Litchfield’s claim of a 29% incidence of adverse psychologic responses to diazepam, a finding that many would disagree with, there is no adequate data base as to the true incidence of such occurrences, types of patients at risk, whether these responses are dose related or not, and whether concurrently administered agents have any significance in their onset.

References
used by clinicians both in response to problem behavior, and in actually preventing or reducing the frequency with which it occurs. The active involvement of the child in developing and rehearsing coping skills they need when faced with dental treatment and other life stresses leads to attributions of mastery and self-efficacy and a positive self-image. A quarter of the children undergoing hospitalization subsequently show positive coping behavior, demonstrating that medical/dental stressors can be used as positive opportunities in children’s emotional development. The responsibility of the dentist, then, along with the parent and child, is to facilitate the learning process, encouraging not only their current, but also their future cooperative and informed use of health care services. As more children receive preventive dentistry, the reduced need for restorations promotes less fear of future visits to the dentist.3

Behavioral Intervention in the Pediatric Dental Setting

Practicing dentists find fearful, disruptive children to be one of their most troublesome problems.4 Punishment techniques such as loud voice5 and hand-over-mouth management6 are used at some time by most clinicians to control temper tantrums, hysteria, aggression, and resistance in young dental patients. The use of behavioral modification techniques has been advocated in the dental literature,7-10 and an empirical data base for evaluating the effectiveness of reinforcement strategies, including these widely used punishment techniques, is emerging. Studies directly evaluating the effect of dentist behavior upon child behavior have either observed naturally occurring dentist-patient interactions,11,12 or experimentally manipulated dentist behavior.8 Data from these studies show that dentist punishment actually increases children’s disruptive behavior. Weinstein et al.14 found that during restorative treatment, fearful behavior in preschoolers’ behavior was most likely in response to dentists’ use of criticism and coercion, and least likely following instruction and reinforcement. Physical holding or restraining was most strongly associated with fearful behavior in the child. Melamed et al.15 reported similar findings in a study that compared four dentist management styles. Instructions were used along with either positive reinforcement, punishment, positive reinforcement and punishment, or no reinforcement strategy. Punishment was most detrimental with older children (older than 7-1/2 years), children with previous dental experience, and children initially low in self-reported dental fears.

The combined effectiveness of instruction and reinforcement has been reported by other researchers as well.13-15 The limited cognitive abilities of children, particularly young children, make it difficult for them to anticipate the expectations of others in novel settings such as the dental office. Instructing the child thus reduces the need for learning by trial and error, and the dentist’s additional use of both praise and punishment provides maximal information about both appropriate and inappropriate behavior.

Punishment techniques such as loud voice, hand-over-mouth, and restraint can be effective methods to quickly suppress a dangerous behavior. Punishment can, however, be accompanied by negative emotional arousal in both the child and the dentist, and although punishment may temporarily suppress a behavior, possible long-term effects include increased anxiety or aggression, and dislike or avoidance of the practitioner. Punishment techniques should rarely be used, and care should be taken to provide positive reinforcement to teach the child to behave appropriately.

Behavioral Preparation Methods to Reduce Anxiety

Behavioral methods of preparation are effective in preventing (vs. remediating) excessively anxious responses to medical/dental stressors.16-18 The interventions all apply principles of learning to teach patients adaptive methods of anxiety management, but focus on different response systems (self-reported anxiety, physiological arousal, vs. behavioral indicators of distress). Multiple treatment packages (e.g., coping skills training), make it difficult to identify the therapeutic ingredient.

Information Provision

Information provision has been considered the necessary first step for patients to psychologically prepare themselves.19 Tell-show-do,20 a widely used technique in which the dentist informs, demonstrates, and then approaches the child for dental treatment, is designed to prepare the child by providing procedural information.

Procedural information alone has not, however, been very effective in alleviating patients’ anxiety regarding medical and dental procedures.16 Treatment effects are stronger when provision of procedural information is combined with other types of information (i.e., sensory information),21,22 or other treatment components, such as modeling23 or reinforcement strategies.24 An effective preparation procedure for novice preschool-aged dental patients was reported by Siegel and Peterson.25,26 Children who were prepared for dental restorations with procedural information plus sensory information describing the typical feelings, sights, and sounds they would experience, were less anxious than children in an attention (placebo) control group. Prepared children displayed less disruptive behavior during treatment, had lower ratings of anxiety and discomfort, and showed less physiological arousal. Furthermore, these effects were maintained at the subsequent treatment session follow-up one week later.
Modeling

Modeling is perhaps the most researched technique for anxiety reduction. Observing a peer (whether live or symbolic), successfully undergo dental treatment is effective in reducing children's anxiety about dental treatment, especially for the inexperienced child. Young, dentally experienced children can be sensitized by modeling procedures, which may elicit their own negative recall of prior events. These children may need additional treatment components to reduce their anxiety.

In addition to the opportunity to observe a model undergoing treatment, modeling presentations provide procedural information to the child viewer. Attempts to separate the treatment effects of these two components suggest that viewing the model is the active ingredient of this intervention. Whether the model shows initial fear but successfully copes, versus exhibiting fearless behavior throughout, is another important parameter. No differential effectiveness in the two types of models has been reported by several investigators. The dental literature is not conclusive, but at the current time the recommendation is to portray a child showing cooperative responses throughout. Peer modeling may be most successful when coping skills are also demonstrated, particularly if the child's active participation is encouraged. Participant modeling, where children practice along with a videotaped peer model demonstrating coping strategies, was more effective than exposure to the same coping videotape without rehearsal, in reducing anxiety and increasing cooperative behavior in children with high injection fears during dental restorative treatment. It remains for future research to ascertain the source of treatment effects in modeling interventions, and to determine the important parameters of presentation in using modeling as an anxiety-reducing procedure. Treatment effectiveness depending upon the child's initial level of fear and prior dental experience also needs to be evaluated.

Reducing Physiological Arousal

Relaxation training is often used to reduce patients' physiological arousal and anxiety-related behaviors. When used alone, relaxation training in dental and in medical settings has been equivocal in reducing patients' anxiety. As with information provision, relaxation may be most effective when used with other types of treatments.

Providing children with other responses that compete with anxiety has been effective in reducing dental fear. Machen and Johnson reported that children who were gradually exposed to a hierarchy of anxiety-producing dental stimuli showed less negative behavior during restorative treatment than control group children. Systematic desensitization is time consuming and requires professional expertise to implement, however, limiting its usefulness in applied settings. On the other hand, Hermez and Melamed found that simple, but active participation imagery training was effective in accessing children's dental anxieties, a prerequisite for fear modification. Imagery should be used cautiously, however, since a period of sensitization may precede extinction of the fear response.

Cognitive-Behavioral Strategies

Cognitions about an event influence how stressful that experience will be. Modifying maladaptive cognitions can reduce patients' distress surrounding medical and dental procedures. Distraction and self-talk show promise as effective components of coping skills or stress inoculation interventions. Nocella and Kaplan trained children in a stress inoculation group to use positive self-talk along with relaxation in response to arousing stimuli during dental restorations. These cognitive-behavioral strategies were effective in reducing children's stress-related behavior during treatment, as compared to an untreated and an attention control group. This study, where training lasted only an average of 15 minutes, also demonstrates the practicality and cost effectiveness of coping skills training, which could occur during the waiting time for appointments. Comforting self-talk and distracting imagery, where children were taught to imagine being in their favorite place, with all of the familiar sights, sounds, and sensations associated with being there, were components of the effective coping skills training used by Siegel and Peterson.

Recently enthusiasm has been generated for the environmental use of distraction in the dental operatory. Patients' attention during dental procedures is diverted by engaging them in alternative activities such as television viewing, video ping pong, or listening to audiographed stories. The results of these studies suggest that environmental distraction may be most effective when combined with dentist reinforcement strategies. Ingersoll et al. found that children for whom listening to audiographed stories during dental treatment was contingent upon cooperative behavior, showed greater reductions in disruptive behavior compared to a baseline session than did either control group children or children who were allowed to hear the material noncontingent upon their behavior.

Factors that Influence Children's Response to Dental Treatment and Interventions

Identifying the Child At-Risk

Children high in dental fear, younger children, and the child with previous medical/dental experience are more likely to be disruptive during dental treatment. Younger children and children with previous experience may be sensitized by psychological preparation if inappropriately prepared. Melamed (in this issue)
discusses research issues relevant to these groups of vulnerable children.

Child Coping Style

The adult literature suggests that individuals’ preferred coping style, “sensitizer” or “repressor,” influences their response to medical/dental stressors and to preparatory intervention. Our knowledge about coping dispositions in children and their relationship to coping with medical/dental stressors is, however, limited. Burstein and Meichenbaum found that children who tended to avoid playing with hospital-related toys one week before surgery were more anxious following surgery in comparison to the children who had chosen to play with such toys. Cortisol production has also been associated with repressive-type coping styles in child patients. Children with avoidant coping dispositions may also retain less information from preparatory procedures.

Further study of children’s coping styles is needed, with evaluation of interactions between preferred coping methods and the methods used in psychological preparation. Siegel’s naturalistic study of coping strategies in children facing medical procedures is a noteworthy example of the direction that future research may take. The number of coping strategies a child reported having used was the best predictor of successful coping with the procedure. Like good problem-solving skills then, good coping skills may involve versatility in applying a variety of strategies.

Agent of Treatment

Relationship with Staff

One of the most important factors in a children’s response to medical or dental treatment is their relationship with the staff. Supportive and friendly interactions with staff alone have constituted active treatments when compared to control groups who received no special attention. Research designs for evaluating treatment efficacy should include attention control groups, both to evaluate the strength of positive staff-child interactions in reducing anxiety, and to separate these effects from those of the treatments under study.

Dentist Anxiety

The relationship between dentist and child anxiety during treatment is an area in need of study. Dental students’ high evaluation anxiety, and high anticipatory anxiety prior to a restorative session have been related to child disruptive behavior during treatment. Dentist physiological reactivity was also related to child disruptiveness. Although these findings need to be further assessed with experienced practitioners, they demonstrate the need for further research into dentist-related factors that may influence child anxiety.

Parenting Factors

Parental disciplinary style is related to how well children cope with dental and medical situations. Zabin and Melamed found that mothers who reported that they used reassurance and who modeled approach behavior in response to their children’s fearful behaviors, had children who coped more effectively with hospitalization and dental restorative treatment than children whose mothers tended to use punishment or who reinforced dependent behavior. Correlations between maternal and child anxiety in dental settings have reinforced the practice of excluding mothers from the dental operatory. Studies examining the effect of maternal presence/absence during treatment have, however, yielded mixed results. Shaw and Routh compared the effect of mother presence and absence, randomly assigned, during preschoolers well-child care examinations and immunizations. Children in the mother-present group had the most negative behavior during the injections, suggesting that mothers’ presence disinhibited or reinforced children’s overt expression of fear. Gross et al. found that older children also cried more with their mothers present. The inhibition of distress behavior in the absence of the mother should not be interpreted, however, to mean that the children were less afraid. The lack of randomization and failure to measure maternal anxiety in many of these studies has limited their usefulness. Separation protest needs to be separated from procedural anxiety, particularly among young children. Actual parenting behavior, beyond the mere presence or absence of the mother needs to be observed. Current work undertaken by Melamed and her colleagues (Melamed, this issue) involves observations of mother-child interaction in the medical/dental settings to identify effective and ineffective patterns of parenting, including the study of how maternal anxiety affects parenting behavior.

Environmental Factors

Little attention has been paid to environmental/situational factors that affect children’s anxiety levels. Waiting increases anxiety. Aside from reducing waiting times, efforts could be made to identify ways to alleviate the stressfulness of waiting (e.g., activities and play materials). The dental operatory itself is apparently a potent anxiety-eliciting stimulus. Conducting initial interviews with children outside of the operatory helps to reduce their anxiety.

Conclusions and Recommendations for Future Research

Two characteristics of effective anxiety-reducing interventions have emerged from this review: (1) techniques in combination are more effective than alone; and (2) treatments that encourage the child’s active participation are more effective than more
passive interventions. The first point suggests that effective interventions provide the child with a repertoire of information and skills to draw upon, consistent with Siegel’s findings suggesting that good coping skills involve versatility in applying a variety of strategies. Future studies might test this hypothesis using additive research designs. The importance of active participation in modifying fearful behavior is predicted from more than one theoretical position. Intervention research needs to become more theoretically guided, testing theoretically derived hypotheses such as proposed by Melamed that optimal physiological arousal during a modeling preparatory film is necessary for the child’s responsibility to its multiple messages.

A developmental perspective needs to be incorporated into research questions and designs themselves, beyond merely analyzing results for age effects (which should be performed and reported universally). Some examples of developmentally related research questions that could be addressed are: (1) How does mode of intervention (e.g., film, staff presented) influence treatment effect on children of different ages and cognitive abilities? Ferguson suggested that visual displays are more appropriate for the young child than verbally mediated interventions, yet this hypothesis has yet to be formally tested. (2) Symbolic modeling is a popular preparation technique, yet the extensive literature on children’s media literacy, including developmental changes in children’s attention, processing, comprehension, and retention of televised material has been ignored. (3) Although a survey by Cuthbert and Melamed showed that children’s fear of dentistry fall into three categories, fear of injection, fear of choking, and fear of drilling, we know little about developmental changes in the content and expression of children’s dentally related fears. This knowledge would appear to be critical in developing age-appropriate interventions. (4) Likewise, our knowledge is limited regarding children’s own repertoire and use of coping strategies, and the manner in which these skills develop.

The methodological rigor of treatment efficacy research can be increased by more careful research designs and measurements. Component and additive research designs are needed to identify treatment effects in procedures. In addition to untreated control groups, groups that control for factors such as staff interaction and placebo effects need to be included as well. Designs need to examine the interaction between treatment and child characteristics (age, previous experience, fear level, coping style). Issues of measurement (discussed in Melamed, this issue) include the need for objective and comparable measures of anxiety across studies, and for the multidimensional measurement of anxiety.

Finally, outcome goals may need to be redefined in future research. Many methods of anxiety reduction exist, both pharmacological and nonpharmacological. The successful intervention should not only reduce anxiety safely, but increase child self-control and self-efficacy. In addition, the goal for treatment should increasingly move toward prevention, rather than remediation of dental anxiety.

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Research Methods, Issues, and Directions in Behavioral Management of the Child Dental Patient

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Drs. Ridley-Johnson and Melamed have thoroughly reviewed methodologies and findings related to psychological-behavioral interventions and psychological preparation for dental treatment in children, as well as, factors influencing children's response to dental treatment and interventions. This paper will discuss behavior management of the child patient from a clinical perspective. Questionnaires and nonverbal assessment techniques, in addition to physiologic monitoring, have begun to promote insight into anxiety. Recent technologic advances now enable investigators to carefully dissect human interactions using videotape monitoring and computer-aided data collection. These methodologies combined with more robust statistical strategies are available to apply questions regarding children in the dental environment. The question is, "Which problems merit investigation?"

Although there are many possible basic and applied behavior questions that can be addressed, and the dental environment lends itself as an experimental laboratory to both types of questions, this paper will attempt to focus on the unique benefits that behavior research can provide for the clinical setting. One approach is to apply ourselves to problems that will have a significant impact on patient care. Stated another way, "What behavior problems are associated with the delivery of children's dental care that prohibit or reduce the probability that good treatment will be provided?" To direct our efforts it is necessary to understand the problems of the clinician.

A study of 281 randomly selected graduates of the University of North Carolina School of Dentistry who were practicing general dentistry for 2 to 18 years in the state provides some insight (Fields H and Dilley D, unpublished data, 1984). The majority reported that greater than 20% of their practice was for children under 12 years of age. Results revealed that 90% wanted to see children for the first dental visit prior to 4 years of age. A large majority had 1-2% handicapped patients in their practices. Other portions of this survey indicated that the practitioners were providing a full spectrum of dental care for the children. These data certainly reinforce the statistics that demonstrate most pediatric dental care is provided by general practitioners.

In this group of practitioners the overwhelming majority reported less than 4% of the children presented real behavioral problems that interfered with treatment. Similar proportions of real behavioral problems were encountered by pediatric dental specialists. The general practitioners stated that fearful, crying behavior was the most commonly encountered behavioral management problem. When faced with behavior management problems, the majority of the practitioners referred less than 10% of these problems. Those categories of behavior most often referred were children with whom the dentist could