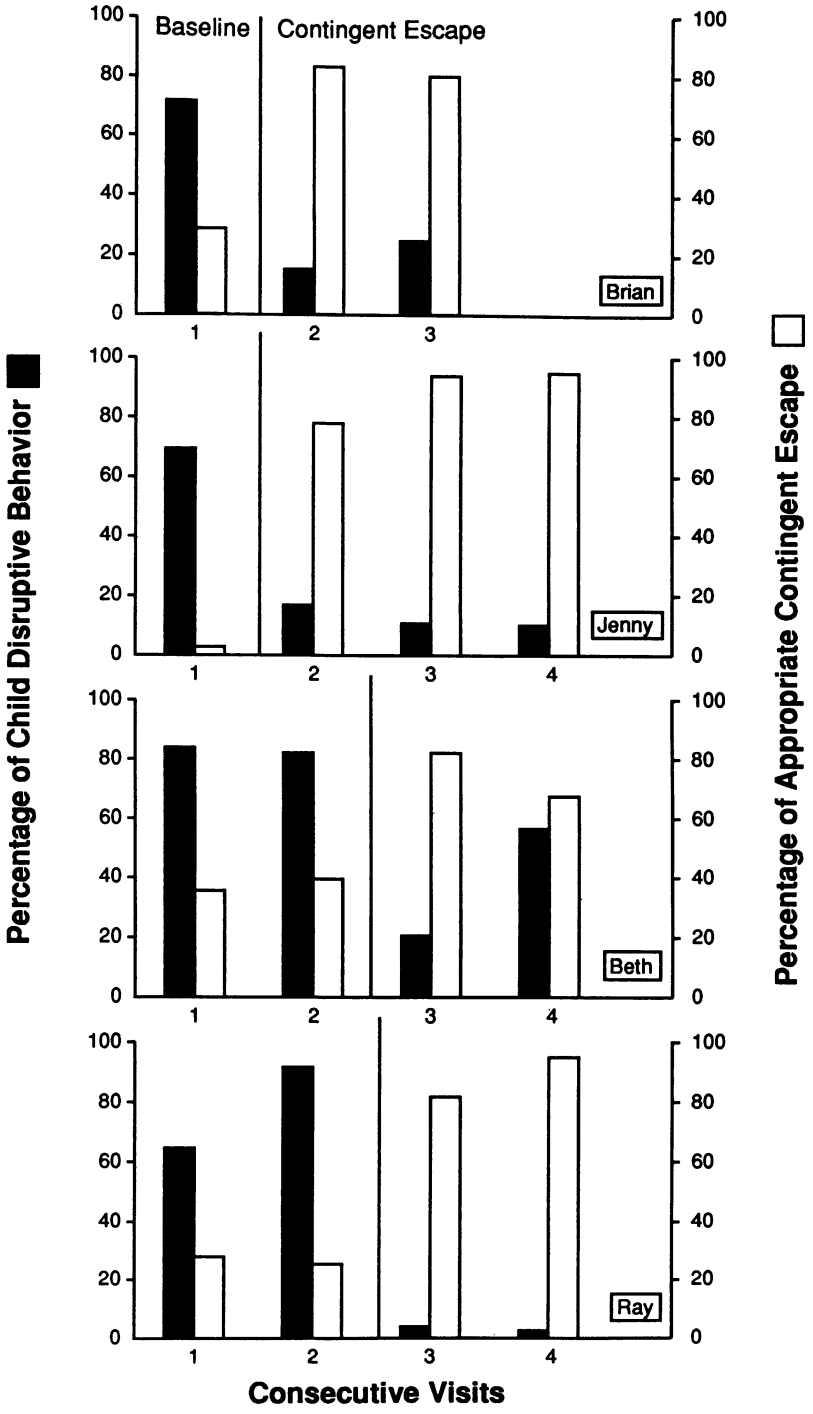


Figure 2. Percentage changes in mean disruptive behavior with corresponding percentage changes in use of the escape contingency. The solid bars represent the principal dependent measure: average disruptive behavior per visit. The open bars represent the independent variable: average use of appropriate contingent escape per visit.

Consequently, the longest the dentist had to wait for cooperative behavior was 4 min during Ray's third visit. Whether other practicing dentists would wait this long for difficult children to calm down warrants further study. Overall, however, the dentist spent no more time engaged in behavior management with the escape contingency than with traditional management procedures, and he obtained more satisfactory results.

Unfortunately, improved child behavior may not be sufficient to strengthen and maintain the use of the contingent escape procedure by dentists. Even after coming into contact with marked improvements in child behavior, the project dentist began to drift toward use of more traditional management procedures during Beth's last visit. In fact, the project dentist reports he now actually uses the procedure well below the study criterion. Perhaps the brief learning history provided here was insufficient to compete with a well-established repertoire of traditional management techniques.

The key to promoting general acceptance of this type of procedure may be in its introduction during graduate and postgraduate training. This is consistent with a recent mandate from the American Academy of Pediatric Dentistry, which called for increased attention to nonaversive, nonpharmacological behavior management techniques with an emphasis on demonstrations of competence with these techniques at the predoctoral level (AAPD, 1988). Training at the graduate level also avoids competing with the busy schedules of practicing dentists, when they may have neither the time nor the interest required to learn new techniques. Finally, providing graduate training to a minimum level of competence with this type of procedure would serve as an endorsement of the procedure, which dentists report is an important variable in their acceptance of new behavior management techniques (Allen et al., 1990).

Although the results of this investigation are encouraging, several questions remain to be answered. First, the project dentist had difficulty implementing the procedure with the 4 target children, who were all more disruptive than the child who participated in the criterion test. When confronted with more resistant disruptive behavior during initial implementation, the dentist dispensed with the escape contingency and relied primarily upon traditional management procedures. Although additional training brought the dentist back to criterion with the appropriate escape contingency, future investigations are needed to determine the parameters of an optimal initial training situation and criterion test. Second, although the results indicate that an escape procedure can be implemented effectively by one dentist, the ease with which other dentists could learn and apply this procedure remains to be studied. In addition, how long other dentists would actually be willing to wait for cooperative behavior is uncertain. Finally, future investigations need to determine the effectiveness of this procedure with children displaying less intense disruptive behavior as well as with children with no history of dental treatment. Each of the children targeted in this study was referred because disruptive behavior had been exhibited during previous treatment visits. Perhaps high levels of disruptive behavior can be prevented by targeting children who do not already have a long learning history in the dental operatory.

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