

# Association Between School-Age Children's Dental Behavior and Play Behavior

J. R. Pinkham, B.S., D.D.S., M.S.  
P. E. Kerber, Ph.D.

## Abstract

*The purpose of this study was to determine whether the association between previous dental behavior and play behavior as reported in a previous investigation in pre-school children could be duplicated in a group of school-age children. The study consisted of 27 subjects divided into two experimental groups: a group of appropriately-behaving children during a restorative dental appointment and a group of decidedly negatively-behaving children during a restorative dental appointment. The children in the study were observed in a simulated dental environment and their play behavior was quantitated by a method devised by McTigue and Pinkham (Journal of Dentistry for Children, May-June, 1978). The results of this study showed a statistically significant difference between the two groups in their play behavior with a toy dental mirror. Discriminate analysis revealed that all 27 children could be re-classified into their appropriate group.*

Previous research reported a relationship between the clinical behavior of pre-school children and the style and pattern of their play behavior in a simulated dental environment.<sup>1,2</sup> McTigue and Pinkham<sup>2</sup> have concluded that patients who demonstrate an inappropriate behavior during the dental experience have a tendency to avoid certain aspects of the play dental experience. They further concluded that the associations of play behavior to actual clinical behavior are such that play behavior may be a reliable predictor of maladaptive dental behavior.

The primary purpose of this study was to determine whether the association between previous dental behavior and play behavior described by McTigue and Pinkham in pre-school children could be duplicated in a group of school-age children.

## Methods and Materials

### Sample

The subjects consisted of 15 males and 12 females

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selected from the patient population of the Pedodontic Clinic of the University of Iowa, College of Dentistry. The following requirements were met by the subjects:

- They had to be between 66 months of age and 80 months of age.
- They had to have experienced previous restorative dentistry, which included the administration of local anesthetic.
- They had to have no reportable or evident physical or mental handicaps, as determined by the investigators, which could interfere with communication.

The clinical behavior of the children during at least one previous operative dentistry appointment was used to selectively assign the children to one of two groups which were defined by a scale developed by Frankel, et al.<sup>3</sup> (Figure 1).

### Experimental Groups

The work of McTigue and Pinkham<sup>2</sup> included three experimental groups: a definitely negative behavior group, a definitely positive behavior group, and a group which displayed both negative and positive behaviors during the dental experience.

It was impossible to recruit a definitely negative category since behavior of even the most anxious children contained some positive behavior. Therefore, this study included a negative group in which the majority of the behavior during a restorative dental visit was classified as negative or definitely negative. Recruitment was done by four pedodontists on the University of Iowa Pedodontic Faculty. All four recruiters were familiar with the scale and had recruited patients for other studies using the scale.

### Experimental Method

The identical playroom arrangement utilized by McTigue and Pinkham was used in this study (Figure 2). Each child was accompanied from the recep-

## SAMPLE

### Categories of Behavior (Frankl et al.)

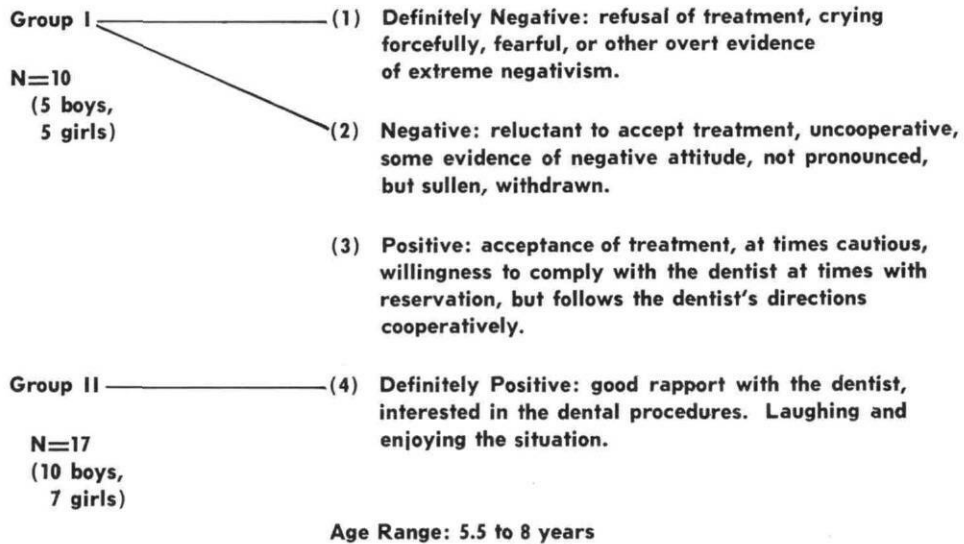


Figure 1. Composition of the two behavior groups according to number, sex, and average age.

tion area to the playroom by a dental assistant. The assistant, using a standard script described the playroom and its contents, and informed the child that he/she would have five minutes play in the room.

The playroom was an 8' x 8' enclosure with a sliding door; the floor was divided into six equal areas utilizing masking tape; and the following items were present in the room:

- A dental chair, approximately 26 inches in height.
- A doll patient, 30 inches in length and having plastic maxillary incisors present.
- A dental handpiece without a cutting bur or power supply.
- Toy dental instruments made of plastic including a needle, mirror, dental probe, forceps, and toothbrush.
- A plastic tea set.
- A plastic telephone.
- A toy firetruck.
- Several small plastic toy firemen.

The firetruck and firemen toys represented sex-appropriate male toys and the tea set and telephone represented sex-appropriate female toys. This proce-

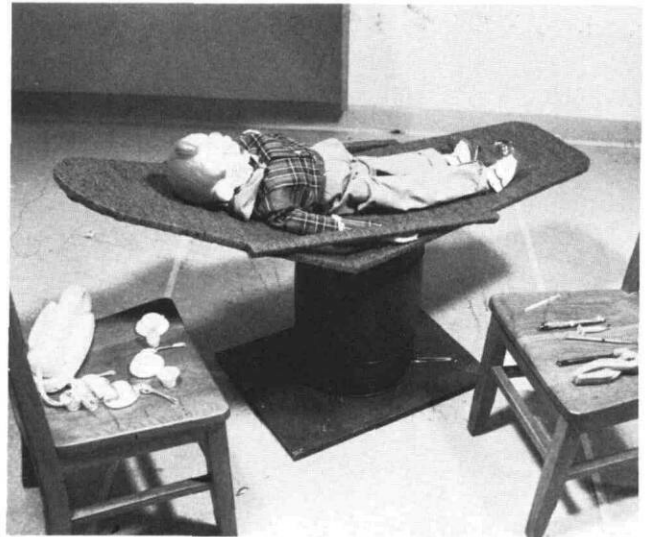


Figure 2. Photograph of playroom.

cedure was recommended by a clinical psychologist from the University of Iowa, Department of Psychology, who is experienced in play therapy.

Each child was told before entering the room that he/she was not required to stay the entire five minutes. Each child was left in the room alone with the

door closed for the specified five minutes and observed through a one-way mirror by two investigators. A data collection form developed previously by McTigue and Pinkham was used. This form has shown a higher inter-observer reliability in two previous studies ( $r > .80$  for all measures). Observers separately recorded the following data at 15-second intervals:

- Location of the child.
- Toys, if any, with which the child played.
- If a dental toy was given attention, whether it was looked at, touched, or actually played with.
- If the child spoke, what he/she said.
- Any critical incidents, not otherwise recordable on the data collection sheet.

The investigators were notified of the 15-second time intervals for data collection by a five minute tape that announced the change of intervals.

The subjects were also videotaped during their five minutes of play. The videotape was utilized to aid the observers if critical incidents were missed or unrecorded during any epoch of time.

#### Data Collection Method

Ratings were collected independently by the two observers, one a dental hygienist in the Department of Pedodontics, and the other a sophomore dental student working on a collegiately-sponsored summer research fellowship. The observers received six training sessions prior to the study and demonstrated high inter-rater agreement during the last three sessions. The observers were not involved in the selection or assignment of the children. The ratings were scored using the following system developed by McTigue and Pinkham:<sup>2</sup>

- Movement in the room: the subject was assigned a score of one each time he/she passed from one square to another for each 15-second period. If the child stayed in the same square he/she received a score of one every 15 seconds. The movement score was the sum of movement during the five-minute stay in the room. Therefore, the minimum score possible after one minute was four.
- Boy's toys: a score of one was given in every 15-second period that the subject played with the boy's toys.
- Girl's toys: a score of one was given in every 15-second period that the subject played with the girl's toys.
- Doll and dental toys: if a child's attention was directed to the doll "patient" or to any of the

dental toys in a 15-second period, the following scoring system was used:

- 1: The child only looked at the objects.
- 2: The child touched the objects.
- 3: The child picked them up or manipulated them in play.

A score of one was to be applied in instances where a child manipulated a dental toy in an aggressive fashion. There were no such instances recorded by either observer during the course of this study.

### Results\*

#### Inter-rater Reliability

The data for each child were divided into five 60-second periods and were totaled. Inter-rater reliability was determined using rank order correlation method, and correlations of  $r = .86$  were found for the sum of all observations on each subject.<sup>5</sup>

#### Analysis of the Data

A discriminate analysis was conducted to determine whether the differences among the two experimental groups were great enough to allow re-classification of subjects into their appropriate groups.<sup>6</sup> Table 3 shows the probability of group membership after discriminate analysis. The discriminate analysis allowed for a 100% re-classification of the 27 children into the appropriate group.

Because the matrix was not of full rank, the program discarded toothbrush and location scores. An  $X^2$  test of homogeneity of the co-variance matrices was conducted. This test was significant at  $< .10$ , so the discriminate analysis was based on the individual within co-variance matrices. The groups were given prior probabilities in proportion to their  $n$ 's.

Table 1 presents the means and standard deviations for each of the variables in the study. ANOVA was conducted to determine which of the variables was probably the most discriminating. Table 2 indicates those variables to be the handpiece and the mirror. Only one was significant and that was the mirror.

### Discussion

The results of this study closely parallel the previous findings of McTigue and Pinkham<sup>2</sup> even though the age group studied was older. McTigue and Pinkham concluded that clinical distinction can be made about the past behavior of children in the dental set-

\* Because the individual within co-variance matrices was used, no discriminate function is available. However, the calibration data are available upon request from the authors.

**TABLE 1. Means and S.D. of Measurements**

	Appropriate			Inappropriate			Total		
	X	SD	N	X	SD	N	X	SD	N
Age	6.44	.81	17	6.6	.94	10	6.50	.84	27
Boy	4.00	6.10	17	2.8	4.29	10	3.56	5.44	27
*Girl	1.91	.67	17	2.33	1.32	10	2.06	.96	27
Doll	50.47	33.17	17	36.2	39.30	10	45.18	35.51	27
*Handpiece	3.78	1.69	17	2.19	1.46	10	3.19	1.76	27
Needle	11.65	13.1	17	7.7	9.06	10	10.18	11.80	27
Probe	8.47	10.09	17	4.5	6.26	10	7.00	8.95	27
*Mirror	4.51	1.78	17	2.16	1.49	10	3.64	2.01	27
*Forceps	2.55	1.35	17	2.32	2.04	10	2.46	1.60	27
**Toothbrush	14.70	18.35	17	6.80	11.00	10	11.78	16.25	27
**Location	33.00	8.26	17	29.60	6.42	10	31.74	7.68	27

\* data + 1 transformation used.  
 \*\* not used in the discriminate analysis.

**TABLE 2. ANOVA Tables for variables whose means were significantly different for behavior groups**

(Handpiece)				
Source	DF	SS	F	P
Behv.	1	660.37	3.76	.064
Error	25	4389.04		
(Mirror)				
Source	DF	SS	F	P
Behv.	1	1746.09	6.58	.017
Error	25	6629.98		

ting by observation of these children in a simulated dental experience play situation. This study supports that conclusion.

This study found a strong tendency for the dentally-anxious child to avoid the manipulation of dental instruments and the role-playing of the dentist during the play situation. It would appear that the children who are able to comply with the expectations of a restorative dental appointment, and who harbor no overt or even subtle dread of the stimuli of the dental of the dental appointment, find the simulated play-room a new and different play environment and quickly adapt to role-playing a dentist and to manipulating and using the dental instruments. The child

who has anxieties regarding the dental experience presumably cannot easily adapt to this unique play environment and occupies his five-minute playtime doing activities other than role-playing the dentist.

Future research might use this play experience method for overcoming the child's anxieties toward the dental experience. Children can, and often do, utilize play activities as a method for dealing with and overcoming certain situational anxieties.<sup>7,8,9</sup> Children who have behaved inappropriately in a dental office might be placed into structured play situations to see if there is an increase in the amount of role-playing of the dentist. If the play experience reduces situational anxieties and increases the role-playing of the dentist, the results of this study might indicate that the child's clinical behavior would also be enhanced. This theory should be tested in the future. Should this method work, it would offer institutional dental clinics, educational dental clinics, and other large dental clinics another method of behavior management and education of children. Perhaps one state-wide or several regional facilities could provide this play therapy for anxiety control and retraining of high anxiety pre-school and school-age children.

Also, future research should attempt to determine if a first-time dental patient's behavior can be predicted using this method.

## Conclusions

The following conclusions seemed evident from this study:

- An association exists between previous dental behavior and play behavior in a simulated dental

**TABLE 3. Probabilities of group membership after discriminate analysis**

Obs.	From Behv.	Classified Into Behv.	Probability of Belonging to Group	
			0	1
1	0	0	1.0000	0.0000
2	0	0	1.0000	0.0000
3	0	0	1.0000	0.0000
4	0	0	1.0000	0.0000
5	0	0	1.0000	0.0000
6	0	0	1.0000	0.0000
7	0	0	1.0000	0.0000
8	0	0	1.0000	0.0000
9	0	0	1.0000	0.0000
10	0	0	1.0000	0.0000
11	1	1	0.0000	1.0000
12	1	1	0.0000	1.0000
13	1	1	0.0000	1.0000
14	1	1	0.0000	1.0000
15	1	1	0.0000	1.0000
16	1	1	0.0000	1.0000
17	1	1	0.0000	1.0000
18	1	1	0.0003	0.9997
19	1	1	0.0000	1.0000
20	1	1	0.0000	1.0000
21	1	1	0.0000	1.0000
22	1	1	0.0000	1.0000
23	1	1	0.0000	1.0000
24	1	1	0.0000	1.0000
25	1	1	0.0000	1.0000
26	1	1	0.0000	1.0000
27	1	1	0.0000	1.0000

environment in school-age children, as seen in the results of the discriminate analysis.

- The nature of the associations of play behavior to clinical behavior presents the possibility that play behavior may be a predictor of maladaptive dental behavior.

- Structured play sessions for inappropriately behaving child dental patients in a simulated dental environment may provide an efficient method to help such children control their anxieties about the dental experience and to become appropriately behaving dental patients.

**References**

1. McTigue, D. J., and Pinkham, J. R.: "Effectiveness and Reliability of a Method to Quantitate Behavior of Children in a Play Dental Environment," *Proc, Iowa Sect of Am Assoc Dent Res*, p. 7, March, 1976.
2. McTigue, D. J., and Pinkham, J. R.: "Associations between Children's Dental Behavior and Play Behavior," *J Dent Child*, 45:42-46, May-June, 1978.
3. Frankl, S.; Shiere, F.; and Fogels, H.: "Should the Parent Remain in the Dental Operator?" *J Dent Child*, 29:150-163, 2nd. Quarter, 1962.
4. Bates, J. and Bentler, P.: "Play Activities of Normal and Effeminate Boys," *Develop Psych*, 9:20-27, July, 1973.
5. Sokal, R. and Rolf, F.: *Biometry*, San Francisco: W. H. Freeman and Co., 1969, p. 538.
6. Service, J.: *User's Guide to the Statistical Analysis System*. Raleigh, North Carolina: Student Supply Stores, North Carolina State University, August, 1972.
7. Erickson, E. H.: "Toys and Reasons," In M. R. Haworth (Ed.), *Child Psychotherapy: Practice and Theory*, New York: Basic Books, 1964, pp. 3-11.
8. Bandura, A., and Menlove, F. L.: "Factors Determining Vicarious Extinction of Avoidance Behavior Through Symbolic Modeling," *J Pers Soc Psychol*, 1968, 8:99-108.
9. Bird, G. E.: *The Effect of Nursery School Attendance upon Mental Growth of Children*. (39th Yrbk Nat Soc (N) Stud Educ) Chicago: Univer. Chicago Press, 1940, Part II, 81-84.

J. R. PINKHAM is Associate Professor of Pedodontics, University of Iowa College of Dentistry, Iowa City, Iowa.

P. E. KERBER is Assistant Professor of Community and Preventive Dentistry, University of Iowa College of Dentistry, Iowa City, Iowa.

Requests for reprints may be sent to Dr. J. R. Pinkham, Department of Pedodontics, College of Dentistry, University of Iowa, Iowa City, IA 52242.