DOCUMENT RESUME

ED 113 290 SP 009 522

AUTHOR Rubinson, Laurna; Stone, Donald B.
TITLE An Evaluation of the Behavioral Aspect of the American Dental Association's "Learning About Your Oral Health" Teaching and Learning Program, Level 2.
PUB DATE Oct 75
NOTE 17p.; Paper presented before the Research Council at the Annual Meeting of the American School Health Association (49th, Denver, Colorado, October 1975)

EDRS PRICE MF-$0.76 HC-$1.58 Plus Postage
DESCRIPTORS *Dental Evaluation; *Dental Health; Elementary Education; *Health Programs; *Scientific Research; Student Behavior
IDENTIFIERS American Dental Association; *Navy Plaque Index

ABSTRACT

The major purpose of this study was to assess the behavioral impact of the American Dental Association's (ADA) Teaching and Learning Program, Level 2. A second purpose was to determine the reliability of the Navy Plaque Index (NPI) when administered to a relatively large sample of elementary school students. The NPI, which has demonstrated validity and reliability over a seven-year period of use when utilized by one dentist on small samples of adults, was used for assessment purposes. It was administered by dentists to 16 randomly selected fifth grade elementary classes in a Midwest community. A pretest and posttest design, with experimental and control groups, was utilized in the study. The Navy Plaque Test was shown to be an unreliable measure of plaque indices in this case. Due to the unreliability of the instrument, the behavioral aspect of the ADA's program could not be evaluated. The investigators are presently in the process of conducting a post-post NPI measurement of the same subjects rerandomizing the dentists in order to distribute the variability of the plaque measures among the various treatment groups. This will provide an opportunity to determine (1) any experimental effects that might have resulted from the program and (2) which effects remain six months after the students were exposed to it. By using a measure of dental health status, this program could make an important contribution to the validation and evaluation of classroom health education experiences. (Author/BD)

AN EVALUATION OF THE BEHAVIORAL ASPECT OF THE AMERICAN DENTAL ASSOCIATION'S LEARNING ABOUT YOUR ORAL HEALTH TEACHING AND LEARNING PROGRAM, LEVEL II

Laurna Rubinson, M.S.
Research Assistant

Donald B. Stone, Ed.D.
Associate Professor

Department of Health and Safety Education
University of Illinois
Urbana-Champaign, Illinois

Presented before the Research Council at the Forty-Ninth Annual Convention of the American School Health Association, in Denver, Colorado, October, 1975

The almost universal prevalence of dental and oral diseases in combination with a lack of appropriate attention to such disorders has resulted in a health problem of staggering proportions (8:145). By age two, when all 20 of the primary teeth have erupted into the oral cavity and are functioning, half of the children in the United States have one decayed tooth. Upon entering school, the average child has at least three decayed teeth, and by age 15 has 11 teeth that are either decayed, filled, or missing.(7:283).

Although dental health is being taught in many schools, children do not appear to be changing their dental health practices. Educators should be concerned with changing behavior of students so that they practice and eventually habituate effective dental health procedures. Because of the evidence of dental disease, it is obvious that there is a need for effective dental health education programs. Applewhite (1:1883) cites the worldwide prevalence of dental diseases as a constant reminder of the practically universal need for effective dental health education programs in the schools.

The schools in the United States are attended by nearly one-third of the nation's population. Therefore, dental health education in the school setting could be an extremely important component of efforts to influence preventive dental behavior (6:212). Haefner (6:212-213) concludes that the schools are the best place for instilling preventive dental behaviors for two reasons. First, the school setting avoids the limitations associated with the dental office: dentists in general have not educated their patients sufficiently. Secondly, dental hygienists spend less than 30 percent of their time on diet and oral health instruction.

Another reason for using the schools to promote preventive dental behavior is that the school setting itself possesses several positive features in its own right (6:212-213). One of the great assets of the schools is the opportunity for communication with nearly all persons within the entire school age group in an explicitly educational context where learning is emphasized and rewarded. Furthermore, continuing educational influence can be exerted on the target audience over a considerable time period. The process can begin at an early age when habit patterns are still in the process of being formed rather than being firmly established and resistant to change, as is true of adults. Another advantage is that dental health education can use both mass communication and personal communication approaches on the same audience, deriving the maximum benefit from each. The school classroom setting also offers the possibility of employing group dynamics in inducing students to take appropriate dental health action (6:212-213).

Even though there have been dental health education programs, few have had success in changing behavior or instilling sound dental health practices. Counsell (4:39) suggests that the empirical repetition of outdated methods and information leads to boredom and frustration in students, and if it does not interfere with learning, it interferes with acceptance of information and the promotion of changed behaviors.

It appears that the behavioral objectives of most educational programs do not match behavior change methods. Cohen and Lucye (3:36) point out that few curricula guides and teacher's manuals match behavior change methods with desired behavior objectives. Educational materials still

concentrate on desbribing tooth structure, the decay process, and the number of teeth. Yet in order to learn to acquire the brushing habit, it is not necessary to know where one's biscuspids are located.

The teaching of desired dental health practices needs to include some of the components that will permit effective self-appraisal and self-reinforcement by the student. Educational efforts should involve follow-up and reinforcement by the school over time until the newly acquired habit is firmly established (9:491).

With the State of Illinois now initiating a comprehensive mandated health education curriculum, it appeared to the investigators that this would be an opportune time to test the effectiveness of the new American Dental Association's Learning About Your Oral Health curriculum materials. A field experiment in dental health represents a unique opportunity for educators to join with members of the dental profession not only to promote the health and well being of children and youth but also to help control a potentially serious and costly problem.

Purpose of the Study

In February, 1975, the study team received a small grant from the Bureau of Dental Health Education of the American Dental Association to evaluate the ADA's Learning About Your Oral Health, Level II (Grades 4-6) teaching and learning program. The general objectives of the study were to:

1. Determine the effects of the program on the knowledge, attitudes, and practices of fifth grade elementary students
2. Develop valid and reliable measures of student dental health knowledge and attitudes

3. Assess the reliability of the Navy Plaque Index when employed by a group of dentists
4. Determine the program's effectiveness as well as its acceptability as judged by administrators, teachers, parents, dental professionals, and students
5. Develop the procedures and adaptations necessary for establishing the oral health program as an integral part of a total health education program.

The major purpose of this study was to determine if students who were exposed to the ADA's oral health educational program would exhibit lower plaque scores than those not exposed as measured by the Navy Plaque Index (NPI).

An additional consideration involved the issue of the importance of in-service education of teachers with respect to the oral health teaching and learning program. In order to assess this particular issue, the research team also included in their design an experimental group (orientation) that received the educational materials but did not receive in-service training. This group attended a brief orientation session (two hours) that was devoted to an examination of the materials. Thus, this procedure would enable the investigators to compare the educational impact of an intensive in-service education program to one involving minimal teacher exposure to the curriculum materials.

The final objective was to determine the reliability of the Navy Plaque Index when it is administered by a group of dentists who were familiar with the instrument.

Methods and Procedures

Six elementary schools were randomly selected from a total of 13 schools in a midwestern community containing approximately 60,000 persons. A total of 375 fifth grade students participated in the experiment; however because of the research design employed, 280 children were administered pre- and post-test measures.

Once the six participating schools were selected, each school was randomly assigned to a treatment group. The workshop group (Treatment I) consisted of six elementary classroom teachers who received an intensive workshop experience relating to the curriculum materials. All of the teachers engaged in the same learning experiences that their students would be exposed to during the experimental period. The teachers met with a trained workshop leader once a week, two hours each week, for a total of ten weeks. Teachers enrolled in the workshop received one unit of graduate credit from the University of Illinois through the office of Continuing Education and Public Service.

The five classroom teachers in the orientation group (Treatment II) did not participate in the workshop but were exposed to a two-hour orientation session concerning the Oral Health curriculum. At the orientation session, teachers were to review the contents of the curriculum and ask any questions concerning the teaching materials, duration of lessons, films, and outside source materials. No instruction was presented on how to employ the materials in the classroom.

The control group (Treatment III) consisted of five fifth grade classes representing two schools that were not exposed to the curriculum materials.

The Navy Plaque Index (NPI) was utilized to obtain the plaque indicies of the subjects. The NPI is designed to reflect the plaque control status of a student and the effectiveness of the student's ability to properly perform plaque control procedures (5:43). The instrument yields two scores, the NPI score (the highest score for one tooth) and the NPI total score (the sum score for all teeth). The NPI total score was employed as the measurement to determine the amount of plaque on the subjects' teeth.

A team of 12 dentists from the Illini Dental Association volunteered their services to participate in the study. All dentists were trained in the use of the NPI in order that their scoring procedures would be consistent. Health education majors from the University were utilized to serve as recorders and stainers for the dentists. The same dentists and recorders were used in schools that received both pre- and post-test measures. The time interval between the measures was five weeks.

Examination stations were established in each school adjacent to the subjects' classroom. Students were first asked to rinse their mouths at the water fountain to remove large food particles. The subjects' teeth were then stained with three drops of an erythrycin dye (trace solution). The students were instructed to use their tongues to spread the solution over all surfaces of their teeth. This was accomplished by having the students run their tongues over the outside surfaces of the upper teeth, then the lower and the same for the inside upper and lower teeth. Subjects were then asked to rinse lightly with one mouthful of water. The student was then examined by a dentist employing a disposable mouth

mirror for each child. Measurements for six designated teeth (3, 9, 12, 19, 25, 28) were scored for the facial and lingual surfaces of each tooth. The lowest possible score that could be obtained by a subject was zero, while the maximum score was 108.

Experimental Design and Statistical Analysis

The Solomon Four Group Design was utilized in the conduct of this study. (See Figure I). This design was selected in order to control for extraneous factors such as history and maturation, the pre-testing interaction effect, as well as any contemporary effects that may occur between the pre- and post-test measurements.

This design also provides a combination of the pre-test/post-test experimental-control design with simple randomized subjects design. Information is provided by the pre-test/post-test procedure and at the same time, shows how the experimental condition effects an unpretested group of subjects (2:247).

The means and standard deviations of plaque scores were calculated for all of the schools in the study. A 1 factor analysis of variance was conducted on the pre-test scores of schools B, C, and A to determine if significant differences between plaque scores existed.

A 2 factor analysis of variance was run on all schools in the study utilizing the post-test plaque scores. The factors considered were training (Treatment I, II, or III) and test sequence (pre-test or no pre-test). All data was submitted to the Digital Computer Laboratory of the University of Illinois for key punching. Analyses were completed by use of the SOUPAC and SPSS programs available at the University of Illinois, Department of Computer Science.

FIGURE I

EXPERIMENTAL PROCEDURE

STUDY DESIGN

TREATMENT I

	PRE-TEST	CURRICULUM	POST-TEST	SCHOOL
WORKSHOP	t_1	X	t_2	B
		X	t_2	D

TREATMENT II

	PRE-TEST	CURRICULUM	POST-TEST	SCHOOL
ORIENTATION	t_1	X	t_2	C
		X	t_2	E

TREATMENT III

	PRE-TEST	POST-TEST	SCHOOL
CONTROL	t_1	t_2	A
		t_2	F

RESULTS

The mean plaque pre to post test scores for all of the experimental and control groups are shown in Figure II. It may be observed that there is approximately a 30 point mean difference between the workshop and control group on the pre-test scores and an even greater difference is found with respect to the post-test data. It is also evident that post-test mean plaque scores increased when it would normally be expected that they would decrease. Additionally, the post-plaque mean scores of those groups that were pretested are also divergent. Furthermore the workshop and orientation groups that were not pre-tested appeared to have post plaque mean scores different from that of the control group. The groups that were pre-tested could be said to be dissimilar with respect to their plaque indicies. The differences found in the mean plaque scores may also have been due to the procedures by which the dentists obtained the plaque scores. The correlation between the control groups' pre and post-test mean plaque score was .12, further suggesting that a basic inconsistency in the procedures employed by the dentists did actually occur.

An analysis of variance on the pre-test scores of schools B, C, and A showed that there were significant differences in mean pre-test plaque scores between the three groups (Table I). An analysis of variance using two factors was run on all of the schools, using only the post-test scores. The factors considered were training and Test Sequence. The results are shown on Table II. There were a significant main effects and a significant training X sequence interaction. Therefore, the main effects were ignored, and the interaction was analyzed for significance.

A Newman-Keuls test of the plaque scores showed a high significance (.01 level) between Workshop (I) and Control (III), between Orientation (II) and Control (III) and between Orientation (II) and Workshop (I) in both pre-test

FIGURE II

MEAN PLAQUE SCORES OF ALL SCHOOLS

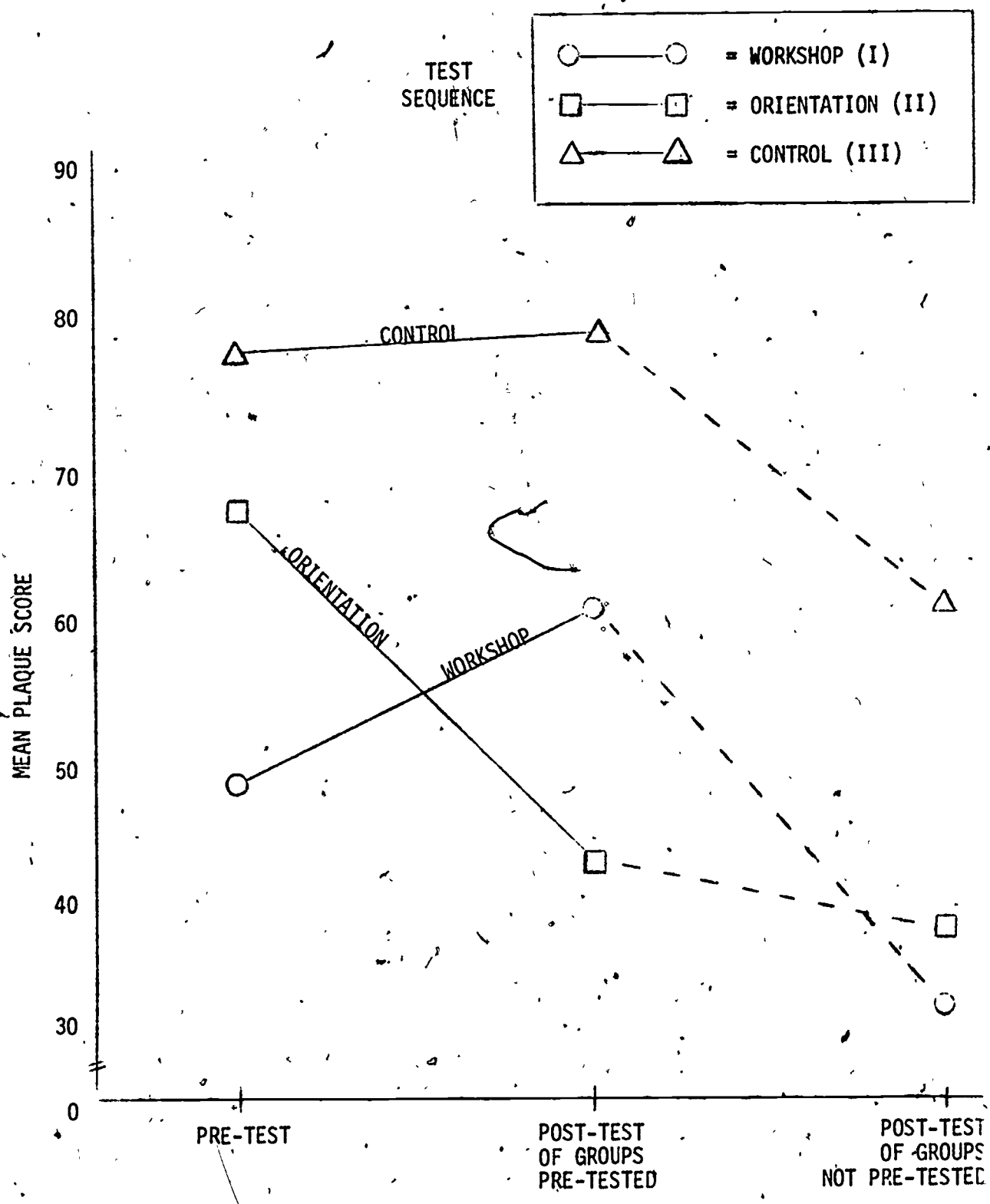

TABLE I

ANALYSIS OF VARIANCE ON PRE-TEST NPI TOTAL PLAQUE SCORES OF SCHOOLS B, C, & A

SOURCE OF VARIATION	DEGREES OF FREEDOM	SS	MS	F
BETWEEN GROUPS	2	20105.8125	10052.9062	21.046**
WITHIN GROUPS	144	68783.6250	477.6641	
TOTAL	146	88889.4375		

**SIGNIFICANT AT/OR BEYOND THE 01 LEVEL

TABLE II

ANALYSIS OF VARIANCE OF PLAQUE SCORES ON ALL SCHOOLS

SOURCE OF VARIATION	DEGREES OF FREEDOM	SS	MS	F
TRAINING (I, II, OR III)	2	42956.230	21478.113	50.246**
TEST SEQUENCE (PRE OR NO PRE)	1	22346.680	22346.630	52.278**
TRAINING X TEST SEQUENCE	2	5750.090	2875.045	6.726**
RESIDUAL	274	117123.750	427.459	
TOTAL	279	183921.062	659.215	

**SIGNIFICANT AT/OR BEYOND THE .01-LEVEL

and post-test scores of those groups that were pre-tested. The effects of the workshop could be due to random error. It was evident that an increase from the pre- to post-measurement was due to a change in the criterion measure used by dentists in evaluation of the Workshop group. In reality the plaque scores should have decreased due to the treatment effect. The reliability of the instrument (NPI) seems to be a problem when measuring the plaque of the subjects. The significance shown in the above analyses may be due to the curriculum or the method in which the plaque score was secured.

Conclusions

1. No definitive statement may be made as yet to ascertain the effectiveness of the Teaching and Learning Program in its behavioral dimension. The investigators are presently in the process of conducting a post-post NPI measurement of the same subjects randomizing the dentists in order to distribute the variability of the plaque measures among the various treatment groups. This will provide an opportunity to determine any experimental effects that might have resulted from the program and which effects remain six months after the students were exposed to it.

2. The Navy Plaque Index was shown to be an unreliable instrument when utilized with a relatively large number of upper elementary level students by more than one dentist, due to differences in the level of plaque recorded by the dentists.

Recommendations

1. Other measurements of plaque indices should be considered in future studies involving more than several dentists or dental hygienists. Consideratic

might be given to Green's Oral Hygiene Index or the Gingival Bleeding Index for measuring plaque in upper elementary school children, although the reliability of those methods also needs to be assessed.

2. If the NPI is to be employed as an evaluative tool, the dentists or dental hygienists should be randomized throughout the sample in order to minimize the subjective nature of the instrument. Additionally, pre-orientation sessions should be conducted for personnel administering the instrument to ensure that the same standards of scoring are being employed.

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(#268 10/1975)