Effects of Type of Value Appealed to and Valence of Appeal on Children's Dental Health Behavior

Lenora G. Knapp

University of Alabama

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Examined the effects of the type of value appealed to and valence of appeal on children's intentions to engage in toothbrushing, their self-report of toothbrushing frequency, and their plaque level. 98 fifth-grade students served as the participants. Slide shows appealed to either health- or socially oriented values and also differed with respect to valence (positive vs. negative). A control group received a message that provided basic dental health information. Group comparisons revealed that children who received the negative social appeal showed a significant improvement in plaque level. Only the negative social appeal group differed significantly from the control group on the dependent measures.

KEY WORDS: children; dental hygiene; health promotion; persuasive communications.

Dental disease will afflict 98% of school-aged children (Peterson, 1987). This extremely high prevalence rate is especially compelling in light of substantial evidence that dental caries and periodontal disease are largely preventable through regular toothbrushing ("Plaque: Current Approaches," 1984). The apparent failure of the majority of children to undertake this relatively innocuous...
health-enhancing behavior attests to the need for improved prevention programming in this area.

Although dental health prevention programs have been relatively successful in increasing both children's knowledge of dental health and their oral hygiene skills, these improvements often have not been accompanied by significant changes in dental health behaviors (Albino, 1984; Rayner & Cohen, 1971). This difficulty in effecting behavior change may be due in part to the emphasis of these programs on health-oriented "fear appeals" (i.e., persuasive communications that emphasize the health threat inherent in failure to engage in the recommended behavior). Children tend to place a low value on dental health (Gochman, 1972b). Moreover, they fail to see themselves as vulnerable to health problems in general (Gochman, 1982), and they have idiosyncratic and relatively unsophisticated views of health and illness concepts (Bibace & Walsh, 1979). Thus, it is not surprising that previous attempts to appeal to children's health values have yielded disappointing results.

Persuasive communications emphasizing values that are more concrete or salient than health could serve as a viable alternative to the health-threat communications that traditionally have been employed with children. Many health behaviors are instrumental in accomplishing goals that are unrelated to, but more highly regarded than, health (e.g., attractive appearance, acceptance by peers). Jenkins (1980) noted that in such situations, one's primary motivation for engaging in health behaviors may lie in the desire to achieve these more socially relevant, as opposed to health-relevant, goals. Given that children do not value health highly, their motivation to improve their dental hygiene might be enhanced more by prevention programs emphasizing the social consequences of toothbrushing than by those emphasizing the health consequences of the behavior.

Preliminary evidence (Robberson & Rogers, 1988) suggested that positive appeals (i.e., messages that stress the rewards of engaging in health-enhancing behaviors) are more effective than negative appeals when the emphasis of the prevention program is on the enhancement of attributes other than health (e.g., appearance). This finding indicated that the valence of the appeal (i.e., positive vs. negative) should also be considered when investigating the use of appeals to the social values of children.

The present study examined the effect of type of value appealed to (health vs. social) and valence of appeal (positive vs. negative) on children's behavioral intentions, self-report of toothbrushing frequency, and level of plaque. It was predicted that there would be a simple main effect for type of value appealed to, such that appeals to social values would be more effective than appeals to health values in producing positive changes in the dependent variables. Based on prior research (Robberson & Rogers, 1988) it was also hypothesized that valence would interact with type of value. Specifically, it was expected that children who
received the positive social message would show greater improvement in intentions, reported frequency of toothbrushing, and plaque level, than those who received the positive health message. Finally, it was predicted that each of the experimental messages would be superior to the control message in producing positive changes in the dependent variables.

METHOD

Subjects

Research participants were 119 fifth-grade students (ages 10 to 12 years) recruited from two elementary schools serving predominantly rural areas of Alabama. Both parental consent and student assent were obtained prior to participation in the study. The following criteria were used to select participants: (a) high pretest plaque scores (.83 or more) on the Simplified Oral Hygiene Index (OHI-S) (Greene & Vermillion, 1964), (b) absence of braces (braces prevent accurate determination of plaque scores), and (c) absence from school during pre- or posttests. A total of 21 children were omitted from the study on the basis of these criteria. Of the remaining participants, 78 received experimental manipulations and 20 were assigned to a control group.

Homerooms were randomly assigned to either an experimental or control condition. At the beginning of the academic year, the school system had randomly assigned students to these homerooms in compliance with a court order mandating that classrooms be stratified by race and intellectual functioning. Level of dental health knowledge was measured to provide a post hoc determination of the equivalency of the groups with respect to their understanding of general dental health concepts.

Experimental Design

A 2 × 2 factorial design was employed. The persuasive messages appealed to one of two different types of values (health vs. social) and also differed with respect to valence (positive vs. negative). A control group was exposed to a message that provided basic dental information (e.g., parts of the tooth, types of teeth), but did not discuss any consequences associated with adopting or not adopting the recommended health action.

Stimulus Materials

The persuasive communications were delivered via an audiotaped slide show presentation. Slides featured photographs, drawings, and diagrams il-
Illustrating the points that were made. Information regarding self-efficacy, response efficacy, and immediacy of consequences was strongly emphasized for each experimental condition. All messages were equated for length, number of points made, number of points summarized, and number of slides presented.

Messages that appealed to health values focused on (a) the relationship between toothbrushing and the development of both caries and periodontal disease and (b) the impact of these problems on dental health. Specifically, the effect of brushing on the strength and durability of teeth and the physical sensations associated with healthy/unhealthy teeth and gums (comfort vs. discomfort) were discussed. Appeals to social values described (a) how toothbrushing can affect appearance, breath, and ability to speak properly and (b) the effect that these characteristics can have on self-esteem and acceptance by peers. Children were informed that the attractiveness of their teeth could affect their overall appearance, how they felt about themselves, and their mood (happiness vs. unhappiness). Also, the appeal stated that the quality of children's articulation and breath could influence how comfortable they felt in the company of their peers, the manner in which other children might treat them (i.e., tease vs. compliment), and the frequency with which peers might invite them to join activities. The consequences discussed in the interventions were selected on the basis of pilot testing indicating that they were perceived by children as realistic results of engaging or not engaging in toothbrushing. Positive valence appeals stressed the consequences of engaging in the recommended response, while negative appeals focused on the consequences of not engaging in the response. In an attempt to equate the content of the positive and negative appeals, these messages were written as complements of each other.

Procedure

Instructions to Teachers and Distribution of Toothbrushing Kits. Approximately 1 month prior to the intervention, permission slips and toothbrushing kits were delivered to the participating classes. Each toothbrushing kit contained a toothbrush and toothpaste; thus, each participant possessed the materials with which to perform the recommended health action. The kits and permission slips were distributed well in advance of the intervention, with the expectation that if these items served as prompts for toothbrushing, the prompting effect would have sufficient time to subside prior to the intervention.

Preintervention Measures. The following measures were taken prior to the intervention: (a) plaque score, (b) level of dental health knowledge, (c) intention to engage in toothbrushing on a regular basis, and (d) self-report of toothbrushing frequency. Plaque scores were obtained immediately upon arrival at school in the
morning. The remaining measures were administered in a questionnaire format during the first-period class. All questionnaire items were read aloud to the class while students followed along on their written copies. Prior to completing the questionnaire, children were instructed that they would be answering the questions anonymously.

**Intervention.** Immediately after the preintervention questionnaire was completed, the class viewed the slide show presentation corresponding with their group assignment. All of the children in the homeroom viewed the slide show; data obtained from children who failed to meet the subject selection criterion were not included in the statistical analyses.

**Postintervention Measures.** A postintervention questionnaire was administered following the slide show presentations. The questionnaire contained items measuring behavioral intentions and the amount of information retained from the slide show. Postintervention measures of self-report and plaque level were taken 2 days after the implementation of the intervention. This 2-day interval was necessary to allow sufficient time for plaque level to change in response to changes in toothbrushing behavior (“Plaque: Current Approaches,” 1984). Consistent with the preintervention procedures, plaque scores were collected upon arrival at school. After each child's plaque level was determined, he or she was asked to complete the self-report measure. Written instructions on the self-report measure reminded children that their answers would be anonymous.

**Manipulation Checks.** To ensure that the independent variables were operationalized successfully, two manipulation checks were performed following the intervention. These data, which were collected via the postintervention questionnaire, assessed participants' perceptions of (a) the type of value appealed to and (b) the valence of the appeal.

**Dependent Variables**

**Behavioral Intentions.** A five-point Likert item was used to measure children’s intentions to engage in the recommended response. The item asked participants to indicate their degree of agreement with the following statement: “Each day I will brush my teeth two times, once in the morning and once at bedtime.”

**Self-Report.** Children were asked to respond to the statement, “How many times a day do you brush your teeth?”

**Plaque Scores.** The OHI-S was employed to measure plaque levels. The index specifies six tooth surfaces to be examined for the presence of plaque. Employing a slightly modified procedure suggested by Blount and Stokes (1986), the teeth were stained with a erythrosin plaque-disclosing solution prior
to examination. Each of the six tooth surfaces was assigned a score from 0 to 3, based on the fraction of the tooth that was covered with plaque. Absence of plaque was scored as a 0. A score of 1 was given if up to one third of the tooth was covered with plaque. If more than one third but less than two thirds of the surface contained plaque, a score of 2 was assigned. Coverage of more than two thirds of the tooth surface with plaque was scored as a 3. The scores assigned to each of the teeth were added and then divided by the number of teeth scored to obtain a measure of overall level of plaque. A research assistant, who was blind to the intervention the children had received, served as the primary observer. Reliability checks were conducted by the principal investigator. Interobserver agreement on the OHI-S was taken for 35% of the preintervention measures and 33% of the postintervention measures for each condition. Reliability was calculated by dividing the number of single surface ratings agreed upon by the total number of agreements plus disagreements and multiplying by 100% (Swain, Allard, & Holborn, 1982). The mean percentages and ranges of reliability for each group, collapsed across pre- and postintervention measures were negative health $M = 83\%$, range = 67–100%; positive health $M = 79\%$, range = 50–100%; negative social $M = 81\%$, range = 50–100%; positive social $M = 80\%$, range = 67–100%; control $M = 81\%$, range = 50–100%.

RESULTS

Ancillary Measures

Analyses of ancillary measures were performed to assess two potentially confounding variables: (a) the level of dental health knowledge prior to the intervention and (b) the amount of information retained from the experimental messages. A Hartley $F$-maximum test of homogeneity of variance was conducted on participants' scores on a 10-item scale measuring knowledge of dental health concepts. The test was nonsignificant ($F_{max} = 1.75, M = 8.72$), suggesting that the experimental and control groups possessed comparable levels of dental health knowledge.

Participants' scores on a 10-item scale measuring the amount of information retained from the messages was submitted to a $2 \times 2$ analysis of variance (ANOVA). The ANOVA was composed of two factors: type of value appealed to (health vs. social) and valence of appeal (positive vs. negative). The experimental groups did not differ significantly with respect to the amount of information retained from the messages, all $F$s < 1.00. All of the groups recalled the majority of information presented during the intervention (negative health, $M = 8.23$; positive health, $M = 8.35$; negative social, $M = 8.32$; positive social, $M = 8.22$).
Manipulation Checks

A chi-square analysis was made on responses to the manipulation check for type of appeal. This analysis indicated no significant differences between the experimental groups, \( \chi^2 = 3.07, \) ns. Apparently, participants who received appeals to health values perceived the consequences discussed in the messages as health-related, while those who received appeals to social values perceived the consequences discussed as related to social concerns.

For the valence manipulation check, a \( 2 \times 2 \) ANOVA was employed. The interaction, \( F(1, 74) = 1.84, \) ns, and main effects were nonsignificant, both \( F_s < 1.00. \) It appears that the consequences associated with the negative messages were seen as "bad" and those described in the positive message were seen as "good." Furthermore, the degree of perceived "badness" or "goodness" was essentially equivalent across messages, as indicated by the absence of significant differences between the means of the experimental groups.

Dependent Measures

Experimental Group Differences. Based on preliminary correlational analyses revealing very low correlation coefficients between the dependent measures (\( r = -0.04 \) to \( 0.27 \)), it was determined that the relationship between these measures was not sufficient to merit conducting multivariate analyses. Therefore, univariate statistics were employed to analyze data on the dependent measures. In an effort to control for possible interpretation problems arising from the pre-post design of the study (viz., sensitization to the dependent measures and regression to the mean), analyses of covariance (ANCOVAs) were performed on the data. Significant ANCOVAs were followed by pairwise comparisons conducted in accordance with the following procedure: Least square means (LSMs) were calculated. Subsequently, all possible probability values for the hypothesis, \( \text{LSM}_i = \text{LSM}_j, \) were derived (SAS User's Guide, 1985). If the size of the difference between the two LSMs was associated with a .0083 probability level, the difference between the groups was judged to be interpretable. The conservative probability level of .0083 was determined by dividing the probability level of .05 by the total number of pairwise comparisons conducted (i.e., six). In interpreting the following analyses, it should be noted that the error term calculated for the ANCOVAs may be a minimal estimate of this source of variance, as only one homeroom was assigned to each experimental condition.

Table I presents the means and standard deviations of pre- and posttest scores for experimental and control groups. A one-way ANCOVA was conducted on each of the three dependent measures to test the hypothesis of a simple main effect for appeals to social values. No simple main effect was found for self-
Table 1. Means and Standard Deviations of Pre- and Posttest Scores for Experimental and Control Groups

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Experimental group</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Negative health</td>
<td>Positive health</td>
</tr>
<tr>
<td>Intention pretest</td>
<td>M 3.61</td>
<td>3.80</td>
</tr>
<tr>
<td></td>
<td>SD 1.94</td>
<td>1.28</td>
</tr>
<tr>
<td>Intention posttest</td>
<td>M 3.89</td>
<td>4.00</td>
</tr>
<tr>
<td></td>
<td>SD 1.02</td>
<td>1.17</td>
</tr>
<tr>
<td>Self-report pretest</td>
<td>M 2.39</td>
<td>2.25</td>
</tr>
<tr>
<td></td>
<td>SD 0.70</td>
<td>0.91</td>
</tr>
<tr>
<td>Self-report posttest</td>
<td>M 2.06</td>
<td>2.00</td>
</tr>
<tr>
<td></td>
<td>SD 0.73</td>
<td>0.91</td>
</tr>
<tr>
<td>Plaque pretest</td>
<td>M 1.19</td>
<td>1.14</td>
</tr>
<tr>
<td></td>
<td>SD 0.44</td>
<td>0.37</td>
</tr>
<tr>
<td>Plaque posttest</td>
<td>M 1.02</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td>SD 0.46</td>
<td>0.46</td>
</tr>
</tbody>
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report, behavioral intention, or plaque score; $F(1, 75) = 0.05$, ns; $F(1, 75) = 0.96$, ns; $F(1, 75) = 3.38$, ns; respectively. Separate 2 x 2 ANCOVAs were employed to examine the predicted interaction between type of value appealed to and valence of appeal for each of the dependent measures. A significant Type of Value x Valence interaction was revealed on the plaque measure, $F(1, 73) = 5.56$, $p < .05$. Comparisons of the probabilities for the LSM differences indicated that the negative social group had lower plaque scores (LSM = .65) than the negative health group (LSM = .99). There were no significant interaction effects on either the self-report, $F(1, 73) = 1.44$, ns; or behavioral intention measures, $F(1, 73) = 1.08$, ns.

Control Group Differences. Orthogonal contrasts, conducted for each dependent variable, were utilized to test for the hypothesized experimental and control group differences. In comparison with the control group, the group receiving the negative social message reported a higher frequency of toothbrushing, $F(1, 92) = 6.14$, $p < .05$, greater intentions to engage in toothbrushing, $F(1, 92) = 5.44$, $p < .05$, and had lower plaque scores, $F(1, 92) = 9.25$, $p < .01$. Comparisons of the remaining experimental groups with the control group yielded no significant differences on any of the dependent measures.
DISCUSSION

The results of the present study suggest that persuasive communications emphasizing the negative social consequences associated with failure to engage in toothbrushing are effective in encouraging children to undertake this behavior. In contrast, neither positive social nor health appeals had an appreciable impact on children's decisions to adopt preventive dental health actions.

Valence appears to play a crucial role in the success of appeals made to the social values of children, as was evident from the significant interaction effect for Type of Value Appealed to by Valence on the plaque measure. The consequences described in the negative social message may have been more salient and hence more motivating than those described in the positive social message. Developmental research suggests that engaging in "negative gossip" is one of the most prominent social processes during middle childhood (Gottman, 1985; Gottman & Mettetal, 1985). The sharing of negative information about peers serves as a means of establishing norms for the group. Because of the social focus during this developmental period, it is possible that the threat of making a negative impression may provide more incentive to brush than the prospect of securing a more positive image.

The failure to find an interaction effect for the second behavioral measure, self-report of toothbrushing, may be attributable to the limited reliability of children's self-report (Ollendick & Cerny, 1981). Given that self-report did not accurately reflect the behavioral changes found in this study, this outcome measure may best be used in conjunction with other dependent variables and any significant effects found on this measure should be interpreted cautiously in future dental health research involving children.

The nonsignificance of the predicted interaction effect on behavioral intentions contradicted one of the central propositions of the theory of reasoned action (Ajzen & Fishbein, 1980); namely, that behavioral intentions are the immediate determinants of behavior. This proposition has received substantial empirical support from health promotion research with adults; however, in this study the significant interaction effect on children's plaque scores was not accompanied by a similar effect on their intentions to brush regularly. Further investigations are needed to evaluate the applicability of the theory of reasoned action with younger populations. The failure to find evidence of an intention–behavior relationship with children may be due to the differential cognitive abilities of children and adults. Whereas the thought processes of children tend to be confined to the "here and now," adults are able to think about the future and "what can be" (Flavell, 1977). The capacity for thinking about the possible enhances one's ability to plan for the future (Seifert & Hoffnung, 1987). It can be hypothesized that children's limited ability to consider and plan for future events may render
them less than fully capable of "reasoned action" with regard to the performance of preventive health behaviors.

The experimental–control group comparisons provided informative data regarding the relative efficacy of health-oriented persuasive messages for children. Although health-threat communications have been the most widely used technique for persuading adults to adopt healthy behaviors (Rogers, 1983), the present results suggest that health-oriented fear appeals are not an effective means of motivating children to engage in health-enhancing behavior. Viewed in light of children's relatively unsophisticated conceptualizations of health and illness (Bibace & Walsh, 1979), their tendency to perceive themselves as invulnerable to health problems (Gochman, 1972a), and the low value that they place on health (Gochman, 1972b), the absence of significant differences between the health appeals and control groups is not altogether surprising. Indeed, the relative ineffectiveness of the traditional health-threat communication (i.e., negative health message) appears to attest to the qualitative differences between the health-related concepts of adults and children. This finding provides some confirmation for the assertion that persuasive communications must be modified to reflect these differences if they are to be used successfully in prevention programs for children (Maddux, Roberts, Sledden, & Wright, 1986).

The performance of manipulation checks in this study provides a basis from which to gauge the interpretability of the unexpected findings and to evaluate explanations as to why the experimental hypotheses were not supported. The successful manipulation of the independent variables suggests that the failure to confirm the hypotheses was not due to a failure to operationalize the independent variables. Rather, the findings appears to be a legitimate, albeit unexpected, outcome of the interventions that were performed.

Although this study did not attempt to test specific propositions of theories of preventive health behavior, the results of this research may have implications for theory development. The current theoretical frameworks used to understand health behavior (i.e., protection motivation theory, Rogers, 1975, 1983; health belief model, Rosenstock, 1966, 1974) are predicated on the assumption that the primary motivation underlying preventive health behaviors is the avoidance of unpleasant physical consequences associated with not engaging in health-enhancing behavior. The results of the present study, however, indicate that children may be motivated to engage in healthy behaviors for reasons other than health enhancement. In their present forms, the protection motivation theory and the health belief model cannot accommodate the findings of this study; namely, that factors unrelated to health may serve as the primary determinants of, or at least influence, a child's motivation to engage in preventive health behaviors. If these results are replicated, a revision of preventive health theories may be warranted in order to provide a more adequate model with which to predict and explain the preventive health behavior of children.
The applied significance of the study is evident in its demonstration of an effective means of encouraging children to engage in toothbrushing. Moreover, the negative social appeal is both time- and cost-effective. This form of persuasive communication can be administered to large groups of children and exposure to one brief presentation of the message appears to be sufficient for initiating an improvement in plaque scores. These features facilitate the implementation of the intervention through a variety of channels. For example, negative social appeals could readily be incorporated in school-based dental health programs or mass media campaigns directed at the general public.

Future research should be directed toward determining whether negative social appeals are differentially effective depending on the type of health behavior targeted and the age of the recipients. Many of the consequences associated with toothbrushing readily lend themselves to the use of social appeals, whereas other behaviors targeted by prevention programs may be less suitable for this type of approach (e.g., injury prevention). Also, children may not be responsive to social appeals in the early school years, due to their relative lack of sophistication regarding social issues during this developmental period. Finally, it would be valuable to focus on techniques for promoting the maintenance of preventive health behaviors that have been initiated in response to social appeals. Possibly, “booster” presentations of the messages would be sufficient for maintaining the behavior.

The results of the present study suggest that appeals to positive social values and traditional health-threat communications have little influence on children’s decision-making regarding dental health. However, negative social messages appear to be a promising technique for motivating children to adopt health-enhancing behaviors. Future research in this area will provide valuable information to be used in formulating more effective preventive health programs for children.

REFERENCES


