

Effectiveness of a distraction technique in managing young dental patients

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Abstract

This research was conducted to evaluate the effectiveness of a distraction technique in reducing young children's negative responses to dental care. Fifty-five dentally naive children, ranging in age from two to six years, were studied over a series of four dental visits. Patients in the distraction condition viewed familiar children's television programs throughout their dental visits; patients in a control condition had no exposure to this distraction stimulus. The children's response to dental care was assessed using a combination of physiological, behavioral, and self-report measures. There was no evidence that exposure to popular television programs is effective in modifying young children's responses to dental treatment. However, children's responses did vary systematically as a function of age and visit type. Further research is recommended to explore the effectiveness of distraction techniques which require more active participation of the pedodontic patient.

Introduction

The young child's emotional and behavioral response to dental treatment is a matter of serious concern to pediatric dentists and researchers. Young children commonly respond to the stress of dental visits with some fear and anxiety. Anxious, resistive behavior seems to occur most frequently among the

youngest patients; the proportion of two-year-olds exhibiting a negative reaction may be as high as 50%.¹

A child's fearful or uncooperative behavior may impede efficient delivery of dental care and compromise the quality of treatment provided. If not adequately resolved, a persistent negative response pattern may emerge which functions as a barrier to routine dental care. Effective techniques to reduce fear and facilitate coping in the dental setting are urgently needed. Since anxious responses are most prevalent among very young children, it is particularly important to develop management approaches appropriate for children as young as two or three years old.

A range of fear management techniques have been described in the literature. They can be grouped into five general approaches: physical restraint,² pharmacological methods,³⁻⁴ behavioral modeling,⁵ reinforcement/contingency techniques,⁶⁻⁷ and distraction methods.

Clinical and research reports provide varying degrees of support for the effectiveness of each method. However, some methods also involve significant disadvantages. Physical restraint and pharmacological intervention may involve a potential physical hazard to the child. Reinforcement and modeling techniques can be quite time-consuming and impractical for the private practitioner to implement. In contrast, distraction methods can be safe, efficient, and inexpensive for the clinician to use. If it can be demonstrated that distraction procedures effectively reduce young children's anxiety, these procedures could be readily adopted by private practitioners.

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The most popular distraction technique has been audio analgesia — presenting music or white noise to patients during the dental visit. Introduced in 1959 by Gardner and Licklider,⁸ audio analgesia was heralded as a potent substitute for nitrous oxide or local anesthesia. Unfortunately, later reports of its effectiveness varied,⁹ and its popularity waned. Howitt¹⁰ used audio analgesia in a controlled study with 138 children aged eight to 14 and found that patients' pain tolerance thresholds were elevated under a white noise condition. However, the increased pain tolerance apparently reflected a placebo effect created by the suggestion that the auditory stimulation would reduce discomfort. More recently, a novel distraction method was employed by Corah and associates¹¹ in which adult patients played a video ping-pong game during treatment. This distraction method was effective in reducing patient anxiety, as assessed by the dentist and the patient. The effects were most pronounced for patients initially classified as highly anxious.

To date, there have been no systematic studies of the effectiveness of distraction procedures with very young children. The present study was therefore undertaken to evaluate the effectiveness of a distraction technique for young dental patients. Viewing of familiar children's television programs was used as the distraction technique.

Methods and Materials

Fifty-five children with no previous dental experience were included in the study; they ranged in age from two to six years. Children were randomly assigned to two groups. The control group, comprised of 30 children, received standard dental care without exposure to the distraction procedure. The experimental group, consisting of 25 children, watched video tapes of Sesame Street, Mister Rogers, and the Electric Company.

The children were studied during a sequence of four visits; an initial examination, two treatment visits, and a polish visit. All visits were conducted in a standard dental operatory. A television was placed in the operatory in a position which allowed viewing during all dental procedures. For experimental children, the television was turned on at the beginning of each dental visit and remained on throughout the visit. For control children, the television remained off during all visits.

The child's response to dental care was assessed using a combination of measures which reflect the multidimensional nature of stress responses. Physiological, behavioral, and self-report indices of anxiety were recorded including heart rate, clinical ratings, and a picture selection task. Immediately after the child was seated in the operatory chair, electrodes

were attached to the chest and abdomen to record heart rate. A one-minute heart rate sample was recorded at three standard points during each visit corresponding to specific dental procedures (Table 1). Mean heart rate values were calculated for each one-minute period by averaging all beat-to-beat heart rate values within the period.

Table 1. Standard dental procedure periods within dental visits.

	Procedure 1	Procedure 2	Procedure 3
Examination Visit	Mirror/Explorer Exam	Prophylaxis	Fluoride Application
Treatment Visit	Mirror/Explorer Exam	Injection	Cavity Preparation
Polish Visit	Mirror/Explorer Exam	Polish	Fluoride Application

During each of these standard periods, a one-minute videotape sample of the child's behavior was recorded via a closed-circuit television camera permanently installed in the operatory. Clinical ratings of anxiety and uncooperative behavior (Appendix) were derived from the videotape samples, using previously validated scales.¹² The Venham Picture Selection Task, a self-report scale of situational anxiety, was administered to the child at the outset of each dental visit. The reliability and validity of this scale has been described elsewhere.¹³

Results

Three-way (group X visit X age) analyses of variance were performed on the heart rate, clinical rating, and self-report measures (Tables 2-5). There was no evidence that the distraction procedure reliably

Table 2. Analysis of variance of heart rates.

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
TX Group	11,911.42	1	11,911.42	0.23
Age	285,149.91	3	95,049.97	1.83
TX X A	107,098.93	3	35,699.64	0.69
Error	2,024,926.92	39	51,921.20	
Visit	2,998,879.35	3	999,626.45	25.16**
V X TX	14,825.72	3	4,941.91	0.12
V X A	577,960.85	9	64,217.87	1.62
V X TX X A	426,836.95	9	47,426.33	1.19
Error	4,649,386.26	117	39,738.34	

**p < .01

affected children's responses to the dental visits. To further explore a possible impact of the distraction procedure, within-visit patterns of response were examined. Responses of the distraction and control groups during the three standard procedure periods were compared using repeated measures analyses of variance. The analyses failed to document an effect of the distraction technique on children's responses to specific dental procedures within visits.

Significant effects of age and visit type were observed on the three-way analyses of variance. On three of the four indices, younger children responded more adversely to dental care than older children. Younger children were rated as more anxious and uncooperative than older children and also reported more negative feelings about the dental situation. A significant effect of visit type was observed on three indices: clinically rated anxiety, uncooperative behavior, and heart rate. The pattern of response was consistent on all three measures; negative responses intensified from the first through the third visit, then decreased on the final polish visit.

Table 3. Analysis of variance of clinical anxiety ratings.

Source	Sum or Squares	Degrees of Freedom	Mean Square	F
TX Group	0.86	1	0.86	0.60
Age	14.98	3	4.99	3.48*
TX _x A	2.56	3	0.85	0.59
Error	67.53	47	1.44	
Visit	24.48	3	8.16	19.33**
V _x TX	2.39	3	0.80	1.89
V _x A	3.27	9	0.36	0.86
V _x A	6.44	9	0.72	1.70
Error	59.53	141	0.42	

* $p < .05$; ** $p < .01$

Table 4. Analysis of variance of uncooperative behavior ratings.

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
TX Group	1.06	1	1.06	0.93
Age	14.61	3	4.87	4.25**
TX _x A	0.31	3	0.10	0.09
Error	53.91	47	1.15	
Visit	24.69	3	8.23	19.23**
V _x TX	1.28	3	0.43	0.99
V _x A	3.79	9	0.42	0.98
V _x TX _x A	4.53	9	0.50	1.18
Error	60.33	141	0.43	

** $p < .01$

Discussion

The findings provided no evidence that exposure to popular television programs is effective in modifying young children's responses to dental treatment. This result contrasts with earlier reports of success using other types of distraction procedures. The difference in results can most likely be attributed to methodological differences between this study and earlier ones.

One possibility is that the television programs were not adequate stimuli to effectively hold the children's attention. It seems plausible that television viewing, as a relatively passive process, would be less effective in distracting patients than either audio analgesia or video game techniques. The video game used by Corah and associates¹¹ required the patient to actively monitor and process the video input, as well as to produce a motor response. Audio analgesia delivered via earphones provides continuous input which, at a minimum, masks potentially anxiety-producing dental sounds. With a passive television-viewing procedure, the child has only to stop looking at the television screen to disrupt the distracting input. In fact, examination of the videotaped behavior samples suggests that the children only attended to the television programs sporadically. Their attention often returned to the ongoing dental procedure, particularly when especially compelling or threatening stimuli were present.

It is also possible that characteristics of our subjects, particularly their young age, accounts for the ineffectiveness of the distraction technique. It seems likely that the patient must actively participate in the distraction process for it to be maximally effective. The patient must recognize the uncomfortable or non-adaptive quality of his/her anxiety and choose to control the anxiety by concentrating on a distracting stimulus. Children in the age range we studied may lack the cognitive ability to sustain a concentrated

Table 5. Analysis of variance of picture selection scores.

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
TX Group	13.97	1	13.97	1.21
Age	90.65	3	30.22	2.62+
TX _x A	4.74	3	1.58	0.14
Error	426.09	37	11.52	
Visit	1.50	3	0.50	0.20
V _x TX	6.19	3	2.06	0.84
V _x A	9.07	9	1.01	0.41
V _x TX _x A	25.91	9	2.88	1.17
Error	272.70	111	2.46	

+ $p < .10$

and selective focus for their attention. They are also unlikely to consider their anxiety or disruptive behavior as inappropriate. Indeed, resisting distraction and maintaining a high level of vigilance may be appropriate adaptive behavior for a young child in an unfamiliar, ambiguous, and potentially threatening setting such as the dental operator.

The observation that young children responded more adversely to dental care confirms previous suggestions that children's dental anxiety declines with age. Hawley *et al.*¹ studied 47 children, aged two to seven years, during their first dental examination visit. Anxious, uncooperative responses were most common in the youngest children and diminished in frequency as the child's age at the first visit increased. Frankl *et al.*,¹⁴ who studied children's responses at both examination and treatment visits, obtained comparable results.

The changing pattern of response across visits is consistent with observations in previous research. Venham *et al.*,¹⁵ studied the response of young children to six sequential dental visits. Children's responses became increasingly negative from the examination visit through the third treatment visit, but then improved during the fourth treatment visit and the polish visit. The authors suggested that the effects of dental experience are complex and that a period of growing sensitization precedes the child's eventual adaptation to stressful treatment procedures.

Conclusions

This research suggests that a passive television-viewing procedure is ineffective in reducing the stress that very young children experience during dental visits. Such null findings must, of course, be considered tentative. Since an effective distraction procedure would have substantial benefits for pedodontic patients and practitioners alike, further research is warranted. It would perhaps be particularly fruitful to explore distraction techniques which require the young patient to actively monitor, process, and respond to the distracting stimuli.

Appendix: Rating scales for anxiety and uncooperative behavior.

Anxiety Rating Scale

0. Relaxed, smiling, willing and able to converse.
1. Uneasy, concerned. During stressful procedure may protest briefly and quietly to indicate discomfort. Hands remain down or partially raised to signal discomfort. Child willing and able to interpret experience as requested. Tense facial expression, may have tears in eyes.
2. Child appears scared. Tone of voice, questions and answers reflect anxiety. During stressful procedure, verbal

protest, (quiet) crying, hands tense and raised, (not interfering much — may touch dentist's hand or instrument, but not pull at it). Child interprets situation with reasonable accuracy and continues to work to cope with his/her anxiety.

3. Shows reluctance to enter situation, difficulty in correctly assessing situational threat. Pronounced verbal protest, crying. Using hands to try to stop procedure. Protest out of proportion to threat. Copes with situation with great reluctance.
4. Anxiety interferes with ability to assess situation. General crying not related to treatment. More prominent body movement. Child can be reached through verbal communication, and eventually with reluctance and great effort he/she begins the work of coping with the threat.
5. Child out of contact with the reality of the threat. General loud crying, unable to listen to verbal communication, makes no effort to cope with threat. Actively involved in escape behavior. Physical restraint required.

Behavior Rating Scale

0. Total cooperation, best possible working conditions, no crying or physical protest.
1. Mild, soft verbal protest or (quiet) crying as a signal of discomfort, but does not obstruct progress. Appropriate behavior for procedure, i.e., slight start at injection, "ow" during drilling if hurting, etc.
2. Protest more prominent. Both crying and hand signals. May move head around making it hard to administer treatment. Protest more distracting and troublesome. However, child still complies with request to cooperate.
3. Protest presents real problem to dentist. Complies with demands reluctantly, requiring extra effort by dentist. Body movement.
4. Protest disrupts procedure, requires that all of the dentist's attention be directed toward the child's behavior. Compliance eventually achieved after considerable effort by dentist, but without much actual physical restraint. (May require holding child's hands, or the like, to start). More prominent body movement.
5. General protest, no compliance or cooperation. Physical restraint is required.

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References

1. Hawley, B., McCorkle, A., Wittemann, J. and van Ostenberg, P.: "The first dental visit for children from low socioeconomic families," *J Dent Child*, 41:376-380, 1974.
2. Levitas, T.: "HOME: hand over mouth exercise," *J Dent Child*, 37:178-182, 1974.
3. Dudley, W.: "Premedication and the use of analgesics in pediatric dentistry," *Dental Clinics of North America*, 14:865-874, 1970.

4. Pruhs, R., and Williams, D.: "Psychological rationale for the use of nitrous oxide psychosedation for children," *J Dent Child*, 45:56-61, 1978.
 5. Melamed, B., Weinstein, D., Hawes, R. and Katin-Borland, M.: "Reduction of fear-related dental management problems with use of filmed modeling," *J Am Dent Assoc*, 90:822-826, 1975.
 6. Melamed, B.: "Strategies for patient management in pediatric dentistry," paper presented at Second National Conference on Behavioral Dentistry, Morgantown, West Virginia, 1979.
 7. Barenie, J., and Ripa, L.: "Use of behavior modification techniques to successfully manage the child dental patient," *J Am Dent Assoc*, 94:329-334, 1977.
 8. Gardner, W. and Licklider, J.: "Auditory analgesia in dental operation," *J Am Dent Assoc*, 59:1144-1150, 1959.
 9. Weisbrod, R.: "Audio analgesia revisited," *Anesth Progr*, 16:8-14, 1969.
 10. Howitt, J.: "An evaluation of audio-analgesia effects," *J Dent Child*, 34:406-411, 1967.
 11. Corah, N., Gale, E. and Illig, S.: "Psychological stress reduction during dental procedures," *J Dent Res*, 58:1347-1351, 1979.
 12. Venham, L., Gaulin-Kremer, E., Bengston-Audia, D. and Cohan, J.: "Interval rating scales for children's dental anxiety and uncooperative behavior," *Pediatr Dent*, 2:195-202, 1980.
 13. Venham, L., and Gaulin-Kremer, E.: "A self-report measure of situational anxiety for young children," *Pediatr Dent*, 1:91-96, 1979.
 14. Frankl, S., Shiere, F. and Fogels, H.: "Should the parent remain with the child in the dental operator," *J Dent Child*, 29:150-163, 1962.
 15. Venham, L., Bengston, D. and Cipes, M.: "Children's response to sequential dental visits," *J Dent Res*, 56:454-459, 1977.
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