

Temperament as a predictor of behavior during initial dental examination in children

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Abstract

Temperament refers to children's behavioral style, or the manner in which they interact with their environment. Temperament has been quantified into nine temperament categories and five temperament constellations by Thomas and Chess.¹ Temperament categories and constellations of children can be measured using one of several parental questionnaires, each of which focuses on age-appropriate behavior. For this study the Behavioral Style Questionnaire (BSQ) was administered to the parents of 50 healthy children (mean age 48.8 months) receiving initial dental examinations. The examinations were videotaped and The Ohio State Behavior Rating Scale (OSUBRS) was used to rate each child's behavior into one of four behavioral categories: 1) quiet; 2) crying only; 3) disruptive movement only; and 4) crying and disruptive movement. For data analysis the percentage duration of each behavioral category was calculated. Using one-way ANOVA, significant differences between constellations were found for quiet ($P = 0.03$) and combination behavior ($P = 0.03$). Using a stepwise linear regression, the temperament category of approach/withdrawal was found to predict the percentage of quiet (multiple $R = 0.42357$, $R^2 = 0.17941$, and $P = 0.002$), crying (multiple $R = 0.42124$, $R^2 = 0.17744$, and $P = 0.002$), and combination behaviors (multiple $R = 0.30008$, $R^2 = 0.09005$, and $P = 0.03$). Additionally, significant regressions were found with temperament categories predicting behavioral categories depending on the child's age. The results of this pilot study suggest that the BSQ temperament constellations and categories appear to be modest predictors of a child's specific behaviors in the dental environment. Knowledge of a child's temperament may prepare the clinician to predict patient behaviors in the dental environment. (Pediatr Dent 16:121-27, 1994)

Introduction

Child temperament has been studied in various medical settings^{2,3} and may be useful to predict how a child will respond to dental treatment. Thomas and Chess were instrumental in developing a measurement of temperament in their study of several groups of children in the New York Longitudinal Study (NYLS).^{1,4-6} They defined temperament as the behavioral style of an individual while interacting with the surroundings and conceptualized nine different categories of temperament to describe the ways an individual responds. The categories were: activity, biological rhythmicity, adaptability, approach/withdrawal, intensity, quality of mood, persistence/attention span, distractibility, and sensory threshold (Table 1). Depending on the constellation of scores within the different categories, Thomas and Chess classified children into one of five clinical groupings: easy, difficult, and slow-to-warm-up, and two intermediate categories (Table 2).⁵ The stability of an individual's temperament, as reflected by the scores from the nine categories as well as a child's clinical grouping over time and development, has been demonstrated.^{7,8}

Age-specific parental questionnaires are available to measure and describe a child's temperament.^{9,10} Parents' responses regarding their child's habits and typical reactions in various situations are analyzed, result-

ing in a characterization of the child's temperament. McDevitt and Carey¹⁰ developed the *Behavioral Style Questionnaire* (BSQ) to quantify the nine temperament categories in 3- to 7-year-old children. This questionnaire, based on the NYLS, consists of 100 items and takes approximately 25 min to complete.

Temperament surveys like the BSQ can be used to help identify temperament risk factors. Carey¹¹ described temperament risk factors as any potentially troublesome temperament characteristics that may predispose a child to an incompatible relationship with the environment. For example, a child's tendency to respond to a new person or situation may predispose a child to either a "poor fit" or "good fit," depending on how the child's temperament harmonizes with the demands of various environmental factors. A high degree of goodness of fit is expected when the demands of the environment are in accord with the child's own capacities, motivations, and style of behavior.¹¹

Lochary, et al.¹² examined the influence of temperament on behavioral responses in 18- to 36-month-old children requiring dental treatment under sedation. They found that a more approachable child, as measured by the Toddler Temperament Scale, was more likely to display cooperative behavior during dental treatment under sedation compared with a child who tends to withdraw from social settings.

Table 1. Definitions of Behavioral Style Questionnaire categories

<i>BSQ Temperament Category</i>	<i>Definition</i>
Approach or withdrawal	The nature of the initial response to a novel stimulus, such as new food, toy, person, or situation
Adaptability	Relative ease or difficulty in negotiating an effective response to new situations
Threshold of responsiveness	The level of stimulation required to evoke a discernible response
Intensity of reaction	The energy level of response, irrespective of its quality or direction
Activity level	The motor component of the child's functioning; includes proportion of active and inactive periods
Rhythmicity	The predictability or unpredictability of the child's functioning, such as in sleep, hunger, and elimination
Attention span and persistence	The length of time an activity is pursued and the capacity to continue despite obstacles
Quality of mood	The amount of pleasant, joyful, and friendly behavior compared with unpleasant and unfriendly behavior
Distractibility	The degree to which extraneous environmental stimuli can interfere with ongoing behavior

If a relationship can be demonstrated consistently, then temperament measurements could be used to identify children who are at an increased risk for displaying behavioral problems during dental treatment. These individuals may benefit from intervention (e.g., desensitization via preoperative visits) designed to produce a "goodness of fit" experience by allowing the dentist to alter the demands of the environment to better fit the child. No studies to date have dealt with analyzing temperament and behavior in nonsedated children undergoing dental treatment.

The purpose of this study was to determine if the temperament categories derived from parental responses to the BSQ can be used to predict specific behavioral responses during an initial dental appointment in 3- to 5-year-old children.

Methods and materials

The sample consisted of 50 children presenting for initial dental visits at the Columbus Children's Hospital (CCH), Columbus, Ohio. Children selected had no previous dental experience and were healthy, between 36 and 60 months of age, and free of any physical or mental handicaps. Subjects who met these criteria were recruited on a first-come basis until the sample was complete. Although the majority of patients registered at CCH are in the low to middle socioeconomic status (SES), no attempt was made to randomize patients on the basis of their

SES, race, or gender. Informed consent for all procedures for this institutionally approved study was obtained.

Preliminary procedures

New patients seeking dental care were recruited and scheduled for an initial dental appointment. Parents were instructed to arrive 15 min before the appointment to receive information regarding their child's involvement in the study and on videotaping the visit.

Initial examinations proceeded as follows: 1) the child was separated from the parent and brought into the operatory; 2) a mirror and explorer examination of both hard and soft tissues of the oral cavity was performed; 3) the child was given a dental prophylaxis with oral hygiene instructions; 4) a fluoride treatment

Table 2. Clinically relevant BSQ temperament constellations and number of subjects in each constellation

<i>Temperament Constellation</i>	<i>Definition of Constellation</i>	<i>Number of Subjects</i>
Easy	The combination of biological regularity, approach tendencies to the new, quick adaptability to change, and predominantly positive mood.	11
Intermediate low	Half of difficult/easy category scores greater than mean, but not greater than 1 standard deviation over mean.	19
Slow to warm up	Characterized by withdrawal tendencies to the new, slow adaptability, frequent negative emotional reactions of low intensity-often labeled "shy".	1
Intermediate high	Half of difficult/easy category scores greater than 1 standard deviation over mean.	13
Difficult	The combination of biological irregularity, withdrawal tendencies to the new, slow adaptability, and frequent negative emotional reactions of high intensity.	6

was rendered; and 5) selected radiographs were exposed as needed. The same dentist (FR) performed all procedures in the above order on every child with the aid of an assistant. All assistants were instructed not to interact with the child. The dentist guided the child through the procedures with the standard behavioral management techniques of tell, show, do and voice control when necessary.

BSQ administration

During the dental appointment, the parent was instructed by a research assistant to complete the BSQ in a separate room. The parents' ability to read was determined by having them read three standardized statements aloud. Then, the standardized instructions from the BSQ were read to the parent and any questions were answered.

Behavior monitoring and rating

For each child, the entire dental visit (except radiographic exposure) was videotaped. The camera was mounted so that the child's entire body could be seen in any position in the dental chair. The Ohio State University Behavior Rating Scale (OSUBRS) was used to rate the child's behavior recorded on the videotapes.¹² Four categories of behavior were scored using the OSUBRS as follows: 1) quiet behavior; 2) crying without disruptive movement; 3) disruptive movement without crying; and 4) crying and disruptive movement or "combination" behavior. Behavior was evaluated during three procedures: 1) the mirror and explorer examination; 2) the dental prophylaxis; and 3) the fluoride treatment. To standardize the data for analysis, each procedure had specific beginning and ending points. The examination period began when the child was seated in the dental chair and ended when caries detection and charting were completed. The prophylaxis period began when the operator picked up the handpiece and ended when the operator returned the instrument to its holder. Finally, the fluoride period began when fluoride trays were placed in the mouth and ended when the trays were removed. None of the procedures were analyzed beyond a 10-min period.

The four behavioral categories were quantified by two research assistants using the Automated Counting System (ACS®—Version 1.0 JAGTECH, Rockville, MD) as described by Lochary, et al.¹² The methods used to rate the videotaped behavior are also described by Lochary, et al.¹² To standardize the variable periods of the three procedures, the duration of each behavioral category was converted to percent duration. Raters were required to demonstrate an inter- and intrarater reliability of 95% or greater.

Data analysis and statistics

BSQs were scored according to standardized instructions. Thus, each patient received a score for each of the nine different categories of temperament.⁸ Then,

patients were also grouped depending on the their nine BSQ scores into clinical constellations.⁸ Correlation coefficients were calculated to assess both the inter- and intrarater reliability.

A *t*-test was used to determine significant differences between males and females for behavior ratings and the nine temperament categories. One-way ANOVA was used to compare the overall BSQ temperament constellations with the percentage duration of the four behavioral categories. Finally, multiple regression analysis was used to determine the ability of the nine individual BSQ categories to predict rated behavior.

Results

Fifty patients — 24 males and 26 females — participated in this study. The age ranged from 36 to 70 months, with an average age of 48.8 months. Parents who completed the BSQ were all mothers except for one mother and father pair who completed the questionnaire together. The distribution of each group by age and gender is seen in Table 3.

Table 3. Age and sex distribution of subjects

Age Group	Number of Patients	Sex (M/F)
3 years	28	13/15
4 years	12	5/7
5 years	10	6/4
All ages	50	24/26

A *t*-test showed no significant differences between males and females for percentage duration of any behavioral category or BSQ scores. A one-way ANOVA indicated that there were no significant differences in the duration of mirror and explorer examination, prophylaxis, and fluoride application among 3-, 4-, and 5-year-olds.

The majority of behavior recorded across the three procedures was that of quiet. A one-way ANOVA indicated that there were no significant differences in percentages of behavioral categories recorded among 3-, 4-, and 5-year-olds. However, on average, the younger children cried more often, were more disruptive, had less movement, and were less quiet than the older age groups (Fig 1).

Temperament constellations and their relationship to behavior

The distribution of subjects into temperament constellations is shown in Table 2. Using one-way ANOVA, significant differences were found between the easy and difficult groups for the percentage of quiet behavior ($P = 0.03$) and between the easy and low intermediate groups for percentage of combination behavior ($P = 0.03$). Easy children were more quiet than difficult

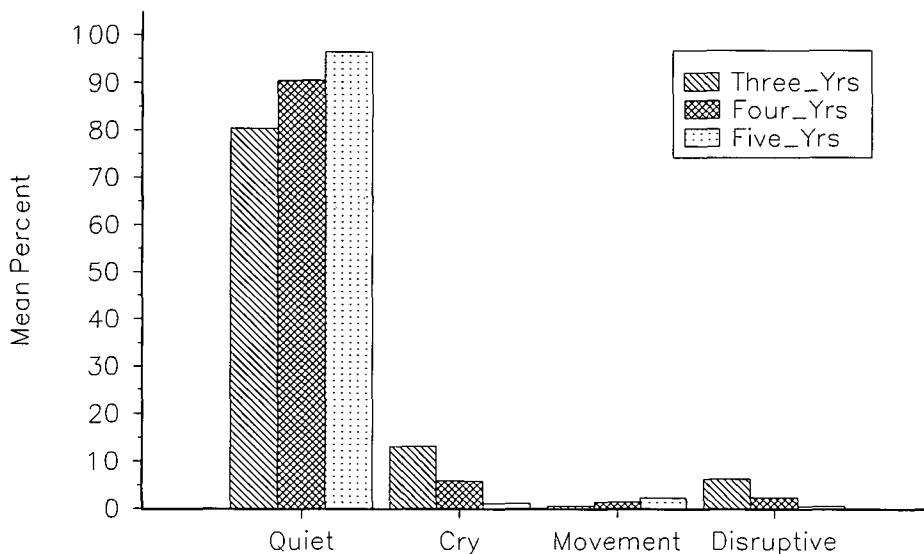


Fig 1. Mean percent occurrences of rated behavioral categories as a function of children's ages.

children and were less likely to cry and move than children rated as intermediate low.

Temperament categories and their relationship to behavior

Stepwise multiple regression analysis was used to determine the ability of the nine BSQ categories to predict behavior. The BSQ category of approach significantly predicted the percentages of quiet, crying, and combination behavior for all ages combined (Table 4). Approach was negatively correlated with quiet behavior and positively correlated with crying and combination behavior.

Among 3-year-olds, the percentage of duration of quiet behaviors was predicted first by approach and then by adaptability in a two-step regression (Table 4). Approach was negatively correlated with quiet behavior, while adaptability exhibited a positive correlation. The regression of these factors on percent quiet behavior can be seen in Fig 2. The majority of 3-year-olds exhibited a large percentage of quiet behaviors, but those who were less quiet tended to be less approachable and less adaptive.

None of the nine temperament categories were significant predictors of behavior in for 4-year-olds.

Among 5-year-olds, the percentage of crying behavior was predicted by a two-step regression involving intensity in the first step then activity (Table 4). Intensity correlated positively with crying behavior, while activity correlated negatively with crying behavior. The regression of these two factors on the percent of crying behavior is shown in Fig 3. There was a tendency for children who were more intense to also be more active; however, extreme caution must be exercised in analysis because of the few 5-year-olds and their small percentage of crying behaviors.

Discussion

The purpose of this study was to determine if any of the nine categories or clinical constellations of temperament predict child behavior during dental treatment. Quiet behavior was noteworthy for all three ages and, on the average, accounted for more than 80% of all behaviors. This is not unexpected.

Significantly more negative behavior (the percent of all behavioral categories except quiet) was found among subjects classified in the difficult constellation as compared with the easy or low intermediate groups. In addition, the individual categories of approach, adaptability, intensity, and activity were significant predictors of quiet and crying behavior at different ages.

Table 4. Stepwise multiple regression analysis: BSQ categories significantly predicting behavior

Age*	Temperament category	Behavior†	Step‡	Multiple R	R ²	P
All (N=50)	Approach	Quiet	1	.42357	.17941	.0022
	Approach	Crying	1	.42124	.17744	.0023
	Approach	Combination	1	.30008	.09005	.0342
3 (N=28)	Approach	Quiet	1	.51010	.26020	.0056
	Adaptability		2	.62156	.38634	.0022
5 (N=10)	Intensity	Crying	1	.66701	.44490	.0351
	Activity		2	.83353	.69477	.0157

* Age of subjects in years. †Percent of total behavior.

‡ Order in which predictive variables were entered into regression equation.

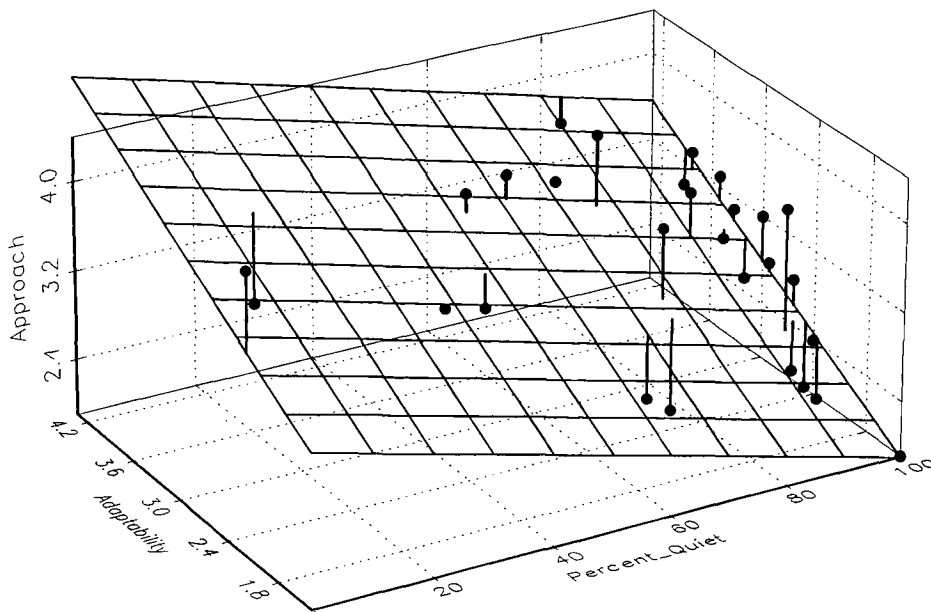


Fig 2. Regression of temperament categories of approach and adaptability on percent of quiet behavior in 3-year-old children. The dark grid represents the regression plane for the distribution of the individual scores of the two temperament categories and the percent of quiet behavior, which are represented in space by the balls with tails. Note the direction of the tail (above or below the ball) represents the direction of variance of the data point from the regression plane.

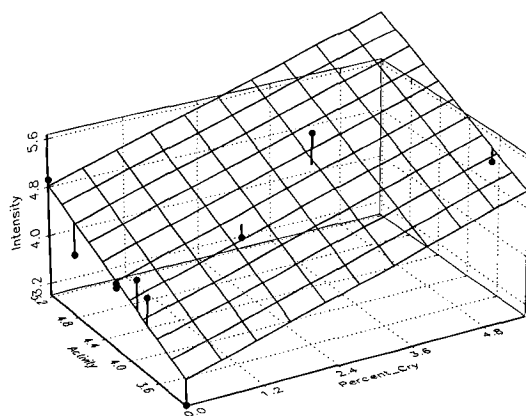


Fig 3. Regression of temperament categories of intensity and activity on percent of crying behavior in 5-year-old children. The dark grid represents the regression plane for the distribution of the individual scores of the two temperament categories and the percent of quiet behavior, which are represented in space by the balls with the tails. Note the direction of the tail (above or below the ball) represents the direction of variance of the data point from the regression plane.

BSQ constellations

Although numbers of subjects in some constellations were low, our findings suggest that the easy and difficult temperament constellations of Thomas and Chess⁵ were significantly related to child behavior in the dental setting. The implication of this finding is

that a child characterized as either easy or difficult may be expected to exhibit a larger proportion of quiet or crying behaviors, respectively, during a dental examination. Consequently, clinicians may anticipate such behavioral patterns and modify their responses accordingly. The validity of these findings will require further study involving a larger sample size. Therefore, caution is advised regarding any predictive association between BSQ constellations and behavioral responses of children in the dental operatory.

The constellations were developed to assess a child's temperament and goodness of fit primarily in the home environment. The demands of that environment are likely to be different from those of a dental visit, but should consistently elicit a given temperamental response. Since

a large number of children fall into intermediate temperament constellations, it may be more useful to try to determine which temperament categories predict an easy or difficult fit within the specific demands of a dental environment.

BSQ categories

Like the BSQ temperament constellations, some of the individual temperament categories were significantly related to child behavior and may help predict how a child will respond to the dental environment.

Approach/withdrawal. Approach refers to the initial response of the child to a novel stimulus such as a new person, situation, food, or toy. According to the BSQ rating system, a higher score in this area indicates a child who is more withdrawn and less likely to respond favorably to new environmental stimuli.¹⁰

Approach was the only temperament category that predicted the percentage of quiet behavior when all ages were combined. When age groups were examined individually, approach significantly predicted the percentage of quiet behavior among 3-year-olds (Table 4), but was not a significant predictor of behavior for 4- or 5-year-olds. The results indicate that 3-year-olds who are easily approached have increased cooperative ability in the dental setting. Conversely, a child with a high withdrawal tendency may not display quiet, cooperative behavior in the dental environment.

Adaptability. Adaptability refers to a child's relative ease or difficulty in negotiating an effective response to a new situation. A very adaptable child (i.e., lower BSQ score) adjusts to new situations and follows directives readily. The temperament category of adaptability, when added as the second step in the regression analysis, explained a larger proportion of the variance than the category of approach/withdrawal alone in significantly predicting the percent duration of quiet behavior in 3-year-olds (Table 4). In general, adaptability scores were inversely related to the percent duration of all behavior categories except quiet (i.e., negative behaviors) in this age group indicating that more adaptable children (lower score) displayed more negative behavior. Regression analysis suggested that children who were less approachable and adaptable tended to exhibit a smaller proportion of quiet behavior. However, prudence is needed in interpreting these data, due to the small sample size and the disproportionately large percentage of quiet behavior. It may be that there exists a significant, but a small portion of younger children who possess these less than optimal temperamental characteristics and respond more frequently with crying behaviors under stressful conditions. Consequently, these results support the concept that temperamental categories are useful in a clinical situation and are especially cogent in that these particular categories seem to reflect more socially oriented adaptive aspects of the individual.

Intensity. Intensity of reaction indicates the energy level of a child's response—irrespective of its quality or direction—to a stimulus. Intense children may react strongly to stimuli like unwanted dental treatment, by crying, moving, or refusing to open their mouths. Intensity was positively correlated with the percentage of crying behavior in 5-year-olds (Table 4). It should be noted that although the R^2 is high, the number of 5-year-old subjects was small.

Activity. Activity refers to the motor component of the child's functioning, such as the amount of physical motion during sleep, eating, or play, and includes the proportion of active and inactive periods. Activity, when added as the second step in regression analysis, increased the ability of intensity to predict the percentage of crying behavior in 5-year-olds (Table 4). Activity (a higher score indicates greater activity) correlated negatively with crying behavior, so older children who were considered more active were less likely to cry. The regression analysis of these two factors suggests that 5-year-olds who tended to cry were more intense and more active than those who didn't cry. However, extreme caution in interpretation is warranted because of the small number of 5-year-olds who cried (three) and the small percentage of crying behavior (< 5% of their total behaviors).

Usefulness of the *Behavioral Style Questionnaire*

The results of this study indicate that the BSQ temperament constellations and categories may help predict child behavior patterns in the dental setting. The small and disproportionate grouping of clinically related constellations may help predict quiet behavior. Theoretically, the groups involved—easy and difficult—are important clinical entities in predicting patient behavior. Likewise, individual temperament categories might be important in managing the child patient in the dental office. Unfortunately, the BSQ takes a relatively long time to complete and thus may be impractical in most private practices.

The categories of approach/withdrawal and adaptability significantly predicted quiet behavior in 3-year-olds, but were not significantly correlated to any behavior in 4- or 5-year-olds. The results of this study, in which the approach/withdrawal category in combination with that of adaptability were significant predictors of uncooperative behavior, corroborated the results of a previous study of sedated children between the ages of 18 and 36 months.¹² Although the relatively small numbers in the older age groups may have influenced results, it is likely that as a child ages, social experiences and cognitive development outweigh or modify temperamental influence. Thomas and Chess⁶ suggest that an individual's temperament continuously interacts with and is modified by the environment. Younger children (3-year-olds) have not yet faced as many new social experiences (e.g., school) or developed as effective coping skills as their older counterparts and thus may be less flexible in the dental environment.

The temperamental inclination to withdraw from new stimuli may be critical for younger children, possibly resulting in a poor fit and negative behavior from a clinician's perspective. Perhaps selected questions from the BSQ could be used to target high-risk individuals who would most benefit from a visit to the dental office prior to their first appointment.

Further studies involving temperament and dentistry are needed. Larger sample sizes, particularly in older age groups, may support the current findings, provide clinically relevant information about a currently little understood aspect of children's behavior, and suggest more practical approaches to children's behavior in the dental setting.

The potential use of shorter temperament surveys to assess key categories of temperament—such as approach—should be tested. In addition, any benefits resulting from a preappointment visit or specialized procedures should be evaluated for effective modification in children whose temperamental profile does not produce a good fit within the dental environment (e.g., withdrawing, poorly adapting). Finally, a thorough

assessment of a child's past social experiences such as school, day care, and hospitalizations, used in conjunction with the temperament questionnaire, could enhance the understanding of how a child's behavior is modified by experience.

Conclusions

1. BSQ temperament constellations of easy, low intermediate, and difficult were found to predict child behavior in the dental environment.
2. Approach/withdrawal and adaptability predicted quiet behavior in 3-year-olds.
3. Intensity and activity predicted crying behavior in 5-year-olds.

This research was done in fulfillment of the requirements for a Master of Science degree during Dr. Radis' residency at Columbus Children's Hospital and the section of pediatric dentistry, College of Dentistry, The Ohio State University. Dr. Radis is in private practice in both Mansfield and Aurora, Ohio. Dr. Wilson is program director of postgraduate program and associate professor, section of pediatric dentistry, College of Dentistry, The Ohio State University and Children's Hospital. Dr. Griffen is assistant professor, section of pediatric dentistry, College of Dentistry, The Ohio State University. Dr. Coury is chief of the section of behavioral-developmental pediatrics, Columbus Children's Hospital, and associate professor of clinical pediatrics, College of Medicine, The Ohio State University, Columbus, Ohio.

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