HHS Public Access

Author manuscript

Tob Control. Author manuscript; available in PMC 2020 August 01.

Published in final edited form as:

Tob Control. 2019 August ; 28(E1): e49–e51. doi:10.1136/tobaccocontrol-2018-054802.

US young adults' perceived effectiveness of draft pictorial e-cigarette warning labels

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Abstract

Significance—Research shows that pictorial warning labels for cigarettes are more effective than text-only warnings, and preliminary work suggests that pictorial warnings could also be considered for electronic cigarettes (e-cigarettes). Pictorial warnings may be important for maximising their effectiveness among young people and enhancing the salience of the single nicotine addiction warning required for e-cigarettes to date in the USA. This study collected pilot data about the perceived effectiveness of draft e-cigarette pictorial warnings.

Methods—Participants were 876 young adults (ages 18–29) recruited through Amazon Mechanical Turk who completed an online e-cigarette survey in 2018. Participants viewed and ranked five versions of the same e-cigarette nicotine addiction warning message— four pictorial and one text-only–on their perceived noticeability, likelihood of capturing young people's attention, memorability, relevance to the addiction warning text and overall effectiveness in warning people about e-cigarette risks. For each outcome, presentation of the five warning versions was randomised. Pictorials included symbolic images of risk and addiction, and of priority audiences for the warning (ie, young people).

Results—For all outcomes, pictorial warnings were ranked higher than the text-only warning, and the warning using a yellow triangle caution icon was ranked highest for all outcomes. The text-only warning was ranked as the least likely to be effective for all four outcomes in which it was assessed. Trends were similar for current e-cigarette users and non-users.

Conclusions—Future research should assess perceptions and the appropriateness of pictorial imagery for e-cigarette warnings and test their efficacy against text-only warnings experimentally.

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Contributors OAW designed and obtained funding for the study and contributed to data analysis and manuscript writing. JS and MTBM led the data analysis, and JS contributed to design and implementation of the study, data collection and manuscript writing. DH provided substantive input into the study design and drafts of the manuscript. All authors approved the final manuscript.

Competing interests None declared.

Patient consent for publication Not required.

Ethics approval The Institutional Review Board at Rutgers University granted approval for the study procedures. Participants were briefed on the survey procedures, then provided online consent to begin the survey.

Provenance and peer review Not commissioned; externally peer reviewed.

INTRODUCTION

Research shows that pictorial warning labels for tobacco products are more effective than text-only warnings, because they more effectively motivate tobacco cessation and increase warning attention, recall, negative affect, knowledge and thinking about the warning.[12] Most of the research on pictorial warning label effectiveness has examined traditional cigarettes. However, previous qualitative work with experts in tobacco warning label research suggests that pictorial warnings could also be considered for electronic cigarettes (e-cigarettes),[3] particularly as a means of maximising their effectiveness with young people, a priority audience for e-cigarette warnings. This may also be important given that only a single text warning about nicotine addiction is currently required in the USA by the Food and Drug Administration (FDA) for e-cigarettes. Although regulators may wish to indirectly convey the lower relative risk of vaping compared with smoking by reserving pictorial warnings for cigarettes, the more harmful product,[45] pictorial imagery is used in warnings for a wide range of consumer health products with relatively modest risk and thus may still be appropriate for e-cigarettes.

Preliminary empirical work suggests that adding visual elements to mandated e-cigarette text warnings may be effective. An assessment of young adults' exposure to text-only warnings found null effects and that warnings received little attention when presented in e-cigarette advertisements.[6] However, in a follow-up study, the authors found that the addition of colour to warnings affected warning attention,[7] an important first step in warning impact.[8] Although cigarette warnings include highly graphic pictorials of health effects, similar images may not be appropriate for e-cigarettes as their long-term health effects are unknown. This exploratory study aimed to examine the potential superiority of pictorial warnings for e-cigarettes and whether the use of other types of pictorials, such as symbols,[9] could improve attention to and perceived effectiveness of e-cigarette warnings.

METHODS

These pilot data were collected as part of a larger experimental study conducted in 2018 about e-cigarette warnings.[10] Participants included 876 young adult (ages 18–29) smokers and non-smokers in the USA, recruited through Amazon Mechanical Turk (M-Turk), who were randomly assigned to view e-cigarette ads with text warnings that varied by warning theme (nicotine addiction; nicotine impact on adolescent brain development; presence of harmful chemicals) and then responded to questions pertaining to e-cigarette use intentions and risk perceptions. Towards the end of the online survey, participants were then shown five versions of the same e-cigarette nicotine addiction warning—four pictorial and one text only (figure 1)—and were asked to rank them in order from 'most' to 'least' (with no ties allowed) for each of the following perceived effectiveness outcome measures: noticeability, likelihood of capturing young people's attention, likelihood of being remembered, relevance to the addiction warning message text (only pictorial warnings were ranked for this outcome) and overall perceived effectiveness in warning people about potential e-cigarette risks.[1112] Participants completed the rankings for each outcome one at a time. For each outcome, the five warnings were presented in random order to control for order effects.

Each warning used the same text required by the FDA as of August 2018: 'WARNING: This product contains nicotine. Nicotine is an addictive chemical'. Four different types of pictorial warnings were tested (see figure 1). A yellow triangle with a black exclamation mark in the middle represented a commonly used general warning icon. An icon featuring a stick figure kneeling and chained to a tobacco product was used to symbolise addiction. A portrait of a young woman with a neutral expression was intended to appeal to and be directed at young people—a priority target audience. Lastly, a more abstract pictorial featured a dark photo of an unidentifiable person surrounded by e-cigarette vapour to represent the behaviour in a negative light (theme referred to as a 'cloud of risk').

For ease of interpretation, participants' initial rankings (1–5) for each image and outcome were reverse-coded for analysis, such that higher ranking scores represented better/more favourable rankings for each outcome. Kruskal-Wallis tests were conducted to compare the distribution of rankings of each warning type for each perceived effectiveness outcome, and pairwise differences were tested using the Dwass-Steel-Critchlow-Fligner method. Ordinal logistic regression analyses were performed to assess whether ranking of each warning type differed by demographics or use of traditional cigarettes or e-cigarettes for the perceived overall effectiveness outcome; this measure encompasses the other outcome measures and is sometimes used as a single measure of perceived effectiveness.[13]

RESULTS

The average age of the 876 young adult participants was 25 years (SD=2.57) and 50.4% were female. The sample was predominantly non-Hispanic white (64.3%), 12.5% Hispanic and 10.6% non-Hispanic black. Over half (51.1%) had at least a college degree and most were employed (75.2%). About one-third of the sample (35.7%) were current smokers (ie, those who smoke cigarettes some days or every day). The majority of participants (61.0%) had ever tried an e-cigarette and 26.1% currently used e-cigarettes some days or daily.

Table 1 displays participants' mean rankings for each warning type for each perceived effectiveness outcome. There were significant ranking differences by warning type for each outcome ($p<0.001$). For all outcomes, the pictorial warning using the yellow general warning icon was ranked highest/most favourably relative to the other warnings, and the mean rank was highest for the perceived noticeability outcome. The text-only warning consistently received the lowest ranking scores for all four outcomes in which it was assessed.

Multivariable ordinal logistic regression results indicated no associations between rank of the overall perceived effectiveness outcome and age, sex, or race/ethnicity for any warning type (data not in the table). However, there was a significant association between the ranking of the yellow general warning icon (for overall perceived effectiveness) and smoking status, such that the odds of more favourably ranking this warning type were significantly higher for current smokers relative to non-smokers (OR: 1.39; 95% CI 1.00 to 1.92; p=0.047), adjusted for age, sex, race/ethnicity and current e-cigarette use. A similar association was observed for current e-cigarette users; however, this association did not reach statistical significance (OR: 1.39; 95% CI 0.98 to 1.96; p=0.063). Neither current smoking nor current

e-cigarette use was associated with the overall perceived effectiveness ranking of the other warning types.

DISCUSSION

This exploratory study with young adults investigated the perceived effectiveness of pairing an e-cigarette warning about nicotine addiction with different types of imagery. Previous work on pictorial warnings for cigarettes has shown nicotine addiction to be the health effect most challenging to effectively communicate visually, given that addiction is an abstract concept.[1] Nevertheless, the pictorial warnings tested in this study, even though not all perceived as equally related to the addiction theme, were still perceived as more effective than the text-only warning version. Notably, the message including the yellow general warning icon, a familiar symbol for caution,[9] was perceived as the strongest for each of several outcomes and the most effective overall.

This study is limited because participants were exposed to the pictorial e-cigarette warnings in isolation and not presented in an advertisement or on e-cigarette devices or packaging. Such exposure may produce different results and should be explored in future studies. In addition, we cannot determine whether participants' rankings may have been influenced by a single exposure to an e-cigarette advertisement (with or without a warning statement) in the broader experiment prior to participants' exposure to pictorial warnings. However, we also tested for outcome differences between the text warning message conditions of the broader experiment and found no significant differences by experimental condition. The results of this study were based only on perceived effectiveness measures, and future experimental studies should examine the effectiveness of different types of symbolic imagery in e-cigarette warnings compared with text-only warnings using additional measures, such as attention, recall and cognitive elaboration. Research should also investigate how the use of pictorial e-cigarette warnings impacts relative risk perceptions of e-cigarettes and cigarettes. Lastly, more representative samples of participants should be used, as those recruited through M-Turk tend to be younger, more educated, more likely to be white and Asian, and have above-average cognitive aptitude than the general population.[14]

Unique consideration should be given to the potential use of pictorial warnings for e-cigarettes. From a regulatory and policy standpoint, it may be argued that the design of and requirements for vaping warnings should be less comprehensive than cigarettes, to imply the differences in relative risk between the two product categories. As such, one approach could be to reserve the use of pictorial warnings only for the most harmful tobacco products, particularly cigarettes. Yet it should be noted that the use of pictures is a common tool to increase the general impact for a variety of warnings targeted at a broad population, such as transit signs and warnings on packages for other product categories.[15,16] An alternative approach could be to make use of a simple set of pictorials for e-cigarettes, including commonly recognised warning symbols, while reserving more graphic and negative imagery for cigarette warnings.

Funding

This work was supported by a grant (K01CA189301) from the National Cancer Institute (NCI) and the Food and Drug Administration Center for Tobacco Products (FDA CTP). Contributions by OAW were also supported in part by U54CA229973 from NCI and the FDA CTP.

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What this paper adds

- Pictorial warning labels have been shown to be more effective than text-only warnings for cigarettes, suggesting similar warnings could be used for electronic cigarettes (e-cigarettes).
- It is unknown which types of pictorial warnings for e-cigarettes may be perceived as most effective by young adults—a priority audience for e-cigarette risk communication.
- Pictorial addiction warnings were perceived to be more effective than the current Food and Drug Administration-required text-only e-cigarette addiction warning.
- A pictorial warning using a yellow triangle caution icon was perceived to be the most effective addiction warning overall.

Pictorial message type	Message tested
Yellow general warning icon	 **WARNING: This product contains nicotine. Nicotine is an addictive chemical.**
Addiction icon	 **WARNING: This product contains nicotine. Nicotine is an addictive chemical.**
Target audience-female	 **WARNING: This product contains nicotine. Nicotine is an addictive chemical.**
Cloud of risk to user	 **WARNING: This product contains nicotine. Nicotine is an addictive chemical.**
Text only	**WARNING: This product contains nicotine. Nicotine is an addictive chemical.**

Figure 1.
Pictorial messages tested for message outcomes.

Table 1

Mean rankings of e-cigarette warnings, by message outcome among US young adults (N=876), M (SD)

	Pictorial warnings					
	Yellow general warning icon	**Addiction icon**	**Target audience- female**	**Cloud of risk to user**	**Text only**	**P value***
Mean ranking (SD) as most:						
Likely to be noticed	4.44 (1.02)	2.78† (1.07)	2.79 (1.29)†,‡	2.92 (1.13)*	2.06 (1.36)	<0.001
Likely to capture young people's attention	3.70 (1.31)	2.77 (1.09)	3.50 (1.37)	3.21 (1.17)	1.81 (1.28)	<0.001
Likely to be remembered	3.70 (1.29)	2.95 (1.17)	3.23§ (1.31)	3.23§ (1.27)	1.89 (1.35)	<0.001
Relevant to the addiction message	3.18 (1.09)	2.52¶ (0.90)	1.78 (1.07)	2.52¶ (0.94)	NA	<0.001
Effective overall in warning people about potential e-cigarette risks	4.23 (1.18)	2.90** (1.14)	2.49*** (1.31)	2.99** (1.19)	2.39*** (1.42)	<0.001

Cell entries are mean rankings (SD) based on a scale from 1 to 5, with higher values indicating higher rankings/more favourable impressions of the warning. For each row and outcome, means with the same superscript symbols indicate no significant pairwise differences; all other means are significantly different from one another according to pairwise tests using the Dwass-Steel-Critchlow-Fligner method.

*Significant differences between all pictorial message groups on all message outcome were based on Kruskal-Wallis tests.

e-cigarettes, electronic cigarettes; NA, not available.