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Responses to pictorial versus text-only cigarillo warnings among a nationally representative sample of US young adults

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Abstract

Background—The US Food and Drug Administration requires six text-only warnings for cigar products, including cigarillos. Research has demonstrated the superiority of pictorial over text-only cigarette warnings, yet the relative effectiveness of pictorial warnings for cigarillos has not been examined. We examined the impact of pictorial cigarillo warnings compared with text-only warnings.

Methods—Data were collected from a nationally representative sample of US young adult (18–29) cigarillo users and susceptible non-users. Participants were randomised to one of three experimental conditions: text-only or one of two pictorial conditions (combined for analyses). For each warning, we assessed negative emotional reactions, cognitive elaboration (ie, thinking about cigarillo risks) and perceived message effectiveness (PME).

Results—Participants (N=661) were 46.5% female, 64.7% white and 21.9% Hispanic; 34.1% reported past 30-day cigarillo use; 41.4% were lifetime users (excluding past 30-day use);

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Contributors JCR led the study design; AJL developed study stimuli; and BAR performed the statistical analyses. All authors contributed to the implementation of the study, writing and revision of the manuscript, and approval of the final version of the manuscript.

Competing interests SMN has served as a paid expert witness in government litigation against tobacco companies. There are no additional competing interests.

Patient consent for publication Not required.

Ethics approval Informed consent was obtained from each participant. The Wake Forest School of Medicine Institutional Review Board approved the study.

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and 24.4% were susceptible non-users. Pictorial warnings elicited more negative emotional reactions and higher PME than text-only warnings (p values<0.01), with interactions showing the largest effects for past 30-day users (emotional reactions: d=0.99, PME: d=0.63). For cognitive elaboration, there was no main effect of warning type, but an interaction revealed effects for past 30-day users (p<0.05, d=0.46).

Conclusions—Pictorial cigarillo warnings elicited greater negative emotional reactions and PME compared with text-only warnings. These effects and the effects on cognitive elaboration were strongest for past 30-day users. Our findings extend research on cigarette warnings to cigarillos, demonstrating that pictorial warnings are superior to text-only warnings for cigarillos in eliciting beneficial responses.

Cigar use, especially cigarillo use, remains a public health concern. From 2000 to 2015, consumption of cigars, including cigarillos, increased by 85%, while cigarette consumption decreased by 39%.[1] In the USA, over 70% of cigar users aged 18–29 report cigarillos as their typical cigar type.[2] Young adults have the highest rate of cigarillo use compared with other age groups, with 39% reporting ever use of cigarillos.[3] Furthermore, 14.6% of current cigarette smokers reported cigars as their first tobacco product, suggesting that cigarillo use may lead to progression to cigarette smoking.[4–7] Cigarillo use causes significant health effects. Some cigarillo smoke constituents exist at higher levels than in cigarette smoke, such as tobacco-specific nitrosamines, ammonia and carbon monoxide.[8–12] Cigarillo smoking causes multiple cancers, heart disease, stroke and chronic obstructive pulmonary disease.[13–15] Cigarillo smoking also exposes users to nicotine and can lead to nicotine addiction.[8] Cigars are often used alongside other tobacco products, and dual/polytobacco use exposes users to additional risk.[3]

Despite these health risks, some young adults believe cigarillos are less harmful and addictive than cigarettes. Because cigarillos are wrapped in tobacco rather than paper, many young adults incorrectly believe they are more natural, more pure and less dangerous than cigarettes.[16–18] Additionally, youth and young adults often underestimate the risks of smoking because they believe they do not smoke frequently enough to cause any health effects and can quit before becoming addicted.[19] Thus, there is a need to educate young adults about cigarillo harms.

One approach for conveying cigarillo harms to discourage use is through health warnings. Exposure to warnings on *cigarette* packaging increases knowledge about the health risks of smoking and smoking quit attempts.[20–24] Data consistently show *pictorial* warnings (text warnings that include an image) are more effective than text-only cigarette warnings in attracting attention and increasing intentions to quit, intentions to not start smoking, negative emotional reactions and quitting behaviours.[24–27] Pictorial warnings are effective because adding imagery can enhance the message processing of the warnings.[26–30]

The US Food and Drug Administration (FDA) regulates cigarillos as cigars under the Family Smoking Prevention and Tobacco Control Act.[31] As part of the FDA's 2016 Deeming Rule, cigarillo packaging and advertising must include six rotating text-only health warning statements (box 1).[32] The implementation date was originally August 2018, but, due to litigation, has been delayed. The US Court of Appeals for the District of Columbia Circuit

ruled the FDA failed to uphold the public health standard by not providing evidence on cigar warning effectiveness among users.[33] Research specific to cigar warnings, such as the current study, will contribute to the needed science base to support cigar warning regulations and withstand legal challenges.

Although there is strong evidence supporting the superiority of pictorial over text-only warnings for *cigarettes*,[24–27] there is limited research globally for pictorial *cigarillo* warnings. Our 2016 systematic review of non-cigarette tobacco product communication found no published studies testing the effectiveness of pictorial versus text-only cigarillo warnings,[34] and we are unaware of any published studies conducted since. Evidence specific to cigarillo warnings is needed, because we cannot assume consumers will react the same way to cigarillo warnings as they do to cigarette warnings. In addition, to withstand current and future legal challenges in the USA, the FDA needs research specific to cigar products to inform rule-making and implementation. In this study, we examine the relative effectiveness of pictorial versus text-only cigarillo warnings.

MESSAGE IMPACT FRAMEWORK (MIF)

We used the MIF—a communication framework for understanding tobacco warning message effectiveness—as our conceptual model (online supplemental figure 1).[27] The MIF is a framework of how people process messages such as health warnings. According to the MIF, characteristics of warnings influence attention to the warning, which influences negative emotional reactions and cognitive elaboration. These reactions then elicit changes in knowledge, attitudes and beliefs, typically after multiple exposures, leading to increases in intentions and ultimately behaviour.[35]

Message reactions important in determining warning impact include emotional reactions (negative affect) and cognitive elaboration (thinking about risks).[36] Negative emotional reactions (eg, disgust and guilt) are a key mediator of quit intentions and behaviour for cigarette pictorial warnings, with multiple studies demonstrating that warnings that elicit greater negative emotions are most effective.[36–40] Cognitive elaboration is the extent to which warnings make people think about health risks. Warnings studies have demonstrated that pictorial warnings are more likely to elicit cognitive elaboration than text-only warnings[24 36 41] and, furthermore, that elaboration mediates the impact of pictorial warnings on quit attempts.[36]

PERCEIVED MESSAGE EFFECTIVENESS (PME)

We also applied PME ratings in the current study. PME refers to participants' judgements of the effectiveness of messages and is a commonly used tool in the tobacco prevention and control literature.[26 27] PME is commonly applied in studies to select messages that have the most potential for impact.[42 43] A 2017 meta-analysis examining PME for tobacco control messaging found that PME was longitudinally predictive of quit intentions and cessation behaviour,[44] and studies of e-cigarette prevention messaging have found PME ratings to mirror the impact of prevention messages on risk beliefs among youth and young adults.[45 46] Additional research also demonstrates that PME predicts biobehavioural outcomes.[47]

The goal of this study was to assess the relative impact of pictorial versus text-only cigarillo warnings on immediate outcomes: negative emotions, cognitive elaboration and PME. We hypothesised that pictorial cigarillo warnings would elicit higher negative emotional reactions, cognitive elaboration and PME ratings compared with text-only warnings.

METHODS

Sample

Data were collected from a nationally representative sample of young adults ages 18–29 from May to June 2018. NORC (National Opinion Research Center) at the University of Chicago administered the survey through their AmeriSpeak panel, a probability-based panel representative of the USA, covering 97% of households. Young adults (N=3302) were invited to complete an eligibility screener. Participants were eligible if they were between ages 18 and 29 and reported ever cigarillo use or susceptibility to cigarillo use (described further). The screener completion rate was 30.1% (n=995). Of participants who completed the screener, 693 were eligible for the full survey (incidence/eligibility rate 69.7%), with a final sample of 661 completed surveys (95.4% survey completion rate by eligible individuals).

Procedure

After completing the screener, eligible participants provided informed consent and were directed to the full survey. They were then randomised to one of three experimental conditions: text-only cigarillo warnings (n=227), pictorial cigarillo warnings set A (n=225) or pictorial cigarillo warnings set B (n=209). Within each condition, participants viewed each of the six FDA-required cigarillo warnings, one at a time, in random order. After viewing each warning, participants responded to questions to assess immediate reactions (emotional reactions and cognitive elaboration) and PME; these items were completed while the warning was on the screen. We then measured use of other tobacco products and demographic characteristics. At the end of the survey, participants were provided information about cigarillo smoking harms.

Experimental stimuli

Systematic, formative research was used to identify and select images to develop pictorial cigarillo warnings.[48] Decisions about images were also guided by prior court cases for cigarette warnings, which have emphasised the importance of avoiding cartoon images and ensuring that images match the text.[49 50] Two images were paired with each of the six FDA text statements. We randomly allocated one image for each text statement to a set, resulting in two distinct pictorial warning sets. Given the potential for a single image to fail in testing because it does not ‘work’ with the text, we included multiple image options for each text warning, similar to other studies.[27 51] Our design expert (AJL) created the warning stimuli on a generic pack containing five cigarillos. Following requirements in the Final Deeming Rule, warnings comprised 30% of the front display panel with white text on a black background. Warning text size and surface area were consistent across conditions. In the pictorial conditions, the warning text was moved to the bottom of the warning area to allow room for the image (figure 1). All warning stimuli are available from the first author.

Measures

Emotional reactions—We assessed negative emotional reactions using the stem 'How much does the warning make you feel...' 'anxious', 'disgusted', 'sad', 'scared' and 'guilty'.[37] Response options ranged from 'not at all' (coded as 1) to 'extremely' (5); responses were averaged (α=0.94).

Cognitive elaboration—We assessed cognitive elaboration using two items: 'This warning makes me think about the risks of using cigarillos' and 'This warning helps me better understand the risks of cigarillo smoking'. Response options ranged from 'strongly disagree' (coded as 1) to 'strongly agree' (5). These items were averaged (r=0.75).

Perceived message effectiveness—We assessed PME using the UNC Perceived Message Effectiveness Scale,[43] adapted for cigarillos: 'This warning makes cigarillos seem unpleasant to me'; 'This warning makes me concerned about the harmful effects of using cigarillos'; and 'This warning discourages me from wanting to use cigarillos'. The response scale ranged from 'strongly disagree' (coded as 1) to 'strongly agree' (5); responses were averaged (α = 0.92).

Tobacco use and susceptibility—As part of the screener, we asked participants about their ever and past 30-day cigarillo use, and never users about susceptibility. Susceptible non-users were defined as those who answered 'definitely yes', 'probably yes' or 'probably no' to any of the following five items shown to predict cigarette smoking experimentation: (1) 'Do you think that you will smoke cigarillos soon?'; (2) 'Do you think that in the future you might experiment with cigarillos?'; (3) 'At any time during the next year do you think you will smoke a cigarillo?'; (4) 'If your best friend were to offer you a cigarillo, would you use it?' or (5) 'Have you ever been curious about smoking a cigarillo?'.[52] Non-susceptible never users were excluded from the full survey. At the end of the survey, we asked about use of cigarettes, traditional cigars, little cigars, e-cigarettes, waterpipe tobacco and smokeless tobacco (chewing, moist snuff and snus).

Demographics—We assessed race, ethnicity, school enrolment, mothers' education and sexual orientation.

Analyses

We calculated descriptive statistics for sample demographic characteristics and tobacco use. We estimated weighted percentages using PROC SURVEYFREQ and weighted means using PROC SURVEYMEANS in SAS V.9.4 to account for sampling design features. Participant characteristics were compared between experimental conditions using F-tests for means. Linear regression models compared emotional reactions, cognitive elaboration and PME of the warnings between pictorial and text-only conditions. Models were fit using PROC SURVEYREG to account for the repeated measures (six warnings viewed per person) and sampling weights. Interactions were examined between experimental condition and cigarillo user status (past 30-day user, lifetime user or susceptible non-user). Preliminary analyses found no differences between the two pictorial conditions, so the two pictorial conditions

were combined for all presented analyses. All tests were two-sided with a 0.05 significance level.

RESULTS

Participants

Participants (N=661) were 18–29 years old (M=23.9, SE=0.24); 46.5% were female, 64.7% were white, 15.0% were Black/African–American, 21.9% were Hispanic; and 85.8% reported being heterosexual. Less than half the sample (41%) had a high school degree or less. Approximately one-third (34.1%) reported past 30-day cigarillo use; 41.4% reported lifetime cigarillo use (excluding past 30-day users); and 24.4% were susceptible non-users of cigarillos. There were no statistically significant differences in participant characteristics between the experimental conditions (data not shown). Table 1 shows sample characteristics.

Emotional reactions

Pictorial warnings (least square means (LSM)=3.02) elicited more negative emotional reactions than text-only warnings (LSM=2.41) ($F(1, 660)=37.2$, $p<0.001$) (table 2). We also found a significant interaction between condition and user status ($F(2, 660)=4.17$, $p=0.02$) (figure 2). The impact of pictorial warnings was greatest for past 30-day users ($d=0.99$, $p<0.001$). Differences in emotional reactions between pictorial and text warnings were significant for lifetime users ($d=0.47$, $p=0.002$), although the effect was lower than that for past 30-day users. There was no significant effect of pictorial warnings for susceptible non-users ($d=0.35$, $p=0.06$).

Cognitive elaboration

Pictorial warnings elicited greater cognitive elaboration (LSM=4.06) compared with text-only warnings (LSM=3.89), but the finding was not statistically significant ($F(1, 660)=3.6$, $p=0.06$) (table 2). However, we found a significant interaction based on condition and cigarillo user status (figure 2) ($F(2, 660)=3.37$, $p=0.04$). Past 30-day cigarillo users reported significantly greater cognitive elaboration about pictorial warnings compared with text-only warnings ($d=0.46$, $p=0.006$). No differences were found for lifetime ($d=0.06$, $p=0.65$) or susceptible non-users ($d=0.31$, $p=0.10$).

Perceived message effectiveness

Pictorial warnings (LSM=4.08) elicited higher PME than text-only warnings (LSM=3.76) ($F(1, 660)=12.8$, $p<0.001$) (table 2). Additionally, an interaction effect was found between condition (pictorial vs text-only) and user status (past 30-day user, lifetime user and susceptible non-user) ($F(2, 660)=4.1$, $p=0.02$) (figure 2). Pictorial warnings elicited significantly higher PME than text-only warnings among past 30-day users ($d=0.63$, $p<0.001$) and susceptible non-users ($d=0.44$, $p=0.01$), but not for lifetime users ($d=0.07$, $p=0.60$).

DISCUSSION

Our nationally representative experiment of young adult cigarillo users and susceptible non-users compared the responses of pictorial and text-only cigarillo warnings on message reaction and PME outcomes. Pictorial cigarillo warnings elicited greater negative emotional reactions, particularly among past 30-day or lifetime cigarillo users, and higher levels of PME, particularly among past 30-day user or susceptible non-users, compared with text-only cigarillo warnings, consistent with cigarette warnings research.[36] We also found pictorial cigarillo warnings elicited higher levels of cognitive elaboration among past 30-day users compared with text-only warnings. Overall, these findings suggest that pictorial warnings are superior to text-only warnings for cigarillos.

Importantly, those exposed to pictorial warnings had greater negative emotional reactions than those exposed to text-only warnings. Negative emotional reactions are an antecedent to quit intentions and behaviour for pictorial cigarette warnings, and research suggests that emotions are persuasive in changing behaviour because of their key role in message processing.[53] Inducing negative emotions can lead to more motivated message processing, especially if the message that evokes the emotions is personally relevant, such as cigarillo warnings being relevant for cigarillo smokers.[54] Additionally, pictorial warnings elicited higher ratings of PME compared with text-only warnings. PME is a valuable tool for selecting more effective messages, and it predicts quit intentions and behaviour.[44 47] Overall, our findings extend cigarette warnings research and suggest that cigarillo pictorial warnings are more effective than text-only warnings at garnering message processing, both cognitive and emotional.[36 41]

This study also explored the relative impact of pictorial versus text-only warnings based on cigarillo user status, and, in general, pictorial warnings significantly outperformed text-only warnings for our key outcomes within user groups. Consistent with the proposition that personally relevant messages that induce negative emotions can lead to more motivated message processing,[54] we found that negative emotional reactions were largest for those reporting past 30-day use, followed by lifetime use and finally by those classified as susceptible non-users who had non-significant ($p=0.06$) but perhaps still meaningful findings ($d=0.35$). Furthermore, cognitive elaboration was greater for pictorial warnings than text-only warnings for those reporting past 30-day cigarillo use. Warnings are likely to be perceived as more personally relevant to those who use cigarillos compared with non-users, and personal relevance can prompt users to think more about the harms of cigarillo smoking. These findings are similar to those in cigarette warning studies, with pictorial warnings leading to more thinking about the harms of smoking compared with text-only warnings.[24 27 41]

Importantly, cognitive elaboration about health risks is an important mechanism of warning effectiveness.[36] Similarly, pictorial warnings led to significantly greater PME ratings than text-only warnings for past 30-day users and susceptible non-users, but not lifetime users. These findings again showed the largest effects for past 30-day users, for whom cigarillo warnings are most relevant. Although findings were not consistent across the three cigarillo user groups, there were no cases in which text-only warnings outperformed pictorial

warnings. From a regulatory perspective, this suggests that although pictorial warnings may have heightened effects for current users, their population-level impact is still likely to be much greater compared with text-only warnings.

The current study was focused on responses to immediate warning reactions and was not designed to examine longer-term changes in beliefs or attitudes about cigarillos. However, growing evidence suggests that pictorial warnings seem to influence behaviour mostly through warning reaction mechanisms, such as negative affect and cognitive elaboration.[36 41 55] The MIF suggests that knowledge, attitudes and beliefs play an important role in warning effectiveness, and there is evidence, for example, that knowledge about the health risks of smoking increases after pictorial warnings are implemented.[25 56 57] However, risk beliefs may not change in response to warnings,[36 41] while other beliefs, such as intentions to quit, are likely to increase.[24] Future research should continue to examine additional mechanisms that influence cigarillo use behaviours, including more distal outcomes and their potential differential impact among cigarillo user groups.

The study findings can inform FDA regulation of cigars and regulation in other countries, such as strengthening warnings for cigarillos. Warnings for cigarillos have not changed in the USA since 2001,[58] and their impact has likely diminished over time. This study provides scientific evidence that could support FDA's efforts to better inform consumers about the risks of cigarillo smoking through improved product warnings. The tobacco industry in the USA has repeatedly challenged and delayed the FDA's efforts to implementing cigarette pictorial warnings. Prior court challenges to the cigarette warnings focused, in part, on the lack of evidence supporting pictorial warnings in achieving the government's stated interest.[49] Empirical studies such as the current study can begin to build the evidence base for the superiority of pictorial (vs text) warnings for cigarillos, laying the groundwork for future FDA action to improve cigarillo warnings.

Strengths of the study include cigarillo warnings developed through systematic formative research, an experimental design and a nationally representative sample. Limitations include that this was a single-exposure experiment. In the real world, users may have hundreds of exposures to cigarillo warnings on their packs, and thus our findings are likely to be an underestimate of effects. Furthermore, given the cross-sectional nature of our study, we were not able to examine changes over time, including behavioural outcomes. Research is needed to examine the longitudinal impact of repeated exposure of pictorial versus text-only cigarillo warnings on behaviour and other distal constructs in the MIF, including studies that label users' cigarillo packs with warnings.

This study presents the first test of responses to pictorial warnings for cigarillos among a nationally representative sample of young adult cigarillo users and susceptible non-users. We found that pictorial warnings were more effective than text-only warnings at generating negative emotional reactions and cognitive elaboration, particularly among cigarillo users. Pictorial warnings also elicited higher PME ratings compared with text-only warnings, and these effects were also more pronounced for past 30-day cigarillo users. These data can inform FDA regulation of cigars and regulation in other countries, such as strengthening warnings for cigarillos. Pictorial warnings for cigarillos show promise, and implementing

pictorial cigarillo warnings may contribute to reductions in tobacco-related morbidity and mortality.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Box 1

Food and Drug Administration cigar warnings

- WARNING: Cigar smoking can cause cancers of the mouth and throat, even if you do not inhale.
- WARNING: Cigar smoking can cause lung cancer and heart disease.
- WARNING: Tobacco smoke increases the risk of lung cancer and heart disease, even in non-smokers.
- WARNING: Cigars are not a safe alternative to cigarettes.
- WARNING: This product contains nicotine. Nicotine is an addictive chemical.
- WARNING: Cigar use while pregnant can harm you and your baby.

What this paper adds

- There is strong evidence that pictorial warnings are more effective than text-only warnings at influencing beliefs, intentions and behaviour for cigarette smoking.
- There is little evidence on the effectiveness of pictorial warnings for cigarillos.
- This study provides evidence that pictorial warnings are superior to text-only warnings for cigarillos.
- Study findings suggest that the effectiveness of pictorial warnings extends beyond cigarettes.

Figure 1.
Text and pictorial cigarillo warnings example study stimuli.

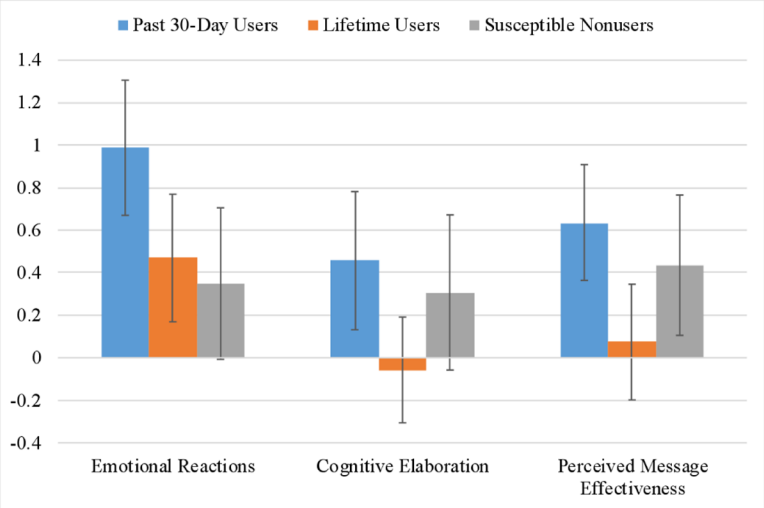

Figure 2.

Least squares mean differences and 95% CIs between pictorial and text-only warnings.

Table 1

Sample characteristics

Variable	N (%) or M (SE)
Age	23.9 (0.24)
Sex	
Male	257 (53.5)
Female	404 (46.5)
Race	
White	383 (64.7)
Black/African–American	104 (15.0)
American Indian or Alaska Native	8 (0.7)
Asian/Asian Indian	34 (4.9)
Native Hawaiian/other Pacific Islander	5 (0.6)
Other/multirace	127 (14.1)
Ethnicity	
Hispanic	190 (21.9)
Non-Hispanic	471 (78.1)
Sexual orientation *	
Gay, lesbian, bisexual or other	110 (14.2)
Heterosexual	541 (85.8)
Education (high school degree or less)	197 (41.0)
Household income less than $35 000	351 (44.3)
Cigarillo use status	
Cigarillo past 30-day use	216 (34.1)
Cigarillo lifetime use †	313 (41.4)
Cigarillo susceptible non-use	132 (24.4)
Other tobacco use	
Little cigar lifetime use	171 (24.4)
Traditional cigar lifetime use	256 (40.2)
Cigarette lifetime use	435 (61.7)
E-cigarette lifetime use	371 (57.3)
Waterpipe tobacco lifetime use	377 (51.0)
Smokeless tobacco lifetime use	128 (20.0)

Note: unweighted N, weighted %.

N=661.

* Seven participants reported ‘I don’t know’ and three participants skipped this question.

† Excluding past 30 days.

Table 2

Warning reactions (N=661)

	Pictorial warnings LSM (SE)	Text-only warnings LSM (SE)	*F*(df) or t value P value
Emotional reactions			
Overall	3.02 (0.07)	2.41 (0.07)	37.23(1,660) <0.0001
Subgroup interaction	–	–	4.17(2, 660) 0.0159
Past 30-day use	3.22 (0.10)	2.24 (0.13)	6.099 <0.0001
Lifetime use	2.97 (0.11)	2.50 (0.11)	3.07 0.0023
Susceptible non-use	2.79 (0.13)	2.24 (0.13)	1.92 0.0552
Cognitive elaboration			
Overall	4.06 (0.06)	3.89 (0.07)	3.60(1,660) 0.0582
Subgroup interaction	–	–	3.37(2, 600) 0.04
Past 30-day use	4.02 (0.09)	3.57 (0.14)	2.75 0.0061
Lifetime use	4.05 (0.09)	4.11 (0.09)	−0.45 0.6501
Susceptible non-use	4.10 (0.13)	3.80 (0.13)	1.65 0.0997
Perceived message effectiveness			
Overall	4.08 (0.05)	3.76 (0.07)	12.76(1,660) 0.0004
Subgroup interaction	–	–	4.07(2, 660) 0.0175
Past 30-day use	4.00 (0.09)	3.37 (0.11)	4.48 <0.0001
Lifetime use	4.07 (0.09)	4.00 (0.11)	0.53 0.5959
Susceptible non-use	4.20 (0.11)	3.76 (0.13)	2.58 0.0100

All measures were answered on 5-point scales.

LSM, least square means.