

Changes in maternal attitudes toward baby bottle tooth decay

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Abstract

Several studies have shown that a significant number of parents whose children have baby bottle tooth decay (BBTD) admit prior knowledge regarding the harmful effects of putting their children to bed with a bottle. The Elaboration Likelihood Model of Persuasion (ELM) offers a theoretical framework for better understanding why knowledge and attitude are often not predictive of behavior. The goal of this study was to use the ELM to analyze the manner in which information about BBTD is evaluated. One hundred twenty low-income women (either pregnant or with a child younger than 7 months of age) at a WIC clinic were randomly assigned to three groups: 1) 5-min audiotaped persuasive message about BBTD; 2) same audiotaped message with overheard audience response affirming the message; and 3) no intervention control group. Knowledge and attitudes about BBTD were measured before and after the experimental intervention. Participants hearing the audiotaped message also were asked to rate the expertise of the messenger and the quality of the message. Both groups hearing a taped message about BBTD showed a significant positive change in attitude and knowledge when compared with the control group ($P < 0.05$). No significant difference was found between the attitude and knowledge of those who heard an audiotaped message accompanied by an audience response compared with those who heard the audiotaped message alone. No significant difference between the ratings of message quality or messenger expertise by group was found. It was concluded that the participants in this study processed the BBTD message primarily through the central route, that is, by careful evaluation of the issue-relevant information contained in the persuasive message. (*Pediatr Dent* 19:56-60, 1997)

One of the earliest and most destructive forms of decay to affect the primary dentition is baby bottle tooth decay (BBTD). BBTD (also called nursing bottle caries) refers to dental decay caused by a child sleeping with a bottle containing liquids with either natural or added carbohydrates. The causes of this condition are well known¹⁻⁵, and methods for prevention and treatment have been well documented.^{1,6-}

¹⁰ Despite this body of knowledge, BBTD continues to be a major source of dental disease in children.

The dental profession has made efforts to inform the public about BBTD, but these efforts have not translated into a substantial decrease in the incidence. Could it be that information about BBTD is not reaching populations at risk for the disease? In an investigation of the characteristics and backgrounds of children with BBTD, Johnsen found that 60% of parents whose children had BBTD denied having any prior knowledge of the harmful effects of putting their children to bed with a bottle.¹¹ Of critical interest is the fact that the remaining 40% of parents in this study admitted having prior knowledge about BBTD, but put their children to bed with a bottle anyway. Merely having knowledge about the harmful effects of sleeping with a bottle was not enough to persuade this group of parents to prevent the harmful behavior.

Similar findings have been reported in other studies.¹²⁻¹⁴ Prior knowledge of the harm of putting a child to bed with a bottle was found in a majority of cases examined by Benitez et al.¹² Twelve of the 17 caretakers of children with early clinical signs of BBTD in this study acknowledged a prior awareness of the cariogenicity of sleeping with a bottle. Further evidence of prior knowledge among parents whose children have BBTD was found in a study of 125 children of migrant farmworkers by Weinstein et al.¹³ Two-thirds of parents whose children had BBTD in this study remembered receiving previous information about the risk of putting a baby to bed with a bottle. More than half of these parents acknowledged being told about BBTD before their child was born. In another recent survey, Leggott et al. found that 74% of mothers whose children had BBTD acknowledged that they had previously received information that sleeping with a bottle was "bad for the teeth".¹⁴ The authors commented that the parents being surveyed for this study were well educated and dentally aware, but disregarded information regarding bottle use.

From a public health point of view, it is disturbing that having prior knowledge about the potential harm of putting a child to bed with a bottle does not prevent

this risk-related behavior given that a primary strategy commonly employed by dentists for preventing or intercepting BBTB has been education of the parent. In order for an educational message about BBTB to be effective, it must successfully persuade the listener to avoid behaviors that could cause the disease.

Cacioppo and Petty have developed a model of persuasion that might lead to a better understanding of why information that parents receive about BBTB is often not persuasive.¹⁵ The Elaboration Likelihood Model (ELM) is based on the belief that there are two relatively distinct routes of persuasion: the central route and the peripheral route.¹⁶ According to the ELM, persuasion through the central route comes about as a result of careful evaluation of the content of the messages being presented. If a person is unable or unwilling to concentrate on issue-relevant arguments, and is instead influenced by peripheral cues (e.g., speaker credibility, response of other listeners, or other factors having little or nothing to do with message content), then the route of persuasion is said to be peripheral.

A knowledge of the route of information processing in which a person is engaging is of interest because of the effects that the route has on attitude development. Attitudes formed through a central route are known to be more persistent and less vulnerable to counterpersuasion, than those formed by the peripheral route.^{15, 17-18} Moreover, attitudes formed by the central route are more likely to be predictive of behavior.¹⁵

Several factors have been shown to interfere with a person's ability to process information through the central route, including the level of stress or anxiety that a person is experiencing while listening to a persuasive message. This is relevant given that dental environments or dental messages are capable of evoking patient/parent anxiety. The purpose of this study was to determine if women hearing a persuasive message about BBTB would process the message primarily through the central or the peripheral route. If it could be demonstrated that mothers presented with a persuasive message about BBTB processed the message primarily through the peripheral route (i.e., paying more attention to peripheral cues than to the message content), then this might help explain why knowledge about BBTB often does not translate into change in behavior.

One method of determining the primary route of persuasion is to deliver a persuasive message accompanied by a peripheral cue. If a listener's attitude is affected by the peripheral cue, rather than by the message content, the primary route of processing can be said to be peripheral.¹⁵ The peripheral cue used in this study was "overheard audience response". The overheard response of other people hearing the same message has been shown to affect attitude development (i.e., cheering and clapping following a speech may influence attitudes regarding the quality of the message and the expertise of the speaker).¹⁹⁻²⁴ An overheard audience reaction would be expected to influence atti-

tude development especially in people who are not engaged in issue-relevant thinking.

Methods and materials

The subjects for this study were 120 low-income women (either pregnant or with a child younger than 7 months of age) who were enrolled in the WIC program (Women, Infants and Children) in eastern Iowa. An additional prerequisite for participation in the study included the ability to complete a consent form and accompanying request for demographic information without assistance. This requirement assured a minimal level of literacy and familiarity with the English language among study participants. After completing the consent form, study participants were asked to complete a questionnaire measuring their current level of anxiety (STAI Form Y-1)²⁵ and a preintervention attitudinal survey about BBTB that was designed to measure their prevailing attitude and level of knowledge on the subject. The attitudinal survey had previously been pilot tested with 15 low-income mothers in a private practice setting who were subsequently excluded from participating in the main study. The attitudinal survey consisted of 17 statements. Participants were asked to rate their agreement with each statement by placing a mark on a visual analog scale consisting of a 100-mm line extending between bipolar responses. The responses anchoring opposite ends of these statements were "very strongly agree" and "very strongly disagree". Eleven of the questionnaire items were designed to measure attitude, and six of the questionnaire items were designed to measure knowledge. Attitude measures included ratings of the importance of primary teeth, perceptions about the seriousness of BBTB, the perceived ease of preventing BBTB, the perceived ease of treating BBTB, and the advisability of putting a baby to bed with a bottle. Knowledge measures included statements about the subject's familiarity with the disease, the causes of BBTB, and the association between sleeping with a bottle and negative oral health outcomes.

Composite mean scores were obtained for each subject by adding the scores, and dividing by the total number of items. Separate computations were done in this manner to calculate a composite score that measured attitude, and a composite score that measured knowledge.

After the preintervention survey, the subjects completed their scheduled WIC visit. These visits were approximately 60 min in length (total time in clinic), and included WIC certification and an educational component tailored to the needs of the client, but not covering oral health. Following completion of the WIC visit, subjects were randomly assigned to one of three experimental groups.

The first experimental group ("Message + Audience") listened individually to an audiotaped message about BBTB lasting approximately 5 min. The message was persuasive in nature and included a description of the importance of primary teeth and the seriousness of

BBTD. A series of strong arguments for preventing BBTD was given, including information about the cosmetic problems associated with this disease, the financial cost and difficulty of restoring teeth affected by BBTD, the potential for pain and infection in children with BBTD, the possibility of extraction as the only treatment option, and the consequences of early loss of primary teeth. The taped message also included reassurance that BBTD is preventable. An overheard audience response was also present on the tape. The audience response was enthusiastic and positive in nature (i.e., "How interesting", "I didn't know that", "Thank goodness"). Applause was present where appropriate, and empathetic verbal exclamations about the seriousness of BBTD were overheard (i.e., "Oh, that's awful", "That sounds terrible", "Poor little kids"). In all, there were 23 separate times during the persuasive message when an audience response was heard.

Subjects assigned to the second experimental group ("Message Alone") listened individually to an audiotaped message about BBTD identical in content to that of the "Message + Audience" group, but without the overheard audience response described above. The third group was a control group that did not hear the audiotaped message.

Following the experimental intervention, both experimental groups and the control group were asked to individually complete a postintervention attitudinal survey identical to the preintervention attitudinal and knowledge survey. The time elapsed between pre- and post- surveys was approximately 1 hr for all groups (the time elapsed for subjects in the control group was 5 min less since they did not hear an audiotaped message). In an attempt to quantify the change in attitude and knowledge among subjects following the experimental intervention, the pre-intervention knowledge and attitude scores were subtracted from the post-intervention knowledge and attitude scores to create a "change in knowledge" and a "change in attitude" score.

The subjects from both experimental groups ("Message + Audience" and "Message Alone") were also asked to respond to six questions designed to measure their perception of the message quality. The response format for each question was a visual analog scale with a 100-mm line extending between bipolar responses. Questions were designed to measure how persuasive the message was, how hard the listener was concentrating on the message, the perceived expertise of the speaker, and the perceived strengths of the arguments contained in the message. The mean of the sum of these items was tabulated to create a "message quality score". Since the control group did not hear a tape-recorded message, these additional six statements were not presented to them.

Results

Ages of the participants ranged from 15 to 37 years old with a mean age of 24.4 years (SD = 4.9). Educational levels of study participants ranged from \leq 8th grade to >2 years of college with a mean educational level of 12th grade. Anxiety scores for the participants in this study ranged from a low of 20 ($N = 8$) to a high of 64 ($N = 1$). The potential range for scores using the STAI is 20–90. The mean anxiety score for all subjects was 34.2 (SD = 9.5). The median score was 32.5, which is lower than the published norm of 36 for this age group (standard scores for normal female adults ages 19–39).²⁵

The main hypothesis of this study was that in response to an audiotaped persuasive message about BBTD, the primary route of processing for participants in the study would be the peripheral route. In order to test this central hypothesis, several supporting hypotheses were developed and tested. It was hypothesized that study participants hearing an audiotaped persuasive message about BBTD accompanied by an overheard positive audience response would demonstrate a significantly larger change in attitude score than would subjects hearing only the persuasive message.

To test this hypothesis, analysis of covariance was used with change in attitude as the dependent variable (see Table 1 for unadjusted mean attitude scores). The covariate used was educational level (educational level has been shown to affect bottle feeding behavior).²⁶ The factors were anxiety level (low, medium, high) and experimental group. A significant main effect was

TABLE 1. MEAN ATTITUDE SCORES BY GROUP

Variable	Message Plus Audience	Message Alone	Control Group
Preattitude score	73.7 (SD = 13.8)	75.8 (SD = 14.3)	73.57 (SD = 10.5)
Postattitude score	83.9 (SD = 12.8)	85.3 (SD = 12.0)	77.20 (SD = 11.6)
Change in attitude	10.38 (SD = 9.8)	9.68 (SD = 11.1)	3.63 (SD = 5.7)

found for the experimental group ($F_{2,106} = 7.38, P < 0.01$). The control group was found to be significantly different than both experimental group "Message + Audience" ($P < 0.01$) and experimental group "Message Alone" ($P < 0.01$). Both experimental groups had a significantly larger increase in their attitude score than did the control group. There was no significant difference in attitude change, however, between experimental groups "Message + Audience" and "Message Alone".

It was also hypothesized that there would be a significant relationship between a subject's anxiety level and the change in their knowledge about BBTD after listening to a taped persuasive message. It was anticipated that high preintervention levels of anxiety would interfere with knowledge acquisition.

To test this hypothesis, analysis of covariance was used with change in knowledge as the dependent vari-

able (see Table 2 for unadjusted mean knowledge scores). The covariate used was educational level. The factors were anxiety level (low, medium, high) and experimental group. A significant main effect was found for experimental group on change in knowledge level ($F_{2,106} = 10.28, P < 0.01$). The control group was significantly different than both experimental group "Message + Audience" and experimental group "Message Alone". Both experimental groups had a significantly larger increase in their knowledge score than did the control group. There was no significant difference, however, between groups "Message + Audience" and "Message Alone", and there was no significant effect for anxiety or for the interaction of group by anxiety.

TABLE 2. MEAN KNOWLEDGE SCORES BY GROUP

Variable	Message Plus Audience	Message Alone	Control Group
Preattitude score	76.3 (SD = 13.5)	77.70 (SD = 10.8)	78.80 (SD = 9.7)
Postattitude score	85.39 (SD = 15.9)	89.14 (SD = 9.8)	78.25 (SD = 13.1)
Change in attitude	9.52 (SD = 13.4)	11.69 (SD = 11.2)	-0.55 (SD = 8.2)

A final hypothesis of this study was that study participants hearing an audiotaped persuasive message about BBTD accompanied by an overheard positive audience response would rate the message quality significantly higher than would subjects hearing only the persuasive message.

To test this hypothesis, analysis of covariance was used with rating of message quality as the dependent variable. The covariate used was educational level. The factors were anxiety level (low, medium, high) and experimental group ("Message + Audience" and "Message Alone"). A significant main effect was found for anxiety ($F_{2,69} = 3.15, P < 0.05$). Subjects in the high anxiety category rated the message quality significantly lower than did subjects with low anxiety scores ($P = 0.02$). There was no significant difference between either high and medium anxiety groups, or between medium and low anxiety groups for message quality. There was no significant main effect by experimental group, or for the interaction of experimental group by anxiety.

Discussion

The purpose of this study was to determine whether a sample of low-income women hearing a persuasive message about BBTD would process the message primarily through the central or the peripheral route. Both experimental groups hearing a persuasive message experienced a similar change in both knowledge and attitude. The change in knowledge and attitude for both experimental groups was higher than for the control group. This finding suggests that the subjects in this study processed the BBTD message primarily through the central route, that is, by paying attention to the content of the persuasive message. This conclusion is fur-

ther strengthened by the finding that there was no significant difference in the rating of message quality by experimental condition.

Had the primary route of processing been through the peripheral route (as hypothesized), subjects hearing the persuasive message together with the peripheral cue (overheard audience response) would have been expected to demonstrate a larger increase in attitude score than individuals who heard the message alone. It was also predicted that individuals exposed to the peripheral cue of audience response would rate the message quality higher than would the group who heard the message alone. This was not the case.

There were elements of the experimental intervention that may have predisposed both experimental groups to process information centrally. The persuasive message presented to both experimental groups in this study was patterned after a message that might be realistically presented in a "real-life" clinical setting: the person delivering the message was an "expert", multiple arguments were presented,

only strong arguments were included, and reassuring information that the disease could be prevented was offered. All of these characteristics about the persuasive message are factors known to increase the likelihood of issue-relevant thinking, or central processing. In addition, the message presented was likely of high relevance to all participants. This is due to the fact that all subjects in the study were either pregnant, or had a child younger than age 7 months. High issue involvement has previously been shown to elicit processing through the central route.¹⁵

Subjects in this study had lower anxiety scores than the norm for this age group, which would further favor central processing. That is, when anxiety levels are very high, an individual's ability to pay close attention to a message is limited. Since this group of subjects had anxiety levels below the normative mean established for this age group, their ability to pay close attention to the message may not have been limited in the same way a more anxious group would have been. Paying close attention to a message is a central requirement if attitude change is to result in behavior change.

While the changes in knowledge and attitude exhibited by the two experimental groups in this study are consistent with central processing of the persuasive message, the changes reported here reflect short-term changes only. It is not clear at this time whether the persuasive message presented will lead to appropriate feeding behavior. If the conclusions of the current study are valid, and study participants processed the BBTD message through the central route, it would be expected that these participants would go on to adopt appropriate feeding behaviors for their children, (especially in comparison with the control group).

The imperfect link between knowledge and behavior is not unique to BBTD. In many areas of health-related behavior there are examples of knowledge not being predictive of behavior. Many people who know the risks of smoking continue to do so, while others who know the risks associated with being overweight fail to modify their diet or exercise. The challenge of the health profession remains to develop persuasive strategies for increasing the likelihood that knowledge will lead to appropriate behavior. The Elaboration Likelihood Model of Persuasion provides one theoretical framework for examining this complicated relationship.

Conclusions

1. Participants hearing an audiotaped message about BBTD showed a significant positive change in attitude and knowledge when compared with a control group.
2. No significant difference was found between the attitude and knowledge of those who heard an audiotaped message accompanied by an audience response when compared with those who heard the audiotaped message alone.
3. No significant difference was found between the ratings of message quality or messenger expertise by group.
4. Participants in this study processed the BBTD message primarily through the central route, that is, by evaluation of the issue-relevant information contained in the persuasive message.

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