ORIGINAL ARTICLE

Do Young Adults Perceive That Cigarette Graphic Warnings Provide New Knowledge About the Harms of Smoking?

Renee E. Magnan, PhD · Linda D. Cameron, PhD

Abstract

Background Although much research on graphic cigarette warnings has focused on motivational responses, little focus has been given to how much individuals learn from these labels.
Purpose This study aims to investigate whether graphic warnings provide greater perceived new knowledge of smoking consequences compared to text-only warnings, and to test a mediational model whereby perceived new knowledge promotes discouragement from smoking through its impact on worry.
Methods In two studies, young adult smokers and non-smokers (ages 18–25) evaluated graphic+text and corresponding text-only labels on perceived knowledge, worry about the harms addressed by the warning, and discouragement from smoking.
Results Compared to text-only labels, graphic+text labels were rated as providing better understanding, more new knowledge, and being more worrisome and discouraging. Perceived new knowledge predicted greater discouragement from smoking directly and through worry.
Conclusions Graphic warnings may be more efficacious than text-based warnings in increasing knowledge and worry about harms, and discouragement from smoking.

R. E. Magnan (✉)
Department of Psychology, Washington State University Vancouver, 14204 NE Salmon Creek Ave, Vancouver, WA 98686, USA
e-mail: renee.magnan@vancouver.wsu.edu

L. D. Cameron
University of California, Merced, CA, USA

Although adult cigarette smoking has generally declined over the past three decades, adult cigarette smoking rates in the United States (U.S.) were stagnate from 2005 to 2012 and only recently dropped below 20 % (to 18.1 %) in 2012 [1]. While this trend is encouraging, cigarette smoking remains the leading behavioral cause of death in the U.S. [2]. With smoking continuing to pose a significant public health threat, there is an ongoing need for new and improved strategies to increase quit attempts and to prevent smoking uptake.

The World Health Organization's Framework Convention on Tobacco Control (WHO FCTC) represents a multi-faceted, worldwide effort to curb tobacco use. A component of this initiative calls for policies requiring large, graphic warning labels on tobacco products communicating the hazardous consequences of smoking [3]. A growing body of evidence supports the potential efficacy of these graphic warning labels. Research generally finds that compared to text-only warning labels, graphic warning labels create greater cognitive reactions (increased perceived risk and severity of consequences) and evoke more emotional responses (e.g., worry, fear), and that these reactions translate into increased motivation to reduce smoking or to not initiate smoking (for review, see [4]). Correlational evidence from countries that have implemented graphic labels finds a reduction in overall smoking rates and greater quit attempts following their introduction [5–7].

In 2009, the U.S. Family Smoking Prevention and Tobacco Control Act mandated that graphic warning labels be included on all cigarette packaging. Yet a court ruling against the Food and Drug Administration (FDA; the entity regulating tobacco products in the U.S.) effectively stopped the proposed graphic labels from being implemented [8]. Research evaluating the utility of the graphic warning labels was criticized for providing little evidence that such warnings convey new knowledge over that provided by text-based warnings but instead were designed to emotionally manipulate smokers to quit [9].

The FDA is required to develop graphic warning labels for cigarette packages, highlighting the need for continued research on the effectiveness of warning labels in terms of understanding smoker and nonsmoker perceptions of the warnings, whether they can improve knowledge and understanding of the consequences of smoking, and whether this improvement in knowledge discourages smoking and promotes quitting behavior. Although research has assessed the effects of graphic warning labels on smoking motivations, less focus has been given to the impact these warnings might have on educating smokers and nonsmokers about the risks of smoking. Such research can further understanding of the relationships of enhanced knowledge of smoking consequences with emotional reactions, motivations, and behavior.

Theory and research support the role of new knowledge about health risks to promote worry, protection motivations, and protective behavior. For example, the Common-Sense Model [10–12] posits that new information about a health threat can trigger changes in representational attributes (e.g., consequences) that, in turn, activate fear-related reactions such as worry. Representations and worry operate in parallel to motivate behavior aimed at reducing the objective threat and relieving the emotional distress. Warnings that provide new knowledge about the harms of smoking should thus increase worry and, in turn, discourage smoking.

The extant research also supports a link between knowledge of health outcomes and motivation to engage in health-protective behaviors. Within the area of smoking, knowledge about health consequences of smoking is associated with motivation to quit [13, 14] and beliefs, or risk perceptions, about the consequences of smoking are associated with intentions to quit [15]. Similarly, learning new information about the harms of smoking can elevate worry, which is also related to motivation to quit [16, 17] and may be more impactful than risk perceptions on smoking motivations [17, 18]. Thus, focusing on new knowledge gained from cigarette warnings and its relationship with worry and smoking motivations may be important as the research community continues to understand the role these labels play in a larger public health context.

To date, the extent to which individuals may gain new knowledge from graphic warning labels over and above the knowledge gained from text-only labels has been understudied.

Research supports that the introduction of graphic warnings on cigarette packs is associated with increases in beliefs of the consequences of smoking [15, 19] and memory of these consequences over time [20]. In addition, Strasser and colleagues [21] used an experimental design to demonstrate that recall of graphic label content is higher than recall of text-only label content. Nonetheless, it remains to be determined whether individuals acquire more new knowledge from graphic warnings than from their text-only counterparts.

Graphic cigarette labels may be more influential than text-only labels conveying the same information for several reasons. Compared to text-only warning labels, individuals may process graphic-based information faster and more deeply [22], more accurately recall information presented [21, 23], and experience greater emotional responses to the content [24]. Moreover, graphic labels may allow more information to be conveyed within the label itself. For example, for a label that notes the connection of smoking to neck cancer in text, an image can convey additional information about what neck cancer actually is or what it means to have neck cancer (e.g., a tumor growth on the neck) without providing lengthy text. Thus, graphic labels may enhance the information provided by making the information more understandable and provide additional information about the consequences of smoking.

Although the literature generally supports the effectiveness of graphic warning labels [4], certain types of images may be more impactful than others [12]. For example, use of real images may be more effective than cartoons conveying the same information [25] and images of disease may be more effective than symbolic or metaphorical images [26, 27]. The consistency between the image and the text within the warning may be critical for enhancing understanding and persuasiveness [28]. A label with a high text-image consistency, such as one with a text message about lung cancer and an image of blackened lungs, is likely to be more effective than a label with low text-image consistency, such as one that presents the same message and an image of a crying woman with no other cues specific to lung cancer. Indeed, in a consumer research report of Canadian graphic warnings, 71 % of the respondents stated that the warnings could be made more effective by choosing text that more closely matched the images on the warnings [29]. To date however, little focus has been given to how this complementarity in a warning's statement and image may influence cognitive and motivational outcomes. Images that are confusing within the context of the text statement may reduce understanding of the risk being conveyed. Confusion and low understanding would be counterproductive to use of cigarette graphic warning labels to educate smokers and nonsmokers about the consequences of smoking. We explore the relationships between text-image consistency and label perceptions in a post hoc analysis.

Current Study

The overall goal of the current study was to investigate young adult perceptions of new knowledge gained from graphic+ text and text-only cigarette warning labels. We focused on young adult nonsmokers and smokers because of their vulnerability for smoking initiation and their potential for smoking cessation. Substance use, including tobacco use, increases among young adults transitioning away from high school into different settings (e.g., school, work, living arrangements) [30, 31], and young adults are more likely to begin smoking

regularly during young adulthood than in later years [31, 32]. Even if an individual is not a regular, daily smoker, they are more likely to become one during young adulthood than as an older adult. Additionally, signs of nicotine dependence can develop in young smokers even among those who smoke infrequently [33] which predicts the development of regular smoking patterns [34]. Young adult smokers who quit prior to the age of 30 show better long-term health outcomes than older adults who quit [35, 36]. Thus, young adults are an important demographic to study regarding perceptions of cigarette warning labels and how they may aid in reducing smoking behavior prevalence in this population.

It is likely that nonsmokers and smokers will exhibit different reactions to graphic warnings. Compared to smokers, nonsmokers may find graphic labels more worrisome and discouraging [26, 37], and they may be more likely to respond to them with enhanced risk perceptions [26] and more frequent thoughts about not smoking [38]. Yet, at least one study found no differences in affective reactions (i.e., feeling negative toward smoking) between nonsmokers and smokers in their responses to graphic warnings [39]. To date, however, the extent to which smokers and nonsmokers differ in their perceptions of new knowledge and understanding gained from graphic warnings has not been addressed.

We selected graphic labels portraying bodily consequences of smoking (e.g., a tumor or blackened lung) based on research demonstrating that they are particularly evocative of emotions such as worry and disgust [4, 26, 40, 41]. Given that the U.S. court decision was in part based on a determination that cigarette graphic warnings were designed to emotionally manipulate individuals without evidence that they are informative, we chose to select labels portraying bodily consequences as they can provide a strong test of the degree to which individuals may learn or understand from such labels. The specific consequences conveyed in the warnings were selected to include a combination of labels that are likely more familiar (e.g., lung cancer, addiction) and less well-known (e.g., eye disease, impotence) given evidence that less familiar consequences may be more impactful in enhancing beliefs about risks, worry, and motivations to not smoke [4, 15, 42]. Our primary questions were twofold: (1) Do graphic labels provide better understanding of consequences and greater perceived new information than do text-only labels for a university sample? If so, do these findings replicate in a more diverse young adult sample? (2) Do greater perceptions of perceived new knowledge indirectly predict discouragement from smoking through their impact on worry about the consequences of smoking? This latter question was tested in a multilevel mediation framework.

We hypothesized that, in both samples, smokers and nonsmokers would rate graphic warnings as providing better understanding of the risks presented in the messages and as conveying more knowledge. We also explored potential differences in perceptions of labels between smokers and nonsmokers.

Based on previous findings that nonsmokers tend to have stronger cognitive and affective reactions to cigarette warnings, we predicted that nonsmokers would express greater worry, discouragement, and perceptions of new knowledge relative to smokers. Additionally, we hypothesized that more perceived new knowledge would predict greater worry about the consequences of smoking and worry in turn would predict greater discouragement from smoking (i.e., motivation). That is, we predicted that more new knowledge perceived from the labels would indirectly predict discouragement to smoke through its impact on worry. Finally, in a post hoc analysis, we explored the extent to which external ratings of consistency within the warnings were associated with perceptions of new knowledge.

Method

Data were obtained from two online surveys of 18–25-year-old adults. Participants in Study 1 completed the survey for course credit in their undergraduate psychology courses. Respondents provided judgments for 36 (18 graphic+text; 18 text-only) cigarette warning labels. Participants in Study 2 were a more diverse sample of U.S. young adults recruited through a national website survey service (Amazon Mechanical Turk; MTurk) and received $3 payment for completion of the survey. Respondents represented 48 out of 50 U.S. states. In order to shorten the length of the survey to ensure complete data, the number of labels for Study 2 was reduced from 36 to 24 (12 graphic+text; 12 text-only). The study protocol was considered by the Washington State University Internal Review Board and designated as exempt due to the low risk associated with participation.

Procedure

In Study 1, 18 graphic labels portraying a bodily consequence of smoking were selected from the WHO FCTC Warnings Database website (http://www.who.int/tobacco/healthwarningsdatabase/en/). For each graphic label, we developed a text-only version presenting the text information and colors that best matched the background and text of each label (e.g., white text on a red background, yellow text on a black background). Thus, each individual viewed 36 labels: 18 graphic+text labels and 18 corresponding text-only labels. The number of labels presented in Study 2 was reduced to 12 graphic+text and 12 text-only labels. Labels emphasized negative consequences associated with lung cancer (Study 1 $n=2$; Study 2 $n=1$); addiction (Study 1 $n=3$; Study 2 $n=3$); heart disease/stroke (Study 1 $n=3$; Study 2 $n=1$); impotence (Study 1 $n=2$; Study 2 $n=1$); eye disease (Study 1 $n=2$; Study 2 $n=1$); neck, throat, and mouth cancers (Study 1 $n=4$; Study 2 $n=3$); and vascular disease (Study 1 $n=2$; Study 2 $n=2$). These labels are presented in the electronic supplemental materials.

After providing informed consent, participants responded to measures of smoking behavior and background information, and then viewed all labels in a random order. They rated each label on perceived understandability, perceived new knowledge gained, the extent to which the label evoked worry, and perceived discouragement from smoking.

Measures

Smoking Behavior and Perceptions Smoking Status. Participants indicated how often they smoke now. Options were never, I am not a smoker; less than once a month; at least once a month; or at least once a day. Anyone who responded less than once a month or more was considered a smoker. Participants also indicated if they had smoked 100 cigarettes or more in their lifetime (yes or no). Anyone who responded I am not a smoker but indicated smoking 100 or more cigarettes was considered a former smoker.

Label Evaluations All evaluation items were answered using 7-point scales ranging from 1=not at all to 7=very much/extremely. Better personal understanding was measured with "How much does this label give you a better understanding of the consequences of smoking?" Learning something new was measured with "Did you learn something new from this label that you did not know before?" For the test of mediation, these two items were averaged across all labels similar between the two studies to create a single score representing perceived new knowledge of the consequences of smoking gained from each label (Study 1 average α=0.52, Study 2 average α=0.37).[1] Worry was assessed with one item: "How much does this label make you feel worried?" Finally, discouragement from smoking was assessed with one item: "How much does this label discourage you from wanting to smoke cigarettes?" Although they can be less reliable, given the number of warnings evaluated, we chose to use single-item measures to reduce participant burden and increase the response rate. Single-item measures are commonly used in research on evaluations of graphic warning labels (e.g., 14, 26, 27).

Consistency Ratings In a post hoc assessment, we evaluated the extent to which the consistency between the text and image presented in the graphic+text warnings was associated with the combined perceived new knowledge ratings. An independent sample of researchers blind to the purpose of the study (N=15) rated each graphic+text label for the degree of consistency between the image and the text presented. On a 7-point scale (1=extremely disagree to 7=extremely agree),

---

[1] Due to the relatively low alphas, we computed separate mediation analyses for personal understanding and perceived new knowledge. Each model yielded identical patterns of findings (tests of the direct and indirect effects were significant at p<.001 in both models), thus we only report the mediation analyses for the combined-item measure.

these individuals rated the extent to which the image clearly conveyed the meaning of the text warning, the text warning was consistent with the image, how easy it was to understand how the image fit with the text warning, how difficult it was to understand what the image was meant to convey, and how confusing was the image. Intra-class correlations indicated inter-rater reliability was acceptable (ICCs 0.83–0.89 across ratings). These five ratings were averaged to create a single consistency score for each label (average α across all labels= 0.86).

Analysis

Paired-samples t tests compared the mean differences on the outcomes of interest between graphic+text and text-only labels. Although analyses were based on a priori hypothesized relationships, due to the number of tests run, we set an alpha level of $p \leq 0.001$ for these tests. For comparisons by smoking status, average scores were created across graphic+text labels and text-only labels for better personal understanding, learning something new, worry, and discouragement. Mean differences on these four outcomes were tested using 2 (label type)×2 (smoker versus nonsmoker status) mixed ANOVAs.

Mediation analysis was conducted using a random coefficient regression (RCR) in a multilevel modeling framework utilizing maximum likelihood estimation [43]. We utilized the procedure outlined by Bauer and colleagues [44] using SAS version 9.3 to test the indirect effect in multilevel mediation. This procedure estimates a 95 % biased-corrected confidence interval (CI) around the indirect effect using a bootstrapping procedure. Ratings of perceived new knowledge, worry, and discouragement were specified as random factors (allowed to vary across labels within participants). Prior to entry into the model, variables were first checked for normality.

The consistency scores for each label were correlated with the average ratings of perceived new knowledge for each label.

Results

Sample Characteristics

Characteristics of each study sample can be seen in Table 1. In Study 1 (N=232), participants were majority female and White/Caucasian. They were on average 19.4 years of age and the majority was nonsmokers. In Study 2 (N=412), participants were majority male and White/Caucasian. They were on average 22.0 years of age and approximately half of the sample was nonsmokers. Four participants (1.7 %) in Study 1 and 13 participants (3.2 %) in Study 2 were designated as former smokers. Analysis excluding former smokers yielded equivalent patterns of findings as when they were included.

Table 1 Study sample characteristics

	Study 1 (N=232)	Study 2 (N=412)	Combined (N=644)
Age (mean, SD)	19.4 (1.3)	22.0 (2.1)	21.1 (2.3)
Gender (% female)	87.0	35.2	53.8
Ethnicity (% White/Caucasian)	72.8	70.4	71.3
Education (% at least some college)	100	85.9	91.0
Smoker (%)	19.0	48.8	38.0
Smoked 100 cigarettes (%)	7.8	39.3	28.0

Given the small number of former smokers and the equivalence in the patterns of findings, we retained them as non-smokers in the analyses. Comparison of the study samples revealed that Study 1 participants were significantly less likely to be smokers [$\chi^2(1; N=644)=56.00$, $p<0.001$, phi (φ)=0.30] and more likely to be female [$\chi^2(1; N=643)=159.91$, $p<0.001$, $\varphi=0.50$] compared to the more diverse Study 2

sample. Although participants were selected based on an age criteria of 18–25, the Study 2 sample was also older, $t(642)=16.75$, $p<0.001$, $d=1.47$.

Label Perceptions

The means, standard deviations, and effect sizes (Cohen's d) for mean comparisons of graphic+text and text-only labels for better personal understanding, learning something new, worry, and discouragement are presented in Tables 2 and 3 (for Studies 1 and 2, respectively). For the following mean comparisons, all ps ≤0.001 unless otherwise indicated.

Study 1 Label Perceptions With the exception of the limp cigarette label (all comparison ps=0.06–1.0; ds=0.00–0.12), participants in Study 1 rated the graphic+text version of each label as providing significantly better personal understanding than the corresponding text-only label (ds=0.20–1.05).

Table 2 Means (SD) for label evaluations in Study 1

Label	Better personal understanding			Learning something new			Worry			Discouragement		
	Graphic	Text	d	Graphic	Text	d	Graphic	Text	d	Graphic	Text	d
Lung cancer												
Healthy/diseased lung	**5.3 (1.7)**	**4.2 (1.82)**	0.62	**2.9 (1.9)**	**2.4 (1.7)**	0.26	**4.8 (2.0)**	**3.8 (1.9)**	0.51	**5.5 (1.8)**	**4.5 (2.0)**	0.56
Respirator	**4.8 (1.8)**	**4.2 (1.72)**	0.35	**2.8 (1.8)**	**2.3 (1.6)**	0.27	**4.5 (1.9)**	**4.0 (1.9)**	0.29	**5.2 (1.8)**	**4.7 (2.0)**	0.30
Addiction												
Hole in throat	**4.8 (1.8)**	**2.9 (1.90)**	1.05	**2.6 (1.8)**	**1.7 (1.3)**	0.62	**4.6 (2.0)**	**2.8 (1.9)**	0.93	**5.2 (1.9)**	**3.5 (2.1)**	0.81
IV	**3.7 (1.9)**	**3.3 (1.95)**	0.20	*2.1 (1.5)*	*1.8 (1.5)*	0.19	**3.5 (1.9)**	**3.1 (2.0)**	0.23	*4.1 (2.1)*	*3.8 (2.1)*	0.16
Cigarette between fingers	**3.5 (1.9)**	**2.9 (1.98)**	0.32	**2.2 (1.6)**	**1.7 (1.4)**	0.35	**3.6 (1.9)**	**2.7 (1.8)**	0.49	**4.1 (2.0)**	**3.6 (2.1)**	0.27
Heart disease/stroke												
Oxygen mask	**4.9 (1.6)**	**4.0 (1.75)**	0.52	**3.2 (1.8)**	**2.5 (1.6)**	0.41	**4.6 (1.8)**	**3.8 (1.8)**	0.48	**5.2 (1.7)**	**4.3 (2.0)**	0.45
Surgery	**5.0 (1.7)**	**3.9 (1.78)**	0.60	**3.3 (1.8)**	**2.5 (1.7)**	0.43	**4.8 (1.9)**	**3.7 (1.8)**	0.59	**5.4 (1.8)**	**4.3 (2.1)**	0.59
Brain	**5.0 (1.6)**	**4.4 (1.68)**	0.38	**3.8 (1.8)**	**3.3 (1.8)**	0.27	**4.8 (1.8)**	**3.9 (1.8)**	0.50	**5.3 (1.7)**	**4.6 (1.9)**	0.35
Impotence												
Limp cigarette in hand	**4.1 (1.7)**	**3.3 (1.71)**	0.46	**3.7 (1.7)**	**3.0 (1.8)**	0.44	*3.4 (1.8)*	*3.1 (1.9)*	0.18	**4.1 (2.1)**	**3.7 (2.0)**	0.22
Limp cigarette	4.7 (1.7)	4.7 (1.74)	0.02	4.3 (1.9)	4.3 (1.9)	0.00	3.6 (1.9)	3.9 (1.9)	0.12	4.4 (2.1)	4.2 (2.1)	0.06
Eye disease/blindness												
Full eye	**4.5 (1.7)**	**3.8 (1.85)**	0.34	**4.1 (1.7)**	**3.5 (2.0)**	0.32	**4.5 (1.9)**	**3.6 (1.9)**	0.48	**5.0 (1.9)**	**4.4 (2.1)**	0.29
Swollen eye	**6.0 (1.5)**	**4.7 (1.70)**	0.83	**5.3 (1.9)**	**4.2 (1.8)**	0.56	**5.8 (1.9)**	**4.2 (1.8)**	0.85	**6.1 (1.5)**	**4.8 (1.9)**	0.81
Neck/throat/mouth cancers												
Cancerous lesion on lip	**5.2 (1.6)**	**3.6 (1.86)**	0.94	**2.8 (1.9)**	**1.9 (1.6)**	0.51	**5.0 (1.9)**	**3.7 (1.9)**	0.69	**5.6 (1.7)**	**4.4 (2.1)**	0.66
Mouth cancer	**5.4 (1.7)**	**4.0 (1.82)**	0.81	**3.2 (1.9)**	**2.4 (1.7)**	0.43	**5.1 (1.9)**	**3.8 (2.0)**	0.64	**5.7 (1.7)**	**4.5 (2.0)**	0.69
Neck cancer hole	**6.0 (1.6)**	**3.9 (1.74)**	1.29	**4.3 (2.2)**	**3.1 (1.9)**	0.58	**5.8 (1.9)**	**3.5 (1.8)**	1.23	**6.3 (1.5)**	**4.4 (2.1)**	1.05
Neck cancer growth	**5.6 (1.7)**	**3.7 (1.85)**	1.07	**4.3 (2.1)**	**2.5 (1.7)**	0.97	**5.6 (1.8)**	**3.7 (2.0)**	1.00	**6.1 (1.6)**	**4.3 (2.1)**	0.96
Vascular disease												
Gangrene foot	**5.4 (1.6)**	**3.8 (1.80)**	0.90	**4.9 (1.8)**	**3.8 (1.8)**	0.63	**5.1 (2.0)**	**3.6 (1.7)**	0.80	**5.6 (1.7)**	**4.1 (2.0)**	0.85
Amputation	**5.4 (1.6)**	**4.5 (1.61)**	0.60	**4.6 (1.8)**	**3.9 (1.8)**	0.36	**5.0 (2.0)**	**4.1 (2.0)**	0.47	**5.5 (1.8)**	**4.7 (2.0)**	0.42

All bolded mean values represent significant mean differences between the graphic+text and text-only label for each measure at p ≤0.001. Italicized numbers are significant at p ≤0.008. d denotes Cohen's d

Table 3 Means (SD) for label evaluations in Study 2

Label	Better personal understanding			Learning something new			Worry			Discouragement		
	Graphic	Text	d	Graphic	Text	d	Graphic	Text	d	Graphic	Text	d
Lung cancer												
Healthy/diseased lung	**5.3 (1.7)**	**4.1 (1.8)**	0.69	**2.2 (1.7)**	**1.7 (1.3)**	0.29	**4.7 (1.9)**	**3.5 (1.8)**	0.65	**5.4 (1.8)**	**4.1 (1.9)**	0.66
Addiction												
Hole in throat	**5.1 (1.8)**	**3.3 (2.1)**	1.01	**2.0 (1.6)**	**1.4 (1.0)**	0.54	**4.6 (1.9)**	**2.6 (1.7)**	1.08	**5.1 (1.8)**	**3.1 (2.0)**	1.06
IV	**3.7 (1.9)**	**3.3 (1.9)**	0.22	**1.6 (1.2)**	**1.4 (0.9)**	0.20	**3.1 (1.8)**	**2.7 (1.8)**	0.22	**3.6 (2.0)**	**3.3 (2.0)**	0.19
Cigarette between fingers	**3.6 (1.9)**	**3.1 (1.9)**	0.28	**1.6 (1.3)**	**1.3 (1.0)**	0.26	**3.1 (1.8)**	**2.6 (1.7)**	0.24	**3.6 (2.0)**	**3.1 (2.0)**	0.26
Heart disease/stroke												
Surgery	**5.1 (1.7)**	**3.9 (1.9)**	0.64	**2.8 (1.8)**	**1.9 (1.4)**	0.56	**4.6 (1.9)**	**3.5 (1.9)**	0.60	**5.4 (1.8)**	**4.0 (1.9)**	0.66
Impotence												
Limp cigarette in hand	**5.1 (1.5)**	**4.3 (1.7)**	0.46	**4.5 (1.9)**	**4.0 (2.0)**	0.26	**3.7 (1.9)**	**3.3 (1.8)**	0.21	**4.1 (2.1)**	**3.9 (2.1)**	0.22
Eye disease/blindness												
Swollen eye	**6.0 (1.3)**	**5.1 (1.5)**	0.62	**5.6 (1.7)**	**4.8 (1.8)**	0.47	**5.5 (1.8)**	**4.2 (1.8)**	0.77	**6.1 (1.5)**	**4.6 (1.9)**	0.78
Neck/throat/mouth cancers												
Cancerous lesion on lip	**5.3 (1.6)**	**3.7 (1.9)**	0.89	**2.4 (1.7)**	**1.4 (1.0)**	0.74	**4.7 (1.9)**	**3.4 (1.9)**	0.71	**5.6 (1.7)**	**4.0 (2.0)**	0.79
Neck cancer hole	**6.1 (1.4)**	**4.2 (1.7)**	1.25	**3.6 (2.1)**	**2.8 (1.8)**	0.38	**5.8 (1.8)**	**3.6 (1.8)**	1.25	**6.3 (1.5)**	**4.1 (1.9)**	1.28
Neck cancer growth	**5.8 (1.5)**	**3.8 (1.9)**	1.11	**3.6 (2.1)**	**1.9 (1.4)**	1.00	**5.6 (1.8)**	**3.5 (2.0)**	1.12	**6.1 (1.6)**	**3.9 (2.1)**	1.16
Vascular disease												
Gangrene foot	**5.7 (1.4)**	**4.0 (1.8)**	1.03	**5.0 (1.8)**	**3.8 (1.9)**	0.66	**5.2 (1.8)**	**3.5 (1.8)**	0.94	**5.6 (1.7)**	**3.8 (1.9)**	1.00
Amputation	**5.7 (1.3)**	**4.7 (1.6)**	0.73	**4.5 (2.0)**	**4.0 (1.9)**	0.23	**4.9 (1.8)**	**3.8 (1.9)**	0.60	**5.5 (1.8)**	**4.4 (2.0)**	0.64

All graphic+text by text-only comparisons were significant at $p < 0.001$. d denotes Cohen's d

Participants reported learning something new more so from graphic+text labels compared to the text-only labels with the exception of the IV label ($p=0.002$, ds$=0.19$–0.62). Graphic+text labels were rated as provoking more worry about the consequences of smoking with the exception of the limp cigarette in hand label ($p=0.007$, $d=0.18$) compared to text-only versions (ds$=0.23$–0.93). Finally, graphic+text labels were perceived to be more discouraging towards smoking than the text-only labels (ds$=0.22$–0.81) with the exception of the IV label ($p=0.008$, $d=0.16$).

The 2 (label type) × 2 (smoker versus nonsmoker status) mixed ANOVAs on averaged ratings revealed that although no comparisons reached the $p \leq 0.001$ criteria, nonsmokers perceived the warnings as generally being more discouraging ($M=4.9$, SD$=0.7$) than did smokers ($M=4.2$, SD$=2.8$), $F(1, 225)=8.24$, $p=0.005$, $\eta_p^2=0.035$. Smokers and nonsmokers did not differ on any other average ratings (ps$=0.23$–0.96; $\eta_p^2=0.000$–0.006). There were also no significant label type × smoking status interactions (ps$=0.07$–0.21; $\eta_p^2=0.007$–0.014).

Study 2 Label perceptions Across all labels, participants in Study 2 rated the graphic+text labels as providing significantly better personal understanding (ds$=0.22$–1.25), learning something new (ds$=0.20$–1.00), as arousing more worry about the consequences of smoking (ds$=0.21$–1.25), and as providing more discouragement to smoke (ds$=0.19$–1.28) than the corresponding text-only label. The 2×2 mixed ANOVAs on averaged ratings revealed that nonsmokers perceived the warnings as being more discouraging ($M=5.1$, SD$=1.3$) than did smokers ($M=4.0$, SD$=1.3$), $F(1, 406)=74.29$, $p<0.001$, $\eta_p^2=0.155$. Smokers and nonsmokers did not significantly differ on any other averaged ratings (ps$=0.10$–0.47; $\eta_p^2=0.001$–0.007), nor were there any significant label type × smoking status interactions (ps$=0.57$–0.67; $\eta_p^2=0.000$–0.004).

Across all assessments for each label topic, the largest and weakest effect sizes (d) were consistent across Study 1 and 2. For the 12 labels used in both Studies 1 and 2, the largest overall graphic+text by text-only effect sizes were found for Neck Cancer Hole (Study 1 avg $d=1.04$, Study 2 avg $d=1.04$) and Neck Cancer Growth (Study 1 avg $d=1.00$, Study 2 avg $d=1.10$) labels. Additionally, both samples reported the least differences in overall perceptions for the IV label (Study 1 avg $d=0.20$, Study 2 avg $d=0.21$).

Mediation Model

Mediational analyses were conducted to test the proposed model that more perceived new knowledge of the label

accounts for greater worry about the consequences portrayed in the label and worry then influences discouragement from smoking (i.e., lesser motivation to smoke). Unstandardized effect estimates can be seen in Fig. 1a. There was a significant total effect of perceived new knowledge on discouragement (est=0.58; SE=0.014). Moreover, the findings indicate that the more new knowledge one perceives from smoking labels, the more worry experienced (est=0.63; SE=0.013). In turn, the more worry experienced is associated with greater discouragement to smoke, controlling for perceived new knowledge (est=0.65; SE=0.014). The indirect effect of perceived new knowledge through worry on discouragement was significant (est=0.58; SE=0.015; 95 % CI=0.55 to 0.61). There remained a significant direct effect of better understanding on discouragement (est=0.16; SE=0.010) suggesting that understanding has a unique effect on discouragement over and above any influence of worry.

The same model was conducted separately for smokers and nonsmokers. Although the estimates within the model varied slightly, the interpretation of outcomes did not change for either group (see Fig. 1b and c for smokers and nonsmokers, respectively). Additional models were tested with graphic warnings alone and text warnings alone. The same patterns of findings were detected for both sets of warnings indicating a significant influence of perceived new knowledge on discouragement both directly and indirectly through worry.

Consistency Rating Associations

Table 4 presents the graphic+text labels in order of the consistency rating with the graphic+text perceived new knowledge scores by Study. Graphic+text labels that were rated as having greater consistency between the text and the image tended to be rated as providing more perceived new knowledge (Study 1—$r=0.51$, $p=0.03$; Study 2—$r=0.61$; $p=0.04$). Although the effect sizes are medium to large, due to the limited number of labels with which to test these relationships,

Fig. 1 **a** Mediation model for the full sample. **b** Mediation model with smokers only. **c** Mediation model with nonsmokers only
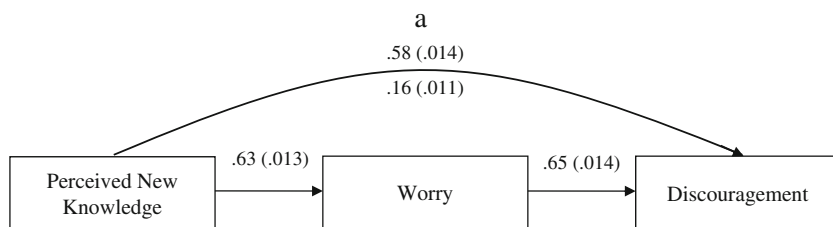
a

.58 (.014)

.16 (.011)

| Perceived New Knowledge | .63 (.013) → | Worry | .65 (.014) → | Discouragement |

Note. Coefficients are unstandardized coefficients and standard error is in parentheses. All paths are significant at *p*<.001. The upper coefficient represents the path before controlling for worry and the lower coefficient represents the path after controlling for worry. Indirect effect estimate = .58 (*SE* = .015), 95% CI: .55 to .61.
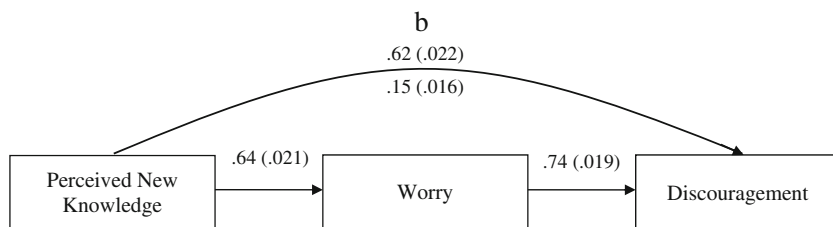
b

.62 (.022)

.15 (.016)

| Perceived New Knowledge | .64 (.021) → | Worry | .74 (.019) → | Discouragement |

Note. Coefficients are unstandardized coefficients and standard error is in parentheses. All paths are significant at *p*<.001. The upper coefficient represents the path before controlling for worry and the lower coefficient represents the path after controlling for worry. Indirect effect estimate = .62 (*SE* = .023), 95% CI: .57 to .66.
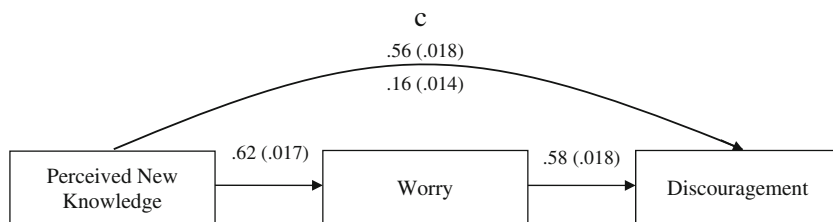
c

.56 (.018)

.16 (.014)

| Perceived New Knowledge | .62 (.017) → | Worry | .58 (.018) → | Discouragement |

Note. Coefficients are unstandardized coefficients and standard error is in parentheses. All paths are significant at *p*<.001. The upper coefficient represents the path before controlling for worry and the lower coefficient represents the path after controlling for worry. Indirect effect estimate = .56 (*SE* = .020), 95% CI: .52 to .60.

Table 4 Consistency and perceived new knowledge means for each graphic+text label [*M* (SD)] by Study

Label	Consistency	Study 1 Perceived new knowledge	Study 2 Perceived new knowledge
Neck cancer hole	6.7 (0.4)	5.1 (1.5)	4.9 (1.4)
Amputation	6.5 (0.6)	5.0 (1.5)	5.1 (1.3)
Mouth cancer	6.5 (0.6)	4.4 (1.5)	–
Healthy/diseased lung	6.4 (0.6)	4.1 (1.4)	3.8 (1.3)
Limp cigarette in hand	6.0 (0.8)	3.9 (1.4)	4.8 (1.4)
Swollen eye	5.9 (1.2)	5.6 (1.5)	5.8 (1.2)
Surgery	5.8 (1.1)	4.2 (1.5)	3.9 (1.4)
Limp cigarette	5.7 (1.4)	4.6 (1.6)	–
Hole in throat	5.4 (1.4)	3.8 (1.4)	3.6 (1.3)
Gangrene foot	5.5 (1.7)	5.1 (1.5)	5.3 (1.4)
Brain	5.2 (1.4)	4.4 (1.4)	–
Neck cancer growth	4.5 (2.0)	4.9 (1.6)	4.7 (1.4)
Respirator	4.5 (1.4)	3.8 (1.4)	–
Cancerous lesion on lip	4.4 (1.7)	4.0 (1.4)	3.8 (1.3)
Oxygen mask	4.3 (1.8)	4.1 (1.4)	–
Cigarette between fingers	4.1 (1.6)	2.9 (1.5)	2.6 (1.3)
IV	4.1 (1.9)	2.9 (1.4)	2.6 (1.2)
Full eye	3.9 (1.8)	4.3 (1.5)	–

these effects did not reach the more stringent significance level set for the current investigation ($p \leq 0.001$).

Discussion

This was an investigation into young adult perceptions of graphic+text and text-only cigarette warning labels. Consistent with our hypothesis and previous work [26, 37], graphic+text labels were generally rated as more worrisome and discouraging towards smoking, and were perceived as providing better understanding of the message and as providing new information more so than the text-only labels. Consistent with previous work [26], nonsmokers were generally more discouraged by the warning messages than smokers; however, this difference did not occur for ratings of worry, understanding, or perceptions of new knowledge. Perceptions of graphic warnings were stronger than perceptions of text-only warnings regardless of smoking status. This is a critical issue for policy as it suggests that both smokers and nonsmokers are equally likely to learn information from these graphic warnings.

We also tested a preliminary framework whereby greater perceived new knowledge predicted discouragement of smoking through greater worry about the consequences of smoking. Perceived new knowledge obtained from graphic or text cigarette labels may drive the emotional experience of the label. Additionally, there remained a significant direct effect of perceived new knowledge on discouragement from smoking suggesting that greater perceived new knowledge

gained from warning content may influence motivation to quit independently of its impact on worry. This outcome highlights the need to focus not only on the emotional and motivational responses of warning labels but also on the degree to which people understand and learn from the content. These findings converge with prior work suggesting that cognitive and affective responses to warnings about less well-known consequences of smoking (e.g., gangrene, impotence) are stronger relative to those focusing on more well-known consequences (e.g., cancer, heart disease) [15, 42]. The model outcomes were consistent for both smokers and nonsmokers, suggesting that focusing on better understanding of the message content could be beneficial for both smokers and nonsmokers alike.

The findings from the mediational model are important given the emphasis on the need to utilize graphic labels as an education tool in the recent court decision regarding graphic labels in the U.S. [9]. The extant literature generally finds that health messages that provoke more worry about the consequences of the behavior are more motivating than are less worry-provoking messages [24]. Although these data cannot determine a causal link, the pattern of outcomes suggests that the more understandable and informative the labels, the greater the potential for eliciting worry and, ultimately, discouragement from smoking. By focusing on developing labels that enhance understanding and provide new information of smoking consequences, smoking labels may influence worry and, subsequently, prevention and discouragement of smoking.

The pattern of perceptions of graphic+text and text-only labels from a University sample was replicated with a more

diverse U.S. adult population. The characteristics of the two samples varied substantially and yet both samples generally rated graphic+text labels as providing more new knowledge, being more worrisome, and more discouraging of smoking. The similarity across samples is consistent with extant literature on warning labels which finds similar patterns of outcomes across ethnic groups, education, and age [25, 27, 41].

Additionally, correlations of ratings of perceived new knowledge with independent ratings of consistency between the text and image in the graphic labels suggest that graphic+text labels with more consistency may be easier to understand and enable an individual to perceive more new information. This approach of measuring perceptions of knowledge and understanding is different than how knowledge gained from warnings has been assessed previously [4]. Whereas previous research has measured absolute levels of knowledge without controlling for prior knowledge levels or focused on recall of the warning labels themselves, the current study provides evidence of perceptions of increments in knowledge and understanding resulting from viewing the label. This study thus provides new and converging evidence that graphic labels may enhance knowledge of the topics of the warnings. Although these outcomes are correlational and cannot imply a causational relationship, they do provide evidence that when developing graphic labels to enhance understanding or perceived new knowledge, it is important to consider the degree of consistency between the graphic and text within the label. Recent work on warning labels found that adding elaborated text explaining the graphic image (compared to a standard graphic+text warning) enhanced perceptions of the consequences of smoking through enhanced believability of the message [45]. Previous work also suggests that the portrayal of diseased body parts is particularly motivating [25, 26]. However, in the current investigation, not all images of diseased body parts were rated highly as providing new information. To enhance understanding and knowledge of the content of the warning, it may be necessary to ensure that the text information clearly conveys consistent information about the image of the diseased body part. Care should be taken when selecting an image to accompany specific text information when attempting to enhance understanding of the graphic+text labels.

There were several limitations that should be considered. First, the samples were University students and MTurk participants who self-selected to participate. MTurk participants are generally more diverse than a typical college sample and provide data that are as reliable as data obtained through more traditional methods [46]. Given the large proportion of individuals who identified as White in both samples, replication needs to be done to determine the extent to which these findings can extend to individuals of other ethnic and racial backgrounds. The measurement of perceived new knowledge included perceptions of gaining new knowledge and does not measure other aspects of learning, such as increments in

accurate knowledge from pre- to post-exposure to a warning (e.g., using quizzes) or memory of information over time (e.g., using recall tests). Continued research is needed to test how graphic warnings influence these other facets of learning. Further, given the within-subjects nature of the study, we cannot control the extent that previous exposure to a text (or graphic) warning influenced subsequent evaluations of the same label. Additionally, this was a cross-sectional investigation and causal conclusions cannot be drawn. Other orderings of the variables in the mediational model are possible (e.g., greater worry could enhance willingness to process and understand information). Experimental evidence is needed to establish a causal link between knowledge gained and the emotional and motivational responses to such labels. We also constrained the probability "significance" level due the number of comparison tests to reduce risk of Type I error. The pattern of findings was highly consistent across graphic+text and text-only label ratings and the effects sizes were generally medium to large, providing confidence in our interpretations. Finally, this study relied on individuals' perceptions of the labels. We did not measure individuals' intentions to change their behaviors or evaluate objective behavior. There is evidence that worry about smoking consequences predicts both motivation to quit [17] and quit attempts [16]. An important component of evaluating the effectiveness of graphic warning labels moving forward will be a stronger focus on behavioral change.

The current investigation was a preliminary look at the role understanding of cigarette warning labels may play in affective response to those labels and discouragement from smoking. The findings suggest that graphic labels may be a tool for providing information to smokers and nonsmokers about the risks of smoking. Messages that enhance perceived knowledge and understanding may directly influence discouragement from smoking and also through worry about the consequences presented in the message. Considerable replication and extension of these findings using experimental methods is needed.

References

1. Centers for Disease Control and Prevention (CDC). *Current Cigarette Smoking Among Adults—United States, 2005–2012*. Morbidity and Morality Weekly Report 2014; 63: 29–34. [accessed 2014 Apr 25].

2. U.S. Department of Health and Human Services. *The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General.* Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health. 2014.

3. World Health Organization. *WHO Framework Convention on Tobacco Control.* Geneva, Switzerland, 2003.

4. Hammond D. Health warning messages on tobacco products: A review. *Tob Control.* 2011; 20(5): 327-337.

5. Azagba S, Sharaf MF. The effect of graphic cigarette warning labels on smoking behavior: Evidence from the Canadian experience. *Nicotine Tob Res.* 2013; 15(3): 708-717.

6. Hammond D, Fong GT, McDonald PW, et al. Impact of the graphic Canadian warning labels on adult smoking behaviour. *Tob Control.* 2003; 12(4): 391-395.

7. Huang J, Chaloupka FJ, Fong GT. Cigarette graphic warning labels and smoking prevalence in Canada: A critical examination and reformulation of the FDA regulatory impact analysis. *Tob Control.* 2014; 23(Suppl 1): i7-12.

8. Bayer R, Johns D, Colgrove J. The FDA and graphic cigarette-pack warnings—thwarted by the courts. *N Engl J Med.* 2013; 369(3): 206-208.

9. R.J. Reynolds Tobacco Co. V. Food and Drug Admin.: D.C. *Cir.*, 2012.

10. Leventhal H, Brissette I, Leventhal EA. The common-sense model of self-regulation of health and illness. In: Cameron LD, Leventhal H, eds. *The self-regulation of health and illness behaviour.* London: Routledge; 2003: 42-65.

11. Cameron LD. Illness risk representations and motivations to engage in protective behavior: The case of skin cancer risk. *Psychol Health.* 2008; 23(1): 91-112.

12. Cameron LD, Williams B. Which images and features in graphic cigarette warnings predict their perceived effectiveness? Findings from an online survey of residents in the United Kingdom. *Ann Behav Med* 2015; in press.

13. Curry SJ, Grothaus L, McBride C. Reasons for quitting: Intrinsic and extrinsic motivation for smoking cessation in a population-based sample of smokers. *Addict Behav.* 1997; 22: 727-739.

14. Hammond D, Fong GT, McDonald PW, et al. Graphic Canadian cigarette warning labels and adverse outcomes: Evidence from Canadian smokers. *Am J Public Health.* 2004; 94: 1442-1445.

15. Mutti S, Hammond D, Reid JL, et al. The efficacy of cigarette warning labels on health beliefs in the United States and Mexico. *J Health Commun.* 2013; 18(10): 1180-1192.

16. Dijkstra A, Brosschot J. Worry about health in smoking behaviour change. *Behav Res Ther.* 2003; 41(9): 1081-1092.

17. Magnan RE, Köblitz AR, Zielke DJ, et al. The effects of warning smokers on perceived risk, worry, and motivation to quit. *Ann Behav Med.* 2009; 37(1): 46-57.

18. Köblitz AR, Magnan RE, McCaul KD, et al. Smokers' thoughts and worries: A study using ecological momentary assessment. *Health Psychol.* 2009; 28(4): 484-492.

19. White V, Webster B, Wakefield M. Do graphic health warning labels have an impact on adolescents' smoking-related beliefs and behaviours? *Addiction.* 2008; 103(9): 1562-1571.

20. Hammond D, Fong GT, McNeill A, et al. Effectiveness of cigarette warning labels in informing smokers about the risks of smoking: Findings from the International Tobacco Control (ITC) Four Country Survey. *Tob Control.* 2006; 15(Suppl 3): iii19-25.

21. Strasser AA, Tang KZ, Romer D, et al. Graphic warning labels in cigarette advertisements: Recall and viewing patterns. *Am J Prev Med.* 2012; 43(1): 41-47.

22. Stacy AW, Ames SL, Knowlton BJ. Neurologically plausible distinctions in cognition relevant to drug use etiology and prevention. *Subst Use Misuse.* 2004; 39: 1571-1623.

23. McCaul KD, Mullens AB, Romaneck KM, et al. The motivational effects of thinking and worrying about the effects of smoking cigarettes. *Cogn Emot.* 2007; 21: 1780-1798.

24. Cameron LD, Chan CKY. Designing health communications: Harnessing the power of affect, imagery, and self-regulation. *Soc Personal Psychol Compass.* 2008; 2(1): 262-282.

25. Hammond D, Reid JL, Driezen P, et al. Pictorial health warnings on cigarette packs in the United States: An experimental evaluation of the proposed FDA warnings. *Nicotine Tob Res.* 2013; 15(1): 93-102.

26. Cameron LD, Pepper JK, Brewer NT. Responses of young adults to graphic warning labels for cigarette packages. *Tob Control* 2013.

27. Thrasher JF, Carpenter MJ, Andrews JO, et al. Cigarette warning label policy alternatives and smoking-related health disparities. *Am J Prev Med.* 2012; 43(6): 590-600.

28. Houts PS, Doak CC, Doak LG, et al. The role of pictures in improving health communication: A review of research on attention, comprehension, recall, and adherence. *Patient Educ Couns.* 2006; 61(2): 173-190.

29. Environics Research Group. *Consumer research on the size of health warning messages: Quantitative study of Canadian youth smokers and vulnerable nonsmokers.* Toronto, Canada: Prepared for Health Canada; 2008.

30. Kirst M, Mecredy G, Borland T, et al. Predictors of substance use among young adults transitioning away from high school: A narrative review. *Subst Use Misuse.* 2014; 49(13): 1795-1807.

31. Hammond D. Smoking behaviour among young adults: Beyond youth prevention. *Tob Control.* 2005; 14: 181-185.

32. Tercyak KP, Rodriguez D, Audrain-McGovern J. High school seniors' smoking initiation and progression 1 year after graduation. *Am J Public Health.* 2007; 97(8): 1397-1398.

33. O'Loughlin J, DiFranza J, Tyndale RF, et al. Nicotine-dependence symptoms are associated with smoking frequency in adolescents. *Am J Prev Med.* 2003; 25: 219-225.

34. Dierker L, Mermelstein R. Early emerging nicotine-dependence symptoms: A signal of propensity for chronic smoking behavior in adolescents. *J Pediatr.* 2010; 156(5): 818-822.

35. Doll R, Peto R, Boreham J, et al. Mortality in relation to smoking: 50 years' observations on male British doctors. *Br Med J.* 2004; 328: 1519.

36. Doll R, Peto R, Boreham J, et al. Mortality from cancer in relation to smoking: 50 years observations on British doctors. *Br J Cancer.* 2005; 92: 426-429.

37. Nonnemaker J, Farrelly M, Kamyab K, Busey A, Mann N. *Experimental Study of Graphic Cigarette Warning Labels.* Rockville, MD: Center for Tobacco Products, Food and Drug Administration. 2010. Contract No. HHSF-223-2009-10135G.

38. Villanti AC, Cantrell J, Pearson JL, et al. Perceptions and perceived impact of graphic cigarette health warning labels on smoking behavior among U.S. young adults. *Nicotine Tob Res.* 2014; 16(4): 469-477.

39. Peters E, Romer D, Slovic P, et al. The impact and acceptability of Canadian-style cigarette warning labels among U.S. smokers and nonsmokers. *Nicotine Tob Res.* 2007; 9(4): 473-481.

40. Berg CJ, Thrasher JF, Westmaas JL, et al. College student reactions to health warning labels: Sociodemographic and psychosocial factors related to perceived effectiveness of different approaches. *Prev Med.* 2011; 53(6): 427-430.

41. Hammond D, Thrasher J, Reid JL, et al. Perceived effectiveness of pictorial health warnings among Mexican youth and adults: A population-level intervention with potential to reduce tobacco-related inequities. *Cancer Causes Control.* 2012; 23(Suppl 1): 57-67.

42. Swayampakala K, Thrasher JF, Hammond D, Yong HH, Bansal-Travers M, Krugman D, Brown A, Borland R, Hardin J. Pictorial health warning label content and smokers' understanding of smoking-related risks—a cross-country comparison. *Health Educ Res* 2014.

43. Cohen J, Cohen P, West SG, et al. *Applied multiple regression/correlation analysis for the behavioral sciences*. 3rd ed. Mahwah, NJ: Lawrence Erlbaum; 2003.

44. Bauer DJ, Preacher KJ, Gil KM. Conceptualizing and testing random indirect effects and moderated mediation in multilevel models: New procedures and recommendations. *Psychol Methods*. 2006; 11(2): 142-163.

45. Emery LF, Romer D, Sheerin KM, et al. Affective and cognitive mediators of the impact of cigarette warning labels. *Nicotine Tob Res*. 2014; 16(3): 263-269.

46. Buhrmester M, Kwang T, Gosling SD. Amazon's Mechanical Turk: A new source of inexpensive, yet high-quality data? *Perspect Psychol Sci*. 2011; 6: 3-5.