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Using Eye-tracking to Examine How Embedding Risk Corrective Statements Improves Cigarette Risk Beliefs: Implications for Tobacco Regulatory Policy

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Abstract

Background—Tobacco companies have deliberately used explicit and implicit misleading information in marketing campaigns. The aim of the current study was to experimentally investigate whether the editing of explicit and implicit content of a print advertisement improves smokers' risk beliefs and smokers' knowledge of explicit and implicit information.

Methods—Using a 2(explicit/implicit) x 2(accurate/misleading) between-subject design, 203 smokers were randomly assigned to one of four advertisement conditions. The manipulation of graphic content was examined as an implicit factor to convey product harm. The inclusion of a text corrective in the body of the ad was defined as the manipulated explicit factor. Participants' eye movements and risk beliefs/recall were measured during and after ad exposure, respectively.

Results—Results indicate that exposure to a text corrective decreases false beliefs about the product ($p < .01$) and improves correct recall of information provided by the corrective ($p < .05$). Accurate graphic content did not alter the harmfulness of the product. Independent of condition, smokers who focused longer on the warning label made fewer false inferences about the product ($p = .01$) and were more likely to correctly recall the warning information ($p < .01$). Nonetheless, most smokers largely ignored the text warning.

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Conflict of interests

No conflict declared.

Contributors

Andrew A. Strasser conceived and supervised the study. Kirsten Lochbuehler completed the analyses. Kirsten Lochbuehler led the writing. Kathy Z. Tang, Valentina Souprountchouk, Dana Campetti, Joseph N. Cappella, and Lynn Kozlowski assisted with the study. All authors have approved the final article.

Conclusions—Embedding a corrective statement in the body of the ad is an effective strategy to convey health information to consumers, which can be mandated under the Tobacco Control Act (2009). Eye-tracking results objectively demonstrate that text-only warnings are not viewed by smokers, thus minimizing their effectiveness for conveying risk information.

Keywords

Eye-tracking; Tobacco advertising; Tobacco regulatory policy

1. INTRODUCTION

An increased public awareness of health risks of smoking has led the tobacco industry to develop “new” products that have been marketed as less harmful than regular cigarettes. The development, advertising and marketing of “new” products started with the promotion of light cigarettes in the 1960s (National Cancer Institute, 2001), and continued with the marketing of potentially reduced exposure products (PREPs), to the most recent marketing of Modified Risk Tobacco Products (MRTPs), which are often developed as lower tar/ nicotine cigarettes (Dunsby and Bero, 2004; US Department of Health Human Services, 2000). In the aggressive marketing of harm reduction, tobacco companies have effectively used cigarette pack design, colors, labels and descriptive terms to communicate strength, harshness, lower nicotine, tar levels and risk of their products (Anderson et al., 2006; Bansal-Travers et al., 2011; Philip Morris Co; Philip Morris Co; Pollay and Dewhirst, 2001; 2002; Slade, 1997; Wakefield et al., 2002).

While previous efforts under the Tobacco Control Act (TCA; 2009) have successfully mandated removal of descriptive terms, other actions to convey health information to consumers, for example the implementation of graphic warning labels, have been upheld by U.S. federal courts. Given evidence that many smokers misinterpret the information contained in cigarette marketing and perceive a modified type of cigarette as safer or having lower health risks than regular cigarettes (Hamilton et al., 2004; O’Connor et al., 2005; Parascandola et al., 2009; Shadel et al., 2006; Shiffman et al., 2007, 2004), it is important to develop more accurate advertising and to counter misinformation in order to better inform smokers of their risks. This correction of misinformation in advertisements calls for and requires a better understanding of *how* accurate information can be conveyed to smokers. The TCA empowered the Food and Drug Administration (FDA) to review MRTPs to ensure that marketing and advertising claims are supported by scientific evidence and are not misleading (U.S. FDA Center for Tobacco Products, 2015). Further, in 2006, the U.S. District Court ordered the use of corrective statements in advertising and promotion to correct past deceptive practices of the tobacco companies and to enhance knowledge among consumers (Smith et al., 2011; U.S. District Court DC. U.S. v. Philip Morris USA, 2006).

Few studies have investigated the effects of counter-advertising and corrective messages on risk perception of cigarette products (Biener et al., 2007; Kozlowski et al., 2001, 1999, 2000; Shiffman et al., 2001; Strasser et al., 2008; Tangari et al., 2010). Some studies demonstrated that counter-marketing ads on TV (Kozlowski et al., 2000) and radio (Kozlowski et al., 2001, 1999) can improve the risk perception of light cigarettes, and that corrective print

advertisements can influence consumers' beliefs about smoking (Tangari et al., 2010). With regard to correctives in print advertisements, Biener et al. (2007) found that providing health information (adding explicit content) in the form of a box at the bottom of print advertisements had only little impact on the risk perception of the product. It remains unknown whether and how much attention smokers paid to the health information that was provided in a box similar to a text warning label at the bottom of the ad. Previous research has shown that viewers rarely focus on a text warning label (Fischer et al., 1989; Munafò et al., 2011). Given these results and the fact that the center of the ad is viewed more attentively (Strasser et al., 2012), integrating explicit corrective text messages in the body of the ad might be a more effective strategy. In a study where smokers were either exposed to the original Quest print advertisement, an ad in which the cigarette packages were altered to the color red (altering implicit content), or an ad where all text was removed from the ad (removing explicit content), it was found that removing the text affects beliefs about the harmfulness of the product (Strasser et al., 2008). Smokers who were exposed to the altered implicit ad did not report fewer false beliefs about the harmfulness of the product than smokers exposed to the original advertisement. It is plausible but remains unknown whether an ad with combined explicit and implicit accurate content would be associated with a more accurate understanding of harm exposure.

These studies demonstrate that the risk perception of a product can be corrected by altering explicit and implicit content of the ad. However, it remains unclear whether adding explicit accurate information (i.e., a corrective statement about product risk) in the body of the ad and altering implicit information (i.e., cigarette package color) affects smokers' risk perception of the product. Therefore, using a 2(explicit/implicit) x 2(accurate/misleading) between-subject design, we investigated the effect of manipulating advertisement content on smokers' false beliefs about the product and smokers' recall of explicit and implicit information after viewing the advertisements. The manipulated explicit factor was the inclusion of a text corrective about tar and nicotine content which has been shown to have a sustained effect on perceived product risk (Kozlowski and Sweeney, 1997). The manipulation of the cigarette package color and background images that have been shown to impact risk perception and have been increasingly used to imply health claims (Bansal-Travers et al., 2011) were examined as an implicit factor.

Additionally, to better understand how smokers view implicit and explicit content, we assessed attention to different parts of the advertisement using eye-tracking. We hypothesized that smokers who were exposed to the explicit and implicit accurate ads, compared to those exposed to the misleading ads, will report fewer false beliefs about the product and will better recall the information stated by the corrective. The results of the present study will provide valuable information on what content of the advertisement draws attention, what content distract smokers from viewing health information, where corrective health information needs to be placed in an ad, and how implicit and explicit information in cigarette advertisements affect risk beliefs about nicotine products. Given the continuous introduction of nicotine-containing products (e.g., low nicotine cigarettes, little cigars, e-cigarettes) and the significant marketing of these products, it is critical that regulatory efforts are aware of how product users can be misled.

2. MATERIAL AND METHODS

2.1 Sample and procedure

A total of 203 current smokers participated in the study. Inclusion criteria were: currently smoking a minimum of 10 cigarettes/day (non-menthol) for a minimum of 5 years; not currently trying to quit or intending to do so in the next two months; between 21 - 65 years old; speaking English fluently; no current substance abuse; no visual impairments. Participants responding to advertisements were screened for eligibility by telephone and those deemed eligible were scheduled. The study consisted of a 90-minute single session where participants were randomly assigned to view one of four versions of the Quest advertisement while eye movements (EM) were measured. After a research assistant explained the procedure and demonstrated the equipment, participants gave informed consent and completed baseline questionnaires (see demographic and smoking history measures). Then, participants provided a carbon monoxide breath sample to biochemically verify smoking status. Based on sensitivity analysis by Raiff et al. (2010), a 5 parts per million (ppm) threshold was used for study inclusion. None of the participants fell under this threshold. Then, participants smoked one of their own cigarettes to standardize time since their last cigarette. They were seated in front of the eye-tracking device, were calibrated and asked to view the advertisement for 30 seconds. After viewing, participants completed post-advertisement measures (risk belief and recall measures). Finally, participants were debriefed to the purpose of the study, had any questions answered and received \$50 compensation. The protocol was approved by the University of Pennsylvania Institutional Review Board.

2.2 Advertisement design

We used a 2(explicit/implicit) x 2(accurate/misleading) between-subject design (see Figure 1 for an illustration of the advertisement conditions). The inclusion of a corrective statement in the body of the ad was investigated as an explicit factor to decrease misinformation about the product. The explicit misleading conditions portrayed the text of the current Quest advertisement, which has been associated with smokers making false inferences about the product (Shadel et al., 2006, Strasser et al., 2008). The explicit accurate conditions were altered and the corrective statement “Nicotine free does not mean risk free. Quest contains as much tar as a light cigarette” replaced the text “Real cigarettes, real premium tobacco, real smoking enjoyment” in the body of the advertisement. The theme of the corrective statement was chosen because this message had been found effective, recalled easily in previous research (Kozlowski et al., 1999), and provided information about nicotine, risk and tar which are central themes to cigarette harm. The rest of the text remained the same as in the current Quest advertisement.

The manipulation of graphic features was examined as an implicit factor to convey product harm. The implicit misleading conditions used the graphics of the current version of the Quest advertisement (image D), which shows blue colored cigarette packs diagonally on the “road to nicotine-free”. The packaging color and background imply light and safe (Bansal-Travers et al., 2011), sun and clouds constitute the background of the ad. The advertisement used in the implicit accurate conditions was altered such that cigarette packages were

presented in red color, laterally across the advertisement. The background clouds and sun were removed, implying more accurate harmfulness of the product, in contrast to implied lightness or less harm.

2.3 Measures

2.3.1 Eye-tracking—Gazetracker software (v.07.01.243.128) was used to display the advertisements. EM were assessed by an Eye-Trac 6 control unit with an R6 pan/tilt optics system and video head tracker (Applied Science Laboratories, Boston, MA). Data transfer was linked using the Eye-Trac 6 User Interface Program (v.1.30.8.0). Areas of interest (AOIs) were identified a priori (see Figure 2 for an illustration of the AOIs). For each region, dwell time (total time viewed in AOI; seconds) and time to first viewing of AOI (seconds) were assessed (Strasser et al., 2012). Fixations were operationalized as any 60-pixel-diameter space with three consecutively sampled observations with a minimum cumulative 200ms duration, consistent with previous viewing images and reading tasks (Rayner, 1978).

2.3.2 Risk Beliefs—To assess risk beliefs, we used an 8-item, 5-point scale (1 = definitely untrue; 5 = definitely true) (Shadel et al., 2006; Strasser et al., 2008). The 8 items included: Quest cigarettes: a) are lower in nicotine than regular cigarettes (true item); b) are lower in tar than regular cigarettes; c) are less addictive than regular cigarettes; d) are less likely to cause cancer than regular cigarettes; e) have fewer chemicals than regular cigarettes; f) are healthier than regular cigarettes; g) make smoking safer; and h) help people quit smoking. Items b-h were considered false statements, based on information in the advertisements indicating that tar levels are not reduced and that Quest cigarettes are not intended to assist smokers with quitting. A belief scale was constructed on items b-h where higher scores mean making more false inferences about Quest cigarettes ($\alpha = .72$).

2.3.3 Recall—Five items in multiple choice format were used to assess the recognition of central explicit and implicit messages conveyed in the advertisement viewed: 1) Quest cigarettes contain no nicotine at all; 2) What statement best captures the content of the warning label?; 3) What color were the cigarette packs?; 4) How did the cigarette packs appear in the ad?; 5) Quest cigarettes contain as much tar as a light cigarette. Responses to each recall item were scored as correct or incorrect.

2.3.4 Demographic and Smoking History Measures—Age, gender, race, ethnicity, educational background, years smoking, daily cigarette consumption, age of first cigarette, time since last cigarette prior to the session, number of cigarettes smoked on session day, and nicotine dependence (Heatherton et al., 1991) were assessed.

2.4 Preparation of eye movement data

There were 26 sessions (12%) with low quality EM data that were excluded from all analyses, resulting in a final sample of 177 smokers. Exclusion was due to calibration difficulties, technical problems with the eye-tracking equipment, or because fixations on the ad were recorded less than 66.6% of the time. The excluded participants were equally distributed over conditions and did not differ by smoking or descriptive measures from those participants included in the analyses. Viewing time of the whole advertisement was

examined to verify attention to the screen during presentation and did not differ by condition.

2.5 Analysis plan

Data were analyzed in SPSS. Descriptive statistics were used to characterize the overall sample and each advertisement group. Analysis of variance (ANOVAs) and Chi-square tests (χ^2) were conducted to identify potential group differences. Analyses of covariance (ANCOVAs) were used to examine the effect of advertisement type on attention to the areas of interest (AOIs) "corrective statement," "cigarette packs," and "warning label." ANCOVAs and logistic regression analyses were conducted to determine models of predicting false inferences about the product and correct recall of information of the corrective and the warning label. Attention measures were inserted into each model. In each analysis we controlled for age, gender, daily cigarette consumption, and the time of the last cigarette smoked prior to the session.

3. RESULTS

3.1 Descriptive statistics and randomization verification

Table 1 displays sample characteristics by condition. Participants were on average 30.6 years old ($SD = 8.07$; range = 21 - 58). The sample was predominantly male (64.5%) and Caucasian (92%). Most participants had completed a high school degree (98%); 39.4% had completed college. Participants on average reported smoking for 12.86 years ($SD = 6.8$), and smoking 16.6 cigarettes/day ($SD = 5.7$), and an average nicotine dependence score of 5.1 ($SD = 2.1$). The most popular brands were Marlboro (41.7%), Camel (24.6%), Parliament (15.4%), and American Spirit (8%). CO-levels measured at session commencement ranged between 6 - 54 ppm ($M = 19.32$; $SD = 9.36$). ANOVAs and χ^2 -tests were conducted to examine whether randomization over the four conditions was successful. Analyses only showed differences with regard to daily cigarette consumption.

3.2 Effects on attention

ANCOVAs were conducted to examine the effect of advertisement type on latency to and dwell time of the AOIs "corrective statement," "cigarette packs," and "warning label." Table 2 displays the dwell time of and the latency to AOIs overall and by advertisement type. Attention data showed that smokers focused on the AOI "corrective statement" relatively early in the overall viewing pattern ($M = 2.16$; $SD = 3.32$), while the latency to the AOI "warning label" was relatively long ($M = 9.27$; $SD = 7.40$). The results also showed an effect of explicit condition on the dwell time of and the latency to the AOI "corrective statement." Smokers in the explicit accurate conditions spent more time focusing on the AOI "corrective statement" than smokers in the explicit misleading conditions ($M = .93$ s vs. $M = .57$ s; $F(1,169) = 7.80$; $p = .006$, $\eta^2 = .04$). Smokers in the implicit accurate conditions fixated on the AOI "corrective statement" faster than smokers in the implicit misleading conditions ($M = 1.53$ s vs. $M = 2.79$ s; $F(1,168) = 8.19$; $p = .005$, $\eta^2 = .046$). No effect of condition on the latency or dwell time of the AOI "warning label" or "cigarette packs" was found.

3.3 Effects on risk beliefs

An ANCOVA was performed to investigate the effect of advertisement type on risk beliefs (see Table 3 and 4). There was a main effect of the explicit condition ($F(1,169) = 7.26, p = .008, \eta^2 = .04$), such that smokers who were exposed to explicit misleading ads ($M = 3.01; SD = .64$) reported more false beliefs than those exposed to explicit accurate ads ($M = 2.79; SD = .62$). Adding dwell time of or latency to the AOI "corrective statement" to the model, the results again showed a main effect of the explicit condition. Dwell time of and latency to the AOI "corrective statement" did not affect risk beliefs. An ANCOVA with dwell time to the AOI "warning label" and condition as independent variables and risk beliefs as dependent variable indicated a main effect of dwell time to the AOI "warning label" ($F(1,165) = 6.25, p = .01, \eta^2 = .04$) and a trend of explicit condition ($F(1,165) = 3.47, p = .06, \eta^2 = .02$). Smokers who spent more time looking at the AOI "warning label" and smokers who were exposed to the explicit accurate conditions made fewer false inferences about the product.

3.4 Effects on recall of information of the corrective and the warning label

In total, 87% of participants correctly recalled item 1 (nicotine content), 42.9% correctly recalled item 2 (warning label content), 93.8% correctly recalled item 3 (pack color), 57.6% correctly recalled item 4 (pack appearance), and 61.6% correctly recalled item 5 (tar content). No differences between conditions with regard to correct recall of item 1, 2, 3, and 4 were found. Table 5 displays the results of logistic regression models assessing the association between condition, attention and recall of the information of the corrective (tar content) as well as the warning label. Explicit condition significantly predicted correct recall of the tar content ($OR = 2.42, 95\% CI = 1.00, 5.87; p = .05$) in a model that also included implicit condition and dwell time to the AOI "corrective statement." Smokers who were exposed to the explicit accurate conditions were more likely to correctly recall the tar content than smokers who were exposed to the explicit misleading conditions. In a similar model including latency to the AOI "corrective statement" explicit condition ($OR = 2.70, 95\% CI = 1.18, 6.18; p = .02$) also significantly predicted correct recall. Dwell time of and latency to the AOI "corrective statement" were unrelated to correct recall of the tar content. Correct recall of the warning label content was significantly associated with dwell time of the AOI "warning label" ($OR = 2.26, 95\% CI = 1.45, 3.53; p = .00$). Smokers who focused longer on the AOI "warning label" were more likely to correctly recall the content of the warning label. In a similar model, latency to the AOI "warning label" ($OR = 1.00, 95\% CI = .92, 1.09; p = .98$) did not predict correct recall of the content of the warning label.

4. DISCUSSION

This study examined whether the correction of explicit and implicit content of an advertisement affects attention to the ad, false beliefs about the product, and recall of information provided by the ad. Results indicate that smokers focus relatively early in their viewing pattern on an explicit text corrective that was embedded in the body of the ad. In addition, exposure to the corrective statement improves smokers' beliefs about the harmfulness of the product and recall of the information provided by the corrective. Interestingly, attention duration to the corrective did not affect these findings, suggesting that

smokers easily acquire this information. These results provide novel, objective information on where to optimally place health information in print ads.

Smokers who focused longer on the warning label made fewer false inferences about the product and were more likely to correctly recall the warning label information. However, most smokers gave little attention to the warning label, and the latency to the warning label was relatively long, exceeding the average total viewing time of a print ad in a real-life situation (Lohse, 1997). In addition, only 41% of participants were able to correctly recall the statement of the warning label. Moreover, attention to the warning label was not improved by either explicit or implicit manipulations of the ad. Together, this pattern of results indicates that while the content of the text-only warning is information smokers are capable of recalling, the late focus on the warning labels makes them highly ineffective as a way to convey information. Given that smokers rarely view text-only warning labels (Fischer et al., 1989; Strasser et al., 2012), the results of this study recommend to embed health information in the center of an ad, an area that is viewed more attentively or to consider warnings with graphic content that can affect attention.

In this study the accurate altered graphic features unsuccessfully conveyed the harm of the product. A single exposure was insufficient to affect beliefs, but repeated exposure could reveal a different result. However, smokers focused faster on the corrective in ads that were more graphically accurate. Possibly, the misleading graphic content distracts and prevents viewers from focusing faster on other parts of the ad. A shorter latency to the corrective might be particularly important in real-life situations, in which viewers generally spend significantly less time on a print ad than in the current study (Lohse, 1997).

These results also inform the marketing of new tobacco and other products containing nicotine. Conveying less harm has been a recurring theme (Pederson and Nelson, 2007) and it will likely be used again by the tobacco industry when new products enter the marketplace. There is already some evidence that similar efforts have recently been made in the marketing of e-cigarettes (de Andrade et al., 2013; Grana and Ling, 2014; Huang et al., 2014; Luo et al., 2014; Paek et al., 2014; Richardson et al., 2013, 2014). Reduced-nicotine cigarettes might become another product that will be targeted and marketed by the tobacco industry as less harmful than regular cigarettes. Recent research has shown that reduced-nicotine cigarettes decreased nicotine exposure and dependence and the number of cigarettes smoked among smokers (Donny et al., 2015). In an environment where nicotine content is regulated, it can be expected that the tobacco industry will aggressively market these products to increase their appeal. Research by Donny et al. (2015) used investigational cigarettes that carried no labeling or package information and those cigarettes were not supported by advertising or marketing, which is a significant focus of the tobacco industry. The TCA (2009) allows the FDA to regulate nicotine levels in cigarettes as well as the way tobacco products are marketed and labeled. The results of the current study provide highly relevant, objective data regarding the correction of misinformation of advertisements of current tobacco products. They also inform the emerging public health question of the marketing of new tobacco products.

A number of limitations to this study should be acknowledged. First, in the current study, the warning label on the print ads were text-based only. It remains unknown whether a corrective has the same effects in the presence of a graphic warning label which has been shown to be attention-grabbing (Strasser et al., 2012). Future research should investigate whether the combination of a corrective and a graphic warning label increases the effects or whether they compete for viewers' attention. Second, a single exposure to an ad with more accurate graphic features (i.e., cigarette package color) had no effect on risk beliefs or recall. However, this is not to conclude that any implicit (graphic) manipulation would fail in conveying the harmfulness of the product. Further research of the effects of other types of graphic manipulations on product perception is needed. Third, the current sample consisted of predominantly well-educated, male, Caucasian smokers, and different effects may be found if we were to focus on different groups of smokers. Further studies on how a potential user might engage with an ad for a new product including different groups of smokers would be of great value and are therefore suggested.

The findings of the current study provide important implications for mandating corrective information in print ads, which falls under the regulatory authority of the FDA. Embedding a corrective statement in the body of an ad has small but reliable effects on decreasing deception and can contribute to conveying health information to consumers. Text warning labels in their current form have again here shown to be ineffective, similar to previous work (Brennan et al., 2011; Kennedy et al., 2012; Scollo et al., 2015). The results of the current study may also have implications for regulating the marketing and promotion of "new" tobacco and nicotine-containing products, like reduced-nicotine cigarettes and e-cigarettes. It is essential that policy and public health stakeholders have strong empirical data to inform decisions on how a newly regulated tobacco product (e.g., e-cigarettes, reduced-nicotine cigarettes) can (and cannot) be marketed and labeled to accurately inform consumers about the product. This is a highly timely and relevant topic given the rapidly evolving tobacco product market and the potential to regulate nicotine content in cigarettes.

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Highlights

- Exposure to a text corrective in print ads decreases false beliefs about the product
- It improves correct recall of information provided by the corrective
- Corrective statements in the body of the ad can convey health information to consumers
- Text-only warnings are insufficiently viewed for conveying information

A) explicit accurate – implicit accurate; B) explicit accurate – implicit misleading; C) explicit misleading – implicit accurate; D) explicit misleading – implicit misleading (current industry version)

Figure 1.
Advertisement conditions.

A) explicit accurate – implicit accurate; B) explicit accurate – implicit misleading; C) explicit misleading – implicit accurate; D) explicit misleading – implicit misleading (current industry version)

Figure 2.
Areas of interest.

Table 1

Descriptive statistics and smoking characteristics by condition.

Characteristics	Explicit accurate - Implicit accurate	Explicit accurate - Implicit misleading	Explicit misleading - Implicit accurate	Explicit misleading - Implicit misleading
N	47	44	42	44
Gender male (count)	30	27	26	28
Age (<i>M, SD</i>)	31.36 (9.19)	28.30 (6.92)	32.33 (8.30)	29.18 (6.69)
Daily cigarettes (<i>M, SD</i>)	18.32 (5.87)	16.75 (6.24)	15.31 (4.87)	15.32 (5.32)
Years smoking (<i>M, SD</i>)	13.57 (7.55)	11.30 (5.66)	13.76 (6.94)	12.07 (6.29)
FTND (<i>M, SD</i>)	5.60 (2.07)	5.07 (2.15)	4.86 (2.11)	4.68 (1.95)
CO-level (<i>M, SD</i>)	20.30 (7.92)	22.05 (10.92)	21.43 (11.95)	18.98 (9.55)
Time since last cigarette prior to session (<i>M, SD</i>)	65.55 (118.46)	42.39 (19.46)	39.57 (26.77)	55.73 (103.95)
Age of first cigarette (<i>M, SD</i>)	17.13 (3.03)	15.84 (2.77)	17.38 (5.33)	15.91 (2.14)
Number of cigarettes smoked on session day (<i>M, SD</i>)	4.43 (2.76)	4.09 (2.46)	3.90 (2.27)	3.77 (2.61)
Race (count)	42	40	35	40
Caucasian				
Asian	1	1	2	2
African-American	2	0	2	1
More than one race	0	0	1	1
Education (count)	39	36	36	38
High School	15	18	23	17
College				

Note. Boldface indicates statistical significance ($p < .05$).

Table 2

Eye-tracking measures overall and by advertisement type.

Area of interest and measures	Explicit accurate conditions M (SD)	Explicit misleading conditions M (SD)	Implicit accurate conditions M (SD)	Implicit misleading conditions M (SD)	Overall/ Independent of condition M (SD)
Cig packs (4)					
Dwell time (in s)	8.31 (3.22)	8.52 (3.89)	8.79 (3.73)	8.03 (3.33)	8.41 (3.55)
Latency	.59 (1.64)	.45 (1.21)	.47 (1.39)	.57 (1.51)	.52 (1.44)
Warning labels (6)					
Dwell time	1.51 (1.69)	1.95 (2.00)	1.50 (1.79)	1.95 (1.90)	1.72 (1.85)
Latency	9.79 (7.81)	8.71 (6.94)	10.49 (7.26)	8.05 (7.39)	9.27 (7.40)
Corrective statement (7)					
Dwell time	.93 (.93)	.57 (.70)	.77 (.89)	.74 (.79)	.75 (.84)
Latency	2.34 (3.27)	1.97 (3.38)	1.53 (1.90)	2.79 (4.21)	2.16 (3.32)

Note. Attention measures in seconds.

Boldface indicates statistical significance ($p < .01$).

Table 3

Analysis of Covariance for risk beliefs.

Source	Sum of Squares	df	Mean Square	F	<i>p</i>	η^2
Explicit	138.36	1	138.36	7.26	.008	.041
Implicit	6.542	1	6.542	.343	.56	.002
Explicit*implicit	2.762	1	2.76	.145	.70	.001
Error	3221.26	169	19.06			
Total	76361.00	177				
Explicit	1.745	1	1.745	4.38	.04	.03
Implicit	.123	1	.123	.309	.58	.002
Explicit*implicit	.010	1	.010	.026	.87	.000
Dwell corrective	.023	1	.023	.057	.81	.000
Error	65.689	165	.398			
Total	1558.39	177				
Explicit	1.952	1	1.952	4.916	.03	.029
Implicit	.003	1	.003	.009	.93	.000
Explicit*implicit	.106	1	.106	.266	.607	.002
Latency corrective	.568	1	.568	1.431	.233	.009
Error	65.105	164	.397			
Total	1548.51	176				
Explicit	65.173	1	65.173	3.469	.06	.021
Implicit	.487	1	.487	.026	.87	.000
Explicit*implicit	.026	1	.026	.001	.97	.000
Dwell warning label	117.363	1	117.363	6.247	.01	.036
Error	3100.02	165	18.788			
Total	76361.0	177				

Note. Adjusted for age, gender, daily cigarette consumption, and the time of the last cigarette smoked prior to the session.

Table 4

Analysis of Covariance for individual risk beliefs.

Risk belief Quest cigarettes:	Source	Sum of Squares	df	Mean Square	F	p	η^2
are lower in nicotine than regular cigarettes	Explicit	.152	1	.152	.18	.67	.001
	Implicit	.160	1	.160	.19	.66	.001
	Explicit*implicit	.497	1	.497	.60	.44	.004
	Error	140.02	169	.83			
	Total	3170.00	177				
are lower in tar than regular cigarettes	Explicit	5.190	1	5.190	4.40	.04	.025
	Implicit	.51	1	.51	.430	.51	.003
	Explicit*implicit	.065	1	.065	.055	.81	.000
	Error	199.272	169	.398			
	Total	2027.00	177				
are less addictive than regular cigarettes	Explicit	3.125	1	3.125	3.135	.08	.018
	Implicit	.009	1	.009	.009	.75	.001
	Explicit*implicit	.162	1	.162	.162	.688	.001
	Error	168.455	169	.997			
	Total	1688.00	177				
are less likely to cause cancer than regular cigarettes	Explicit	2.209	1	2.209	2.447	.12	.014
	Implicit	.004	1	.004	.004	.95	.000
	Explicit*implicit	.622	1	.622	.690	.41	.004
	Error	152.553	169	.903			
	Total	1133.00	177				
have fewer chemicals than regular cigarettes	Explicit	2.310	1	2.310	2.972	.09	.017
	Implicit	.486	1	.486	.625	.43	.004
	Explicit*implicit	.000	1	.000	.000	.98	.000
	Error	131.361	169	.777			
	Total	2045.00	177				
are healthier than regular cigarettes	Explicit	2.702	1	2.702	2.282	.13	.013
	Implicit	.027	1	.027	.023	.88	.000
	Explicit*implicit	.021	1	.021	.017	.90	.000
	Error	200.158	169	1.184			
	Total	210.305	177				
make smoking safer	Explicit	4.076	1	4.076	3.604	.06	.021
	Implicit	.670	1	.670	.593	.44	.003
	Explicit*implicit	.537	1	.537	.475	.49	.003
	Error	191.113	169	1.131			
	Total	1336.00	177				

Risk belief Quest cigarettes:	Source	Sum of Squares	df	Mean Square	F	p	η^2
help people quit smoking	Explicit	1.099	1	1.099	.794	.37	.005
	Implicit	.014	1	.014	.010	.92	.000
	Explicit*implicit	.016	1	.016	.011	.92	.000
	Error	233.870	169	1.384			
	Total	2170.00	177				

Note. Adjusted for age, gender, daily cigarette consumption, and the time of the last cigarette smoked prior to the session.

Table 5

Logistic regression analysis predicting recall of tar content and warning label content.

Recall tar content			
	OR	CI	<i>p</i>
Explicit	2.42	1.00, 5.87	.05
Implicit	.76	.31, 1.84	.54
Dwell corrective	.87	.33, 2.30	.77
Explicit	2.70	1.18, 6.18	.02
Implicit	1.07	.48, 2.39	.88
Latency corrective	1.18	.95, 1.45	.13
Recall warning label content			
	OR	CI	<i>p</i>
Explicit	1.98	.73, 5.33	.18
Implicit	1.60	.58, 4.38	.36
Dwell warning label	2.26	1.45, 3.53	.00
Explicit	1.66	.58, 4.72	.35
Implicit	.59	.21, 1.68	.32
Latency warning label	1.00	.92, 1.09	.98

Note. Adjusted for age, gender, daily cigarette consumption, and the time of the last cigarette smoked prior to the session.