JOURNAL OF APPLIED BEHAVIOR ANALYSIS 1989, 22, 297–307 NUMBER 3 (FALL 1989)

DISTRACTION: ITS UTILIZATION AND EFFICACY WITH CHILDREN UNDERGOING DENTAL TREATMENT

LORI J. STARK
RHODE ISLAND HOSPITAL/BROWN UNIVERSITY PROGRAM IN MEDICINE

KEITH D. ALLEN
MEYER CHILDREN'S REHABILITATION INSTITUTE,
UNIVERSITY OF NEBRASKA MEDICAL CENTER

MICHAEL HURST, DAVID A. NASH, BROOKE RIGNEY
WEST VIRGINIA UNIVERSITY

TREVOR F. STOKES
UNIVERSITY OF SOUTH FLORIDA, FLORIDA MENTAL HEALTH INSTITUTE

We investigated the utilization and efficacy of distraction in reducing the anxious and disruptive behavior of 4 children undergoing dental treatment. During the distraction procedure, the children were shown a poster and told a story about it during dental treatment. They earned a prize if they attended to the poster and story and could correctly answer questions about them following each intervention visit. The children's disruptive behavior was assessed via direct observation, and results were analyzed within a multiple baseline design. The children exhibited high levels of anxious and disruptive behavior across baseline visits, regardless of the length of time in treatment or number of visits. Anxious and disruptive behavior decreased upon introduction of the intervention for all children. This was accompanied by the children meeting the criterion for correct answers on the distraction quiz. However, 2 of the children demonstrated an increase in their anxious and disruptive behavior across intervention visits. Results are discussed in terms of the need to evaluate treatment strategies that promote maintenance as well as initial changes.

DESCRIPTORS: children, distraction, dental visits, cooperative behavior

A variety of behavioral interventions designed to reduce children's distress during intrusive dental treatment have been investigated. These interventions have sought to decrease anxious and disruptive behavior and to teach children more adaptive behavior through provision of information (Siegel & Peterson, 1980), live and filmed modeling (e.g., Klingman, Melamed, Cuthbert, & Hermecz, 1984; Melamed, Yurcheson, Fleece, Hutcherson, & Hawes, 1978; Stokes & Kennedy, 1980; Williams, Hurst, & Stokes, 1983), and reinforcement of appropriate behavior (Allen, Stark, Rigney, Nash & Stokes, 1988; Allen & Stokes, 1987; Stokes & Kennedy, 1980).

Many of the treatments that have been found effective in decreasing anxious and disruptive behavior (e.g., Klingman et al., 1984; Siegel & Peterson, 1980) consist of a package of interventions that often includes modeling, relaxation, deep breathing exercises, distraction, and calming self-talk. It is unclear whether all strategies, either alone or in various combinations, are equally effective or necessary. Identification of individual components of interventions that are effective in reducing anxious and disruptive behavior may reduce the time necessary for intervention and yield more efficient management strategies. Recently, Allen and Stokes (1987) evaluated reinforcement in isolation from other strategies. Reinforcement for cooperative behavior during practice and actual dental visits was

The authors wish to thank Anthony Spirito and Vincent Barone for their editorial comments and Marcia Kaplan for preparation of the manuscript.

Correspondence and requests for reprints should be sent to Lori J. Stark, Child and Family Psychiatry, Rhode Island Hospital, 593 Eddy Street, Providence, Rhode Island.

JOURNAL OF APPLIED BEHAVIOR ANALYSIS 1989, 22, 297–307 NUMBER 3 (FALL 1989)

DISTRACTION: ITS UTILIZATION AND EFFICACY WITH CHILDREN UNDERGOING DENTAL TREATMENT

LORI J. STARK
RHODE ISLAND HOSPITAL/BROWN UNIVERSITY PROGRAM IN MEDICINE

KEITH D. ALLEN
MEYER CHILDREN'S REHABILITATION INSTITUTE,
UNIVERSITY OF NEBRASKA MEDICAL CENTER

MICHAEL HURST, DAVID A. NASH, BROOKE RIGNEY
WEST VIRGINIA UNIVERSITY

TREVOR F. STOKES
UNIVERSITY OF SOUTH FLORIDA, FLORIDA MENTAL HEALTH INSTITUTE

We investigated the utilization and efficacy of distraction in reducing the anxious and disruptive behavior of 4 children undergoing dental treatment. During the distraction procedure, the children were shown a poster and told a story about it during dental treatment. They earned a prize if they attended to the poster and story and could correctly answer questions about them following each intervention visit. The children's disruptive behavior was assessed via direct observation, and results were analyzed within a multiple baseline design. The children exhibited high levels of anxious and disruptive behavior across baseline visits, regardless of the length of time in treatment or number of visits. Anxious and disruptive behavior decreased upon introduction of the intervention for all children. This was accompanied by the children meeting the criterion for correct answers on the distraction quiz. However, 2 of the children demonstrated an increase in their anxious and disruptive behavior across intervention visits. Results are discussed in terms of the need to evaluate treatment strategies that promote maintenance as well as initial changes.

DESCRIPTORS: children, distraction, dental visits, cooperative behavior

A variety of behavioral interventions designed to reduce children's distress during intrusive dental treatment have been investigated. These interventions have sought to decrease anxious and disruptive behavior and to teach children more adaptive behavior through provision of information (Siegel & Peterson, 1980), live and filmed modeling (e.g., Klingman, Melamed, Cuthbert, & Hermecz, 1984; Melamed, Yurcheson, Fleece, Hutcherson, & Hawes, 1978; Stokes & Kennedy, 1980; Williams, Hurst, & Stokes, 1983), and reinforcement of appropriate behavior (Allen, Stark, Rigney, Nash & Stokes, 1988; Allen & Stokes, 1987; Stokes & Kennedy, 1980).

Many of the treatments that have been found effective in decreasing anxious and disruptive behavior (e.g., Klingman et al., 1984; Siegel & Peterson, 1980) consist of a package of interventions that often includes modeling, relaxation, deep breathing exercises, distraction, and calming self-talk. It is unclear whether all strategies, either alone or in various combinations, are equally effective or necessary. Identification of individual components of interventions that are effective in reducing anxious and disruptive behavior may reduce the time necessary for intervention and yield more efficient management strategies. Recently, Allen and Stokes (1987) evaluated reinforcement in isolation from other strategies. Reinforcement for cooperative behavior during practice and actual dental visits was

The authors wish to thank Anthony Spiritó and Vincent Barone for their editorial comments and Marcia Kaplan for preparation of the manuscript.

Correspondence and requests for reprints should be sent to Lori J. Stark, Child and Family Psychiatry, Rhode Island Hospital, 593 Eddy Street, Providence, Rhode Island.

Dentistry for excessive levels of anxious and disruptive behavior (e.g., kicking, screaming, noncompliance) during prior dental treatment. Each parent provided informed consent. At the time of enrollment in the study Stan and Andy were 4 years, 6 months of age; Frank was 5 years, 6 months; and Rick was 7 years, 3 months of age. None of the children were related to one another or had known cognitive deficits. All were Caucasian and from middle-class families. Each of the children required three or more restorative visits; all treatments were conducted in a dental operatory (3 m by 3 m).

Table 1

The Anxious and Disruptive Behavior Code (ADBC)

1. *Head movement (H)*: Any head movement of 15 mm or more, except facial muscles or movements of lower jaw. Movement was scored during interval in which it occurred. Movements in response to dental instructions or questions were not scored.

2. *Body movement (B)*: Movement of any one part of the body 15 cm or more, in either one continuous motion or smaller repetitive (back and forth) motions, that cumulated to 15 cm without interruption of 1 s or more. This was scored during interval in which it occurred or magnitude criteria were met.

3. *Complaints/crying (C)*: Any crying, moaning, gagging, or complaining about dental procedures or pain. Complaints in response to questions by the dentist were not scored.

4. *Restraints (R)*: Firm holding of any part of child's body by dental assistant to restrict movement. Light touches to calm or comfort child were not scored.

Dependent Measures and Reliability Assessment

Anxious and Disruptive Behavior Code (ADBC). The code developed by Allard and Stokes (1980) and Stokes and Kennedy (1980) was refined and used in the present study. The four categories, head movement, body movement, complaining, and restraint, and their operational definitions are presented in Table 1. Occurrence of these behaviors was scored in 15-s intervals by a graduate student in psychology. Observation began when the dentist entered the operatory, sat down, looked at the child and touched the child's mouth. Data collection temporarily stopped 5 s after the dentist looked away or ceased touching the child's face. Observation ended when the dentist signaled the end of treatment.

Interobserver agreement was assessed during 87% of the observations, with a second psychology graduate student serving as an independent observer. The two observers were trained to 90% reliability during 2 weeks of clinic observations of children not participating in the study. Interobserver agreement on occurrence and nonoccurrence of anxious or disruptive behavior was calculated separately by dividing the number of agreements by agreements plus disagreements and multiplying by 100. The mean level of interobserver agreement on occurrence of disruptive or anxious behavior across all children was 86.5% (range, 70% to 93%). Mean interobserver agreement on occurrence was 87%, 82%, 82%, and 91% for Stan, Andy, Frank and Rick, respectively. Interobserver agreement on nonoccurrences of disruptive or anxious behavior was calculated using the same formula for all children, except Frank, and was 86% (range, 72.3% to 95.7%). (Frank's raw data were lost in a house fire and were not available for analysis of nonoccurrences.) Mean agreement on nonoccurrence for the individual children was 93.5% for Stan, 80.3% for Andy, and 84.4% for Rick. Interobserver reliability was also calculated for Stan, Andy, and Rick using Cohen's Kappa statistic (Cohen, 1960) and was .92, .84, and .77, respectively, with an overall Kappa of .81.

Dental Procedures Code (DPC). Concurrently with the ADBC, the occurrence of six common dental procedures was scored by the same observers. The procedures included explorer/mirror; injection; rubber dam and clamp; dental handpiece with drilling burr; water/air/suction; and restorative procedures (e.g., amalgam/resin, filling, stainless steel crown, pulpotomy, and extraction). A procedure was scored when the instrument was inside or touching the child's mouth at anytime during a 15-s interval. Interobserver reliability was calculated on the same 87% of dental visits as the ADBC and was 95% (range, 85% to 100%).

Assessment of mastery and utilization of distraction. The children's mastery and utilization of the distraction stimuli were assessed via a 14- to 16-item quiz following removal of the distraction stimuli. Interobserver reliability was assessed on

Table 2
Cooperation Rating Scale (CRS)

1. *Extremely Cooperative*

Child never disrupted dental procedures. He sat very still, did not move head or body very much. Child was very quiet, and always followed dental instructions. Overall, child did not interfere with dental procedures.

2. *Very Cooperative*

Child almost never disrupted dental procedures. He sat still, rarely moving head or body. Child was very quiet except for an occasional moan and almost always followed dental instructions. Overall, child did not interfere with dental procedures.

3. *Cooperative*

Child occasionally disrupted dental procedures. He may have moved head, squirmed in seat, complained, or moaned, causing the dentist to readjust equipment slightly, without pausing. Child usually followed dental instructions but may have needed more than one instruction before complying. Overall, child's behavior was of concern, but did not interfere.

4. *Uncooperative*

Child disrupted dental procedures several times. He may have moved his head, closed his mouth, moved his body, or cried or moaned so loud as to cause the dentist to stop the procedures for a few seconds to a few minutes to calm child. Child usually required more than one instruction and/or manual guidance before he complied with the dentist's instructions. Overall, child interfered with procedures enough to cause an interruption for a few seconds to a few minutes.

5. *Very Uncooperative*

Child frequently disrupted dental procedures. He may have moved head away from dentist, attempted to grab and/or dislodge instruments, or pushed dentist's hand away. Child may have moved body a lot, or kicked at dentist. Child may have screamed long or loud, or refused to follow dental instructions. Overall, child's behavior caused some delays for a few minutes or prevented some treatment.

6. *Extremely Uncooperative*

Child often disrupted dental procedures. He may have moved his head a lot, grabbed and/or dislodged instruments, or pushed dentist's hands away. Child may have moved his body excessively, or screamed, cried, moaned very loud or long. Child may have refused to follow dental instructions. Overall, child's behavior was of such intensity as to cause termination of ongoing dental procedures or frequent prolonged delays of several minutes.

80% of the children's answers regarding use of the distraction stimuli during a dental visit and was 100%. Reliability was also assessed on 33% of the mastery data during training and was also 100%.

Cooperation and anxiety rating scales. Two 6-point rating scales were devised for the dentist and dental assistant to evaluate the children's level of cooperation and anxiety. As shown in Tables 2 and 3, the children were rated from 1 (extremely cooperative) to 6 (extremely uncooperative) on the Cooperation Behavior Scale (CBS; see Table 2) and from 1 (extremely relaxed) to 6 (extremely anxious) on the Anxiety Behavior Scale (ABS; see Table 3). The children were rated independently on the CBS and ABS by the dentist and assistant four times during treatment at approximately 10 s after the dentist's entrance to the operatory and upon completion of injection, drilling, and restoration. In addition, they each gave the child a global rating immediately after his visit.

Interobserver agreement on the scoring of the dental and dental assistance ratings was assessed on 81.1% of the data and was 98.8%. In addition, the interrater agreement between the dentist and dental assistant was calculated using the Pearson Product Moment Correlation. The correlation between the dentist and dental assistant ratings of cooperation following each dental procedure plus the global cooperation rating was .73. The correlation between the dentist and dental assistant on the global cooperation rating alone was .60. On their ratings of the children's anxiety following each procedure plus the global anxiety rating the correlation was .83. The correlation on the global anxiety rating alone was .81.

Physiological measures. Heart rate (HR) and blood pressure (BP; systolic and diastolic) were taken automatically every 2 min using the DINAMAP® Adult/Pediatric Vital Signs Monitor with a pediatric cuff (Critikon, 1981). The cuff was placed on the child's arm upon his being seated in the dental chair, followed by a 6-min habituation and 6-min baseline phase. The three readings obtained during baseline were averaged to provide the basal HR and BP measures.

During treatment the DINAMAP® continued to report HR and BP every 2 min; these measures were recorded by an undergraduate observer. The observer also recorded the ongoing dental procedure during each physiological measurement. If more

Table 3
Anxiety Rating Scale (ARS)

1. *Extremely Relaxed*

Child looked calm and his body was very relaxed. Child's arms were lying still beside or on his body. Child appeared willing and was able to converse. He had deep and regular breathing. Overall, child seemed unconcerned about dental work and may have focused on other things in room or sat with eyes closed.

2. *Very Relaxed*

Child looked calm and his body was very relaxed most of the time. Child's arms were lying beside or on his body. Child appeared a little concerned about procedures and would briefly focus on a procedure when it was introduced (e.g., look at equipment) and/or ask questions. This concern was easily alleviated when dentist explained the equipment or procedure. Child's breathing was deep and regular. Overall, child appeared only slightly concerned about dental work and usually focused on other things or kept eyes closed.

3. *Relaxed*

Child was usually calm, but occasionally looked frightened. Child usually relaxed but may have occasionally tensed up or become shaky. Child usually focused on the dental procedures, but did not interfere. For the most part child's breathing was very regular. Overall, child was calm, but concerned about procedures.

4. *Anxious*

Child appeared a little anxious about the procedures. Child's body was somewhat tense and shaky and child may have engaged in repetitive movements with feet or legs that did not interfere with dental treatment. Further, child may have shown great concern about dental procedures (e.g., had eyes open very wide most of the time, asked questions, or shook head vigorously in response to questions). Also, child's eyes may have been teary or watery. Child's breathing was somewhat irregular. Overall, child appeared apprehensive and anxious about procedures.

5. *Very Anxious*

Child appeared very nervous about procedures. Child's body appeared rigid or shaky. Child sat with arms underneath body or often jerked arms up and down in response to procedures, but never attempted to interfere. Child may have engaged in vigorous repetitive feet or leg movements that did not directly interfere with dental work. Child's eyes were wide open and often focused on dentist or procedures. Child may have answered the dentist's questions with a shaky voice or vigorous head shake. Child may have been sitting quietly but had tears running down cheeks.

6. *Extremely Anxious*

Child appeared very nervous and upset about dental procedures. Child's body was very tense or shaky. Child sat with arms underneath body most of the time (over half) or poised to interfere with procedures. Child may have engaged in vigorous repetitive movement of hands, feet, or legs. This movement may or may not have interfered. Child was very concerned about dental procedures and watched almost all procedures most of the time and may have asked questions, such as "Am I done?", frequently. Child may have been quietly crying or softly sobbing. Child's breathing may have been shallow and/or irregular. Overall, child appeared very anxious and concerned about dental treatment.

than one HR and BP (systolic and diastolic) were obtained during the four main procedures (injection, rubber dam, drilling, and restoration) these measurements were averaged to provide a single score for each procedure.

Reliability was provided by a person simultaneously recording the DINAMAP® reading and the concurrent dental procedure during one visit per child (approximately 20% of the data). Reliability was again calculated as previously reported, and the mean observer agreement on the DINAMAP® readout for HR and BP (systolic and diastolic) was 100% on each. Reliability on the dental procedure during physiological measurement was 85%. Reliability on the ongoing dental procedure was lower when taken during the physiological measurement than when recorded simultaneously with ADBC (95%). The discrepancy in agreement between the two recordings is probably a function of the difficulty of detecting the onset of the physiological measurement as signaled by the inflation of the pediatric cuff and is not attributable to the code for dental procedures.

Procedure

Each child visited the operatory three to five times, with 1 to 2 weeks between appointments. Each appointment lasted 15 to 60 min depending on the dental procedure being conducted and the child's disruptive behavior. All dental work was performed by the third and fourth authors and a dental assistant. Both dentists had extensive experience with children. Each child, except Rick, was served by the same dentist throughout his treatment. Rick saw the fourth author on his first visit and the third author on four subsequent visits.

Baseline. During the first visit the child was separated from his parent in the waiting room, brought into the operatory room, and familiarized with the DINAMAP® Vital Signs Monitor. Each visit consisted of a brief exploration of the child's mouth, injection of a local anesthetic, placement of the rubber dam, drilling, and restorative work (either resin, crown placement, or pulpotomy).

The procedures during baseline were those typically followed at the dental clinic. The dentist or dental assistant explained each procedure as it was performed and described sensations that might be associated with it. The dentist praised the child whenever the child cooperated and prompted him to sit still or to be quiet. If the child did not respond to the verbal prompt to cooperate, the dentist would either temporarily stop the procedure or the dental assistant would restrain the child (see ADBC). At the end of the appointment the child received a helium balloon and a small trinket, regardless of his behavior.

Distraction. Four posters from the Peabody Language Development Kit and 13-min audiorecorded stories about the posters were used as the distraction stimuli. The posters were colorful, depicted children and animals, and presented unusual scenes (e.g., outer space). One of the posters was hung approximately 1.2 m above the child's head as he lay in the dental chair, and a corresponding story was presented simultaneously via earphones and a Sony Walkman® tape player.

Following the last baseline appointment, the child was instructed to remain in the dental chair. A graduate student explained that she would teach a special technique that may help the child relax while in the dentist's office. The child was taken through four steps to teach him to use repetition (saying things over and over to himself) as a means of remembering the information presented in the poster and story. The first step was teaching the child to repeat aloud information presented in the story. Second, when the child was consistently doing this, he was told to whisper. Third, he was instructed to move his lips, but not make any sound. Fourth, he was told to repeat the information to himself only, without moving his lips or talking aloud. This behavior most closely approximated the manner in which the child would use distraction during treatment. When the child could answer 75% or more of the questions about the poster and story, he was sent home. This usually took 20 to 25 min.

On the first distraction visit, the child was told he could play a video game or choose a toy if he listened to the story, looked at the poster, and could answer a lot of questions about them after the appointment. The child was then taken to the operatory and a refresher mastery test was given for 2 min of the training story and poster. Following this, a new poster and story were selected randomly and presented when the dentist entered the operatory. All other procedures were conducted as in baseline. The earphones did not prevent the child from hearing the dentist talking to him.

At the end of treatment the new poster and story were removed and the child's mastery of them was assessed through a 14- to 16-item quiz. If the child answered 65% or more of the questions correctly, he was allowed to choose a treat. If the child did not answer 65% or more of the questions correctly, he was told he would have to try harder next time. The child received the helium balloon and small trinket as he did in baseline, independent of his behavior or mastery.

Experimental design. The distraction procedure was introduced within a multiple baseline design across subjects.

RESULTS

Disruptive Behavior

Figure 1 presents the children's disruptive behavior per 3-min interval across baseline and distraction conditions. The dental procedure that was implemented during each 3-min interval is indicated by the symbol of the data point on the line graph for all children but Frank. (As mentioned above, Frank's raw data were lost in a house fire and could not be reanalyzed to indicate the sequence and timing of dental procedures he received.) During baseline, all children showed high rates of disruptive behavior, regardless of the number of visits (two or three) or the amount of time in treatment

(12 to 40 min). Andy, Frank, and Rick exhibited increases in disruptive behavior across baseline visits.

Following the introduction of the distraction intervention, all children demonstrated an immediate decrease in overall disruptive behavior during the first distraction visit. Stan's disruptive behavior decreased from an average of 60% during baseline visits to 6% during distraction. Andy showed a decrease from 49% to 15%. Frank's disruptive behavior decreased from an average of 50% to 19% and Rick's decreased from 47% to 29%. Further, for Stan and Andy, disruptive behavior during the injection was lower than on previous visits. Because of required dental work, Frank and Rick were available for more than one visit during the intervention phase. Their disruptive behavior increased across successive visits during the distraction condition.

Dental Ratings

The means of the dentist's and dental assistant's global ratings of each child's degree of cooperation and anxiety are presented by visit in Figure 2. The global cooperation ratings show that the children were rated as cooperative during the baseline, but that Andy, Frank, and Rick became less cooperative across baseline visits. On the first distraction visit, the ratings show a decrease in uncooperative behavior across all children. However, Frank and Rick were rated as being less cooperative across visits during the distraction phase (Visits 4 and 5). Stan, Andy, and Frank were rated as "relaxed" during baseline and Rick was rated as "anxious." On the first distraction visit, ratings improved to "extremely relaxed" for Stan and Frank and "very relaxed" for Andy and Rick. However, on subsequent distraction visits, both Frank and Rick were rated as being more anxious.

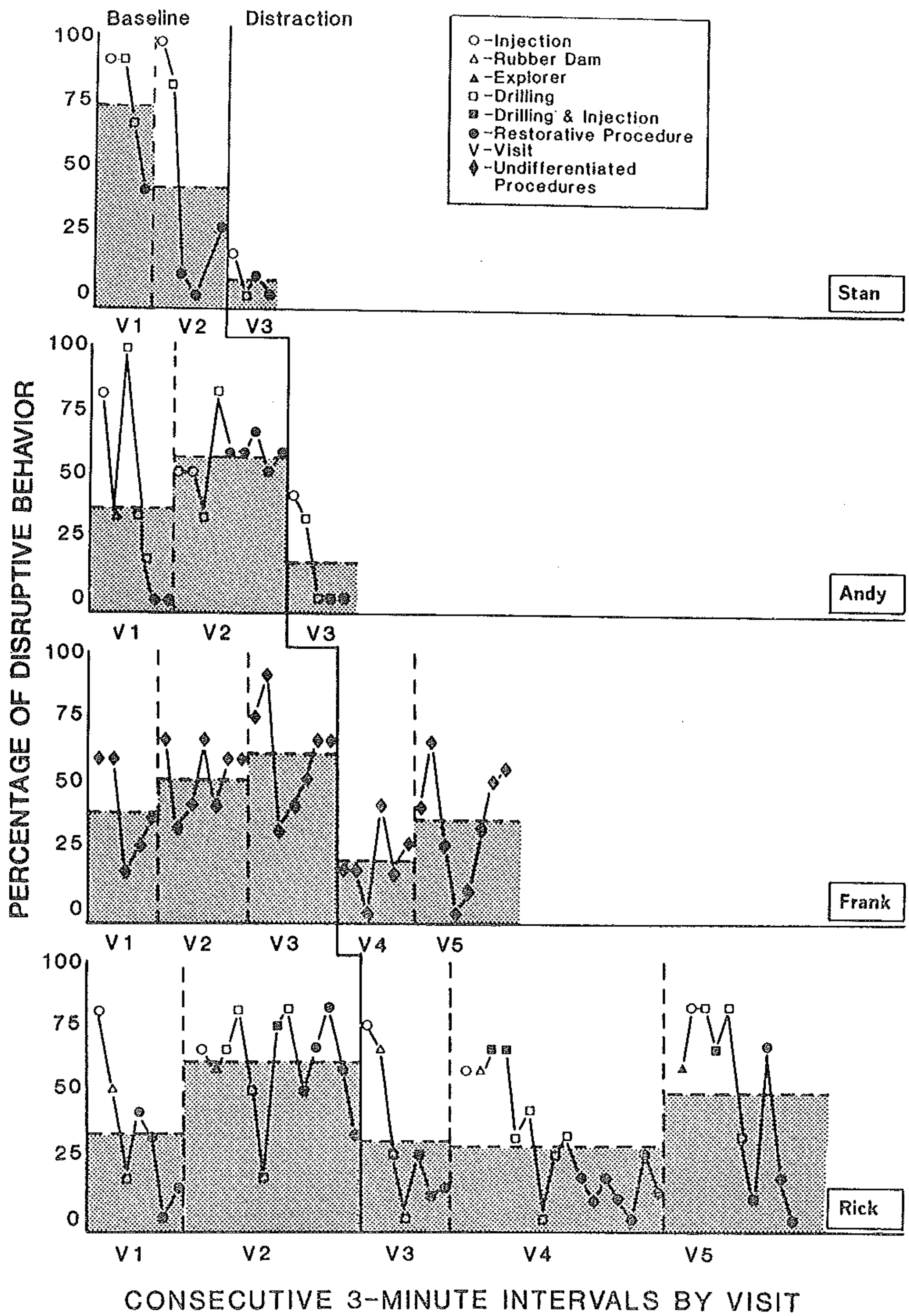
Mastery and Utilization Data

On the mastery quiz following the initial training of distraction, Andy, Frank, and Rick obtained 100% correct scores and Stan achieved 81% correct. On the utilization assessment immediately following each dental visit, Stan obtained 65% correct, Andy 47% correct, and Frank 93% and 100% correct during his two visits, respectively. Rick obtained 93%, 86% and 77% correct during his three visits, respectively.

Physiological Data

Statistical analyses of changes in data of heart rate (HR) and blood pressure (BP) were precluded by the small sample size. However, visual inspection of the means and standard deviations for change scores (basal reading minus procedure reading) did not appreciably differ from pre- to postintervention. During the baseline condition, the mean change in HR from basal to dental treatment was 3.9 beats per minute (bpm) (SD = 10.9), whereas during the distraction condition it was 5.3 bpm (SD = 9.0). During baseline the mean change in diastolic BP from basal to dental treatment was 12.7 millimeters of mercury (mm/Hg) (SD = 11.6), whereas during distraction it was 7 mm/Hg (SD = 11.4). The mean change in systolic BP was 13.4 mm/Hg (SD = 10.6) during baseline and 8.3 mm/Hg (SD = 12.7) during distraction.

Furthermore, an examination of the interaction of the children's physiological status by procedure indicates that the largest increases in arousal occurred during injections, regardless of experimental condition. The mean change score in HR during baseline for injection was 13.5 bpm (SD = 13.76) compared to .166 bpm (SD = 8.22) during all other dental procedures combined. Similarly, during the distraction condition the mean change score in HR for Frank and Rick during injection was 18.67 bpm (SD = 6.8), whereas the change score in HR during the other dental procedures was 1.78 bpm (SD = 7.2). At baseline, the mean change in diastolic and systolic BP was 23.6 mm/Hg (SD = 11.3) and 22.8 mm/Hg (SD = 11.7), respectively, during injection and only 7.7 mm/Hg (SD = 7.2) and 11.5 mm/Hg (SD = 9.4), respectively, during all other dental procedures combined. In the distraction condition the mean change in diastolic and systolic BP for Frank and Rick from basal to dental treatment was 18.3 mm/Hg (SD = 16.5) and 26.7 mm/Hg (SD = 17.2), respectively. The mean change in diastolic and systolic BP from basal to treatment for all other dental


Baseline
Distraction
O -Injection
Δ -Rubber Dam
▲ -Explorer
□ -Drilling
▣ -Drilling & Injection
● -Restorative Procedure
V -Visit
◆ -Undifferentiated Procedures
Stan
Andy
Frank
Rick
PERCENTAGE OF DISRUPTIVE BEHAVIOR
0
25
50
75
100
V1
V2
V3
V4
V5
CONSECUTIVE 3-MINUTE INTERVALS BY VISIT

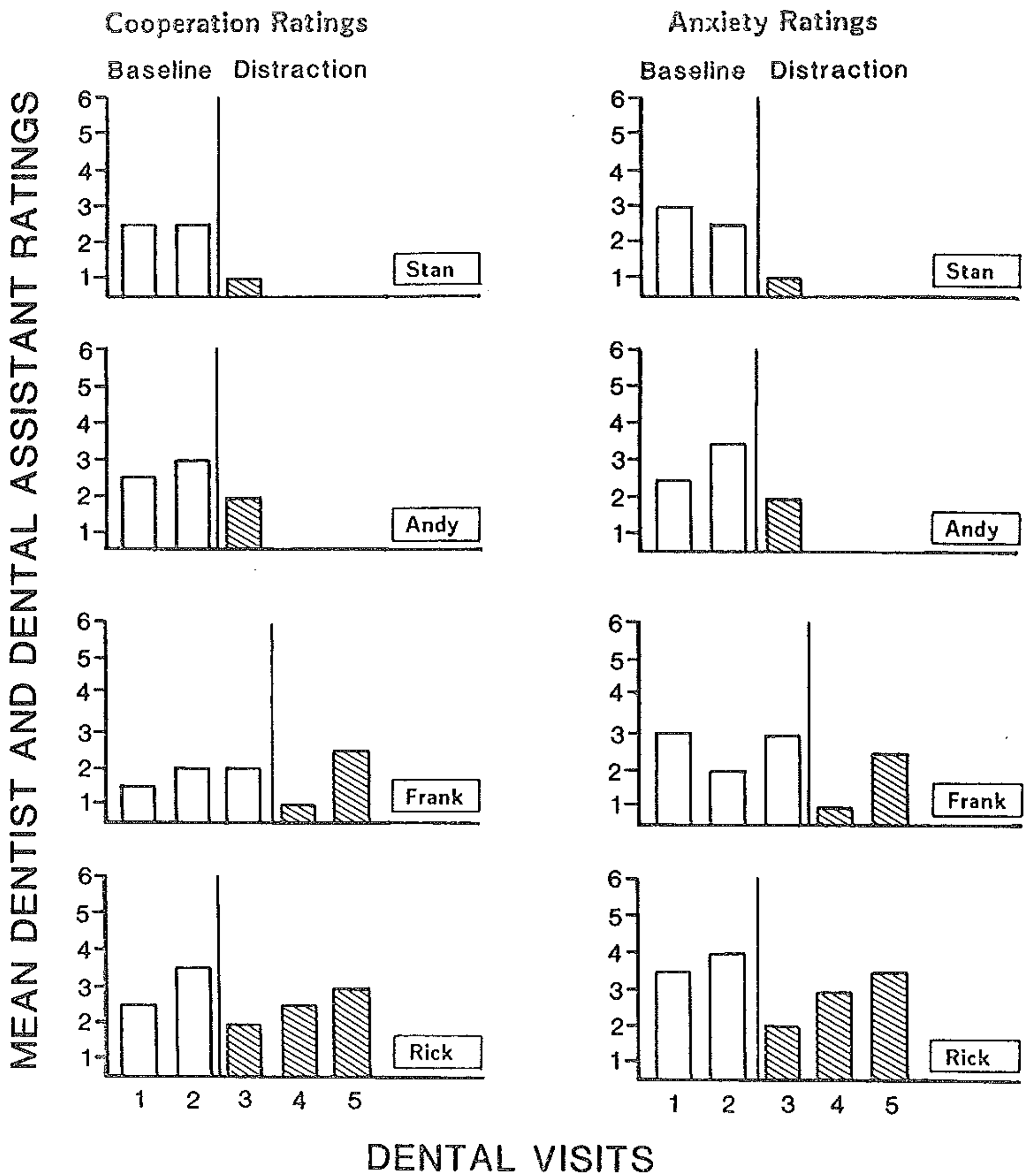


Figure 2. Mean global ratings of each child's cooperation and anxiety by the dentist and dental assistant across dental visits. The open bar graphs represent baseline visits, and the shaded bars represent intervention visits.

←

Figure 1. Percentage of disruptive behavior for each child during baseline and distraction. Dental visits are separated by dotted and solid vertical lines. The shaded bars show the daily mean percentages, and the line graph shows behavior during consecutive 3-min intervals of dental work. The ongoing dental procedure is indicated by the symbol of the data point on the line graph.

procedures combined during distraction was only 2.9 mm/Hg ($SD = 10.9$) and 10.0 mm/Hg ($SD = 9.8$), respectively.

DISCUSSION

Our results suggest that distraction, when strengthened with an external contingency requiring attention to the stimulus, was an effective strategy for initially reducing anxious or disruptive behavior of children undergoing dental treatment. The data show that the children were able to master the distraction task in approximately 20 min and that 3 of the 4 children showed use of the distraction stimuli (i.e., their utilization score was above criterion) during their actual dental visits. The children's use of the distraction stimuli corresponded to decreases in anxious or disruptive behavior.

Although findings obtained during the initial intervention visit for each child were similar to those reported by previous investigators (e.g., Klingman et al., 1984; Melamed et al., 1978), children who received more than one intervention visit in the clinic did not maintain these positive effects. Our results are similar to those reported by Siegel and Peterson (1981), who noted that treated children were less disruptive than control children but were more disruptive across a second intervention visit than during their initial intervention visit. In the present study, disruptive behavior increased across intervention visits. Further, the increase in disruptive behavior was accompanied by a decrease in performance on the distraction utilization test for 1 (Rick) of the 2 children who attended more than one intervention visit. Rick's simultaneous decrease in performance on the distraction quiz and increase in disruptive behavior suggests that use of distraction may have been related to decreased disruptive behavior.

Interestingly, the criterion established for access to the rewards did not seem particularly important in ensuring improved behavior. For example, Andy did not meet criteria on the distraction quiz yet had large reductions in disruptive behavior. Frank consistently met the criterion on the quiz, but his disruptive behavior still became worse across visits. In fact, the 2 subjects (Frank and Rick) who continued treatment were both able to earn the prize by meeting criterion on subsequent visits even though their behavior began to deteriorate. Thus, the goal of ensuring that the children used the distractor was achieved with the added contingency, yet there was no maintenance of the treatment effects from the initial intervention visit.

The initial treatment effects were not maintained because the children learned, over repeated exposure to the distraction stimuli, that they could engage in disruptive behavior and answer a sufficient number of questions about the poster and story to earn a prize. Because we did not intervene to change the dentist's or dental assistant's response to the children's disruptive behavior, it is possible that the dentist or dental assistant temporarily stopped or delayed various dental procedures contingent on disruptive behavior. Thus, it is possible that the children were concurrently able to engage in the distraction task and earn a prize and to engage in disruptive behavior to escape (if only temporarily) dental procedures. Future research might investigate the extended benefits of the removal of the escape contingency by making exposure to the distraction stimuli contingent upon cooperative behavior. Previous research has found this contingency to be effective in improving the behavior of generally cooperative children (Ingersoll, Nash, Blount et al., 1984; Ingersoll, Nash & Gamber, 1984). However, this contingency has not been evaluated with highly disruptive children.

The effects of distraction on physiological variables were similar to previous research in which disruptive behavior did not influence physiological responding (Klingman et al., 1984). The reason for the lack of positive results on physiological parameters is unclear, but several possible explanations exist. It may be that the learned association between procedures (e.g., the injection syringe) and physiological arousal cannot be modified through brief pairings of cooperative behavior and dental procedures. Alternatively, the nature of the intervention, active distraction, may have maintained the increased physiological arousal. Seyrek, Corah, and Pace (1984) report an increase in the electrodermal response of adult dental patients who used more active distraction procedures such as video games and audio-visual stimuli versus those who received only audio stimuli.

In summary, distraction, even when enhanced with an external reward contingency, does not appear to be an optimal intervention strategy for children undergoing dental treatment. In the present study, we found that although effective initially, the results were not maintained across repeated visits. Other procedures, such as the escape and reward paradigm reported by Allen and Stokes (1987), require no more time than enhanced distraction but have more durable effects during implementation of the procedures. The present results, however, are important in that they emphasize the value of determining the presence of competing contingencies, such as negative reinforcement via temporary escape from invasive dental procedures, and the necessity of evaluating psychological interventions across successive visits and procedures.

REFERENCES

Allard, G., & Stokes, T. F. (1980). Continuous observation: A detailed record of children's behavior during dental treatment. *Journal of Dentistry for Children*, **47**, 246–250.

Allen, K. D., Stark, L. J., Rigney, B., Nash, D. A., & Stokes, T. F. (1988). Reinforced practice of children's cooperative behavior during restorative dental treatment. *Journal of Dentistry for Children*, **55**, 273–277.

Allen, K. D., & Stokes, T. F. (1987). Use of escape and reward in the management of young children during dental treatment. *Journal of Applied Behavior Analysis*, **20**, 381–390.

Cohen, J. (1960). A coefficient and agreement for nominal scales. *Educational and Psychological Measurement*, **20**, 37–46.

Critikon. (1981). DINAMAP adult/pediatric vital signs monitor model 845. *Service Manual 776-138B*, 1–4.

Ingersoll, B. D., Nash, D. A., Blount, R. L., & Gamber, C. (1984). Distraction and contingent reinforcement with pediatric dental patients. *Journal of Dentistry for Children*, **51**, 203–207.

Ingersoll, B. D., Nash, D. A., & Gamber, C. (1984). The use of contingent audiotaped material with pediatric dental patients. *Journal of the American Dental Association*, **109**, 717–719.

Iwata, B. A. (1987). Negative reinforcement in applied behavior analysis: An emerging technology. *Journal of Applied Behavior Analysis*, **20**, 361–378.

Klingman, A., Melamed, B. G., Cuthbert, M. I., & Hermecz, D. A. (1984). Effects of participant modeling on information acquisition and skill utilization. *Journal of Consulting and Clinical Psychology*, **52**, 414–422.

Melamed, B. G., Yurcheson, R., Fleece, E. L., Hutcherson, S., & Hawes, R. (1978). Effects of film modeling on the reduction of anxiety-related behaviors in individuals varying in levels of previous experience in a stress situation. *Journal of Consulting and Clinical Psychology*, **46**, 1357–1367.

Nocella, J., & Kaplan, R. M. (1982). Training children to cope with dental treatment. *Journal of Pediatric Psychology*, **7**, 175–178.

Seyrek, S. K., Corah, N. H., & Pace, L. F. (1984). Comparison of three distraction techniques in reducing stress in dental patients. *Journal of the American Dental Association*, **108**, 327–329.

Siegel, L. J., & Peterson, L. (1980). Stress reduction in young dental patients through coping skills and sensory information. *Journal of Consulting and Clinical Psychology*, **48**, 785–787.

Siegel, L. J., & Peterson, L. (1981). Maintenance effects of coping skills and sensory information on young children's response to repeated dental procedures. *Behavior Therapy*, **12**, 530–535.

Stokes, T. F., & Kennedy, S. H. (1980). Reducing child uncooperative behavior during dental treatment through modeling and reinforcement. *Journal of Applied Behavior Analysis*, **13**, 41–49.

Stokes, T. F. & Osnes, P. A. (in press). An operant pursuit of generalization. *Behavior Therapy*.

Venham, L., Goldstein, M., Gaulin-Kremer, E., Peteros, K., Cohan, J., & Fairbanks, J. (1981). Effectiveness of a distraction technique in managing young dental patients. *Pediatric Dentistry*, **3**, 7–11.

Venham, L., & Quatrocelli, S. (1977). The young child's response to sequential dental visits. *Journal of Dental Research*, **56**, 734–738.

Williams, J. A., Hurst, M. K., & Stokes, T. F. (1983). Peer observation in decreasing uncooperative behavior in young dental patients. *Behavior Modification*, **7**, 225–242.

Received April 11, 1988
Initial editorial decision June 20, 1988
Revisions received September 20, 1988; December 2, 1988; February 18, 1989
Final acceptance March 16, 1989
Action Editor, John M. Parrish