Evaluation of smoking prevention television messages based on the elaboration likelihood model

Brian S. Flynn1*, John K. Worden1, Janice Yanushka Bunn2, Scott W. Connolly1 and Anne L. Dorwaldt 1

1Office of Health Promotion Research, College of Medicine, University of Vermont, One South Prospect Street, Burlington, VT 05401, USA and 2Department of Medical Biostatistics, University of Vermont, Burlington VT, 05401, USA

*Correspondence to: B. S. Flynn, Office of Health Promotion Research, College of Medicine, University of Vermont, One South Prospect Street, Room 4425, Burlington, VT 05401. E-mail: brian.flynn@uvm.edu

Received on November 15, 2010; accepted on July 21, 2011

Abstract

Progress in reducing youth smoking may depend on developing improved methods to communicate with higher risk youth. This study explored the potential of smoking prevention messages based on the Elaboration Likelihood Model (ELM) to address these needs. Structured evaluations of 12 smoking prevention messages based on three strategies derived from the ELM were conducted in classroom settings among a diverse sample of non-smoking middle school students in three states (n = 1771). Students categorized as likely to have higher involvement in a decision to initiate cigarette smoking reported relatively high ratings on a cognitive processing indicator for messages focused on factual arguments about negative consequences of smoking than for messages with fewer or no direct arguments. Message appeal ratings did not show greater preference for this message type among higher involved versus lower involved students. Ratings from students reporting lower academic achievement suggested difficulty processing factual information presented in these messages. The ELM may provide a useful strategy for reaching adolescents at risk for smoking initiation, but particular attention should be focused on lower academic achievers to ensure that messages are appropriate for them. This approach should be explored further before similar strategies could be recommended for large-scale implementation.

Introduction

Mass media interventions are among the strategies recognized as effective for achieving reductions in youth smoking prevalence [1, 2]. Substantial proportions of the declines in youth smoking prevalence may have been achieved through the effects of media campaigns on higher risk youths [3]. Slower declines in recent years [4] might be explained by reduced resources, among other factors, but it is possible that campaigns aimed at broad adolescent audiences are not addressing the needs of youth at higher risk for smoking [5, 6]. Although multiple strategies have contributed to youth smoking reductions in the past two decades [7–13], the impact of once effective strategies may diminish over time [14]. These trends suggested a need for testing new approaches targeted to higher risk youth.

The Elaboration Likelihood Model (ELM) is a theoretical approach that may offer guidance on development of messages that meet these needs [15–17]. Since individuals are exposed to vast amounts of information, it is only possible to carefully process the most relevant. The ELM postulates an elaboration likelihood continuum whereby messages with high personal importance are scrutinized, processed and...
elaborated with care, and others may be processed with less effort using heuristics or issue-irrelevant message cues.

The ELM suggests that if an individual with motivation and ability to process information concerning an important issue is exposed to a message perceived to contain relevant arguments, that person is more likely to invest in effortful ‘central processing’ of the arguments with cognitive elaboration of the content to advance their decision making. As a result of central processing and elaboration of message arguments such an individual is more likely to experience stable changes in cognitive structures relevant to their decision.

In contrast, the ELM suggests that if an individual who is not motivated (or able) to carefully process and elaborate arguments is exposed to similar messages, that person is likely to utilize a less effortful or peripheral method of processing the information, such as heuristics or social cues, to assess message content. As a result of lower investment in processing arguments, any cognitive structure change experienced by this individual following exposure to the message is likely to be less stable than changes resulting from central processing.

These general concepts were applied to testing a media message strategy that might be effective for young people at risk for smoking initiation. Following the ELM approach, young people in a life situation where they are faced with a decision about cigarette smoking may be motivated to process and elaborate messages containing strong factual arguments for not smoking. Young people at lower risk for smoking initiation may be less motivated to process and elaborate these factual arguments. These considerations suggested that higher risk youth may prefer smoking prevention messages that are rich in factual arguments and lower risk youth may be less interested in this type of message [18, 19]. Conversely, lower risk youth may be more interested in prevention arguments embedded in messages with generically attractive hedonic features and the higher risk group may be less interested in this message type.

The ELM framework was applied in a message testing context where non-smoking adolescents were exposed to a planned mix of smoking prevention messages and asked to rate each message on multiple criteria to assess achievement of short-term objectives. Outcomes were focused on immediate audience reactions to multiple test messages to assess differences in responses to differing types of messages by adolescents who may be more or less involved in a smoking initiation decision.

The main hypothesis was that messages emphasizing strong factual arguments about negative consequences of smoking would be rated more positively by higher risk youth than messages emphasizing peripheral cues. A secondary hypothesis was that messages emphasizing peripheral cues about smoking prevention would be rated more positively by lower risk adolescents. The study also analyzed responses to messages by other youth subgroups to explore potential differences due to gender, race/ethnicity and academic achievement.

Method

A diverse group of non-smoking Grade 7–8 students from public schools in three states evaluated three types of smoking prevention messages based on strategies suggested by the ELM. Students provided individual evaluations of message qualities in a single classroom period. Participation of 1400 students in 60 classrooms was planned to provide 90% power to detect a difference of 10% in message ratings between groups. Differences in perceived qualities of the three message types were analyzed by an indicator of involvement in a cigarette smoking initiation decision and by other group characteristics. The individual was the unit of analysis with an adjustment effect for clustered sampling. Study procedures were approved by the institutional review board at the University of Vermont.

Setting and participants

We collaborated with school districts in three states selected to increase the generalizability of results and provide a sample of adequate size and diversity with representation of lower income households, which would be more likely to include youth exposed to
a cigarette smoking environment. Free lunch program eligibility (a family income indicator) was 65% for four participating Boston-area schools, 58% for three Miami schools and 56% for two North Carolina schools. One district required active parental consent, while others requested use of passive parental consent.

**Key concepts**

Several concepts based on the ELM were operationalized. We defined a message type hypothesized to appeal to youth with greater motivation to process factual arguments as those that contained explicit factual arguments for avoiding negative consequences of smoking such as effects on health, tobacco addiction and monetary costs; this message type was labeled Argument Rich (AR). We defined messages hypothesized to appeal to those with lower motivation to process explicit factual arguments as containing no explicit negative consequence arguments, focusing instead on a variety of peers modeling non-explicit arguments such as social norms favoring non-smoking or successful refusal of cigarette offers; this message type was labeled Argument Light (AL).

We used an indirect measure of motivation to categorize students as more or less likely to choose a central processing strategy to evaluate arguments against smoking. Students who were non-smokers but reported multiple smokers in their immediate social environment have been shown to be at high risk for smoking initiation during adolescence [3]. We reasoned that students in this type of environment had higher motivation to carefully process arguments against smoking than peers not living in such an environment. We also reasoned that ability to process arguments would not be a limiting factor in this situation since the messages were originally developed for this age group, and testing procedures minimized distractions. This method categorized students as likely to have Higher Involvement (HI) or Lower Involvement (LI) in a smoking initiation decision.

**Test messages**

Message type criteria described above were used to select test messages from a pool of 30 smoking prevention television messages developed in 2002–05 for youth media campaigns [14]; these messages were developed based on Social Cognitive Theory, an approach shown to be effective in an earlier study [11]. One message meeting the AR criteria and six messages meeting AL criteria were identified through systematic review. We also identified three messages that blended elements of these message types. We produced and pilot tested two additional messages based on AR criteria. The resulting message set included three AR, three Blended and six AL (see Appendix 1).

**Measurement**

All measures were self-reported by students in a classroom setting using a structured form.

**Smoking status**

Current smokers were identified by an affirmative answer to the question ‘Have you smoked a cigarette in the past 30 days?’ [4].

**Involvement in smoking decision**

Those reporting two or more smokers among household members or with two or more friends who smoked cigarettes were categorized as having HI in a cigarette smoking initiation decision; all others were classified as having LI.

**Central processing response indicators**

Two characteristics were assessed to indicate student perceptions of the extent to which they used a central processing strategy in response to a message. The first indicator reflected perceptions that a message contained factual arguments promoting avoidance of cigarette smoking; participants were asked to indicate to what extent a message ‘Has good facts’. The second reflected the extent to which a message had the desired effect of stimulating cognitive processing of message arguments; participants were asked to indicate to what extent a message ‘Makes me think’. Participants rated these characteristics on a 0–100 scale anchored by ‘not at all’ and ‘a lot’ at the extremes [14, 20, 21].
Peripheral processing response indicators
Two characteristics were assessed to indicate student perceptions concerning the extent to which they used a peripheral processing strategy in response to a message. These indicators rated the extent to which a message ‘Looks cool’ and is ‘Fun to watch’. Responses were provided on the same 0–100 scale.

Message appeal
Message appeal was used as a global assessment of attitude toward the message. This variable has been found to be associated with the persuasiveness of commercial advertising and has been identified by marketing researchers to be an important mediator of message effectiveness [22–25]. Participants indicated ‘How much I liked this ad’ on the 0–100 scale.

Student characteristics
Race/ethnicity was measured by a single item that offered six categories led by the question ‘Which of the following best describes you?’ Participants were allowed to choose more than one category. Academic achievement was measured by a single item asking ‘How well do you do in school?’ with structured academic grade responses.

Message testing procedure
Tests were conducted in schools during regular class periods under research staff leadership. After reviewing purpose, procedures and assent with consented students, participants completed an anonymous form with descriptive information on the back of the scoring sheet. The research team then showed each of the 12 messages, followed by a 1 min pause while participants completed assessments of that message on the scoring sheet without discussion. Multiple sequences of the 12 messages were rotated systematically across classrooms.

Statistical analysis
Responses from students who reported smoking in the past 30 days were excluded. Ratings for the AR, AL and Blended message types were computed as the mean of ratings of all messages of that type. Hypothesis tests regarding message appeal ratings and other evaluative indicators were based on repeated measures analysis of variance, with message type as the repeating factor, student characteristics as grouping factors and a fixed effect for metropolitan area. The unit of analysis was the individual with an additional effect to account for clustered sampling within metropolitan area. Student characteristics included involvement, gender, race/ethnicity and academic achievement. The possibility of differences in message type ratings for different sub-groups was explored by including an interaction between student characteristics and message type. Significant interaction effects were followed by post hoc comparisons, with a Bonferroni correction to preserve the overall alpha at 0.05. Analyses were performed using SAS, version 9.1 [26].

Results
Participation rates were high in all schools; 87% of students in active consent classrooms and 93% in passive consent classrooms completed the evaluations. Of 1897 participants, 96 were excluded because they reported smoking in the past 30 days and 30 were excluded because of incomplete or invalid responses. Among the included 1771 non-smoking students, 40.3% were categorized as at HI and 59.7% at LI in making a smoking initiation decision; 80.5% of the HI group had two or more smoking peers. The sample included similar proportions of females (52.3%) and males. Reported race/ethnicity showed that 31.6% were Hispanic, 23.8% African American and 44.6% Caucasian or other. The distribution of reported school grades showed that 27.4% received mostly A, 45.1% mostly B and 27.1% mostly C or D grades.

Message evaluation by the overall sample
The initial set of repeated measures analyses was performed without a grouping factor to obtain overall ratings by message type. For the central processing indicator Has good facts, participants gave highest ratings to the AR messages, lower ratings to the Blended messages and lowest ratings to the
AL messages (Table I). Similar results were found for the central processing indicator Makes me think. These ratings were consistent with expectations based on the ELM.

For the peripheral processing indicator Looks cool, students gave highest ratings to Blended messages, followed by AR messages and lowest ratings to AL messages. A similar pattern was found for the indicator Fun to watch. These results were partially consistent with expectations from the ELM. For the message appeal measure ‘How much I liked this ad’, ratings favored the AR and Blended message groups equivalently, with lower ratings for AL messages. In summary, AR messages received highest ratings on the central processing indicators; Blended messages received highest ratings on peripheral processing indicators and the AR and Blended messages were rated somewhat more positively than AL messages for message appeal.

**Message evaluation by decision involvement**

Message ratings were then analyzed using the involvement indicator as a grouping factor. No differences between the HI and LI groups were found for the central processing indicator Has good facts, as shown by the non-significant group term in Table II.

For the central processing indicator Makes me think, HI students rated messages generally lower than other students, as shown by the significant group term. However, this difference also varied by message type, as shown by the Group × type interaction. The interaction indicated that HI student ratings were equivalent to those given by LI students for AR messages but were relatively lower for other message types.

HI students generally gave lower ratings than LI students for the peripheral processing indicators and for the message appeal measure. Appeal ratings trended toward a smaller gap between involvement groups for AR than for other message types, but the interaction was not significant. In summary, HI students generally gave lower ratings to all message types on all evaluative measures; however, they gave ratings equivalent to those from other students for AR messages on the central processing indicator Makes me think.

**Message evaluation by gender**

Message ratings also were analyzed with gender as the grouping factor (Table III). For the central processing indicator Has good facts, the interaction term indicated that female student ratings were relatively higher for Blended messages but equivalent to male ratings for other message types. For the Makes me think indicator, females generally gave higher ratings. Females gave relatively higher ratings to AL messages on the peripheral processing indicators and the message appeal measure.

<table>
<thead>
<tr>
<th>Evaluation measures</th>
<th>Message types</th>
<th>AR, mean (SD)</th>
<th>Blended, mean (SD)</th>
<th>AL, mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central processing indicators</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has good facts</td>
<td>80.54 (20.88)(^a)</td>
<td>47.44 (27.49)(^b)</td>
<td>31.83 (24.40)(^c)</td>
<td></td>
</tr>
<tr>
<td>Makes me think</td>
<td>72.15 (25.80)(^a)</td>
<td>53.59 (27.53)(^b)</td>
<td>43.52 (25.36)(^c)</td>
<td></td>
</tr>
<tr>
<td>Peripheral processing indicators</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Looks cool</td>
<td>52.99 (26.03)(^b)</td>
<td>54.13 (25.80)(^a)</td>
<td>49.38 (23.74)(^c)</td>
<td></td>
</tr>
<tr>
<td>Fun to watch</td>
<td>51.13 (26.06)(^b)</td>
<td>53.79 (26.86)(^a)</td>
<td>51.51 (24.51)(^b)</td>
<td></td>
</tr>
<tr>
<td>Message appeal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How much liked</td>
<td>63.70 (24.66)(^a)</td>
<td>63.70 (24.23)(^a)</td>
<td>57.34 (22.47)(^b)</td>
<td></td>
</tr>
</tbody>
</table>

For each criterion, differently labeled mean ratings across message types (a, b, c) differed significantly based on tests with Bonferroni correction for multiple comparisons. Similarly labeled ratings did not differ significantly. Labels are alphabetical by size of mean ratings.
Evaluation of smoking prevention television messages

Table II. Lower (n = 1058) and higher (n = 713) decision involvement student evaluations for AR, Blended, and AL smoking prevention messages

<table>
<thead>
<tr>
<th>Evaluation measures</th>
<th>Involvement categories</th>
<th>Message types</th>
<th>AR, mean (SD)</th>
<th>Blended, mean (SD)</th>
<th>AL, mean (SD)</th>
<th>Type</th>
<th>Group</th>
<th>Group × type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central processing indicators</td>
<td>Has good facts</td>
<td>Lower (LI)</td>
<td>81.82 (20.21)</td>
<td>48.78 (27.74)</td>
<td>33.37 (25.31)</td>
<td>&lt;0.001</td>
<td>0.256</td>
<td>n.s.</td>
</tr>
<tr>
<td></td>
<td>Higher (HI)</td>
<td>79.89 (20.75)</td>
<td>46.33 (26.93)</td>
<td>30.34 (23.05)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Makes me think</td>
<td>Lower (LI)</td>
<td>74.31 (24.64)</td>
<td>56.49 (26.69)</td>
<td>46.65 (25.18)</td>
<td>&lt;0.001</td>
<td>0.003</td>
<td>0.026</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Higher (HI)</td>
<td>71.04 (25.70)</td>
<td>51.22 (27.58)</td>
<td>40.69 (24.75)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peripheral processing indicators</td>
<td>Looks cool</td>
<td>Lower (LI)</td>
<td>55.06 (25.38)</td>
<td>56.49 (25.59)</td>
<td>51.94 (23.67)</td>
<td>&lt;0.001</td>
<td>0.071</td>
<td>n.s.</td>
</tr>
<tr>
<td></td>
<td>Higher (HI)</td>
<td>51.42 (26.33)</td>
<td>52.61 (25.18)</td>
<td>47.16 (23.29)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fun to watch</td>
<td>Lower (LI)</td>
<td>53.24 (25.25)</td>
<td>54.62 (25.98)</td>
<td>54.26 (23.79)</td>
<td>&lt;0.001</td>
<td>0.023</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Higher (HI)</td>
<td>49.64 (26.28)</td>
<td>51.84 (26.96)</td>
<td>49.09 (24.41)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Message appeal</td>
<td>Liked</td>
<td>Lower (LI)</td>
<td>65.68 (23.77)</td>
<td>66.33 (23.24)</td>
<td>59.97 (21.89)</td>
<td>&lt;0.001</td>
<td>0.008</td>
<td>n.s.</td>
</tr>
<tr>
<td></td>
<td>Higher (HI)</td>
<td>62.30 (25.05)</td>
<td>61.50 (24.41)</td>
<td>55.03 (22.41)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When a significant interaction was found, mean ratings across risk groups for each message type and within each criterion were labeled differently if the means differed significantly (a, b) based on tests with Bonferroni correction for multiple comparisons. Similarly labeled mean ratings for risk groups did not differ significantly (a, a).

Table III. Female (n = 926) and male (n = 845) student evaluations of AR, Blended, and AL smoking prevention messages

<table>
<thead>
<tr>
<th>Evaluation measures</th>
<th>Gender</th>
<th>Message types</th>
<th>AR, mean (SD)</th>
<th>Blended, mean (SD)</th>
<th>AL, mean (SD)</th>
<th>Type</th>
<th>Group</th>
<th>Group × type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central processing indicators</td>
<td>Has good facts</td>
<td>Females</td>
<td>81.58 (20.75)</td>
<td>50.35 (27.10)</td>
<td>33.44 (24.57)</td>
<td>&lt;0.001</td>
<td>0.005</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Males</td>
<td>80.45 (20.10)</td>
<td>45.17 (27.56)</td>
<td>30.73 (24.28)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Makes me think</td>
<td>Females</td>
<td>75.54 (23.83)</td>
<td>57.32 (26.85)</td>
<td>46.95 (25.43)</td>
<td>&lt;0.001</td>
<td>0.001</td>
<td>n.s.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Males</td>
<td>70.19 (26.19)</td>
<td>51.13 (27.16)</td>
<td>41.28 (24.56)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peripheral processing indicators</td>
<td>Looks cool</td>
<td>Females</td>
<td>54.05 (26.18)</td>
<td>55.33 (26.08)</td>
<td>52.12 (23.90)</td>
<td>&lt;0.001</td>
<td>0.216</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Males</td>
<td>53.10 (25.43)</td>
<td>54.49 (24.84)</td>
<td>47.72 (23.12)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fun to watch</td>
<td>Females</td>
<td>53.44 (25.73)</td>
<td>55.97 (26.16)</td>
<td>54.90 (24.06)</td>
<td>&lt;0.001</td>
<td>0.001</td>
<td>0.013</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Males</td>
<td>49.98 (25.62)</td>
<td>53.05 (26.73)</td>
<td>49.19 (23.95)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Message appeal</td>
<td>Liked</td>
<td>Females</td>
<td>65.94 (24.01)</td>
<td>66.03 (23.20)</td>
<td>61.08 (21.64)</td>
<td>&lt;0.001</td>
<td>0.001</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Males</td>
<td>62.54 (24.60)</td>
<td>62.58 (24.39)</td>
<td>54.58 (22.37)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When a significant interaction was found, mean ratings across gender groups for each message type and within each criterion were labeled differently if the means differed significantly (a, b) based on tests with Bonferroni correction for multiple comparisons. Similarly labeled mean ratings for gender groups did not differ significantly (a, a).

Message evaluation by race/ethnicity

Hispanic and African American students generally gave higher ratings than Caucasian students for the central processing indicator Has good facts (Table IV); Hispanic students gave relatively higher ratings to the AL and Blended messages, but ratings were equivalent across all groups for AR messages. For the Makes me think indicator, Hispanic and African American students generally gave higher ratings. For the peripheral processing indicators, Hispanic
students gave relatively higher ratings to AR messages, but ratings were equivalent across groups for the other message types. Hispanic students generally gave higher ratings for message appeal. Overall, Hispanic students tended to give higher ratings for all measures and message types, followed by African Americans. Hispanic students gave relatively higher ratings to AR messages on peripheral processing indicators, but no other pattern was apparent.

### Message evaluation by academic achievement

For the central processing indicator Has good facts, students reporting ‘C’ or ‘D’ grades gave relatively higher ratings for AL and Blended messages and relatively lower ratings for AR messages (Table V). For the Makes me think indicator, C/D students generally gave lower ratings and relatively lower for AR and Blended messages. These results were contrary to the expected effects of the three message types and contrary to the overall results in Table I. For the peripheral processing indicators Looks cool and Fun to watch and for message appeal, C/D students generally gave lower ratings for all three message types. Overall, C/D students generally gave lower ratings for most message types on most measures.

### Discussion

The ELM suggests that adolescents who are involved with decisions about initiating cigarette smoking will find messages that provide strong factual arguments to be appealing because they supply useful information for active consideration of the pros and cons of cigarette smoking. Results obtained in this study provided some support for this implication of the ELM.

Indicators reflecting message elicitation of central processing among all participants showed that AR messages were notably successful in communicating ‘good facts’ about cigarette smoking compared with
other message types (Table I) and were similarly successful in eliciting reports of active thinking about arguments against smoking. Significant differences were found among message types for indicators reflecting peripheral processing, but these were small differences that favored the AR and Blended messages rather than AL messages.

When student ratings were analyzed with likely involvement in a cigarette smoking initiation decision as a grouping factor, HI students provided lower ratings for all message types on nearly all evaluative measures (Table II), as expected from previous research [6]. The HI part of the early adolescent population, as defined for this study, is likely to have more immediate concerns about cigarette smoking than other early adolescents and may be more likely to challenge the content of smoking prevention messages in general.

In a notable exception to this pattern, HI students gave ratings to AR messages for the Makes me think central processing indicator that were equivalent to those given by other students. This result suggested that the factual arguments made in the AR messages served their intended purpose of eliciting relatively more active cognitive processing of message arguments in the HI group, as suggested by the ELM. However, overall message ratings did not find the hypothesized stronger appeal for the AR messages among HI compared with LI participants.

Similarly, there was no evidence that the AL messages were especially appealing to the LI participants. Analyses focused on peripheral processing indicators showed significant but small differences among message types, inconsistent differences between groups and no significant interactions. The message appeal analysis showed overall lower ratings for the AL messages regardless of group. It appeared that both groups preferred the AR and Blended messages.

Comparison of message ratings for the central processing and peripheral processing indicators provided some support for the internal consistency of results. AR messages were far more successful than other messages in communicating factual arguments

<table>
<thead>
<tr>
<th>Evaluation measures</th>
<th>Message types</th>
<th>Type</th>
<th>Group</th>
<th>Group × type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central processing indicators</td>
<td>Has good facts</td>
<td>A</td>
<td>83.18 (18.58)</td>
<td>Blended, mean (SD)</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>82.86 (18.71)</td>
<td>50.43 (26.81)</td>
<td>33.17 (24.22)</td>
</tr>
<tr>
<td></td>
<td>C/D</td>
<td>76.08 (23.62)</td>
<td>47.89 (28.49)</td>
<td>33.89 (25.74)</td>
</tr>
<tr>
<td></td>
<td>Makes me think</td>
<td>A</td>
<td>74.22 (23.83)</td>
<td>53.29 (27.07)</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>75.30 (23.72)</td>
<td>57.68 (26.07)</td>
<td>46.33 (24.73)</td>
</tr>
<tr>
<td></td>
<td>C/D</td>
<td>67.93 (27.82)</td>
<td>49.92 (28.35)</td>
<td>41.20 (26.29)</td>
</tr>
<tr>
<td>Peripheral processing indicators</td>
<td>Looks cool</td>
<td>A</td>
<td>55.44 (24.63)</td>
<td>54.66 (25.78)</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>55.40 (25.21)</td>
<td>58.41 (23.75)</td>
<td>52.78 (22.52)</td>
</tr>
<tr>
<td></td>
<td>C/D</td>
<td>48.82 (27.39)</td>
<td>50.51 (27.00)</td>
<td>44.64 (24.68)</td>
</tr>
<tr>
<td></td>
<td>Fun to watch</td>
<td>A</td>
<td>52.98 (24.44)</td>
<td>55.58 (26.27)</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>53.66 (25.28)</td>
<td>57.30 (25.35)</td>
<td>54.64 (23.06)</td>
</tr>
<tr>
<td></td>
<td>C/D</td>
<td>47.54 (27.24)</td>
<td>49.07 (27.69)</td>
<td>46.45 (25.37)</td>
</tr>
<tr>
<td>Message appeal</td>
<td>Liked</td>
<td>A</td>
<td>65.76 (23.02)</td>
<td>64.86 (23.57)</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>66.43 (23.21)</td>
<td>67.67 (21.71)</td>
<td>60.66 (20.82)</td>
</tr>
<tr>
<td></td>
<td>C/D</td>
<td>59.38 (26.69)</td>
<td>58.48 (26.26)</td>
<td>52.66 (24.37)</td>
</tr>
</tbody>
</table>

When a significant interaction was found, mean ratings across academic achievement groups for each message type and within each criterion were labeled differently if the means differed significantly (a, b) based on tests with Bonferroni correction for multiple comparisons. Similarly labeled mean ratings for academic achievement groups did not differ significantly (a, a).
against smoking and eliciting reports of active processing of arguments among all participants and notably among HI students (Tables I and II). The peripheral process ratings concerned with entertainment value consistently showed slightly stronger responses to Blended messages, which included substantial representation of entertainment values. Contrast in these results shows that participants were discriminating in their ratings of differing message types and use of the evaluative measures. Although message appeal results supported neither of the main hypotheses, results based on indicators of message impact on cognitive pathways provided modest encouragement for further exploration of the ELM in smoking prevention message design.

Exploratory results using gender as the grouping factor showed that females gave relatively higher scores to AL messages. These results are generally consistent with earlier research, which showed that females were more likely to favor messages with social themes [6]. Analyses using race/ethnicity as a grouping factor showed that Hispanic students generally gave higher ratings, followed by African American students. This result is inconsistent with an earlier study that showed equivalent ratings among major racial/ethnic groups [6]; the relationships between adolescent race/ethnicity and message preferences deserve further exploration. Results based on gender and race/ethnicity, however, did not raise substantial issues regarding ELM and smoking prevention message development.

Analyses using academic achievement as a grouping factor confirmed previous findings that lower achieving students generally gave lower ratings to smoking prevention messages [6]. Lower academic achievers also gave relatively lower ratings to AR messages on the indicators Has good facts and Makes me think suggesting difficulty in identifying and engaging with the negative consequence arguments in these messages. Although the study was designed to focus on motivation-related factors that might influence message processing, ability also may have been a factor for this group as suggested by the ELM [16]. Lower academic achievers are at elevated risk for smoking initiation and should be engaged in message development to ensure that message objectives are achieved among this group, especially if the strategy is built on active cognitive processing.

**Limitations**

Several limitations of the study should be noted. The method used to categorize students who were likely to be involved with a smoking initiation decision cast a wide net. The social environment approach had the advantage of focusing on a large at-risk group that probably included a large proportion of those likely to be involved in making such a decision. But this approach lacked precision from both theoretical and methodological perspectives. It does not directly measure motivation or the alternate construct of current involvement in a decision. Inclusion of students with lower motivation in the high involvement group may have weakened the hypothesized relationships between involvement and message preferences. Direct assessment of motivation to carefully weigh arguments or direct measurement of involvement in a decision could provide a more focused account of these relationships.

The messages used in this test included a combination of previously produced messages, based on social cognitive theory, and new messages produced specifically for the study. They focused on either direct factual arguments against smoking or high entertainment values with embedded arguments or blends of the two types. These message types did not include other elements found to be effective in smoking prevention research, such as strong emotional appeals, graphic imagery, exposure of industry manipulation or sensation seeking [13]. Future research should examine the possibility of producing messages based on the ELM specifically for test purposes that explore the potential place of these strategies in an ELM framework.

The numbers of messages representing each type varied from three to six. The smaller number for AR and Blended messages may have reduced the precision of response measures for these types due to unique characteristics of specific messages.

The relatively low ratings for AR messages on the central processing indicators (Table V) by low
academic achievers suggests that the messages intended to elicit active cognitive processing were somewhat ineffective in achieving this result for the lower ability group. Since active processing is a key feature of the ELM framework, audience groups with lower levels of ability should be prominently represented in the message development process.

Conclusions

The study engaged a large and diverse sample of non-smoking middle school students in evaluations of smoking prevention television messages based on well-defined strategies. Participants included nearly 1800 early adolescents from three distinctive geographic areas with representation of major racial/ethnic groups. Hypotheses were drawn from a widely recognized theoretical model. Evaluation procedures were systematically administered to test the hypothesized impact of differing message strategies. Non-smoking students who were at higher risk of smoking initiation reported relatively higher ratings on an indicator of active cognitive processing for fact-based messages, as suggested by the ELM. Practitioners may note that students generally rated fact-based messages high in appeal, despite deliberate avoidance of entertainment qualities or other attractive features in producing these messages.

Although evidence supporting the hypothesized effects was modest and the study had several limitations, results suggested that the ELM strategy for design of messages targeted to early adolescents at risk for smoking initiation should be explored further. The ELM framework may provide a useful strategy for reaching young people at higher risk for smoking initiation, perhaps in combination with other effective smoking prevention message approaches. These findings should be developed further before an ELM strategy as tested here could be recommended for implementation on a large scale.

Funding

National Cancer Institute, National Institutes of Health (CA82708).

Acknowledgements

We gratefully acknowledge the contributions of Greg S. Dana, Dona Wolcott and Ruth Davis to the data collection and the generous participation of school districts, teachers, students and parents in Miami Florida, Asheville North Carolina and Revere and Boston Massachusetts.

Conflict of interest statement

No conflicting or competing interests.

References


---

**Appendix 1 Descriptions of test messages by message type**

**Argument rich (AR) messages**

1. Numbers. In a visually depressing black and white scene near a city subway, a tough-looking guy questions spending $7 a pack to subtract 7 min a cigarette 20 times a day from his life, 7 days a week, 52 weeks a year, spending thousands of dollars to ‘slowly torture his lungs and throw away his future’.

2. Smoker’s life. On older girl shows pictures of the smoker’s life, starting with a kid stealing cigarettes from the family, to an addicted 25 years old who’s already spent $10 000 on cigarettes, to a person ‘our parents’ age’ with lung disease, to dying the smoker’s death. She finally asks, ‘Do you want the smoker’s life?’

3. Add it up. An African American narrator with attitude stands on a city street flipping over hand-made flashcards stating that smoking takes an average of 16 years off a life and kills 400 000 people a year, which is more than HIV, suicide, car accident injuries, alcohol use and murders added together. At the end, he says: ‘add up the numbers, sucker!’

**Blended messages**

4. Listening to mom. While talking with her teen daughter in the kitchen, Mom asks how she handles friends pressuring her to smoke. The daughter, annoyed by mom’s smoking, says her friends don’t smoke, but that she’d tell them ‘it’s gross, my mom’s been trying to quit for 6 months, and I don’t have time for a habit’.

5. Trick biker. High-energy split-screen views of boys doing tricks on BMX bikes on a hilly dirt race course. An older biker says smoking would slow you down, throw you off balance and keep you from doing your best.

6. The rap. An African American dad and son drive in a car while a rap sends the message that the dad’s addiction to smoking not only hazards the father’s health but also sets a bad example for his son.

**Argument light (AL) messages**

7. Coolness checklist. With a fast-paced Latin rhythm, Juan mingles with the crowd in a school-yard as a narrator says he’s cool because he wears the right gear, is a good student, is nice to girls, is...
cool with the guys and he doesn’t smoke. When Juan refuses a cigarette, friends comment that he did the right thing.

8. Jamie’s daydream. An attractive young blonde has a daydream about what she wants to do when she gets older. We see her driving a convertible along with three girlfriends, shopping, having lunch at an outdoor cafe and turning down a good looking boy who offers a cigarette, saying smoking is not something she’ll do.

9. Word. A cool-looking guy walks down the street to music with a beat and words appear on T-shirts on teens along the way who obviously admire him, like ‘fresh’, ‘popular’ and ‘cool’. But on his return trip he has a cigarette and the words on their shirts change to words like ‘disgusted’, and ‘allergic’. He looks at his shirt that says ‘smoker’, thinks about it and crushes the cigarette.

10. Don’t miss it. At a teen house party, a good-looking guy keeps trying to light up but is put off first by attractive girls and then by the host who says he’ll have to smoke outside, while showing him out the back door. The smoker is left standing in the dark as the porch light goes out.

11. I Don’t smoke. In an edgy scene set in a school stairwell, older boys pressure a younger boy to smoke. When he refuses, they make fun of him until other students step forward one at a time and say, ‘I don’t smoke’. The bully and his buddies are left looking subdued.

12. Most kids don’t. An ethnically mixed group of young boys and girls at a school dance take note as a good-looking boy arrives at the door. But the dancing stops and everyone is shocked when he tries to offer a cigarette. They all are relieved when he gives up the cigarettes and they start dancing again.