Educating smokers about their cigarettes and nicotine medications

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Abstract

The objective of this study was to test the efficacy of specially designed educational materials to correct misperceptions held by smokers about nicotine, nicotine medications, low tar cigarettes, filters and product ingredients. To accomplish this, 682 New York State Smokers’ Quitline callers were randomized to one of two groups: control group received counseling, nicotine patches and quit smoking guide; and experimental group received counseling, nicotine patches, quit guide, plus information about cigarette characteristics mailed in a brand-tailored box. Participants were contacted 1 month later to assess knowledge about cigarettes and actions taken to alter smoking behavior. The results found that respondents in the experimental condition were more likely to report using and sharing the test materials with others compared with the control condition. Overall mean knowledge scores for the experimental group were slightly higher compared with those who received the standard materials. Knowledge of cigarette ingredients was not related to quit attempts or quitting smoking. This study found that the experimental materials were better recalled and contributed to higher levels of knowledge about specific cigarette design features; however, this did not translate into changes in smoking behavior.

Introduction

It is difficult to argue that people today are not better informed about the dangers of tobacco compared with their counterparts a half century ago. In fact, the declining rate of smoking in the United States over the past 50 years can be traced directly to increasing public awareness of the dangers of smoking [1]. Recent studies suggest that while many smokers are aware of well-publicized health risks from smoking such as lung cancer, they remain largely uninformed about the products they use, how they become addicted and what they can do to quit [2–12].

Today’s smoker is bombarded with marketing pitches for a wide array of product choices that are promoted in advertisements to lessen health risks by lowering exposure to tar, nicotine and other smoke constituents. Examples of such marketing practices include the development and promotion of electronic cigarettes and increased advertising of low tar (e.g. light, ultralight, mild, medium) and ‘natural’ varieties of cigarette brands [10, 13–19]. How smokers interpret these messages about tobacco products is likely to influence the choices they make about whether to smoke or not, what products to smoke, quitting smoking and how to use nicotine medications. To date, only a handful of studies have actually attempted to test the impact of messages developed specifically to counteract common misperceptions that smokers have about specific product characteristics, including low tar, filter vents, nicotine and nicotine medications. Kozlowski et al. [20] tested simulated radio messages and found that ‘light’ smokers who heard that ‘light’ cigarettes were just as dangerous as ‘regular’...
cigarettes increased their desire to stop smoking. Shiffman et al. [21] tested the impact of three health messages on beliefs and intention to quit: one message focused on vent holes, another on sensory effects of light and ultralight cigarettes and a third on health consequences of smoking. Their results showed that the message focusing on smokers’ sensory perceptions of light and ultralight cigarettes resulted in the most positive change in beliefs about safety, delivery and intent to quit; it was particularly effective among those who believed that these cigarettes were less harsh. Shiffman et al. concluded that addressing smokers’ sensory experience that low tar cigarettes feel less harsh may be a promising strategy for changing their misperceptions and increasing cessation.

Mooney et al. [22] tested the impact of giving smokers, enrolled in a nicotine gum clinical trial, brief tailored feedback about nicotine and nicotine medications in hopes that this would increase participant compliance with the nicotine replacement therapy. The intervention was successful in changing knowledge and attitudes about nicotine and nicotine medications but did not alter compliance. Finally, Bansal et al. [23] tested print materials, sent to smokers who called a quitline and designed specifically to address misperceptions about nicotine, cigarette ingredients and low tar cigarettes. Smokers who called the quitline were receptive to receiving information about their cigarettes, but few smokers could recall the actual content of the materials sent to them after only 6 weeks. When subsequent focus groups of smokers were shown the printed materials tested in this study, it was found that the brochures were too verbose and failed to effectively communicate the relevant information about cigarette characteristics and nicotine medications.

This paper reports the results of the CEASE (CEssation After Smoking Education) Study, a study intended to test the efficacy of a specially designed set of graphic educational materials developed to correct misperceptions that many smokers have about nicotine, nicotine medications, low tar cigarettes, filters and product ingredients. Building upon the previous findings from Bansal et al. [23], we relied upon the input from smokers to help us create the educational materials and packaging tested in this study. A post-test only control group design was employed to test if adult smokers calling a quitline exposed to our new educational materials would report higher levels of knowledge about nicotine, nicotine medications, low tar cigarettes, filters and product ingredients compared with those getting the quitline’s standard stop smoking guide. Secondarily, we evaluated if increasing smokers’ knowledge about their cigarettes would impact their smoking behavior. This study was approved by the Roswell Park Cancer Institute Institutional Review Board to safeguard the rights of all participants.

### Methods

#### Development of study materials

Three telephone focus groups and five in-depth interviews were conducted with adult smokers recruited from callers to the New York State Smokers’ Quitline to help guide the development of the educational materials tested in this study. Feedback from focus group participants encouraged the research team to package the materials in large boxes that were designed to get attention, as well as incorporate cessation tips and tools in the test materials. The final materials developed for the study are shown in Fig. 1.

#### Recruitment of participants

The test materials were evaluated on a group of 682 adult smokers who contacted the New York State Smokers’ Quitline seeking quitting assistance for themselves from December 2004 through February 2005. The study population was restricted to current cigarette smokers, 18 years or older, who provided and wanted information about their cigarette brand, spoke English, agreed to be recontacted for a follow-up interview and were eligible to receive a free 2-week supply of nicotine medications. Callers were offered a 2-week supply of nicotine patches (either 21 or 14 mg depending upon how much they smoked daily); to be eligible for the
patches, callers had to report currently smoking at least 10 cigarettes per day, express an interest to stop smoking within the next 2 weeks, not report any contraindications to using the nicotine patch and agree to a follow-up call. Medicaid and uninsured callers were excluded from this study since this group of callers was eligible for extra counseling calls and up to 6 weeks of free nicotine medication through another Quitline program. Of the 682 who met the eligibility criteria and agreed to enroll into the CEASE study, 341 were randomly assigned to receive the specially designed set of materials (experimental group) and 341 were randomly assigned to receive the Quitline’s standard quit smoking guide (control group). Randomization of participants to study condition was conducted using a pre-randomized list that assigned participants to experimental condition based upon the order in which they called and were deemed eligible for participation. An analysis of the baseline characteristics of participants assigned to the experimental and control conditions revealed no significant differences between the groups on demographic and smoking history characteristics.

**Description of study materials**

In an effort to enhance the likelihood that participants would attend to the test materials, we sent two separate mailings. The first mailing sent to the experimental group was packaged to resemble an oversized box of the respondent’s self-reported current brand and type of cigarettes (regular full flavor, light, ultralight and menthol); the banner on the box was labeled ‘The Truth about Your Smokes’ (Fig. 1). The back of the package included information on the benefits of quitting smoking, while the two side panels previewed the materials contained inside the package. Inside the box were two colorful glossy pamphlets—one on cigarette ingredients and another on low tar cigarettes, a dozen graphic colorful stickers to put on the front of their cigarette pack, two decals promoting a smoke-free home and car environment, a squeezable stress pack and a BetterQuit plastic cigarette substitute. The test materials also included instructions for experiments which illustrated concepts pictorially. For example, one of the experiments showed respondents how to identify reconstituted tobacco using a glass of water and one of their cigarettes. The other experiment
demonstrated how to identify filter vents in their cigarettes by deconstructing the filter and shining a flashlight through the vent holes in the filter paper. A second mailing sent a day later included the free nicotine medications and a pamphlet on nicotine and nicotine medications. These materials were packaged in an oversized envelope that highlighted the benefits of the nicotine medication for smoking cessation by stating on the envelope: ‘90% effective in easing stress from nicotine withdrawal’.

In contrast, participants randomized to the control group were mailed the standard ‘Ready to Quit’ kit 1 day after their initial call and a nicotine medication 2-week starter kit 2 days after their initial call. The standard materials included a cover letter congratulating the participant on their decision to quit smoking. They also contained a self-help guide called the ‘Break Loose Guide’, which is a 12-page guide outlining some health risks from smoking (such as lung cancer, emphysema and heart disease), how smoking affects you if you are pregnant, a few chemicals in cigarettes, testimonials from four people who successfully quit smoking and suggestions on how to fight cigarette cravings. The standard materials also include an information sheet (black and white) about stop smoking medications, dealing with withdrawal symptoms, the dangers of secondhand smoke and tips on how to stay tobacco free in different social situations.

**Follow-up survey**

All participants enrolled in the study were contacted by a professional telephone survey firm approximately 1 month later and asked questions intended to assess their knowledge about nicotine, nicotine medications, low tar cigarettes, filters and product ingredients. Respondents were also asked to report their use of the educational materials, the nicotine medication and their current smoking status. Follow-up interviews were completed with 515 of the original 682 study participants, yielding an overall response rate of 76%. Response rates were similar for participants in the experimental and control conditions (75 versus 76%, respectively). Compared with non-responders, responders were more likely to report prior quit attempts, were slightly older than non-responders and reported smoking for a greater number of years, although differences were slight.

**Outcome measures**

**Level of attention given to the study materials**

All study participants were asked how carefully they had read the materials sent to them in the mail (i.e. read carefully, just glanced at it or did not look at them). Those who answered that they read or glanced at the materials were then asked four additional questions inquiring about use or sharing of the materials (specific questions outlined in Table I). The respondent was given a score of one for each question which they answered affirmatively and a zero if answered negatively. The scores were then summed for a composite index score representing level of attention given to the materials (i.e. scores ranging from 0 to 5; Cronbach’s reliability coefficient = 0.68).

**Knowledge**

Table II displays the 12 questions used to measure a respondent’s knowledge of low tar and filtered cigarettes, nicotine and nicotine medications and cigarette ingredients. Respondents were given a score of one for a correct answer and zero for an incorrect answer. An overall mean knowledge score was computed by summing the number of correct answers given across the 12 questions and dividing by the total. Since there was not a consistent pattern of responses across each of the separate knowledge domains (i.e. low tar and filtered cigarettes, nicotine and nicotine medications, tobacco constituents), we report results for each item individually.

**Actions taken to stop smoking**

Respondents in the follow-up survey were asked about their use of the nicotine medication sent to them, quitting smoking for 24 hours or longer in the past month and current smoking status. Respondents were classified as having quit if, at the 1 month follow-up interview, they answered ‘not at all’ to the question: ‘Do you now smoke cigarettes every day, some days, or not at all?’ and answered ‘no’ to
the question: ‘Have you smoked a cigarette, even a puff, in the last seven days?’

Data analysis

All statistical analyses were performed using SPSS Versions 13.0 and 14.0. The chi-square statistic was used to test for the level of variation between experimental and control groups in the proportion giving correct responses to individual knowledge items, using the nicotine medication, making a quit attempt and quitting smoking. The Bonferroni correction was also employed to reduce experiment-wise error from multiple statistical testing [24]. The Mann–Whitney U-test statistic was used to test for differences in mean level of attention given to the materials (range of scores 0–5) and overall mean knowledge score (range of scores 0–12).

Results

Level of attention given to the materials

Respondents in the experimental condition were more likely to report using the test materials (P-value < 0.05) and sharing them with others compared with participants who received the control materials (P-value = 0.10). When considering level of attention as a composite score, the mean level of attention given to the materials was significantly different between the control and intervention groups (3.55 versus 3.82, respectively, Mann–Whitney U-test, P-value < 0.05).

Knowledge

Table II displays the percentage of respondents in the experimental and control groups giving correct responses to the 12 knowledge items. On most of the knowledge items about two-thirds of respondents gave a correct answer, with only slight differences observed between the two study conditions. Overall mean knowledge scores for respondents who received the experimental test materials were slightly higher compared with those who received the standard materials (0.68 versus 0.64, P < 0.05 level). However, the difference in overall knowledge scores between groups was mainly the result of responses to two questions—one about the use of reconstituted
Table II. Summary of responses to knowledge items by 515 respondents who completed the CEASE Study One Month Follow-Up Survey, 2005

<table>
<thead>
<tr>
<th>Knowledge category</th>
<th>Correct response(^a)</th>
<th>Percent correct</th>
<th>Chi-square statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Control group (%)</td>
<td>Intervention group (%)</td>
</tr>
<tr>
<td>Low tar and filtered cigarettes</td>
<td>Your chances of becoming ill from smoking are greater if you smoke a full-flavored high-tar cigarette OR Your chances of becoming ill from smoking are not changed much by switching to a light, low-tar cigarette</td>
<td>85</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>While not huge, there is a slight health benefit to be gained by switching to a light cigarette.</td>
<td>73</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>Switching to a low tar cigarette means you will inhale less tar into your lungs.</td>
<td>62</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Your chances of becoming ill from smoking are greater if you smoke an unfiltered cigarette compared with one that has a filter OR Your chances of becoming ill from smoking are not changed much by smoking a filtered cigarette</td>
<td>71</td>
<td>73</td>
</tr>
<tr>
<td>Nicotine and nicotine medications</td>
<td>Nicotine does not cause cancer OR The nicotine in cigarettes is the chemical that causes most of the cancer in smokers</td>
<td>29</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>It is easier to quit smoking if you switch to a cigarette brand that is lower in nicotine OR Switching to a low nicotine cigarette brand does not improve your chances of quitting smoking.</td>
<td>84</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>It makes no difference one way or the other if someone uses a nicotine patch to quit; it just comes down to how badly the person wants to stop smoking OR All other things equal, using the nicotine patch increases a person’s chances of quitting successfully</td>
<td>81</td>
<td>81</td>
</tr>
<tr>
<td></td>
<td>Nicotine medications like the patch help people to feel less irritable when they quit smoking.</td>
<td>88</td>
<td>86</td>
</tr>
<tr>
<td>Tobacco constituents</td>
<td>One way to tell if a cigarette has lots of chemical additives is that the smoke usually feels harsher on your throat OR Cigarette companies use additives to make smoke easier to inhale</td>
<td>64</td>
<td>68</td>
</tr>
</tbody>
</table>

\(^a\) Correct responses were determined by the researchers based on scientific evidence.
tobacco and the other about the health risks of low tar cigarettes; participants who received the test materials were more likely to give a correct answer.

**Actions taken to stop smoking**

There was no difference between control and experimental participants with regards to reported quit attempts, use of nicotine medication and smoking status. Logistic regression analyses were conducted to assess joint and independent effects of the experimental group assignment and the level of attention given to the materials on measures of self-reported smoking status at follow-up. Increasing levels of attention paid to the materials was associated with an increasing likelihood of not smoking at follow-up ($P$-value < 0.01; odds ratio = 1.33, 95% CI: 1.15–1.53), but this effect was independent of experimental group assignment.

**Discussion**

In this study, we found that compared with the standard quitline materials given to smokers, the test materials we developed were attended to more often by participants and contributed to minimal increases in levels of knowledge about specific product characteristics of cigarettes. This lack of effects on knowledge scores is striking considering the domains of questions asked were specifically targeted toward content included in the experimental materials. However, improved knowledge of these characteristics was not related to quit attempts or quitting smoking after 1 month. Smokers given the test materials were not found to be more likely to make a quit attempt, use nicotine replacement therapy or stop smoking compared with those given the standard quitline materials.

While it is recognized that only a few of the specific knowledge items showed significant differences between the two study groups, the findings from this study have implications for public health practitioners, as it describes specific approaches that can be effective when developing future public health and smoking cessation campaigns. The greater attention given to the test materials by smokers in this study is an important achievement since this was a major shortcoming of our prior study [23] and it is the first critical step needed for information processing. Results from the previous study found that approximately half of the participants recalled receiving the test materials and few recalled any of the information presented in those materials. Participants appeared to like the test materials, as we received several unsolicited
requests for additional copies from study participants who got them, so they could share with other family members and friends. Our findings support the use of interactive learning experiments, where smokers are given an opportunity to do the experiments on their cigarettes themselves to learn about ingredients and design features. Seventy-one percent of participants who received the experimental materials reported looking at the experiments and 50% of these respondents reported actually doing an experiment. Those who reported in the follow-up interview that they had actually conducted the experiments were more knowledgeable about the presence of reconstituted tobacco and the health risks of low tar cigarettes than those who had not done the experiments.

This study identifies gaps in smokers’ knowledge that should be addressed when designing future interventions. For example, 60% of participants incorrectly believe that the sensation of smoke on the throat is linked to the relative health risk from smoking and two-thirds incorrectly believe that nicotine causes cancer. Specific misperceptions such as these should be targeted when creating educational materials for smokers.

One limitation of this study is based on the likelihood that smokers willing to call a quitline represent a unique and non-representative subgroup of smokers from the population at large. Smokers who, by their own volition, are willing to contact a quitline for quitting assistance may actually be beyond the point where additional information about the risks of smoking and features of their cigarettes would impact their smoking behavior. Another limitation was the fact that it was not possible to conduct a pre-test of knowledge and beliefs prior to sending participants the test materials, as the standard intake interview for a caller is already very lengthy; however, since group assignment was randomized for each individual caller prior to the start of the study, it is assumed that the baseline knowledge between the control and intervention groups is comparable. It is also noted that the concepts included in the educational materials attempted to communicate complex concepts and that questions asked in the follow-up survey may have been too complex to accurately assess changes in knowledge. The reading ease score for the follow-up survey was at the eighth to ninth grade level [25]. This suggests that the questions may have been too complex for some participants to fully comprehend, which could have limited our ability to sufficiently measure these constructs. Finally, in order to make the two experimental groups as equivalent as possible at baseline, we limited the study to privately insured callers who were eligible for our basic quitline services, which entailed one support follow-up call and a free 2-week supply of nicotine patches. Callers who were on Medicaid or uninsured were excluded from the study since these smokers were eligible for extra counseling, support calls and additional free medications. As a result of this exclusion, participants in the study were not completely representative of all smokers and, specifically, are likely to be better educated and more affluent than smokers in the general population. One might speculate that the intervention would have been more effective among smokers with less knowledge about the risks of smoking.

In summary, this study suggests that it is possible to educate smokers about specific product features of the cigarettes they consume. However, improved knowledge about cigarette ingredients and product design was not associated with an increased likelihood of quitting smoking in a sample of smokers calling a quitline seeking quitting assistance. These findings highlight that, despite the use of pre-tested graphic materials, there is an insufficiency of certain smoking myths among smokers that calls for a strong public health need for more improved and effective educational interventions. The results from this study should be considered a foundation for further work to determine what the most critical messages are to communicate to smokers and the most effective means of delivering those messages. Smokers did seem to pay more attention to the test materials, and designing materials to permit interactive learning through the use of pack inserts and/or online educational modules is something that would appear to have some promise. Hammond et al. [26–28] recently reported that a majority of smokers rely on the cigarette pack as a source of...
health information. Governments should give serious attention to using pack warnings and pack inserts as a free way to repeatedly reach smokers with information about their cigarettes, health risks and methods for quitting smoking.

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Conflict of interest statement

None declared.

References

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